Annual Report

2013–2014

सत्यमेव जयते

Department of Scientific and Industrial Research
MINISTRY OF SCIENCE AND TECHNOLOGY

http://www.dsir.gov.in

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DSIR ANNUAL REPORT

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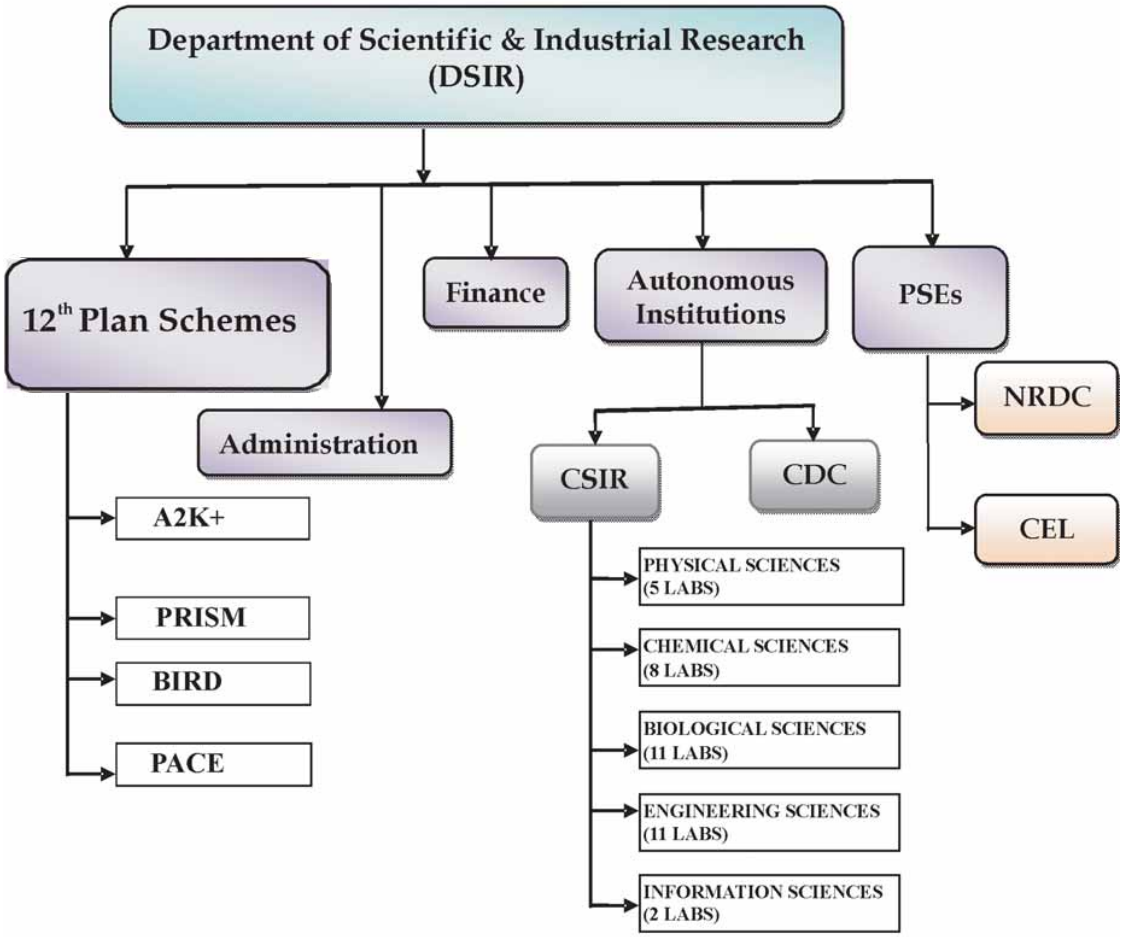
FUNCTIONAL STRUCTURE



PRISM	Promoting Innovation in Individuals, Start-ups and MSMEs
PACE	Patent Acquisition and Collaborative Research and Technology Development
BIRD	Building Industrial Research and Development
A2K+	Access to Knowledge for Technology Development and Dissemination
CSIR	Council of Scientific and Industrial Research
CDC	Consultancy Development Centre
PSEs	Public Sector Enterprises
NRDC	National Research Development Corporation
CEL	Central Electronics Limited

Highlights of Annual Report 2013-14

DSIR ANNUAL REPORT

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HIGHLIGHTS

- A National Conference on 'Accelerating Technology Innovation for Inclusive and Sustainable Growth' was organized by DSIR on 7th November, 2013 at Vigyan Bhawan, New Delhi in collaboration with National Manufacturing Competitiveness Council (NMCC)

- Around 64 technologies developed under the scheme TDDP have been commercialized or are under commercialization. The department has received about Rs. 17.52 Crore royalty on the projects supported during 2001-2013.

- The department has also successfully completed sixty-two (62) on-going TePP projects supported during 11th five year plan. Some of the successfully completed projects are CNG Magneto rheological finishing machine, Tractor mounted pulverizer, Innovation of high performance cricket leg gear, Supportive limb for physically challenged, Multi-crop portable circular oil expeller, Process technology for production of Photographic Films, Portable non-invasive Oral Cancer Detection System, "2 in 1" , Self secured orthodontic spring separator for predictable separation of teeth in orthodontic patients and so on.

- During 2013-14, BIRD crf SFC document was prepared and CRTDH programme received SFC approval with a budget outlay of Rs 41 cr (*Ministry of MSME has committed during SFC to contribute in addition Rs 30 crores for creating CRTD-Hubs at appropriate locations in the plan period).* Draft scheme document including guidelines and application format has been prepared and are submitted for approval.

- DSIR is the nodal Department for granting recognition to in-house Research and Development centres of industry. As on 31st March, 2014, there were 1820 in-house R&D centres with DSIR recognition. Of these, 79 Industries incurred an annual expenditure of over Rs. 50 crores each, 320 Industries incurred an annual expenditure in the range of Rs. 5 crore to Rs. 50 crores and 262 Industries incurred an annual expenditure in the range of Rs. 2 crore to Rs. 5 crores.

- Secretary, DSIR is designated as the Prescribed Authority under section 35(2AB) of Income-tax Act, 1961. Fresh approvals were accorded to 207 companies by the prescribed authority

- DSIR Nomination of "Automation of DSIR Enterprises Operations & Industrial S&T Services Portal" was awarded 'Award of Recognition' by prestigious CSI-Nihilent e-Governance Awards instituted by the Computer Society of India's Special Interest Group on e-Governance and sponsored by Nihilent Technologies.

- Standing Finance Committee (SFC) Memo of the PACE scheme was first approved by

the Hon'ble Minister on 4th March, 2013, which was revised and the final SFC Memo was approved on 24th October, 2013. The scheme guidelines were approved by the competent authority on 31st October, 2013. In order to ascertain the areas in which SMEs would be interested in acquiring patents so that such patents can be acquired by DSIR and the same may be made avalable to the SMEs on a non-exclusive basis. Eight such Workshops were planned during the FY 2013-14. First four workshops were organized at Pune, Hyderabad, Coimbatore and Ludhiana. R&D and Academic Institutions which attended the workshop included: PEC University, UICET, Punjab University, Chandigarh, Lovely Professional University, Jalandhar, GSSDGS Khalsa College, Patiala, GHG Khalsa College of Pharmacy, PAU, Chandigarh, NIT, Jalandhar, PSCST, Chandigarh, GNDEC, Ludhiana, etc.

- CSIR Ranked at 81st among 2740 institutions worldwide, CSIR is the only Indian organization among the top 100 global institutions, according to the Scimago Institutions Ranking World Report 2013. CSIR holds the 16th rank in Asia and leads the country at the first position. CSIR's average output per scientist is not far behind in comparison to the other leading publicly funded organizations in the world. With a budget of about 4.34 Billion USD, CNRS, France average output per scientist is about 10.99, RIKEN, Japan with 1.07 Billion USD at 5.11 and CSIR with only 0.61 Billion USD is at an admirable 4.71.

- The scientific staff of CSIR only constitutes about 3-4% of India's scientific manpower but they contribute to about 10% of India's scientific outputs. For instance during 2012 CSIR published 5006 papers in SCI journals with Average Impact factor per paper 2.673.

- CSIR has published 5006 research papers during 2012 with an average impact factor per paper as 2.673 in SCI journals of national and international repute contributing to 9.43% of Indian R&D literature.

- CSIR-NAL developed an indigenous system for Detection and Hit Visualization using Acoustic N-wave Identification (DHVANI) for locating bullet hits on targets for the Indian Army. This involved the deployment of an array of acoustic sensors under the general flight path of such projectiles, acquiring and analyzing the signal in real-time and instantaneous display of results in a graphical form at the shooter's end. The system is cost effective and reduces training time

- The CSIR-IIP developed advanced soaker visbreaking technology has been transferred to M/s Hindustan Petrochemicals Limited (HPCL) and M/s Indian Oil Corporation Limited (IOCL). Test run has successfully been carried out at HPCL and the one at IOCL is expected to be completed very soon. It is expected to increase the profit of HPCL by Rs. 935 lakh per annum and that of IOCL by Rs. 845 lakh per annum. CSIR has earned a fee of Rs. 270 lakh.

- CEL has developed a number of products for the first time in the country through its own R & D efforts and in close association with the premier National & International Laboratories including Defense Laboratories.

- Result Framework document (RFD) for Department of Scientific & Industrial research for 2012-13 are placed in Departmental website. Composite score for the year 2012-13 was 81.51

DSIR ANNUAL REPORT

An Overview

1. Introduction
2. DSIR Programmes
3. RTI Act 2005
4. Autonomous Institutions
5. Public Sector Enterprises
6. Result Framework Document
7. ISO 9001: 2008

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I. AN OVERVIEW

1. INTRODUCTION

The Department of Scientific and Industrial Research (DSIR), one of the departments of the Ministry of Science and Technology, was set up through a Presidential Notification, dated 4th January, 1985 (74/2/1/8 Cab.). The mandate of DSIR includes promotion of industrial research for indigenous technology promotion, development, utilization and transfer. Shri Jaipal Sudini Reddy assumed as Union Minister for Science & Technology and Earth Sciences on 29th October, 2012. Prior to that Late Shri Vilasrao Deshmukh was holding the charge as Union Minister for Science & Technology and Earth Sciences.

The Allocation of Business for the Department is as follows:

- All matters concerning the Council of Scientific and Industrial Research.
- All matters relating to National Research Development Corporation.
- All matters relating to Central Electronics Limited.
- Registration and Recognition of R&D Units.
- Technical matters relating to UNCTAD and WIPO.
- National register for foreign collaborations.
- Matters relating to creation of a pool for temporary placement of Indian Scientists and Technologists.

The primary endeavour of DSIR is to promote R&D by the industries; support industrial units to develop state-of-the-art globally competitive technologies of high commercial potential; catalyze faster commercialization of laboratory-scale R&D; augment technology transfer capabilities; enhance the share of technology intensive exports in overall exports; strengthen industrial consultancy and establish a user-friendly information network to facilitate scientific and industrial research in the country. The DSIR has two public sector undertakings viz. National Research Development Corporation (NRDC) and Central Electronics Ltd (CEL) and two autonomous organizations viz. Council for Scientific and Industrial Research (CSIR) and Consultancy Development Centre (CDC). The Department also provides host facilities and assistance to Asian and Pacific Centre for Transfer of Technology (APCTT) as the focal point in the country.

2. DSIR PROGRAMMES

The Technology Promotion, Development and Utilization (TPDU) Scheme in 11th Five Year Plan was aimed at promoting technology development and industrial research in the country and encouraging its utilization by various sections of economy including industry, academic/research/scientific institutions and the society at large. The components of the TPDU programme were:

- Industrial R&D Promotion Programme (IRDPP)
- Technology Development and Demonstration Programme (TDDP)
- Technopreneur Promotion Programme (TePP)
- Technology Development Utilization Programme for Women (TDUPW)

During the 12th five year plan, the DSIR has initiated four schemes focusing on innovations, after the recommendation of the Steering Committee on Science and Technology, in-principle approval of the planning commission and approval of the Standing Finance Committee. The four schemes are:

(i) Promoting Innovations in Individuals, Start-ups and MSMEs (PRISM) - This scheme focuses on supporting individual innovators, start-up companies, incubatee companies in public funded technology business incubators and MSMEs *besides supporting the approved 11th Plan projects related to Technopreneur Promotion Programme (TePP) spilling over from the 11th five year plan.*

(ii) Patent Acquisition and Collaborative Research & Technology Development (PACE) - This is a new scheme focusing on technology acquisition and its development and demonstration for commercialization.

(iii) Building Industrial Research & Development (BIRD) - This is a new scheme which focuses on creation of common research facilities for micro and small enterprises and *subsumes components of the 11th Plan scheme, viz., Industrial R&D Promotion Programme, Information Technology and e - Governance (ITeG) and Asian and Pacific Centre for Transfer of Technology (APCTT).*

(iv) Access to Knowledge for Technology Development and Dissemination (A2K+) - This is a new scheme focusing on facilitating access to scientific journals by in-house R&D units of industry and Scientific and Industrial research Organizations (SIROs). *The scheme subsumes the 11th Plan component scheme on Technology Development and Utilization Programme for Women (TDUPW) and DSIR Building and Infrastructure. Besides, the scheme supports the approved 11th Plan projects related to Technology Development and Demonstration Programme (TDDP) spilling over from the 11th five year plan.*

Present report includes only the committed liabilities of 11th Plan Technology Promotion, Development and Utilization (TPDU) Scheme.

2.1 Major Achievements

The major achievements of the various programmes of the Department during the period under report are as under:

2.1.1 ACCESS TO KNOWLEDGE FOR TECHNOLOGY DEVELOPMENT AND DISSEMINATION (A2K+)

The twelveth five year plan scheme of (A2K+) has been evolved on the premises that access to knowledge is one of the most desirable inputs for any entrepreneur, innovator conceptualizing a business model to establish or run a company for wealth creation through innovative R&D interventions. The scheme includes the following programme components:

NEW PROGRAMME

- A2K for in-house R&D Industries and SIROs
- Industrial Technology related studies
- National and International conferences, exhibitions

ON-GOING PROGRAMME

- Technology Development and Utilization Programme for Women(TDUPW)
- Technology Development and Demonstration Programme (TDDP)

Two studies titled "Study on Innovative Interventions required in manufacturing sectors to make them globally competitive" and "Study on Identification of Innovative, Commercializable & Socially Relevant Technologies" were completed during the year. These reports have been uploaded on DSIR website.

A National Conference on 'Accelerating Technology Innovation for Inclusive and Sustainable Growth' was organised by DSIR on 7th November, 2013 at Vigyan Bhawan, New Delhi in collaboration with National Manufacturing Competitiveness Council (NMCC).

Nineteen projects were supported under Technology Development and Utilization Programme for Women (TDUPW). Five projects supported during the earlier period were completed during the year. Also efforts have been initiated for inviting online applications for projects under this program.

Under Technology Development and Demonstration Programme (TDDP) in operation since 1992 the department has supported 254 R&D projects of

Industrial units. These projects cover products and processes in various important industries such as metallurgy, electrical, electronics, instrumentation, mechanical engineering, earth moving and industrial machinery, chemicals and explosives, etc. Under the program 32% engineering; 27% electronics; 21% Chemical; 17% energy and waste utilization and 13% Health & Pharmas project have been supported. The TDDP supported projects covers 22 states with maximum number of projects supported to Andhra Pradesh 18% followed by Karnataka 15%, Maharashtra 13%, Delhi 10%, Tamil Nadu 10%.

Around 64 technologies developed under the scheme have been commercialized. The department has received about Rs.17.52 Crore royalty on the projects supported during 2001-2013.

2.1.2 Promoting Innovations in Individuals, Start-ups and MSMEs (PRISM)

PRISM (Promoting Innovations in Individuals, Start-ups and MSMEs) scheme aims at to support individual innovators which will enable to achieve the agenda of inclusive development - one of the thrust area of XIIth five year plan (2012-2017). It would also provide support to autonomous institutions or organizations or to society registered under the Societies Registration Act, 1860 or Indian Trusts Act, 1882 or other statues leading to development of state-of-art new technology solutions aimed at helping MSME cluster units.

The proposals shall preferably be considered in the following focus sectors: **Green technology, Clean energy, Industrially utilizable smart materials, Waste to Wealth, Affordable Healthcare, Water & Sewage Management and any other technology or knowledge intensive area.**

The financial assistance under the programme may vary from Rs. 2.00 lakh to Rs. 50.00 lakh. The department has also successfully completed sixty-seven (67) on-going TePP projects supported during 11th five year plan. Some of the successfully completed projects are CNG Magnetorheological finishing machine, Tractor mounted pulverizer, Innovation of high performance cricket leg gear, Supportive limb for physically challenged, Multi-crop portable circular oil expeller, Process technology for production of Photographic Films, Portable non-invasive Oral Cancer Detection System, "2 in 1" , Self secured orthodontic spring separator for predictable separation of teeth in orthodontic patients, Sollector Dish : A New Approach tp Solar Tracking for Concentrating Solar Power(CSP), Multiple Well CompletionTechnology and so on.

2.1.3 Building Industrial Research & Development And Common Research Facilities (BIRD-Crf)

In the current financial year of 2013-14, the Standing Finance Committee (SFC) meeting of BIRD-crf scheme for implementation under the 12th Five year plan was conducted. The scheme was approved subsuming a new component /programme-(i) Creation of Common Research and Technology Development Hubs (CRTDH) along with three ongoing programmes of DSIR namely (ii) Flagship programme - Industrial R&D Promotion Programme (IRDPP), (iii) Committed programme - Asian and Pacific Centre for Transfer of Technology (APCTT) (iv) Mandatory programme - Information Technology and e-Governance (IT-eG).

2.1.4 Industrial R&D Promotion Programme

DSIR is the nodal Department for granting recognition to in-house Research and Development centres of industry. As on 31st March, 2014, there were 1820 in-house R&D centres with DSIR recognition. Of these, 79 Industries incurred an annual expenditure of over Rs. 50 crores each, 320 Industries incurred an annual expenditure in the range of Rs. 5 crore to Rs. 50 crores and 262 Industries incurred an annual expenditure in the range of Rs. 2 crore to Rs. 5 crores.

Under the e-governance initiative of DSIR, department has started online application submission facility for greater accessibility and transparency of the department programmes/schemes. DSIR has been awarded the "CSI-Nihilent e-Governance Award 2012-13".

During the period under report, 197 in-house R&D centres were accorded fresh recognition and recognition of 330 centres was renewed.

Scientific research foundations in the areas of medicine; agriculture; natural and applied sciences; and social sciences seek DSIR recognition and registration as Scientific and Industrial Research Organisations (SIROs) under the programme granting recognition to SIROs. The registered SIROs are eligible for availing customs duty exemption on imports and central excise duty exemption on indigenous purchase of essential scientific and technical instruments,

apparatus, equipment (including computers), accessories, spare parts thereof and consumables, required for R&D activities. During the period under report, 41 SIROs have been accorded fresh recognition.

DSIR is the nodal Department for registration of public funded research institutions (PFRI), universities, IITs, IISc and NITs, for availing customs duty exemption and central excise duty exemptions under notifications 51/96-Customs and 10/97-Central Excise. During the period under report, 14 such institutions were newly registered with DSIR; and 107 institutions were granted renewal of registration.

Secretary, DSIR is designated as the Prescribed Authority under section 35(2AB) of Income-tax Act, 1961. Fresh approvals were accorded to 207 companies by the prescribed authority. Agreements of co-operation for R&D were also signed with these companies. The detailed R&D expenditure of the approved companies have also been examined by DSIR and 321 reports valued at Rs. 7517 crores have been forwarded to DGIT (E) in Form 3CL, as required under the IT Act.

2.1.5 Asian Pacific Centre for Transfer of Technology (APCTT)

The Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology (MOST), Government of India has been the national focal point of APCTT since its inception in 1977. Matters pertaining to the APCTT and UN-ESCAP are dealt with in cooperation with the Ministry of Commerce and Industry and the Ministry of External Affairs, Government of India. DSIR also plays an active role in APCTT's functioning, particularly relating to its programmes and policies. India being the host country, has been providing institutional support to APCTT. During the period under report, institutional support of US$ 200,000 in Indian Rupees was provided to APCTT for meeting local costs. In addition, funding for building repairs, renovation work, and municipal taxes was also provided. DSIR has also extended programme support towards the APCTT project entitled, "Promotion of National Innovation Systems (NIS) in Countries of the Asia-Pacific Region - Phase II". Among other Government of India support received by APCTT, the Ministry of New and Renewable Energy (MNRE) has funded another project entitled, "Establishing an Institutional Cooperation Mechanism to Promote Renewable Energy" in Asia and the Pacific. This project was successfully completed in 2012.

The revised Statute of APCTT, adopted by the Commission at its Sixty-first session in May 2005, through its resolution 61/4, stipulates among other things, that the Centre shall have a Technical Committee consisting of experts from members and associate members of ESCAP and from inter-governmental and non-governmental organizations. Members of Technical Committee shall be appointed by the Head of APCTT in consultation with the Executive Secretary of ESCAP. The Technical Committee shall be responsible for advising on the formulation of the programme of work and on technical matters concerning the operations of APCTT. The 9th Technical Committee of APCTT held at Kuala Lumpur, Malaysia was attended by departmental representative. It is also stipulated that the Centre shall have a Governing Council consisting of a representative designated by the Government of India and no fewer than eight representatives nominated by other members and associate members of ESCAP elected by the Commission. The members and associate members elected by the Commission shall be elected for a period of three years, but shall be eligible for re-election. The members of APCTT's Governing Council for the period 2011-2014 are Bangladesh, China, Fiji islands, India, Indonesia, Islamic Republic of Iran, Malaysia, Nepal, Pakistan, Philippines, Samoa, Sri Lanka, Thailand and Viet Nam. The 9th Governing Council held at Bangkok during the year was attended by the departmental representative.

2.1.6 Information Technology and e-Governance

IT-eG division implements e-Governance in the Department progressively that needs to be in conformance to the National eGovernance Action Plan. IT-eG Division operates on a separate IT Budget Head that came into effect in DSIR since FY 2004-05 for the implementation of an IT Action Plan.

A project entitled 'Design, Development, Implementation of Enterprise Application and Maintenance Support Services for DSIR' is ongoing. The project has two RFPs, ie. RFP1 includes Enterprise Integration, Program Implementation and eService Delivery and RFP2 includes Office Automation Solution, Workflow Management, Record Management, and Data Warehousing. Most of the programmes / modules have been made functional under the ERP project and are being reviewed regularly. Hands-on-Training is being imparted to the DSIR employees for use various modules developed and gone live. DSIR Nomination of

"Automation of DSIR Enterprises Operations & Industrial S&T Services Portal" was awarded 'Award of Recognition' by prestigious CSI-Nihilent e-Governance Awards instituted by the Computer Society of India's Special Interest Group on e-Governance and sponsored by Nihilent Technologies. The award, now into its second decade, is a gold standard for evaluating e-Governance projects in the country. Shri J. Satyanarayana, Secretary, DeitY, Government of India was chief guest for the awards function and presented the award to DSIR team at a grand ceremony of 48th Annual Convention of CSI held in Visakhapatnam.

3. RTI ACT 2005

The Right to Information Act 2005, enacted on 15th June 2005, has been implemented successfully in the department. As per the provisions of the Act Nodal Officer, Appellate Authority, Transparency Officer, Central Public Information Officer and Central Assistant Public Information Officer are designated:

The proactive disclosures under Section 4 (1) (b) of the RTI Act 2005 enacted on June 15, 2005 are regularly updated and available on the DSIR Website at http://dsir.gov.in/rti/rti-dsir.htm DSIR has complied with the directives received from Central Information Commission.

DSIR has received 164 Applications during 2013 [01/01/2013 to 31/12/2013] and all the Applications were registered and disposed off on RTI Request & Appeal Management Information System, http://164.100.42.72/rrmis/ and http://www.rtionline.gov.in/RTIMIS.

DSIR has been effectively using various IT applications like RTI-MIS Updation System at http://164.100.42.72/rtiupd/, RTI Request & Appeal Management Information System at http://164.100.42.72/rrmis/ and http://www.rtionline,gov.in/RTIMIS, RTI Annual Return Information System at http://rtiar.nic.in. The quarterly returns were uploaded on RTI Annual Return Information System at http://rtiar.nic.in.

4. AUTONOMOUS INSTITUTIONS

4.1 Council of Scientific and Industrial Research (CSIR)

4.1.1 Preamble

Constituted in 1942, The Council of Scientific & Industrial Research (CSIR), an autonomous body known for its cutting edge R&D knowledgebase in diverse S&T areas, is a contemporary R, D & E organization. Having pan-India presence, CSIR has a dynamic network of 38 national laboratories, 39 outreach centres, 3 Innovation Complexes and 5 units. CSIR's R&D expertise and experience is embodied in about 4600 active scientists supported by about 8000 scientific and technical personnel.

Wide spectrum of science and technology is covered by CSIR - from radio and space physics, oceanography, geophysics, chemicals, drugs, genomics, biotechnology and nanotechnology to mining, aeronautics, instrumentation, environmental engineering and information technology. It provides significant technological intervention in many areas with regard to societal efforts which include environment, health, drinking water, food, housing, energy, farm and non-farm sectors. Further, CSIR's role in S&T human resource development is noteworthy.

Pioneer of India's intellectual property movement, CSIR today is strengthening its patent portfolio to carve out global niches for the country in select technology domains. CSIR is granted 90% of US patents granted to any Indian publicly funded R&D organization. On an average CSIR files about 200 patents in India and 300 patents in abroad per year. About 9% of CSIR patents are licensed - a number which is above the global average. Amongst its peers in publicly funded research organizations in the world, CSIR is a leader in terms of filing and securing patents worldwide.

CSIR has pursued cutting edge science and advanced knowledge frontiers. The scientific staff of CSIR only constitutes about 3-4% of India's scientific manpower but they contribute to about 10% of India's scientific outputs. For instance during 2012 CSIR published 5006 papers in SCI journals with Average Impact factor per paper 2.673.

For boosting entrepreneurship CSIR has operationalized desired mechanisms, which could lead to enhanced creation and commercialization of radical and disruptive innovations, underpinning the development of new economic sectors.

CSIR has put in place CSIR@80: Vision & Strategy 2022 - New CSIR for New India. CSIR's mission is "to build a new CSIR for a new India" and CSIR's vision is to "Pursue science which strives for global impact, technology that enables innovation-driven industry and nurture trans-disciplinary leadership thereby catalysing inclusive economic development for the people of India".

- **CSIR's Global Positioning**

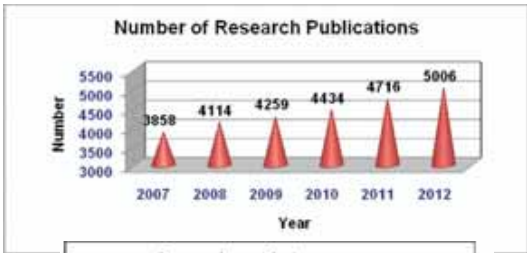
Ranked at 81st among 2740 institutions worldwide, CSIR is the only Indian organization among the top 100 global institutions, according to the Scimago Institutions Ranking World Report 2013. CSIR holds the 16th rank in Asia and leads the country at the first position. CSIR's average output per scientist is not far behind in comparison to the other leading publicly funded organizations in the world. With a budget of about 4.34 Billion USD, CNRS, France average output per scientist is about 10.99, RIKEN, Japan with 1.07 Billion USD at 5.11 and CSIR with only 0.61 Billion USD is at an admirable 4.71.

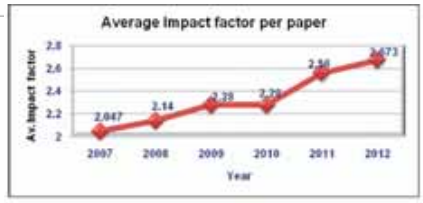
4.1.2 Scientific Excellence

- CSIR has published 5006 research papers during 2012 with an average impact factor per paper as 2.673 in SCI journals of national and international repute contributing to 9.43% of Indian R&D literature.

Table : World Ranking of Indian S&T Organizations

Organization	World Rank	Publica-tions	Patents (Unique Published PCT Appln/ US Granted)	Scientific Manpower	R&D Expenditure (Federal + Instl. Funding)
CSIR, India	81	5067	73/51	4600	$ 612Mn
Massachusetts Institute of Technology, USA	43	5161	196/270	3470	$ 1.28 Bn
Mayo Clinic, USA	68	4702	47/52	3330	$ 885Mn
California Institute of Technology, USA	102	3256	91/137	1537	$ 654Mn
Fudan University, China	86	4555	31/3	2678	NA
National Institute of Advanced Industrial Science & Technology, Japan	136	2071	131/101	2288	~ $ 791Mn
Oak Ridge National Laboratory, USA	308	1781	29/61	3000	$1.65Bn





- Several research papers were in high impact factor journals like Chemical Reviews' (IF 41.298) , 'Lancet' (IF 38.278), 'Nature' (IF 38.597), 'Science' (IF 31.20), 'Chemical Society Reviews' (IF 28.76) etc. Following Graphs show the trend of research over the last few years.

Value Generation through Intellectual Property

- CSIR has filed 367 patents abroad and 200 patents in India during 2012-13. It is maintaining a portfolio of 2767 patents abroad and 1746 patents in India as on 31.03.2013 with 13.86% utilization as on 20.09.2012. The following graph provides data on patents filed and patents granted over the last five years.

Creating and Nurturing S&T Human Resource

CSIR has been systematically creating and nurturing highly qualified S&T manpower in the country. It is presently supporting more than 8000 Research fellows, 159 Senior Research Associates and more than 1000 research schemes to various universities.

CSIR Scientists in Frontier of Science

CSIR scientists are well recognized and are awarded prestigious fellowships and conferred awards regularly. A glimpse of these recognitions is given below:

Shanti Swarup Bhatnagar Prize 2012: Shantanu Chowdhary, CSIR-IGIB, Gangadhar J. Sanjayan,CSIR-NCL

Infosys Foundation Award 2012 and 2013: Dr. Ashish Lele CSIR-NCL, Dr. A. Ajayaghosh, CSIR-NIIST, Dr. Rajesh Gokhale, CSIR-IGIB

INSA Fellows (w.e.f. 1.1.2013): Dr. A. Ajayaghosh, CSIR-NIIST, Dr. P.S. Ahuja, CSIR-IHBT, Prof. Gautam Biswas CSIR-CMERI, Dr. Madhu Dikshit, CSIR-CDRI, Dr. A.K. Giri, CSIR-IICB, Dr. K. S. Krishna, CSIR-NIO, Dr. G. Parthasarthy, CSIR-NGRI, Dr. R. Sankaranarayanan CSIR-CCMB, Dr. Yogendra Singh CSIR-IGIB,

Infosys Prize 2013

INSA Medal for Young Scientist 2012 and 2013: Kaushik Biswas,CSIR-CGCRI, Kaushik Chakraborty,CSIR-IGIB, R K Chaturvedi,CSIR-IITR, Maheshwar Ojha,CSIR-NGRI, Suman Dasgupta,CSIR-NEIST, Dr. Arun Trivedi, CSIR-CDRI, Dr. Susanta Kar, CSIR-CDRI, Dr. Rajeev Saraswat, CSIR-NIO

The shield and certificate won by CSIR

4.1.3 Some noteworthy accomplished

Thomson Reuters India Innovation Award 2013

CSIR bags Thomson Reuters India Innovation Award 2013 in the category of Hi-Tech Academic & Government. CSIR was given this award in 2010 but could not be considered eligible for the award for last 2 years (2011 and 2012) as per the methodology that Thomson Reuters follows.

Infosys Prize 2013 in Life Sciences is awarded to Dr. Rajesh S. Gokhale, Director, CSIR-Institute of Genomics and Integrative Biology (CSIR-IGIB), Delhi. Since its inception in 2009,this is the 4th prize to CSIR Scientists (two in Life Sciences, one in Engineering and Computer Sciences and one in Physical Sciences). It is testimony of that internationally competitive highest scientific research is being carried out in CSIR and CSIR has an outstanding young scientific leadership in position.The Infosys Prize has been instituted to enhance the prestige of scientific research in India and inspire young Indians to choose a vocation in scientific research. The prize is given annually to honor outstanding achievements of researchers and scientists across six categories namely, Engineering and Computer Sciences, Humanities, Life Sciences, Mathematical Sciences, Physical Sciences and Social Sciences.

Open Source Drug Discovery (OSDD) Programme: A unique platform for innovation in the domain of affordable healthcare

CSIR launched Open Source Drug Discovery (OSDD) programme is a unique platform for innovation in the domain of affordable healthcare. Known world over, OSDD has emerged as a CSIR-led 'Team India' consortium with global partnership. It has more than 7000 researchers from 130 countries as registered

participants. Working towards the objective of finding new drugs for neglected diseases with Tuberculosis (TB) as the first target disease, OSDD's Clinical Trial of a new molecule and a new combination for TB treatment, in collaboration with the Global Alliance for TB, is awaiting desired clearances. The OSDD has been hailed as one of the successful open innovation models by magazines like Science, Forbes etc. During the 12th Five Year Plan, OSDD will cover diseases like Malaria and Leishmaniasis (Kala-Azar) and it will have four verticals namely, Open Source Drug Discovery; Open Source Drug Development; Open Source Drug Delivery and Open Source Disease Diagnostics.

CSIR-Fourth Paradigm Institute

CSIR has transformed its unit namely CSIR-Centre for Mathematical Modelling & Computer Simulation (CSIR-CMMACS) as CSIR-Fourth Paradigm Institute (CSIR-4PI) in order to empower high end computational and data intensive scientific research in CSIR to complement and implement the envisaged 12th Five Year Plan Activities of CSIR cutting across all the five clusters and thus foster trans-disciplinary research. CSIR-4PI is a hub and spoke architecture with geographical & scientific spread. The major goal of the CSIR-4PI is to achieve a global leadership position in the informatics domain. The hub is located in Bengaluru and the spokes are seven fourth paradigm units (4PUs) located in Chandigarh, Chennai, Delhi, Hyderabad, Kolkata, Nagpur, and Pune, each focusing on a specific domain/cluster to support the planned objectives of CSIR-4PI. CSIR has setup a High Computing facility (360 TFOPS peak with 304 TFLOPS sustained on LINPACK). Access to this computing facility, no. 1 supercomputer in India and 82nd Global Supercomputers list (November, 2012), is through National Knowledge Network.

Societal Benefits due to CSIR-IMTECH's Streptokinase

After introduction of CSIR's streptokinase, prices have dropped (by 65 percent, to less than one month of per capita income), availability has increased, access to a life-saving medicine has risen, and patients have realized a worth of over Rs. 16,000 crores. The economic impact, or the additional benefit that would be lost if this CSIR-IMTECH Streptokinase technology intervention had not been there, is assessed based on medical impact of Streptokinase and using per capita income to be Rs. 2180 crores. The Lab itself accomplished net earnings valued at Rs. 1.8 crores and the Industry partners together realized value addition of Rs. 17 crores.

Council of Scientific and Industrial Research (CSIR) and National Innovation Council (NInC) Partnership on Micro, Small and Medium Enterprises Cluster Innovation Programme

CSIR & NInC have entered into a Memorandum of Understanding (MoU) to enhance the innovation capability and capacity of 26 million MSMEs of the country, through establishment of 'Cluster Innovation Centres' at 150 identified MSME clusters. The initiative is creating enabling frameworks for technological interventions/innovations, which will in turn contribute to enhanced productivity and competitiveness of MSMEs. Six Pilot Clusters have been made operational namely (i) Mango Cluster, Krishnagiri (ii) Brass Cluster, Moradabad (iii) Bamboo Cluster, Agartala (iv) Auto Cluster, Faridabad (v) Ayurveda Cluster Thrissur, and (vi) Life Sciences Cluster, Ahmedabad. As a part of this focused effort, CSIR scientists have developed: protocols for Mango Cluster for enhancing the storage life of Krishnagiri mangoes from 7 days to 35 days; for the Brass Cluster Moradabad, a lacquer has been developed to give more shine to Moradabad Brass artifacts vis-à-vis Chinese Products and an efficient furnace has been developed and handed over for commercial use; and at Agartala Bamboo Cluster, cheaper alternative to Jiget binding material for making Agarbatties has been developed.

CSIR has also decided to take up additional 62 MSME Clusters for seeding innovations.

Energy Efficient Brass Melting Furnace

Moradabad Brassware cluster has roughly 29000 units with 3,50,000 employees and is exporting brasswares worth Rs. 2500 crore. All the units were using primitive coal furnaces for melting of brass which was not only non-economical but also posing great health hazard to its employees. As an initiative of CSIR- National Innovation Council (NInC) collaboration, CSIR-NML developed smoke-free coal furnace which handles more charge (brass melt), reduces gas emission and pollution by 80% and consumes 20% less coal. The furnace is costing Rs. 9600 which can fetch an annual return of Rs. 1.5 lakh/annum. It is user friendly as artisans can adopt this furnace without changing their current practices and like the present furnace; this modified version can also be repaired by the artisans. The knowhow has been transferred to Moradabad Industrial Development Company Private Limited (MIDCO) free of cost under an agreement on 25thJune, 2013 in the presence of Chairman, NInC.

Tejas Flight Simulation

The encounter of modern combat fly-by-wire aircraft with the wake of another aircraft during combat, formation flying or refueling is fraught with hazards. A simulation model of the fighter aircraft has been developed by CSIR-National Aerospace Laboratories (CSIR-NAL) incorporating the rigid body dynamics air data system and flight control laws to clear Tejas for the wake penetration trials. The flight model was also incorporated into the Engineer-in-the-loop Simulator (ELS) to enable the pilots to practice the wake penetration flight test profiles. The ELS simulator was used for evaluation of the auto-throttle mode, and for the Autopilot design and high-Angle-of-Attack studies.

DHVANI for Indian Army

CSIR-NAL developed an indigenous system for Detection and Hit Visualization using Acoustic N-wave Identification (DHVANI) for locating bullet hits on targets for the Indian Army. This involved the deployment of an array of acoustic sensors under the general flight path of such projectiles, acquiring and analyzing the signal in real-time and instantaneous display of results in a graphical form at the shooter's end. The system is cost effective and reduces training time

Drishti Systems at Main Runway 28-10 of IGI Airport

Based on the excellent performance of Drishti installed at IGI Airport (New Delhi) in December 2011, Indian Meteorological Department requested NAL to install three more systems on a priority basis at the main Runway 28 of IGI Airport. The systems were needed to handle the urgent requirement of the winter season of 2012-13. In a record time of three weeks, three systems were fabricated and installed at the touchdown, mid & takeoff points of runway 28 in the first week of January 2013. Presently there are five Drishti systems at IGI airport, the only Cat III B airport in the country wherein aircrafts have to land under conditions of lowest visibility of 50 meters. Drishti system is capable of measuring visibility down to 5 meters and meets all the stipulations of International Civil Aviation Organisation (ICAO) & World Meteorological Organisation (WMO).

In December 2012, one more system was installed in Netaji Subhash Chandra Bose International Airport, Kolkata. The systems have been awarded International Class I certification. As on today, seven latest state of the art Drishti systems are working in three international airports viz., Lucknow, IGI (New Delhi) and NSCBI (Kolkata).

Certificate for Limited Series Production of a Wankel Engine

The second flight test of the indigenous 55 hp Wankel Rotary Combustion Engine (WRCE) was carried out on 20 June 2012 on the Aeronautical Development Establishment's (ADE), NISHANT UAV at Kolar airfield. This engine was the second flight worthy prototype delivered to ADE by CSIR-NAL. Two out of three engines produced by DRDO based on the CSIR-NAL design, through a private partner, were also flight tested and shown to meet the requirements of the mission. Based on the performance, CEMILAC accorded the Certificate for 'Limited Series Production' on 7thFebruary 2013.

Launch of RV Sindhu Sadhana

With the launching of new multi-disciplinary Oceanographic Research Vessel RV Sindhu Sadhana, on 31stJuly 2012, at ABG Shipyard, Surat, in the presence of Prof. Samir K Brahmachari, Director General, CSIR, the CSIR-NIO achieved an important milestone in the history of CSIR. This is one of the ambitious and prestigious projects of the CSIR taken up at a cost of Rs. 226.51 crores. The new Oceanographic Research Vessel will greatly enhance the capabilities of Indian oceanographers to make multi-disciplinary observations, with adequate spatial and temporal resolution, enabling them to understand the oceanographic process in the seas around India and to translate this knowledge to benefit the nation.

Design & Development of Remotely Operated Vehicle (ROV)

Remotely operated vehicles (ROVs) are robot submarines that are tethered to a ship, where “pilots” control their movement and actions. ROVs are often equipped with manipulator arms for grabbing, moving, or placing items in the sea. High-definition video and still cameras on the vehicles record images of sea life, geology, and experiments. The vehicles carry a variety of sampling equipment and sensors for collecting information about the ocean and seafloor. CSIR-CMERI has designed, developed and conducted successful sea trial of a Remotely Operated Vehicle christened ROV-500 at a depth of 500m on 27.08.13 with active support, cooperation and close association of National Institute of Ocean Technology (NIOT), Chennai. It is capable to operate at 500 m under the sea with a speed of 2-4 knots and collect the photographs of the

underwater environment on line as well as other useful information. On 24th August 2013, the ROV system was loaded onboard research vessel ORV Sagar Nidhi to carry out sea trial off the Chennai coast of the Bay of Bengal with active support of NIOT.

Development of an integrated micro PCR system with *in-situ* Identification

bigtec, Bangalore with support from CSIR-New Millennium Indian Technology Leadership Initiative (CSIR-NMITLI) has developed a handheld, battery operated microPCR with real-time detection. The system consists of a PDA running an application, a handheld unit housing the control electronics, a disposable chip with integrated temperature control elements and optical detection system for real time monitoring. The microPCR device (nanodgxTM) has dual wavelength detection system, enabling internal positive control based HBV qPCR. This duplex reaction on single chip avoids false negative results due to sample inhibition or reagent/chip malfunctioning. The primers/probe has been developed compatible for the duplexed reaction (IPC +HBV) and the system has been validated for sensitivity, specificity, quantitative linear range and reproducibility. The chips have been developed for detection of Tuberculosis, Malaria, Dengue, Chikungunya, Hepatitis B and H1N1, ailments that contribute significantly to the disease burden in India. The device is currently expected to cost a tenth of a conventional real-time PCR and a fifth of existing NAAT tests in the market and these can further come down with scale and early adoption by governmental programs. The microPCR was launched on Technology Day 2013 by Hon'ble Minister, S&T and ES and Vice President, CSIR, Shri S. Jaipal Reddy in the august presence of Hon'ble President of India.

Supercontinuum Light Source based on the Photonic Crystal Fiber

Under CSIR-NMITLI, M/s Vinvish Technology Ltd., Trivandrum along with CSIR-Central Glass & Ceramics Research Institute (CSIR-CGCRI) has developed Supercontinuum Light Source based on the Photonic Crystal Fiber. The developed product is powered by +24 VDC power supply and is affordable and relatively simple to operate. It has wide range of applications in the fields of industrial, medical, bio-photonics, nano-photonics, imaging, confocal microscopy etc.The Supercontinuum Light Source was launched by Hon'ble Minister, S&T and ES and Vice President, CSIR, Shri S. Jaipal Reddy on CSIR Foundation Day 2013.

Technology for production of tellurium metal powder from copper refinery anode slime - A technology developed by CSIR-IMMT, Bhubaneswar for Hindalco Ind. Ltd. (Birla copper unit), Dahej, Gujarat

The application of tellurium includes Cadmium telluride solar panels, free machining additives in metallurgy, catalysts, colour ceramics, etc. Massive commercial production of Cadmium telluride solar panels and Bismuth telluride in refrigeration technologies in recent years has significantly increased tellurium demand. The selling price of tellurium is ~US$ 200/kg. Average world production of tellurium is estimated at 450-500 tonnes per year. The world reserve of tellurium is around 24,000 tonnes contained mostly in copper resources.

Worldwide, more than 90% of tellurium is produced from anode slimes collected from electrolytic copper refining, and the remainder is derived from skimmings at lead refineries and from flue dust and gases generated during the smelting of bismuth, copper and lead ores. The anode slimes of copper and lead refineries normally contain about 3% tellurium. World refinery capacity is concentrated in USA, Japan, Canada, Belgium, Germany, Peru and Philippines. Hindalco Ind. Ltd. at their Birla copper unit produces ~2600 tpa anode slime. Presently a fraction of the tellurium resource is utilized for production of copper telluride. The present process developed by CSIR-Institute of Minerals and Materials Technology (CSIR-IMMT) utilizes the secondary material-anode slime, from copper refinery plant of Hindalco Industries Ltd. - A Birla copper unit, located at Dahej, Gujarat, for production of tellurium powder. At present, there is no plant producing tellurium in the country. Process know-how and basic engineering is provided by CSIR-IMMT for a plant capacity of 60 tpa tellurium (~13% of world tellurium production). By-products of 300 tpa copper cathode and 600 tpa lead sulphide will be produced.The process is a close loop process and hence will not produce any solid/liquid effluents. The residue after recovery of tellurium will be used for recovery of precious metals using existing process. Plant construction approval has been obtained. The plant is expected to be commissioned by June, 2014.

Iron ore beneficiation

- **Commercial plant of Brahmani River Pellets Ltd.**

Iron ore beneficiation plant was set up by Brahmani River Pellets Ltd. (BRPL) at Barbil (Odisha) on the process flowsheet developed at CSIR-Institute of

Minerals and Materials Technology (CSIR-IMMT), Bhubaneswar, to operate 6 million tonnes of low grade iron ore toproduce 4.5 million tonnes of iron ore concentrate. Thisconcentrate is to be transported through pipeline to their pellet plant which is situated ata distance of 250 km. The plant has been commissioned after gettingthe environmental clearance.

- **Commercial plant of Essar Steel India Ltd.**

Iron ore beneficiation plant was set up by Essar Steel India Ltd. on the process flowsheetdeveloped at CSIR-Institute of Minerals and Materials Technology (CSIR-IMMT), Bhubaneswar. The plant is located at Barbil (Odisha) toprocess 16 million tonnes of low grade iron ore to produce 12 million tonnes of iron oreconcentrate. This concentrate is to be transported throughpipeline to their pellet plant which is situated on the coast at Paradeep at a distance of 260km. The plant is under erection and commissioning after getting the environmentalclearance from Ministry of Forest & Environment, Govt. of India.

Indian origin of the European Romapopulations

Roma populations are distributed widely within Europe including the Balkans and Scandinavia as well as throughout the Near East. Linguistic studies established that the various dialects spoken by the Roma derive specifically from North India. The presence of Indian specific Y-chromosome haplogroup H1a1a-M82 and mtDNA haplogroups M5a1, M18 and M35b among Roma has corroborated that their South Asian origins and later admixture with Near Eastern and European populations. CSIR-CCMB performed a detailed phylogeographical study of Y-chromosomal haplogroup H1a1a-M82 in a data set of more than 10,000 global samples to discern a more precise ancestral source of European Roma populations. The phylogeographical patterns and diversity estimates indicate an early origin of this haplogroup in the Indian subcontinent and its further expansion to other regions. The short tandem repeat (STR) based network of H1a1a-M82 lineages displayed the closest connection of Roma haplotypes with the traditional scheduled caste and scheduled tribe population groups of northwestern India.

National Vector Borne Disease Control Program (NVBDCP)

Based on the effectiveness of the technique National Vector Borne Disease Control Program (NVBDCP), Ministry of Health, Government of India, has taken up the technology for its field application in phase wise manner. The preface action will be implemented in Gujarat, Arunachal Pradesh, Manipur, Assam and Mizoram.

First reporting of Native Gold Grains from the chromitites of Nuggihalli Schist Belt, South India

Occurrence of native gold in ultramafic (high magnesium rich) rocks is rare. CSIR-NGRI reported, probably for the first time, occurrence of native gold from the chromitite samples from the Mesoarchaean Tagadur Mines of the Nuggihalli Schist Belt (NSB), south India. The findings are based on Electron probe micro-analyser (EPMA) analysis of the thin sections of some rock samples. Distinct spectra of native gold grains, silver, copper, iron and tin as well as Fe-Ni-Cr-Cu alloys has been observed. These Tagadur Chromitites extend along a strike length ~1-2 km north of Tagadur Mines in a narrow zone of 50-90 m. The current findings warrant a re-evaluation of the economic potential of chromitite ores by mapping lateral and depth extent of this formation by detailed geophysical and geochemical exploration.

Simultaneous Production of US Grade Gasoline and Pure Benzene from FCC C6 Heart Cut

CSIR-IIP carried out substantial experimental and simulation studies with feedstock provided by M/s Reliance Industries Limited (RIL) and demonstrated that US grade gasoline and pure benzene can be simultaneously produced from a FCC C6 heart cut stream using extractive distillation (ED) route with aqueous NMP as the solvent. The gasoline thus produced has sulphur content <10ppm and benzene <0.3%. The technology has been transferred to RIL which is setting up 600,000 MTPA unit costing Rs. 160.00 crore. The annual gasoline production from this unit would equal to a prospective export monetary value of around 682 Million USD per annum with an additional profit of around 102 Million USD per annum from the sales of the recovered high purity benzene (Current market Value of Gasoline and Benzene ~ 1400 US $/ MT).

Advanced Soaker Visbreaking Technology

The CSIR-IIP developed advanced soaker visbreaking technology has been transferred to M/s Hindustan Petrochemicals Limited (HPCL) and M/s Indian Oil Corporation Limited (IOCL). Test run has successfully been carried out at HPCL and the one at IOCL is expected

to be completed very soon. It is expected to increase the profit of HPCL by Rs. 935 lakh per annum and that of IOCL by Rs. 845 lakh per annum. CSIR has earned a fee of Rs. 270 lakh.

Synthetic Aviation Lubricants

India is totally dependent on developed countries for its aviation lubricant requirements which are of immense strategic importance in the Defence-preparedness of our country necessitating self-reliance in this field. A Task Force involving CSIR-Indian Institute of Chemical Technology (CSIR-IICT) as Nodal Agency, Indian Oil Corporation Ltd (IOCL), CSIR-National Aerospace Laboratories (CSIR-NAL), Hindustan Aeronautics Limited (HAL), Gas Turbine Research Establishment (GTRE), and The Center for Military Airworthiness & Certification (CEMILAC) has been formed for developing indigenous capabilities in aviation lubricants. The Task Force shortlisted lubricants OX-27 meeting MIL PRF-23699F and OX-38 meeting DEF STAN 91-98 specifications for development.

CSIR-IICT has developed two lubricants, SVS11 and SVS21. A specialized bench & pilot scale facility, and a sophisticated analytical testing facility were established at CSIR-IICT. The Rolling Element Bearing Test Facility, a first of its kind in India, was established at CSIR-NAL. The developed lubricants have passed all the mandatory tests. With this landmark development, India has joined the select group of countries having capabilities in aviation lubricant technologies. Provisional Certificates for Airworthiness Approval has been granted by CEMILAC for SVS11 and SVS21 lubricants, which is essential for their commercial exploitation.

Technology Upgradation of Ethiopian Tanneries

Ministry of Trade and Industry (MoTI), Federal Democratic Republic of Ethiopia (FDRE) had enrolled the services of the CSIR-Central Leather Research Institute by invitation for the Bench Marking Program aimed at the Technology Upgradation of selected Ethiopian tanneries. With the technological interventions of CSIR-CLRI through two consultancy projects, the Ethiopian tanneries are emerging as reliable suppliers of quality finished leather in the International market.

Treatment and safe disposal of effluent

CSIR-NEERIhas provided a technological solution to M/s Mahindra Vehicle Manufactures Limited (MVML), Pune for treatment and safe disposal of its effluent using high rate transpiration system. The designed HRTS model was implemented in the field at M/s MVML, Pune. The HRTS design consists of filter media which provides more surface area for interaction of pollutants and also removes the suspended solids present in the wastewater was prepared.

CETP scale electro oxidation plant

The first ever CETP scale electro oxidation plant has been designed in India for treatment of highly recalcitrant chemical industry effluents, based on the technology developed by CSIR-NEERI. This technology helps to meet the effluent discharge norms (COD of 250 mg/l) with low foot print area (4m x 4 m per reactor) and is easy to install, operate and cost-effective.

Commercial plant for producing synthetic hydrotalcite (SHT)

Synthetic hydrotalcite (SHT), which has profound industrial applications due to its intercalation properties, is another such compound whose know how has been developed by CSIR-CSMCRI. The technology has been licensed to M/s Heubach Colour Ltd., Ankleshwar, part of the Multinational group famous in the pigment industry and well known for producing the base pigment for Ferrari red. M/s Heubach Colour Pvt. Ltd. has installed a commercial plant for producing 1000 tonnes per annum synthetic hydrotalcite (SHT) employing knowhow developed at CSIR-CSMCRI.

Technology for sodium extraction

Technology for sodium extraction for use in Fast Breeder Reactors developed, for the first time in the country, at 500 Amp scale wherein more than 20 kgs of sodium was produced. It is presently being scaled up to a 2000 Amp cell at the premises of Heavy Water Board at Baroda.

Autonomous Vertical Profiler

The AVP (Autonomous Vertical Profiler) technology (US Patent #6,786,087) developed by CSIR-NIO has been transferred to M/s CT Control Technology India Pvt. Ltd., Bengaluru, Karnataka. Weighing about 15 kg, made of aliminium alloy and having a speed upto 1m/s, the AVP offers a fast, cost effective, optimized approach to profiling in coastal waters. It consists of hands-free, motor driven in-situ robot profiler that

requires no operator skill or deployment gear, while fulfilling the requirement of repetitive sampling. It uses standard oceanographic sensors to measure parameters such as chlorophyll, conductivity, temperature, radiance, dissolved oxygen at high resolution in water depths ranging from 5-200 m. It can also be used for surveying in dams, lake and estuaries.

CSIR-800

- **CSIR-CIMAP Vetiver (Khus) bio-village for rural income enhancement**

The roots of Vetiver, commonly known as Khus, are the source of high value essential oil used in perfumery, cosmetics and flavour industries. Vetiver is normally cultivated as 18-20 months crop. CSIR-Central Institute of Medicinal and Aromatic Plants (CSIR-CIMAP) has developed a new variety CIM-Vridhi with reduced growth cycle of 10-12 months as compared to18-20 months. With a root yield of about 18 quintals/ha and oil content of 1.69%, the crop gives an yield of about 30 kg/ha of essential oil enabling a farmer to earn about Rs 1,50,000 as net profit per hectare. Reduction in cropping duration has provided flexibility to CIM-Vridhi to be accommodated in various kinds of crop-rotations (rice-vetiver; rice-wheat and vetiver; maize-potato-vetiver) as well as its co- cultivation with food (wheat and lentil) and medicinal aromatic crops (mints and Ocimum) which ultimately led to increased profits/ unit area over a period of time. Thus, it has provided a new dimension to diversification in agriculture (suitable to agro-forestry too) as well income augmentation of the farming community.

The demand of the crop has increased so high that participating farmers also started getting additional benefits by the sale of planting material. A farmer from Barabanki district could sell around 5,00,000 slips of this variety to other farmers interested in cultivation of vetiver (khus). CSIR-CIMAP's technological interventions through development of short duration (annual-12 months) and high yielding cultivar CIM-Vridhi with quality oil and potential to grow over a vast varying agro-climatic conditions, has attracted large number of farmers and has become popular among the farmers of U.P., Bihar, Chhattisgarh, Jharkhand, Karnataka, Orissa state in last couple of years. Farmers of Vidarbha, Assam, Meghalaya and Nagaland have shown keen interest in cultivation of Khus and have started cultivating Khus for higher incomes.

Efforts are being made to popularize the cultivation technology of vetiver crop variety CIM-Vridhi through bio-village mode, extending to more than 10000 ha area of the country and about 22000 numbers of farmers are engaged in cultivation of this crop in U.P., Bihar, Karnataka etc. It is estimated that about 115000 kg good quality oil is being produced per annum based on the technology and variety developed by CSIR-CIMAP which is valued at about Rs. 150 crore with an employment generation of about 15,00,000 mandays.

- **Cultivation of medicinal and aromatic plants in Jammu and Kashmir: S&T interventions by CSIR-Indian Institute of Integrative Medicine (CSIR-IIIM), Jammu**

i. Srinagar

CSIR-IIIM,Jammu is responsible to introduce cultivation of medicinal and aromatic plants such as Rose, Lavender, Clarysage, Rosemary and Geranium in Kashmir region. Improved varieties of these plants have been developed which find use in pharma, aroma, flavor and fragrance industry. Seven companies have come up in Kashmir region to cultivate aromatic plants as an industry and more than 40 farmers have been roped in as contract farmers of these plant varieties. The value added products isolated from these plant varieties find good market outside India that fetches them premium prices. The cultivation of these varieties has provided self-employment to many rural and underprivileged farmers.

ii. Gurez

Gurez valley remains snow bound for six months. Field demonstration centre have been established in the Gurez area for providing planting material to the farmers for medicinal and aromatic plants generating employment and revenue. Mint, lavender, *Rosa demascena* and *Monarda citriodora* are best suited crops for this area and were successfully introduced.

iii. Pahalgam

Lavender Park has been developed in Pahalgam in collaboration with Pahalgam Development Authority (PDA) where it has shown profuse growth. The area which is thronged by a very large number of domestic and international tourists, Lavender park has resulted in popularizing Kashmir lavender as a brand in the International Market.

iv. Bhaderwah, Jammu

Medicinal and aromatic plant garden was developed in village Dardu (Bhaderwah) in collaboration with Bhaderwah Development Authority and local farmers. Field demonstration and Training programmes and kissan melas were held in collaboration with KVK Bhaderwah. *Lavendula officinalisand Rosemarianus officinalis* crops which are alternative high income crops, are slowly replacing traditional low income crops in the area by rural farmers for their self-employment and additional revenue.

- **Fresh Orders for Setting up of RO desalination Plants in Rajasthan**

Based on the proven performance of the RO desalination units in Rajasthan and the quality of service rendered, CSIR-CSMCRI received order from Department of Science & Technology, Govt. of Rajasthan for setting up 50 indigenously designed RO plants during the current year. The distinguishing feature is the high recovery of product water and management of fluoride in reject stream.

4.2 Consultancy Development Centre (CDC)

CDC has made significant strides in emphasizing the need for effective use of consultancy services in various Central/ State Govt. Ministries/ Departments. Consolidating its position as a Centre for promoting and developing consultancy, CDC offers a vast range of services to Clients and Consultants.

During the year 2013-14, CDC carried out both developmental and revenue generating activities. This Report captures details & achievement of CDC in various activities. Some of the new initiatives undertaken during the year are as follows:

- Project Report for setting up "Indian Institute of Consultancy Management (IICM)"
- Development of virtual network and a portal for clients & consultants to interact & transact
- Scheme on "Financial Assistance to Micro, Small & Medium Enterprises for availing consultancy support"
- Design & Development of new certificate programmes in HR & IT consulting

5. PUBLIC SECTOR ENTERPRISES

5.1 National Research Development Corporation (NRDC)

The National Research Development Corporation (NRDC) is a premier organization, under Department of Scientific & Industrial Research (DSIR), Ministry of Science & Technology, engaged in the development, promotion and commercialization of the R&D results/ technologies emanating from Research Institutes/ Universities/Industries, etc. The Corporation provides comprehensive technology transfer services and acts as a catalyst for transforming innovative research into marketable industrial products. The Corporation is a unique organization entrusted with the mandate of both promotional function of development/up-scaling of lab-scale technologies, promotion and inculcating the spirit of inventivity and commercial function of transferring/licensing these technologies to industry and making them commercially successful. During the operation for nearly six decades since its inception, the Corporation has developed strong links and network with various R&D organizations in the country as well as abroad for transfer of technologies. Its operations cover the entire spectrum of industrial technologies ranging from Agriculture to Agro processing, Chemicals to Metallurgy, Mechanical engineering, Electrical engineering, Electronics, Biotechnology and so on.

During the year, the Corporation continued to face leadership crisis and hardship and as a result could not maintain all round progress in its activities. The dedicated, hard and sincere work of the employees of the Corporation could not fetch enough revenue earnings to overcome the financial obligation. The Corporation's gross income was Rs. 709.86 lakhs, as compared to Rs 1073.32 lakhs in the previous year.

During the year, the Corporation ended up with Deficit before Tax of Rs. 247.60 lakhs as compared to a deficit of Rs. 61.81 lakhs in the previous year.

5.2 Central Electronics Limited (CEL)

Central Electronics Limited (CEL) is a Public Sector Enterprise under the Department of Scientific and Industrial Research (DSIR), Ministry of Science & Technology, Government of India. It was established in 1974 with an objective to commercially exploit the indigenous technologies developed by National Laboratories and R & D Institutions in the country. CEL

is one of the companies that utilized home grown technologies during all these years of its existence. The Company is primarily engaged in production of strategic components for defence applications of national importance, equipment for railway safety and solar photovoltaic modules and systems.

The Company has developed a number of products for the first time in the country through its own R & D efforts and in close association with the premier National & International Laboratories including Defense Laboratories. In recognition of all these efforts, CEL not only have the distinction of being a DSIR recognized R & D Company, but also has been honored a number of times with prestigious awards including "National Award for R & D by DSIR".

CEL holds a unique position among the family of Public Sector Enterprises in the country, with its emphasis on indigenous technology inducted both from its in-house developments and from the National Laboratories, for its production programme in diverse high-technology areas of national importance. CEL has facilitates networking with leading research laboratories and leading institutions in India (IIT, IICT, NCL, NPL etc.) and abroad (UNSW, Georgia Institute of Technology, EPFL etc.). The company is already approved from the year 1994 as an R & D centre from the DSIR.

CEL has already established partnerships and linkages with various state-holders and business associates in the areas of railways, telecom, police, power generation and distribution companies, service providers in the energy sector, public funded institutions and even rural communities through the state governments. The existing marketing channels are being consolidated and expanded harnessing the unique advantage CEL has in terms of its Government backing.

The renewed mandate of CEL includes development and harnessing technology for (i) Solar Energy Systems and Solutions (ii) Strategic Electronic Components and systems required for Defense, Space, Atomic Energy and other Science & Technology Mission (iii) Signaling and Safety in Public Transport Systems (iv) Infrastructure, Eco-systems management and energy conservation and (v) Security and Surveillance in strategic establishments.

CEL has been the pioneer in the country in the different areas of manufacturing & proprietary manufacturer of the many strategic electronic components for use by defense organizations in the country.

6. RESULT FRAMEWORK DOCUMENT

Government of India has approved the outline of a "Performance Monitoring and Evaluation System (PMES) for Government Departments" to measure the performance of the Government by preparing Results-Framework Documents (RFD) of all Ministries/ Departments every year, which provides a summary of the most important results that a department/ Ministry expects to achieve during the financial year. Result Framework document (RFD) for Department of Scientific & Industrial research for 2012-13 are placed in Departmental website. Composite score for the year 2012-13 was 81.51

7. ISO 9001: 2008

Reference to the mandatory indictor under RFD lay down by "Performance Management Division" of the Cabinet Secretariat; the Department has started initiatives for implementation of ISO 9001: 2008. During 2013-14, necessary action plan has been developed. Consultancy has been engaged. Draft Quality Manual and Procedure Manual has been presented before the Departmental officers and Quality Council of India representative for due diligence. The final Manual is ready for approval of the Competent Authority.

DSIR ANNUAL REPORT

Access to Knowledge for Technology Development and Dissemination (A2K+)

1. Objectives
2. Scope
3. Activities

II

सत्यमेव जयते

II. ACCESS TO KNOWLEDGE FOR TECHNOLOGY DEVELOPMENT AND DISSEMINATION (A2K+)

New Programme

- Access to Knowledge for Industries and Institutions
- Industrial Technology related studies
- National and International conferences, exhibitions

On-going Programme

- Technology Development and Utilization Programme for Women(TDUPW)
- Technology Development and Demonstration Programme (TDDP)

1. OBJECTIVES

The A2K+ scheme is mainly focused on the following objectives:

i. To provide access to science, technology and innovation related information.

ii. To sponsor industrial technology related studies and dissemination them widely.

iii. To organize, support and participate in national and international conferences, seminars & workshops, exhibitions etc. to share the knowledge and success stories with stake-holders and end-users.

iv. To promote technological up-gradation of tiny, small and medium enterprises run by entrepreneurs, support proposals for design and development of products, processes beneficial to women.

v. To support and complete the Technology Development and Demonstration Programme (TDDP) projects that were approved in the 11th five year plan or earlier and have spilled over in the 12th five year plan period.

2. SCOPE

The scope of A2K+ scheme is as follows:

a. Dissemination of information on innovation and technology transfer aspects.

b. Sponsoring studies in emerging areas of technology for wider dissemination amongst all stakeholders including industry, consultants and researchers useful for the overall industrial development of the country.

c. Supporting conferences and exhibitions on selective basis to provide an important platform for interaction aimed at policy initiation framework and showcasing the knowledge and technologies developed by industries, R&D institutions, Innovators etc.

d. Encouraging women in adopting new technologies, design and development of products, processes, etc. beneficial for women to meet their

specific needs and to enhance their technological capability.

e. Strengthening the interface between industry, R&D establishments and academic institutions and demonstration of innovative product and process technologies, traversing the journey from proof of concept or laboratory stage to pilot stage rendering them fit for commercialization in all sectors leading to industrial useful applications.

3. ACTIVITIES

3.1 Industrial Technology related studies

During the year two studies have been completed. The complete reports have been uploaded on DSIR website. A brief write up on the studies completed during the year is as follows: -

Study on "Innovative Interventions required in manufacturing sectors to make them globally competitive".

The study was awarded to M/s. Dun & Bradstreet Information Services India Private Limited, Mumbai. The objectives of the study were to identify parameters influencing the competitiveness of eight identified sectors i.e. (i) Textiles and Garments, (ii) Leather & Footwear, (iii) IT hardware & Electronics, (iv) Food Processing, (v) Aero Space, (vi) Shipping, (vii) Capital Goods and (viii) Pharmaceuticals. A competitive assessment for all these sectors vis-à-vis that of competing countries has been carried out in the report and gaps and issues summarised. Recommendations related to technology and research & development have also been detailed in the report and also innovation framework prepared for each of these sectors.

Study on "Identification of Innovative, Commercializable & Socially Relevant Technologies"

The study was awarded to M/s SREI Infrastructure Finance Ltd. The objectives of the study were to identify the latest world-class innovative and socially relevant technologies that could be adopted and commercialised by potential Indian companies. The categorization of Institutes, Technologies and Industries was broadly made under nine sectors of social and economic importance viz. Energy/Alternate Fuels, Health, Pharma and Bio-Sciences, Agriculture, Urban Infrastructure & New Materials, Water & Waste Management, Transport, Telecom & IT, Electronics and Consumer Durables, Safety and Security and Environment Protection. A total of 130 research institutes / agencies comprising of 62 international and 68 national institutes working in above nine sectors were considered for the study. Hundred technologies have been identified and listed in the study report based on well-defined selection criteria.

3.2 National and International conferences, exhibitions

National Conference on 'Accelerating Technology Innovation for Inclusive and Sustainable Growth'

National Conference on 'Accelerating Technology Innovation for Inclusive and Sustainable Growth' was organised by DSIR on 7th November, 2013 at Vigyan Bhawan, New Delhi.

The objective of the Conference was to address various aspects influencing the generation, implementation and acceleration of technology innovation. Mechanisms of creating, supporting and strengthening an eco-system for innovation were also discussed. The Conference was organized in collaboration with National Manufacturing Competitiveness Council (NMCC), and the other partners were Associated Chambers of Commerce & Industry in India (ASSOCHAM), Engineering Export Promotion Council (EEPC), World Association for Small and Medium Enterprises (WASME), Federation of Indian Micro, Small & Medium Enterprises (FISME), and Consultancy Development Centre (CDC).

The Conference was inaugurated by Hon'ble Minster for Science & Technology, Shri S. Jaipal Reddy. The event was structured to have a *Leaders Forum* on 'Creation of New Innovation Frontiers' followed by three technical sessions on (i) 'Innovation Challenges and Opportunities'; (ii) 'Innovation Trends' and (iii) 'Nurturing Technological Innovation'.

Eminent speakers were invited for each of the sessions and the Conference provided a platform for high level networking amongst innovators, entrepreneurs, members of industry associations, policy makers and consultants. More than 300 delegates attended the Conference.

The concluding remarks were given by Shri Sam Pitroda, Advisor to Prime Minister on Public Information Infrastructure & Innovations (PIII) and Shri Ajay Shankar, Member Secretary, NMCC.

3.3 Technology Development and Utilization Programme for Women (TDUPW)

The program is a 11th Five Year Plan program subsumed in the 12th Five Year Plan and is aimed to meet specific needs of women and to enhance their contribution towards technology capability building. The objectives of the programme are:

- Promoting the adoption of new technologies by women.
- Awareness creation and training of women on technology related issues with regard to women.
- Promoting technological up-gradation of tiny, small and medium enterprises run by women entrepreneurs.
- Showcasing of appropriate technologies and organizing demonstration programmes for the benefit of women.
- Design and development of products, processes beneficial to women.

Thirtyeight projects were supported under the program and of these projects sixteen projects continued during the year and five projects completed. Efforts were initiated for inviting online applications for projects under the scheme. A brief write up on some of the completed projects is as follows:

i. Development of women entrepreneurs in advanced pottery technologies in Vilavancode taluk of Kanyakumari district

The main objectives of the proposal received from Centre for Social Development, Ammandivilai, Kanyakumari are to upgrade the skill of the women in pottery production technologies in scientific procurement, testing and processing of raw materials to suit the production activities, to introduce affordable and efficient mechanical devises for quantity and quality products fabrication and elimination of production drudgery, to introduce new designs in the products development and producing diversified value added products, to create effective marketing channels and outlets and to train the beneficiaries as entrepreneurs in collective / individual production system and run the units with sustainability.

For the implementation of this project seven potters concentration, namely Kollemcodu, Kappicadu, Kaithagam, Malaicode, Kaliyal, Athencodu and Arumanai villages of Vilavancodu taluk were selected. Skill up gradation programmes were conducted in all the seven villages. The duration of each training programme was 6 months. In each village one training programme was organized with 15 beneficiaries in a batch. The course content for training the women potters covered better techniques of pot making by using locally available raw materials and covered details of theory and practical classes. Importance was given to practical classes to upgrade their knowledge and skill level.

ii. Skill upgradation of Women group for income Generation through utilization of Local resources

The main objectives of the proposal received from Gramin Sudhar Avam Shramik Sewa Sanstha, Rudraprayag, Uttaranchal were introduction & demonstration of low cost and replicable technology for processing of NRM products thereby ensuring fair returns to the community for their agricultural products, capacity building of the Self Help Groups (SHG) members by imparting training on value addition of these locally available natural resources and generating livelihood through appropriate technology intervention and linking federation of SHG to these IGAs (Income Generating Activities), training community members to become master trainers for further community outreach, establishment of a centralized processing unit and satellite units and laying out marketing linkages: establishment of

collection centres laying out retail and distribution network.

The project introduced and demonstrated economical, low cost and easily replicable technology for processing of natural resources products, thereby ensuring fair returns to the community for their agricultural products. The project imparted training on value addition of selected agro produce, natural resources and millet, scientific interventions regarding processing and preservation of product, grading, packaging etc. The project contributed in capacity building of the SHG members by imparting training on value addition of locally available natural resources and generating livelihood through appropriate technology intervention and linking federation of SHG to these IGAs.

iii. Creation of small scale enterprises by women on smart revenue billing technologies

The objectives of the proposal submitted by ERDC, Ambala were promotion of adoption of new technologies by women, awareness creation and training of women in Computer and Information Technology, application of Computer Technologies in the area of Smart Cards preparation by women entrepreneurs, application of computer technologies in the area of revenue Generating Bills preparation by women entrepreneurs and to induce entrepreneurial skills in women to set up their own small scale enterprises.

Under the project, women entrepreneurs were imparted training on preparation of smart cards and revenue generating bills preparation with an ultimate aim for setting up small scale entrepreneurship.

iv. Entrepreneurship promotion programme through training on utilization of software technologies for image edition, 2D animation, offset printing and website design for empowerment of unemployed graduate women in Erode district

The main objectives of the proposal received from Institute of Road Transport Technology, Erode Tamilandu, were to train women in potential areas which offers them job as well as self employment opportunities in the district. Women were trained in the areas such as image editing, offset printing and website design etc. Courses on Adobe Photoshop, Coreldraw, Flash, Dreamweaver and Pagemaker.
160 women (total 4 batches and each batch with 40 beneficiaries) benifited by undertaking training in image editing, 2D animation and website design using Photoshop, Flash and Dream weaver. The training comprises of 200 hours of theory and practical sessions. The beneficiaries got hands on training in Image editing, 2D animation and Web designing software. They were given assistance in seeking jobs and sufficient support to become entrepreneurs. They were given exposure to the loan facilities given by Government of Tamilnadu, through Tamilnadu Industrial Investment Corporation. During completion of the project, 164 beneficiaries were successfully trained. Most of the beneficiaries were from rural background and attended this training with lot of interest and enthusiasm.

v. "Technology Adoption and Utilization Programme for Women in Coconut fibre Sector

The main objectives of the proposal received from Kerala Rural Development Agency (KRDA), Karunagappally, Kollam Dt, Kerala were to promote the adoption of new mechanical-ratt Technology in Coconut fibre craft production among 60 women in coastal belt of Karunagappally in Kerala and to promote the adoption of coloring Technology among 300 women craftsmen in Coconut fiber Craft in Kerala and to build up capacity and awareness of the craftsmen engaging in the Coir craft activity. 60 beneficiaries were trained in mechanical-ratt for production of coir rope. The Technology behind the mechanical Ratt was innovated and developed by the Coir Board, Govt. of India. The beneficiaries selected were trained in two training units set up at Kuttivattam and Maruthoorkulangara. In each center 15 trainees in a batch of 4 were trained under master trainers. 300 women were trained in Dye making. The Trainees were given training in Vegetable dye making, its combinations and its applications in natural fibers. This technology of vegetable dyeing in natural fibers was developed by the Regional Design and Technical Development Centre (RDTDC), Government of India, Bangalore.

As a part of the capacity building training programme the trainees were given training on Micro enterprise, credit management, banking and group strengthening activities. Among the 60 trained women in *Coir Ratt Technology,* 54 have started producing coir rope by themselves as individual enterprises.

vi. Empowerment of women through Vermi Compost Technology

The main objectives of the proposal received from Association for Rural Development (ARD), Madurai

were to create awareness on the importance and need of vermi compost production and the technology to utilize vermi compost to regain the lost fertility of the agriculture land, to promote the skill of vermi compost production through practical exercise and exposures among rural women and to promote Technological Upgradation of tiny, small and medium enterprises run by women entrepreneurs.

Under the project 20 training programmes for women beneficiaries were conducted. The training included practical exercises and exposure visits. 500 rural women have gained knowledge on vermi compost production and techniques of their marketing. The women beneficiaries may start their own small business units at village level. Nearly 123 low cost vermi compost production units have been promoted among the target community.

vii. Technology propagation and development of micro enterprise by SHG women

The objectives of the proposal by Kalasalingam University, Tamilnadu were to provide training to the women Self Help Group (SHG) members and propagate the suitable technology for imparting them income generating skills, to locate and identify the beneficiaries and to offer training in income generation activities based on resource analysis and demand in the study area, to produce and develop the content to impart necessary technical skills on identified income generating activities, to create awareness among SHG women on technology related issues, to demonstrate and train selected women SHG members on technology based enterprises and to facilitate linkage with financial institutions to undertake livelihood activities.

The project involved training to unemployment women, preferably from lower income group, in agro processing, sericulture and food processing. Mainly rural unemployed women, of the society were selected for the training programmes. Training was imparted to members of SHGs in Virudhunagar District of Tamilnadu. 33 women from various Self Help Groups (SHGs) were trained in various functional areas of sericulture. During the programme, field visits were arranged in the industrial places like Udumalaipet, Vanniyampatti, Tenkasi, and Kuttralam. The training involved various aspects of silk production like, seed production, reeling, re-reeling, twisting, doubling, weaving and processing. The participants were also imparted training on germ plasm bank, plant introduction and acclimatization, selection, hybridization, polyploid and mutation breeding, breeding for disease and drought resistance etc.

The women participants were also trained on vermi compost and mushroom culture. 15 women members each (from various SHGs') in Batch I and II were trained. Training was imparted to the participants in the field of mushroom culture, vermin compost and natural farming. 32 women participants from various SHGs were trained in the field of food processing and marketing of products. Throughout the training, trainees were given hands on training on preparation of food products like squash, pickles, dry products, essence, juices etc.

A write up on some of the ongoing projects is as follows:-

i. Economic Empowerment of SC & ST women on processing of *Moringa oleifera* leaves and its products as an income generating activity

The project from Home Science College and Research Institute, Tamilnadu Agricultural University, Madurai was supported for application of new technologies for developing and standardizing new innovative traditional value added products using Moringa leaves retaining its nutritional benefits and medicinal value.

ii. Composting coir pith for sustainable livelihood and eco-restoration in Satyabadi block of Puri District in coastal Orissa

The proposal of "ANUPAMA", District-Puri, Odisha was supported to help women set up microenterprises based on coir pith compost technology in rural areas of Satyabadi by technics like organic farming.
100 women beneficiaries from 10 self-help group of Satyabati block and 11 project team members have been trained under this project.

Women beneficiaries preparing coir pith compost

iii. To educate and train rural women of western Uttar Pradesh in the cultivation and processing of medicinal plants for the preparation of nutraceuticals/ functional foods and health care products

The proposal of Amity Institute of Herbal Research and Studies, Amity University, NOIDA was supported to educate and train women of the weaker section of the society in the identification, cultivation of locally available medicinal and aromatic plants for preparation of nutraceuticals/ functional foods and health care products for personal use and gainful employment.

Under the program eleven villages, namely, Matki, Ghunna, Telipura, Salempur, Pikki, Mehrwani, Mirjapur, Maheshwari, Ghanna, Boandaki and Puaraka were selected in District Saharanpur of Western Uttar Pradesh. About 721 beneficiaries were educated, trained and encouraged in the cultivation and processing of the medicinal plants, namely, Curcuma longa (Haldi), Aloe vera (Ghrit Kumari), Andrographis paniculata (Kalmegh), Withania somnifera (Ashwagandha), Acorus calamus (Vacha), Rauwolfia serpentina (Sarpgandh), Ocimum sanctum (Holy basil), Lajwanti, Asparagus racemosus, Bacopa monneri, Centella asiatica and Moringa oleifera.

3.4 Technology Development and Demonstration Programme (TDDP)

The Department has been providing partial financial support to research, development, design and engineering (RDDE) projects proposed by industry in the following areas:

(a) Development of a new or improved product resulting in prototype development and ending with demonstration in commercial environment.

(b) Development of a new or improved process resulting in establishment of process know-how, development of process equipment and demonstration of yield, efficacy etc on a pilot plant.

(c) Absorption and up-gradation of imported technology.

(d) Priority technology development projects of PSUs in consultation with and co-financing from economic ministries. Under this, consortium projects for development of technologies of common interests for group of industries or associations to be undertaken by industrial units, national laboratories, user industries in important focused areas such as Electronics and Communications, Railways, Drugs, Chemicals and Fertilizers etc.

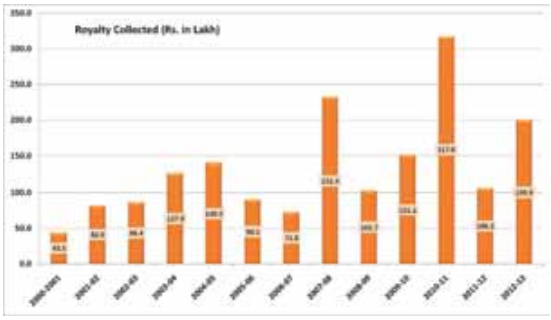
(e) Development and demonstration of technologies for common use by industry clusters.

(f) Development and demonstration of technologies for government's flagship and mission mode projects.

The partial financial support by DSIR in the above areas primarily covers prototype development and pilot plant work, testing and evaluation of products from such R&D, user trials, etc. Bulk of the cost of the project is met from the proposer industry's resources.

The Department, under this programme has so far supported about 254 R&D projects of Industrial units. These projects cover products and processes in various important industries such as metallurgy, electrical, electronics, instrumentation, mechanical engineering, earth moving and industrial machinery, chemicals and explosives, etc. Under the program (32%) engineering; (27%) electronics; (21%) Chemical, (17%) energy and waste utilization and (13%) Health & Pharma projects have been supported. The TDDP supported projects covers 22 states with maximum number of projects supported to Andhra Pradesh (18%) followed by Karnataka (15%), Maharashtra (13%), Delhi (10%) and Tamil Nadu (10%).

Around 64 technologies developed under the scheme have been commercialized or are under commercialization (Annexure-10). The department has received about Rs. 17.52 Crore royalty from different industries during 2001-2013.



Year-wise royalty received from the commercialized products/processes developed under TDDP scheme

3.4.1 Status of the Projects Supported During the Eleventh Plan

i. Development of Indigenous Radiotherapy Simulator (RTS) for Radiation Treatment of Cancer by M/s Elim Meditech Pvt. Ltd., Kanyakumari, Tamil Nadu.

M/s Elim Meditech Pvt. Ltd. has taken up the project for development of Indigenous Radiotherapy Simulator for Radiation cancer. The company has made progress in assembling all the hard ware mechanical sub-systems of the old Radiotherapy Simulator (RTS) system like Radiological Imaging System, mimicking all the mechanical functions of a Teletherapy treatment machine (telecobalt Machine or Linear Accelerator) and developed new electronics sub systems and software controls for the design, development and demonstration for delivering accurate radiation dose conforming to the tumour. The project is under progress.

ii. Development and Demonstration of process for manufacture of Hydrogel at Pilot Plant Scale by M/s Earth International Pvt. Ltd., New Delhi

Hydrogels also known as Super Absorbent Polymers (SAP) are substances that have a unique water absorption capacity. This property can be a boon for agriculture since absorbed water along with nutrition and other desirable substances can continuously provide all requirements of the plants. Hyrdrogel is a cross-linked polymer, which when put in water traps the water and forms swollen networked structures, forming a gel like substance. The hydrogels developed in Indian Agriculture Research Institute (IARI), in its dry form are capable of absorbing 400-500 times its weight of water, can withstand up to 50°C temperature, have repetitive gelling character, biodegradable with a shelf life of 2 years. These hydrogels besides meeting water demands of the plant improves germination and minimizes soil erosion. These hydrogels in combination with drip irrigation can transform the barren land to a productive one.

The performance trials and test runs on various crops in different climates are in progress by the company. The company is scaling up the lab process up to pilot scale (initially in a batch of 5 kg with the maximum of 25 kg) and developing field trials data for commercialization of the lab scale technology on use of Hydrogels. The project is nearing completion.

iii. Development of Indigenous Technology of Materials for Nano Photofunctional Applications by IICT, Hyderabad, and Sapala Organics (P) Ltd., Hyderabad

The project is to develop the pilot scale process to manufacture two ruthenium polypyridyl complexes based materials for Nano Photofunctional Applications used in Dye sensitised solar cells (DSC) dyes. The technology at bench scale level (2 grams) has been developed at IICT, Hyderabad. The proposal aims to develop the technology at 500 grams to 1 Kg level in pilot plant. Dye sensitised solar cells (DSC) have emerged as a very promising source of energy at considerably lower costs. The functioning of DSC mimics natural photosynthesis in that the photoreceptor and charge carriers are different elements unlike a PV cell where the semiconductor assumes both the functions. This separation of functions reduces the stringent purity requirements of the raw materials and consequently makes DSC a cheaper alternative. The advantages of DSC, apart from being a low cost alternative, include Good performance under standard reporting conditions, Stable performance under non-standard conditions of temperature, incidence angle etc., Semi-transparency and multi-colour range possibilities. The dye in the DSC needs to fulfil several requirements, the most notable ones being a broad absorption spectrum, adequate ground and excitation states, long stability, no toxicity and good adherence. The project is completed.

iv. Development of Nitroscanate - Sequent Scientific Ltd. (P.I. Drugs & Pharmaceuticals Ltd.), Thane.

The company has taken up project for the synthesis of nitroscanate (1-isothcocyanato -4- (4-nitrophenoxy) benzene ($C_{13}H_8N_2O_3S$). Nitroscanate is an anthelmintic of the diphenyloxide group. It is known to interfere with and inhibit the synthesis of ATP in *Fasciola hepatica* while AMP levels are increased. The alterations in ATP levels are shown to be irreversible and continuous with time. An initial increase in end-product formation, namely acetate and lactate is observed, possibly due to increased levels of the enzyme phosphofructokinase resulting from depletion of ATP levels, but this increase is later abolished. In the nematode *Haemonchus contortus* adenine nucleotide pools are depressed by nitroscanate. Efficacy of nitroscanate is increased approximately four-fold if given with food due to slower passage of the drug through the gastrointestinal tract, with increased contact time with the parasite. The Project is completed.

v. Development of Small size pistons for Two Stroke Engines by high pressure die casting process by Abilities India Pistons & Rings Ltd., Delhi

There is current trend to revive the 2 stroke version of the engines for the smaller versions of the engines for applications like Chain saws, Brush cutters, Hedge trimmers and agricultural sprayers basically from the point of view of utilizing the inherent advantages of the 2 stroke engines with upgraded technology in the manufacture of the components with lesser weight, lower inertia masses with added cost advantage coupled with high productivity. One of the upgraded technologies currently being tried out internationally is to produce the most vital component like the Pistons for the Engines in High pressure die casting process which offers the possibility of producing the components with intricate shapes and contours with thin walled sections with" Near Final Shape" with out any additional machining for achieving these shapes which render the engine more efficient in terms of improved fuel economy and reduced emissions.

Under the project the company proposes to develop small size Pistons (size 44mm for 50cc Engines and size 37.08mm for 33cc engines) with high silicon content for two stroke engines employed in specialized applications like chainsaw, brush cutter, trimmer etc. adopting the high pressure die casting process.The project is under progress

vi. Manufacture of Magnesium & Calcium Metal Powder by M/s Ardee Business Services Pvt. Ltd.

The objective of the project is manufacture of Magnesium and Calcium Metal Powder through Pidegeon process for use in steel industries. Traditional method generates a huge amount of carbon di-oxide. The present proposal will reduce energy requirement substantially. The project is nearing completion.

vii. Development of Coal dry beneficiation system -X-Ray based Sorting system for Indian Coals of size range 13-50mm (ArdeeSort) by Ardee Hi-Tech Pvt Ltd, Vishakhapatnam

The project is for development of field scale X-ray based sorting system to provide complete solution for coal dry beneficiation for particle size, in the range of 13-50 mm. This technology will yield similar results as compared to the existing technologies without using water. The system electronics, removal technology, logic of separation is totally different than its competitors. Prototype developed & field trial under progress.

viii. NLT 40% L-Dopa from Mucuna Prurious Seeds by BACFO Pharmaceuticals (I) Ltd., New Delhi

The objective of this project is to develop a process for Commercial Manufacture of Standardized Extract NLT 40 % L- Dopa from *Mucuna pruriens* (Kaunch) seeds. *Mucuna pruriens* (Kaunch) seeds have L-Dopa with hundreds of compounds, of different chemical groups. The potential ingredients from the seeds have been separated by the company with pH selective extraction, as combination of synergistic ingredients, with L-Dopa, highly useful in treatment of Parkinson's disease. Laboratory Experiments of 1.0 Kg. batch size have been successfully completed to produce free flowing yellow brown powder having NLT 40 % L-Dopa with 61 gm yield. The company is in the process of developing Commercial scale process for Manufacture of Standardized Extract NLT 40 % L- Dopa from *Mucuna pruriens* (Kaunch) seeds at 500 Kg. batch size pilot plants.

ix. E-waste Recycling & Precious Metal Recovery by Eco Recycling Ltd., Mumbai

E-waste is a growing concern and will continue to rise with the socio-economic developments. This 'waste' is resource rich and also very hazardous. The present proposal will provide complete solution to address all the relevant concerns and will help in recovering the precious metals from Printed Circuit Boards. The project is nearing completion.

x. Indigenous Development of FTIR Spectrophotometer by M/s ELICO Limited, Hyderabad

The objective of the project involves indigenous development of FTIR in the Price band less than 5 Lakhs Rupees to make it affordable to academic & research institutions and Industry Sector. The targeted FTIR Instrument would come with configurable optics,

application specific accessories, in-built PC Processing capabilities, and advanced Human / Machine Interfaces like Touch Screen, USB Mass Driver storage, USB Printing, and TCP/IP for networking. The project is under progress.

xi. A New Approach for Synthesis of an Import Substitute 3-Methyl-N-Nitroiminoperhydro-1,3,5-Oxadiazine (MNIO), an intermediate for the Manufacture of Thiamethoxam by M/s. Insecticides (India) Ltd. , Bhiwadi, Rajasthan.

The company has taken up a project for synthesis of an import substitute 3-methyl-N-nitroimino perhydro-1,3,5-oxadiazine (MNIO), an intermediate used for manufacture of Thiamethoxam.manufacturing Thiamethoxam – a broad spectrum insecticide. The Project is completed.

xii. Development of Endoxifen as a new efficacious and safe therapeutic agent for the treatment of breast cancer by M/s. Intas Pharmaceuticals Ltd, Ahmedabad.

The main objective of the project is the Development of a delayed release and scaleable Endoxifen formulation safer than the parent Tamoxifen as a selective estrogen receptor modulator. The Project is under progress.

xiii. Process development for Dibenzamidodiphenyldisulfide (DBD), dithidianiline (DTDA) and dithiodicaprolactam (DTDC) by M/s. Merchem Limited, Kerala.

The main objective of the project is to scale-up the process for manufacture and commercialization of Dithiodianline(DTDA) and Dibenzamidodiphenyldisulfide(DBD) based Peptizer and Recclaiming Agents starting from Benzothiazole and to scale-up the process for making and Commercialization of Dithiocaprolactam (DTDC) starting from Caprolactam. The Project is completed.

xiv. Innovative Electronic Control System for PNG (Pipeline Natural Gas) fueled stationary engine by M/s. Minda Industries Ltd., New Delhi.

The main objective of the project is to develop an Engine management system consisting of electronic control units and sensors for Pipeline Natural Gas fueled Stationary Engines like Genset System at a significant lower cost, with an innovative self diagnostic feature and fully integrated system. The Project is completed.

xv. Innovative Process Development for the Manufacture of Peptide APIs by Neuland Laboratories Ltd., Hyderabad.

The main objective of the project is Process Development for commercial manufacturing of Peptide APIs' using three types of H-bond disrupters viz. Pseudoprolines dipeptides, Isoacyl dipeptides and Dmb-amino acids/dipeptides and further improvement on the current manufacturing processes for these H-bond disrupters. The Project is completed.

xvi. Development of Non-infringing processes for API's in pilot scale by M/s. Ogene Systems (I) Pvt. Ltd., Hyderabad.

Development of 17 Active Pharmaceutical Ingredients (APIs) (viz Telmisartan, Zolmitriptan, Levetiracetam, Irbesartan, Lacidipine, Valsartan, Olmesartan Medoxomil, Manidipine Hydrochloride, Fosamprenavir, Montelukast, Linezolid, Nifedipine, Felodipine, Florfenicol, Bifonazole, Tamsulosin Candesartan) by non-infringing processes at in-house R&D from gms scale to Kgs scale in the pilot plant. The Project is under progress.

xvii. Process Up-scaling & Clinical Evaluation- PBL 1427 – A Novel Long Acting DPP IV Inhibitor for the Treatment of Type 2 Diabetes by M/s Panacea Biotec Ltd., New Delhi

The antidiabitic compound developed by the company PBL1427 has exhibited potent, reversible competitive inhibition in human DPP IV enzyme activity with an IC50 of 12 nM. It has > 15000 fold selectivity for DPP IV over DPP8 / 9. PBL 1427 binds more strongly to the DPPIV enzyme as compared to Sitagliptin and Vildagliptin. PBL 1427 showed a good *in vivo* efficacy in lean mice and rats in terms of improvement in oral glucose tolerance test suggesting a better glycemic control. PBL 1427 is a novel long acting DPPIV inhibitor with an attractive profile that meets the need for promoting safer drugs to treat T2DM in growing patient population. The company is in the process of filing foreign patent application on this product. The project is under progress.

xviii. Development and commercialization of Aliskiren and its Intermediates by M/s. Penn Bio-Chemicals (India) Pvt Ltd.

The overall objective of this proposal is to produce Aliskiren and its intermediates. The Aliskiren compound is complex molecule with four stereo centers in the structure. For the sake of convenience, the company is targeting to synthesize three fragments and market all these three synthons. Design and synthesis of novel approach for the three fragments (AK1, AK2 and AK3), the work will be carried out in-house R&D centre and the scale up will be done by using pilot scale. The long term goal is to develop the most efficient operating conditions for large scale synthesis of the Aliskiren and its intermediates to market the finished product in the India as well as in the world markets. The project is under progress.

xix. Development of a novel, Cost effective liquid and stable Adsorbed Rabies Vaccine based on Vero Cell Platform by M/s. Pochiraju Industries Limited, Hyderabad.

The main objective of the project is to develop a safe and effective rabies vaccine technology superior to the existing ones which does not need ultra Centrifuge. The Vaccine formulation will be liquid stable and storable at 4°C with a shelf life of 2-3 years and a process that is highly reproducible and with complete removal of host cell DNA contamination. The Project is under progress.

xx. Liquid Coolant Recovery System by Pure Tech India, Trichy

The company has taken up the project for development of Liquid Coolant Recovery System for testing coolant obtained from different working environments. A coolant test equipment of capacity 10 LPH has been developed. The equipment is designed for Trump Oil separation, suspended solids removal and bacterial disinfection.The project is completed.

xxi. Optimization and Pilot Plant trials towards commercialization of Standardized Colocynthin extract from the medicinal plant "Citrullus Colocynthis by M/s. SAMI Labs Ltd., Bangalore.

The main objective of the project is to optimize the extraction process of Colosynthin at several scale-up levels and also to identifiy quality raw materials sources from different parts of India. The Project is under progress.

xxii. DSP based high-end active professional audio speakers by DSP based high-end active professional audio speakers by M/s Sonodyne Technologies Pvt. Ltd., Kolkata.

The project will produce a range of high quality DSP based active professional speakers for application in studio, live and installed sound applications, converting core research into products by way of advanced testing and measurement, and creation of tools, and dies and fixtures to make production ready. The project is completed.

xxiii. Development of Magnesium alloy Pressure Die Castings for Automotive applications by M/s. Sundaram-Clayton Limited

The objective of the project is to develop environment friendly, cover gas technology (in lieu of SF_6 currently

being used) for processing magnesium pressure die castings, to further extend it to the stage of putting-up an automated pre-commercial production plant and finally converting it into a commercially viable production plant for manufacturing magnesium alloys die castings for transport applications. The project is completed.

xxiv. Conversion of steel/iron forged/cast under chassis auto-components e.g. steering knuckles & suspension links to lighter weight aluminium equivalents by deploying advanced LPDC process by M/s. Synergies Castings Limited, Visakhapatnam.

The project is aimed at conversion of steel forged / cast under chassis auto-components to lighter weight Aluminum equivalents by deploying ***advanced LPDC process.*** E.g. Steering Knuckles & Suspension Links.Conversion identified pilot components such as 'Suspension Links', 'Steering Knuckles' from cast / forged steel/iron components for commercial production with LPDC Aluminum equivalents. Optimization of LPDC Equipment with temperature and flow rate dependent process controls. Methodology of casting simulation, flow analysis & die design for LPDC. The Project is nearing completion.

xxv. Fuel Cell Bus development Programme by Tata Motors Ltd, Mumbai.

The project is aimed at design, development and demonstration of Fuel Cell Bus and continue efforts to bring down cost to affordable level. The Project is under progress.

xxvi. Development of Large Size CNC Rotary Table 2500 x 2500 with Translation Movement – Model URH – SQ 2500 – X by Uday Computer Aided Manufacturing (P) Ltd., Bangalore

Large size CNC rotary tables, a highly specialized machine tool, are imported in the country. The company has taken up a project for development of a Large Size CNC Rotary Table of size 2500 x 2500 with Translation Movement for domestic as well as global market. The project is completed.

xxvii. Purification of Gas Gangrene Clostridium Toxins & Development of Monovalent and Polyvalent Antitoxins by VINS Bioproducts Ltd., Hyderabad.

The objective of this project is production of gas gangrene causing toxins from three different *Clostridium* strains namely *C. perfringens*, *C. septicum* and *C. novyi*, purification of toxins from the culture media by chromatography based methods, development of strategic immunization schedule for obtaining high titre antitoxin from equines, standardization and purification from equine plasma and testing the efficacy of the purified antitoxin by animal assays and user trials. The project is under progress.

xxviii. Design and development of ultra high pressure (6000 bar) pump by M/s. Water Jet Germany Pvt. Ltd, Tamil Nadu.

The project involves design and development of a pump which can build up pressures beyond 6000 bar for increasing cutting speeds, thereby improving productivity of the water jet cutting machine. The Project is under progress.

xxix. Bench an Pilot Scale Process Development for UV Reflective Security Inks & Pigments (UVRIP) by M/s Aron Universal Ltd., Bangalore.

The main objective of the project is to develop security inks and pigments with improved performance

characteristics in terms of glow intensity under UV exposure, solvent reistance, reduced particle size and acid/ alkali resistance; to commercialize such state of the art novel UV-reflective security inks and pigments and thereby enhance the country's capability for its industrial as well as defense and security applications and thus improve their security, confidentiality and quick detection of their violations on the strengths of the self reliant indigenous technology. The Project is under progress.

xxx. Rapid Diagnosis of Malaria by Multiplex Fast-PCR Assay by M/s. Chromous Biotech Pvt. Ltd., Bangalore

The proposal envisages the development of Fast-PCR (FasTaq™ polymerase-based) and multiplexed primer sets that facilitate diagnosis of malaria (consensus primers) as well as discrimination of *P. falciparum* from other *Plasmodium spp*. (amplification of specific genes). Both PCR products will be detected using VeriPCR™ and if found positive, visualized on agarose gel using GreenView™ to discriminate *P. falciparum* from other species of Plasmodium. The Project is under progress.

xxxi. Development and Commercialization on Low Temperature Polymer Exchange Membrane Fuel Cell and Stack by Elpro Energy Dimensions Pvt. Ltd., Bangalore

The objective of the project is Development of Polymer Exchange Membrane fuel cell stacks for stationary applications. The development of fuel cells is very critical in view of the energy and environmental considerations. The work on low temperature and high temperature fuel cells for stationery applications is being carried out at IIT Mumbai and upon successful development the company shall manufacture the same commercially. The fuel cells developed at proof of concept level at IIT Mumbai delivered the power of 0.2 watts per cm^2 with air as an oxidant. However, further development work needs to be carried out, initially at IIT and subsequently upto pilot scale at the company before commercialization. The Project is under progress.

xxxii. Smart Closed Loop Energy Management Solution by M/s. Genus Power Infrastructures Ltd, Jaipur.

The main objective of the project is to reduce transmission, distribution and commercial losses in LT distribution system through smart closed Loop Energy management system. This solution leverages the potential of Power management with IT and Telecommunication technologies to help utilities realize the hitherto unrecoverable revenues; to monitor and control losses in an LT distribution network. It encompasses Automatic and Remote meter reading for a group of 1ph and 3ph LT/HT consumers mapped to a distribution transformer which in turn is mapped to a feeder; to provide closed loop metering rendering the abnormalities immediately on the GPS map, enabling specific and concentrated counter-measures; to establish a management server to monitor and control the billed and unbilled electricity consumption etc. The Project is nearing completion.

xxxiii. Project "Development & Commercialization of Seating Mechanism (Recliner, Track & Lifter)" - Ms. Hema Engineering Industries Limited, Gurgaon

The objective of the proposal is to develop compact Seat Mechanisms for automobiles invoving recliner, track and lifter. In the existing mechanism the release of the slider is done by togal bar. In the proposed lifter the seat cushion can be raised by 1.5 mm in each stroke. The mechanisms would be inline with the specifications and cost targets of the benchmarked front row seats of passenger car segments B and C respectively.The mechanisms would meet all the regulatory and safety requirements for seating systems. The project is in progress.

xxxiv. 3-Dimensional Mixer by M/s. Hexagon Product Development Pvt. Ltd., Vadodara

The objective of this project proposal is design and development of 3-Dimensional mixer of 500 litres

capacity for efficient mixing of powder and liquid materials for pharmaceuticals, paints, construction and finishing industry. The company has already developed a prototype of 75 litre capacity and plans to develop mixers up to 500 litres capacity. The Project is under progress.

xxxv. Smarter Material Handling Automated Guided Vehicles (AGVs) by M/s. Hi-Tech Robotic Systemz Ltd., Gurgaon

The objective of the project is to develop an AGV Pallet Truck, which combines an autonomous navigation system with a pallet handling system with a new generation of AGV controller, a new power pack and guidance system. The two-fold goal of this project is to develop an indigenous vehicle as a substitute for imported vehicles and develop a new generation controller. The Project is under progress.

xxxvi. Development of novel Biopesticides from Antagonistic Microbes Bacillus subtilis and Trichoderma viride using Dextrose as a carrier by M/s. Nirmal Seeds Pvt. Ltd. Jalgaon

The project envisages development of novel bio-pesticides from antagonistic microbes *Bacillus subtilis* and *Trichoderma viride* using Dextrose as a Carrier. The company has formulated these bio-pesticides in the lab and plans to scale up production. Trichoderma Viride is a green coloured, fast growing beneficial fungal species. It has multiple uses in crop protection, as a bio control and decomposing agent. The Project is nearly completion.

xxxvii. Solid Handling Fluid transfer Pumps by M/s. Oriental Engineering Works Pvt. Ltd., Yamuna Nagar.

The objectives of the project is to design and develop the prototypes of solid handling fluid transfer pumps and associated accessories as per the need of customers and test these pumps in house as well as in field for different application e.g. Viscous Liquids, Site Drainage, Raw/Process Water, Storm/Flood Water, Emergency Pumping, Sewage, Sludge, Slurry and Bentonite. The Project is under progress.

xxxviii. TDDP project, "Development of Spiral Cobalt Radiotherapy Machine" by M/s Panacea Medical Technology Pvt. Ltd., Bangalore

The aim of the project is development of Spiral Cobalt Radiotherapy Machine for treatment of cancer. The deliverable output of this project is fully functional

prototypes for Rotational Gamma Beam machine to achieve conformal therapy. The proposed machine will be able to offer the 3D conformal therapy using cobalt 60. The overall cost of treatment delivery with such a configuration will be lowest, while offering the 3D conformal treatment. Isotope based tele-therapy machine work with maximum advantage when the distance from source to tumor is lower. This machine offers a very low distance of 60 cm. This is a major breakthrough in tele-therapy and it will be first of its kind in the world. This machine will be precise, accurate, rugged and reliable for conformal therapy at a fraction of the cost of competing technologies in developing countries. It is also operated by a battery with low power consumption is built in, suitable for rural India. The project is under progress.

xxxix. Development & commercialization of Rapid cast Technology for manufacturing of stainless/steel castings of weight 5000 Kgs single piece by M/s. PTC Industries Limited, Lucknow.

The project aims at development of Rapid Cast Technology for highly complex stainless/steel castings weighing up to 5,000 Kgs single piece. The project is under progress.

xl. Development and Validation of a novel computer aided drug design (CADD) technology for drug discovery by M/s. Rational Labs Pvt Limited, Hyderabad.

The objective of the project is to develop an integrated CADD technology for drug discovery, validation for Relative Solvation Free Energies of Small Molecules and Validation for a Diverse Set of Small Molecules and Drug Targets. The project is under progress.

xli. Application of Layered Manufacturing technique for development of new light weight drive chain for two-wheelers with modified work material and optimized processes by M/s Rockman Industries Ltd., Ludhiana.

The project aims at development of a new light weight drive chain with layered manufacturing technology with 15% reduction in weight of existing chain of two wheelers. The Project is under progress.

xlii. Integrated energy efficient system with automated control facility for varied climatic conditions by M/s. Saveer Biotech Ltd., New Delhi

The objective of the project is to develop innovative solution for greenhouse technology by development of an integrated and standardized energy efficient automation system with HI-Tech controlled production facility for varied climatic conditions, innovation in Structural Aspect of Green Houses, flexibility in Ventilation for saving energy, automation for optimum utilization of Ambient conditions, integration of abiotic factors. The Project is completed.

xliii. Manufacture of Corey's Lactone and Prostanoids: Iloprost, Lubiprostone and Travoprost by M/s Sai Advantium Pharma Ltd., Hyderabad.

The main objective of the project is to synthesize Corey' lactone, a key intermediate required for the syntheses of several prostanoids; to synthesize Iloprost, Lubiprostone and Travoprost from Corey's lactone'; to match purity of Corey's lactone with samples supplied by Cayman (US); to develop analytical methods for synthesized prostanoids. The Project is under progress.

xliv. Development of Chiral APIs by M/s Sharon Bio-Medicine Ltd. Mumbai.

The main objective of the project is to develop fermentation and downstream processes for Chiral Immobilized Enzymes for Target Molecules/Target Transformations) by screening of libraries for specific biocatalysts Isolation and production of identified variants; improvement of selected enzymes (biocatalysts); continued search and operation of new libraries; developing Fermentation capabilities in order to provide Enzymes for various Transformations; optimizing fermentation, down-stream process to prepare the target molecule/s including use of immobilized enzymes and also using Walden inversions via enzymatic-switch routes. The Project is under progress.

xlv. BLDC Motor and control for hybrid car on transmission shaft by M/s. S K Dynamic Pvt. Ltd., Roorkee

The objective of the project is to develop, fabricate, test and commercialize Brushless DC motor (BLDC) and control for hybrid car that can be mounted on the transmission shaft. The company has also filed the patent application for this development. The Project is under progress.

xlvi. Development and Demonstration of Innovative Technology for the automation of Firework Manufacturing by M/s Sri Kaliswari Fireworks Private Ltd., Sivakasi, Tamil Nadu.

The objective of the project is to develop machinery for automation in cracker manufacture in order to achieve elimination of human touch of toxic chemicals, improving the occupational hazards, improving the productivity and elimination of environmental pollution. The project is under progress.

xlvii. Design and Development of Biological Toilet System by M/s. Stone India Ltd., Kolkatta

The objective pf the project is to eliminate open defecation fully and to prevent human wastes from being dumped on the ground through biological digestion using bio media, to make further purify of resultant water & recycle for flushing, discharged on the ground or used for agriculture satisfying environmental limits. The concept of bio digester tank has been jointly developed by Stone India Limited along with its technical collaborators in India and overseas. The Project is nearing completion.

xlviii. New Process Development for Special Elastomer Compound by M/s. Som Shiva (Impex) Limited, Ahmedabad

The objective of the project is regenerating Polymer which has gone through certain heat cycles there by imparting specific end-use properties. Low melting temperatures of Elastomer and high melting temperatures of Polymers are used for compounding the Polymer Matrix in order to make it a viable commercial proposition. The project is under progress.

xlix. Development of Biofertilizers (Emulsifiable Concentrate) for Neutrient Management of Agricultural Crops by M/s. T. Stanes and Company Ltd., Coimbatore

The objective of the project is to improve the existing technology for liquid formulation of Bio-fertilizer, to have greater shelf-life, to improve the efficiency of the microbes and faster regeneration of the microbes when applied to the soil to enhance the growth, avoiding contamination during storage and keeping the shelf-life for a minimum of 2 years. The project is completed.

l. Development of LTE Macro eNodeB Base stations by M/s TEJAS Networks LTD., Bangalore.

The objective of the proposal is to design, develop, manufacture and sell TD-LTE Macro eNodeB Base stations. The project is under progress.

li. Project "Upscaling and commercial production of the lactic acid bacteria starter culture for yogurd curd production" - M/s. Tropilite Foods Pvt Ltd, Gwalior

The objectives of the project are isolation and identification of lactic acid bacteria for curd and yogurt production; standardization and upscaling of mass production of lactic acid bacteria; standardization of commercial chemical media for mass production of lactic acid bacteria; standardization of upstream and downstream process for the production of freeze dry lactic acid bacteria starter culture. The company during the project would set up a pilot plant facility including pilot scale fermenters, centrifuge and lyophilizer. The project is in progress.

lii. Development of Uni-Density Insulator for Vehicles by M/s. Uniproducts (India) Ltd., Noida.

The need for a uniform density insulation part is to cater to the future requirements of the automobile industry. The lamination with the current technology using fibre is the non linear density of the insulation material which necessitates usage of higher GSM in areas of the dashboard as the clearance of the lowest thickness of the dash insulator determines the uniform weight area of the felt in the part. The proposed activity intends to make an improvement in process and product during the manufacture of NVH components (mainly UNI-density dash) that will enable production of parts having superior insulation quality along with lower weight and having uniform density across the entire area of the part. The project is completed.

liii. Development of Process Know How for the Manufacture of Vinflunine, and anti cancer Molecule in API Form by M/s Vinkem Labs Ltd. Kakkalur Thiruvallur, Dist. Tamilnadu.

The objective of this R&D work is to evolve the process know how for the manufacture of the chemical Vinflunine Tartrate. The project is completed.

liv. Development & demonstration of technology to manufacture a new dosage form namely Oral Thin Films by M/s. ZIM Laboratories Ltd., Nagpur.

The project involves developing of an innovative product i.e. oral thin film producing machine and its process thereof. The method comprises formulation of solution/dispersion/ emulsion required for solvent casting and its characterization. Clinical design and fabrication of machine with larger capacity for film formation of polythene sheets, film rolls, transdermal patches, paper lamination etc. is the uniqueness of this proposal for making oral thin film over the medicines. These machines would achieve the affordability of final product substituting the foreign machine with higher cost. The proposed product and process will help in drug delivery in general and for paediatric and geriatric use in specific. The Project is under progress.

lv. Development of 90 KW Brushless Eddy Current Clutch Gear Unit for Radiator Cooling Fans in Diesel Electric Locomotives of Indian Railways by M/s Eddy Current Controls (I) Ltd., Chalakudy, Kerala

Design and development of 90 KW Brushless Eddy Current Clutch Gear Unit for Radiator Cooling Fans with constraints imposed by limited space available and high ambient temperature environment prevailing in the engine space to replace the brush type couplings inherently prone to frequent breakdown. The project is completed.

DSIR ANNUAL REPORT

Promoting Innovations in Individuals, Start-Ups and MSMES (PRISM)

1. Preamble

2. Other Objectives

III

सत्यमेव जयते

III. PROMOTING INNOVATIONS IN INDIVIDUALS, START-UPS AND MSMEs (PRISM)

1. PREAMBLE

Department of Scientific and Industrial Research (DSIR) has launched a new programme viz. Promoting Innovations in Individuals, Start-ups and MSMEs(PRISM) during 12th five year plan. The programme aims at to support individual innovators having original ideas to convert them into working miodels, prototypes etc. It also aims at supporting autonomous institutions or organizations or registered society for developing state-of-art new technology solutions aimed at helping MSME units in industrial clusters. As a part of its commitment to complete on-going spill-over projects supported under erstwhile TePP, the department has successfully completed sixty-seven (67) projects during the period. The details of the completed projects supported under erstwhile TePP are given in Annexure-11. Further, details of some of the completed TePP projects are given below:

CNG Magnetorheological Finishing Machine

The innovator Dr. Sunil Jha of IIT Delhi has designed and developed a CNC MRF machine to finish 3D surface with the help of MR fluid to achieve surface finish up to nanometer level. The machine can be used to finish ferromagnetic as well as nonmagnetic materials. The developed machine may have its potential uses in aerospace, automobile, moulds manufacturing industries, semiconductor and optics machining and so on.

Damper Controlled Above Knee Prosthesis

Dr. Manoj Soni of Delhi has developed a low cost Above Knee Prosthesis for Indian consumers. The design has been made to ensure simplicity, ease of fabrication, assembling and after sales service. The design ensures use of readily available consumables such as spring, damper and flow control valve assembly as against the imported versions, which requires custom built components. The clinical trial of the above knee prosthesis has been done at AIIMS,

Photograph of final assembly without cover

New Delhi. The product is ready for manufacturing on large scale.

Banana Fibre Separator Machine

Shri K. Murugan of Tuticorin has developed two models of Banana Fiber Separator machine : fixed type and portable type having automation features. Each machine has capacity to produce 300 Kg. of high quality of banana fiber per day. The innovator has successfully commercialized the technology. The technology is patented as well.

Process Technology for Production of Photographic Films

Shri Aman Agarwal of Ambala Cantt. has developed the process technology for production of Photographic Films. The innovator has also successfully installed an automated unit for production of photographic films. The installed capacity of the plant is around 1-2 lakh sq. m./annum. The production facility created by the innovator is first such initiative in India and 5th in the world. Other global manufacturers of photographic films are M/s Kodak, Agfa, Konica and Fuji.

High Performance Cricket Leg Gear

Shri Sanath Reddy of Ahmedabad has developed a cricket leg guard prototype which is 25% lighter than the conventional leg guard. The innovator has designed a single trouser, a mobility suit and embedding protection material into the suit by fusing 4 pieces (2 leg guards and 2 thigh guards) of protection materials (slim new age composite). The developed gear weighs around 1.2 Kg whereas the presently available gear in the market weighs about 2.8 Kg. The product is PVC free and only uses foams and plastics that is reusable. The unique internal design architecture of the composite and foam has enhanced the protection. A unique thermoforming process has been explored. The product is compliant with the regulations of Melbourne Cricket Club (MCC). The innovator has also addressed the production and crucial mobility by designing a single suit by embedding production material into the suit.

Mobile Crime and Accident Reporting Platform(MCARP)

Shri Sanjay Vijayakumar of Kochi has developed an exclusive solution viz. MCARP to tackle crime and other violations efficiently. Built using MobShare technology, it is an intuitive and secure android-based application which aids in mobile capture and cataloguing of visual evidence, real-time from the incident scenario coupled with a comprehensive, secure web platform for report management. The application helps in transfer of pictures shot in digital format, audio recordings, video clips along with geo-location tagging to a central server. The National Investigation Agency (NIA) personnel can take pictures, video and audio recordings of the riot /Bomb blast/crime scene and send them to the control room, letting control-room staff visualize and understand the actual scene, and then use those proofs for investigating purpose. At a later date, the Investigating agency can also analyse the data to gather trends on bomb- blast areas, crime areas etc.

"2 in 1", Self-Secured Orthodontic Spring Separator for predictable separation of teeth in orthodontic patients

Dr. Sudhansu Kansal of Delhi has developed an innovative "2 in 1" Self-Secured Orthodontic Spring Separator (an orthodontic appliance) that is wedged between the teeth which creates adequate space

between them by using spring action; that allows easy placement of an orthodontic band (special metal ring) around the said tooth for desired fixed orthodontic (dental braces) treatment. This step is the primary and critical step in any dental braces treatment that is used worldwide on 95% above orthodontic patients. More than 10 million dental braces patients are treated in India and US alone for whom above 80 million separators may be consumed every year.

2. OTHER OBJECTIVES

2.1 A number of other activities organised/ participated by PRISM/TePP during the year to sensitize academia, disseminate information on TePP to the larger mass of the populace network partners and impact generation among common masses:

- PRISM/TePP innovators participated in the Pride of India Science Exhibition during centenary session of ISC-2013 at University of Calcutta, Kolkata (3rd – 7th January, 2013).
- PRISM/TePP innovators participated in the India Vision 2020 – Indian Science Congress 2014 Exhibition.

DSIR ANNUAL REPORT

Building Industrial Research & Development and Common Research Facilities (BIRD-CRF)

A. Creation of Common Research and Technology Development Hubs (CRTDH)

B. Industrial R&D Promotion Programme

C. Asian Pacific Centre for Transfer of Technology (APCTT)

D. Information Technology and E-Governance

IV

सत्यमेव जयते

IV. BUILDING INDUSTRIAL RESEARCH & DEVELOPMENT AND COMMON RESEARCH FACILITIES (BIRD-Crf)

In the current financial year of 2013-14, the Standing Finance Committee (SFC) meeting of BIRD-crf scheme for implementation under the 12th Five year plan was conducted. The scheme was approved subsuming a new component /programme–(i) Creation of Common Research and Technology Development Hubs (CRTDH) along with three ongoing programmes of DSIR namely (ii) Flagship programme - Industrial R&D Promotion Programme (IRDPP), (iii) Committed programme - Asian and Pacific Centre for Transfer of Technology (APCTT) (iv) Mandatory programme - Information Technology and e-Governance (IT-eG).

(A) CREATION OF COMMON RESEARCH AND TECHNOLOGY DEVELOPMENT HUBS (CRTDH)

One of the key determinants of competitiveness is innovation capabilities, which refers to capabilities both in developing new scientific and technological inventions, and also in carrying out incremental

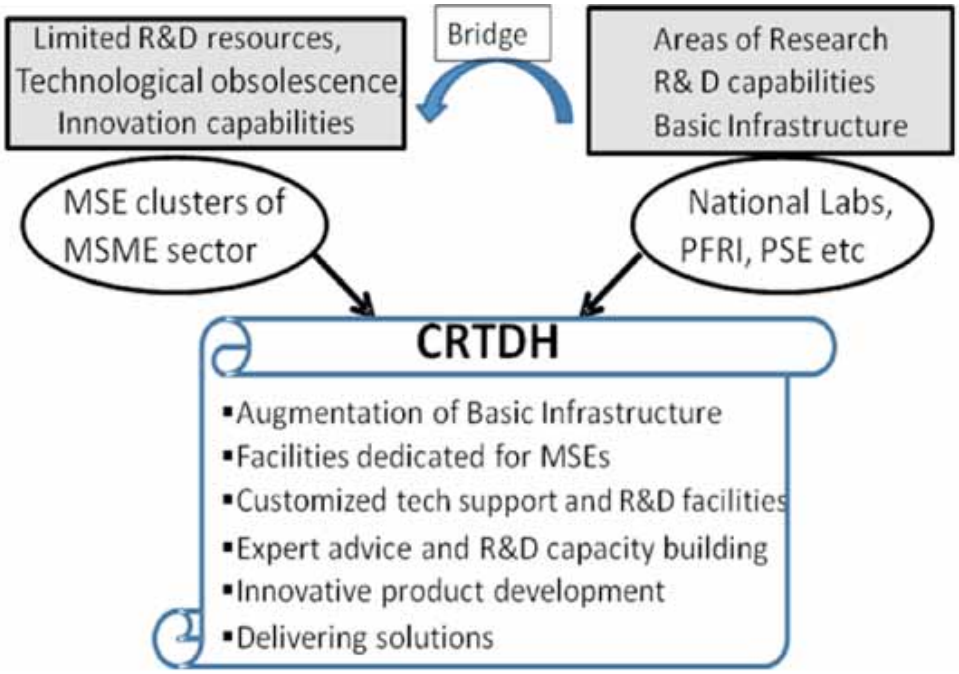


Fig : Rationale behind establishment of CRTDH

changes, systemic changes and changes in the manner of doing business. Many companies are unable to translate new technologies and ideas into marketable products and services posed by innovation challenges, as they are hard-pressed for want of suitable resources. In this respect, particularly smaller companies from the Micro and Small sectors remain deprived of taking part in innovation processes due to financial constraints, inspite of their innovation acumen. It is desirable that such companies are facilitated to pursue technological challenges, by providing suitable facilities to enable them continue with their innovation-related pursuits. With the vision of creating an enabling environment for nurturing Industrial Research and Developing innovative products and processes, DSIR has launched the Scheme of **'Building Industrial Research & Development and Common Research Facilities (BIRD-crf)'** in 12th Plan. The scheme would enhance the linkages between Micro and Small Enterprises (MSEs) and research institutions. This programme aims at creation of Common Research and Technology Development Hubs (CRTDH) in research institutions and other public funded organizations to facilitate MSEs to carry out research and development including testing of innovative products & processes.

Objectives:

(i) The major objective of CRTDH will be to enhance productivity and competitiveness of MSEs by providing assistance in technological problem-solving and capacity building.

(ii) Provide partial financial support as Grant-in aid to the Host organization (National laboratories, public bodies or institutions having a distinct legal entity as per GFR guidelines) that establishes CRTDH towards procurement of R&D equipment and infrastructure creation to operate R&D equipment.

(iii) Creation of 3 Common Research and Technology Development Hubs (CRTDH) that will provide infrastructure and equipment facilities for MSEs to conduct their research and development including testing of innovative products & new technologies. The program aims to create CRTDHs in following focus sectors:

(iv) R&D assets such as design engineering center, pilot & scale-up plant, development of prototypes/ processes, technical knowledge and indigenous consultancy (exclusively for the research), testing and validation, skill development and research information, etc. may be supported under this scheme for MSEs to develop innovative products and new technologies.

Achievements 2013-14:

During 2013-14, BIRDcrf Standing Finance Committee (SFC) document has been appoved by the SFC. The Guidelines and Application Formats of the CRTDH programme are under finalization.

(B) INDUSTRIAL R&D PROMOTION PROGRAMME

1. OBJECTIVES

The broad objectives of the Industrial Research and Development Promotion Programme are to:

- Bring in-house R&D into sharper focus;
- Strengthen R&D infrastructure in industry and Scientific and Industrial Research Organisations (SIROs);
- Promote R&D initiatives of the industry and SIROs;

S.No	Focus sectors	Priority areas
(i)	Affordable Health	Diagnostics, Bio Pharmaceutics, Medical Devices, etc.
(ii)	Electronic/Renewable Energy	Power electronics, Strategic electronics, Solar\Thermal Photovoltaic, MRT signaling, Railways, etc.
(iii)	Environmental interventions	Water technology, Effluent treatment, Waste disposal, e-waste, Recycling technologies, etc.
(iv)	Low cost but advanced machines	Machine tool design, Production and testing equipment, CNC machining, 3D Metal and plastic forming techniques, etc.
(v)	New Materials/ Chemical Process for additive manufacturing	Chemical processes, Chemicals/ petrochemical, Metal and Metallurgy, Material testing, 3D-manufacturing, impregnations, technical textiles, nano material in textiles, etc.

- Ensure that the contributions made by the in-house R&D centres and SIROs dovetail adequately in the overall context of technological and industrial development.

2. AREAS OF COVERAGE

The specific areas covered under the component scheme are:

- In-house R&D in Industry,
- Scientific and Industrial Research Organisations (SIROs), and
- Fiscal Incentives for Scientific Research

Activities and achievements in each of above areas are presented below:

3. IN-HOUSE R&D IN INDUSTRY

3.1 Recognition of In-house R&D Units

A strong S&T infrastructure has been created in the country. This covers a chain of national laboratories, specialised R&D centres, various academic institutions and training centres, which continuously provide expertise, technically trained manpower and technological support to the industry. Various policy measures have been introduced from time to time, to meet the changing industrial and technological requirements of the industry. The Government has been giving special attention to promotion and support to industrial research in industry. Several tax incentives have also been provided which encourage and make it financially attractive for industrial units to establish their own in-house R&D units.

A scheme for granting recognition to in-house R&D units in industry is operated by the DSIR. A number of incentives and support measures are made available to in-house R&D units. Ministry of Finance has issued notification amending the basic notifications under customs and central excise. As per the amendments, all DSIR recognized in-house R&D units other than hospitals can avail customs and central excise duty exemption on their procurements for research purposes.

The in-house R&D units qualifying for recognition are expected to be engaged in research and development activities related to the line of business of the firm, such as, development of new technologies, design and engineering, process/ product/design improvements, developing new methods of analysis and testing; research for increased efficiency in use of resources such as capital equipment, materials and energy; pollution control, effluent treatment and recycling of waste products.

The R&D activities are expected to be separate from routine activities of the firm, such as production and quality control. The in-house R&D units should have staff exclusively engaged in R&D and headed by a full-time R&D manager who would have direct access to the chief executive or to the board of directors depending upon the size of the unit. The in-house R&D units are also expected to maintain separate identifiable infrastructure and R&D accounts.

Number of in-house R&D units recognised by DSIR increased steadily from about 100 in 1973 to about 275 by 1975, to over 700 by 1980, around 925 by 1985, over 1100 in 1990 over 1200 in 1995 and thereafter is hovering between 1200 to 1250; 1361 in March 2010; 1618 in December 2011, 1767 in December 2012 and 1820 in March, 2014. Of these nearly 1700 are in the private sector and the remaining units are in public/joint sector. The last updated 'Directory of Recognised in-house R&D Units' was brought out as on December, 2012. This Directory lists 1638 recognised in-house R&D units, giving registration number, name and mailing address of the company, location of the in-house R&D unit(s) and validity of DSIR recognition. From January, 2013 the scheme has become totally online.

Under the e-governance initiative of DSIR, department has started online application submission facility for greater accessibility and transparency of the departmental programmes / schemes. For the purpose of recognition of in house R&D units, submission of online application facility started in the year 2012 through the department website (http://www.dsir.gov.in). Details about the schemes are available on department website.The applications received are scrutinised for their completeness in the DSIR and are then circulated for comments to various other departments/agencies such as concerned administrative ministries, MSME, CSIR, ICAR, ICMR, CCRAS, DBT, DC & PC, DoT, DRDO, DIT, DoP and NRDC. The units seeking recognition are invited for presentation in DSIR and visited, if need be, by expert teams comprising of representatives of DSIR, as well as outside agencies, like, administrative ministries, CSIR, NRDC, DBT, ICAR, ICMR, DRDO, DIT, DOT, IITs and

local educational and Research Institutions before they are taken up for consideration to verify their separation from the commercial activities like production and quality control and services. In order to obtain first hand information on R&D activities of the applicant firms, discussions with the chiefs of the R&D unit and executives of the firm are also held in DSIR in many cases. During the discussions outside experts are invited and their comments are sought. The applications along with comments from outside agencies, visit reports, and the Department's own evaluation are considered by an Inter-Departmental Screening Committee constituted by the Secretary, DSIR. The Committee meets every month to consider the applications and makes recommendations to the Secretary, DSIR based on its evaluation of the R&D infrastructure and R&D activities of the applicant firms.

R&D recognition is considered on the basic requirement to avail fiscal incentives focused towards R&D and separation of R&D activities from commercial production/service activities of the company is considered important.

During the period January 2013 to March 2014 report, the Screening Committee met 15 times. Of the 346 applications received for recognition, the screening committee considered 275 applications. 197 R&D units were granted fresh recognition based on their satisfactory R&D Infrastructure, Qualified Manpower and Programmes; 120 applications were rejected and 71 applications are under process at the end of 31st March, 2014. A statement giving month-wise receipt, disposal and pendency of applications for recognition of in-house R&D units is given at **Annexure-1**.

During the period under report, more than 300 discussions/meetings were held with heads/ representatives of in-house R&D units. Also, expert teams visited a number of in-house R&D units.

3.2 Renewal of Recognition

Recognition to R&D units is granted for a period ranging from 2 to 5 years. The R&D units are advised to apply for renewal of recognition well in advance (3 months prior to the date of expiry of the recognition). The department has for the first time made arrangements for online submission of applications for renewal of recognition beyond 31.03.2013. The applications are examined in DSIR taking into account the inputs received from other agencies for taking suitable decision on their renewal. As of 1st April 2013, 388 in-house R&D units were due for renewal of recognition out of which 345 applications were received. Based on the evaluation of the performance of the R&D units, renewal of recognition was granted to 330 R&D units. Recognition granted to 43 companies could not be renewed because of the reason that either their application is not received or the R&D performance was not up to the mark. A statement showing month-wise receipt, disposal and pendency of the cases of renewal of recognition of the R&D units is given in **Annexure 2.**

3.3 R&D Expenditure

The expenditure incurred by in-house R&D units in industry has steadily increased. During 1980-81 it was of the order of Rs. 300 crores. In 1985-86, it was of the order of Rs. 500 crores. It is estimated that the present R&D expenditure of the 1820 recognised in house R&D units is of the order of more than Rs.18,000 crores per annum. The share of public and joint sector is about 20 per cent and that of private sector about 80 per cent. Of these 1820 recognized in-house R&D units 79 spent over Rs. 5000 lakhs each on R&D while 320 spent between Rs. 500 lakhs to Rs. 5000 lakhs each per annum on R&D and 262 spent between Rs. 200 lakhs to Rs. 500 lakhs each per annum on R&D The list of these R&D units is given in **Annexure 3, 4 and 5** respectively.

3.4 R&D Infrastructure

The in-house R&D centres have created impressive infrastructural facilities for R&D including sophisticated testing facilities, laboratory equipment and pilot plant facilities. Analytical facilities such as HPLCs, HPTLC, FTIR, GCMS, Polymerase Chain Reaction(PCR) equipment, Hydrogenator, Stability Chamber, Aflotoxin analyzer, X-ray defractometer, Salt Spray test chamber, Vickers hardness tester, IR/UV-VIS spectrophotometers, NMR spectrometers, electron microscopes, particle size analyzers, portable particle counting systems; vibration test equipment, calorimeter, ultra filtration equipment, sonicator, spectro fluorimeter, protein purification set up, digital viscometer, high temperature test and evaluation facilities, CAD-CAM facilities, rapid prototype building machines, greenhouse and tissue culture laboratory facilities are available with many in-house R&D units.

3.5 R&D Manpower

There has been a steady increase in R&D manpower employed by the in-house R&D units. By 1975-76, about

12,000 R&D personnel were employed by recognised in- house units and by 1981-82, the figure was over 30,000. The present estimated manpower for the **1820** in-house R&D units is over **1,50,000.**

3.6 Achievements of In-house R&D Units

Some of the R&D achievements reported by the recognised in-house R&D units are listed below:

Agricultural Sciences:

1. Development of DISCO GUARD: A special seed coating polymer that has insect repellant activity and is very useful in seed storage godowns.
2. Development of Genius Coat L-431: A seed coating polymer having organic active that stimulates genes for root proliferation, seedling growth and final yield enhancement
3. Development of ONX encrustment: This is seed encrusting of Onion and Cumin seeds to add weight and better flowability so that better sowing in the field is done.
4. Development of Splash and Grow: Artemisia seeds are extremely small and difficult to sow. With this technology, there is an increase the weight and size to about 10-15 times that facilitates easier sowing, saving of seeds by proper spacing, effective loading of agrochemicals and lower mortality in the field.
5. Development of Promotor in Cumin: By priming, the seeds start germinating/emerging in 6-7 days, thus substantially reducing irrigation as well as mortality.
6. Development of Promotor In Bitter Gourd: This priming procedure in bitter gourd not only removes dormancy, but also provides uniform germination.
7. Development of Spaghetti for Export Markets, Ragi Vermicelli with high protein, Multigrain Vermicelli, Hot n Sour soup, Instant multigrain Pulav, New Gulab jamun variant with enriched dietary fibre, Instant Upma mix with lemon flavour, Instant pasta with 3 variants of seasonings.
8. Development of Castor hybrid, Maize hybrid and Pearl millet hybrids
9. Development of Earth Essentials which is a balanced blend of 100% bio-organic materials, micro nutrients & beneficial micro-flora, suitable for all kinds of plants and home gardens.

Biological Sciences:

1. Development of Portable Diffused Reflectance based Oral Cancer detection System
2. Development of Fiber based Phototherapy system for Children
3. Development of Isolation of human mesenchymal stem cells from novel sources like perinephric fat
4. Development of Endovascular stent graft with Innovative patented design, 465CHE2011 and Peripheral Stent for stenosis
5. Development of Fabrication using sandwich technique and the development of a percutaneous stented valve that is re positionable.
6. Development of Non-enzymatic isolation of stem cells from human tissue sources.
7. Development of Halobetasol Propionate cream and ointment. Halobetasol propionate is a corticosteroid used in the treatment of psoriasis.
8. Development of Calcium carbonate chewable tablets and suspension.
9. Development of sustained release tablet formulation of Potassium chloride in combination of diuretic drug Bendroflumethazide.
10. Development of stable temozolomide cocrystals with longer half life and good bioavailability. Soluble curcumin cocrystals and eutectics as anti cancer drugs.
11. Development of Fabric based lateral flow immunoassays to test for pregnancy.
12. Development of Plastic microfluidic chips for multiplexed detection of female infertility hormones at laboratory scale.

Chemical Sciences:

1. Development of Molding Glass (Process for curved glass molding) Joining of molded Curved Glass.

2. Development of Non Detergent Organic matter NDOM reduced in AOS from 2.50 percent to 1.00 percent

3. Development of Temozolomide cocrystals of improved stability and color, and Curcumin eutectics/ cocrystals of high solubility

4. Development of Natural Rubber based colored compound for manufacturing of Rubber Sheet for Hospital Application.

5. Development of Introduction of Reclaim Rubber in low cost formulation for non critical end use application.

6. Development of Low cost compound in Synthetic Poly-isoprene based polymer.

7. Development of Natural and Synthetic Poly-isoprene Rubber based compound for Plain and Textured Tourniquet product in Straw, White, Blue & Light Blue colors for export market.

8. Development of Various (Fluorescent Green & Orange) Colored Natural Rubber based compound for Fishing Lure application.

9. Development of Synthetic Poly-isoprene based compound (in Yellow, Green & Red color) for manufacturing of Exercise Band.

10. Development of Direct screen emulsion for solvent base ink under brand name SONAKOTE, Direct screen emulsion for water base ink under brand name CS5/WR, Direct screen emulsion for UV base ink under brand name A-1 Emulsion.

11. Development of alumina products for heavy duty wear resistance application, reaction bonded SiC products, 98% alumina armour products and monolithic armour

12. Development of High Stable (HS) Insoluble Sulphur,High Dispersed (HD) Insoluble Sulphur, Silica (AS) and Zinc Oxide (ZnO) Grades of Insoluble Sulphur.

13. Development of Specialty polymer blankets insulation for belt press applications; Pneumatic and Hydraulic activated pressure bags for Field Vulcanizing Presses; Rubberisation of T72 Tank wheels for Defence - H.V.F.

14. Development of Target shooting rubber sheets for Rifle Shooting Range.

15. Development of High hardness compounds for on-site curing at low temperature and pressure.

16. Development of Non Conductive Rubber Compounds for corrosion protection application.

17. Development of Food grade Rubber compounds for lining applications

18. Development of EPDM based super soft Sponge coextruded door weather strip for vehicles

Engineering Industries:

1. Development of E.P. Valve, Oil pump, pipe assembly, Lube oil and Water Pump for railways, Switching Elements and Rugged Console System - Welding Items

2. Development of TIG Welding on Stainless Steel and Aluminium Alloys, Machining of Titanium Alloys, Magnesium Alloys, inconel, Inbar materials

3. Development of Car Parking Systems, ASRS, Precision Gantry Robots, Assembly Conveyors, Assembly Machines Etc.

4. Development of Filter Diaphragms in various specialty elastomers for mineral processing operations.

5. Development of Oil and Heat resistant steel cord splicing kits for Conveyor Belt repairs.

6. Development of Range of Vertical Turbine pumps, Split case pumps, Multistage pumps, End Suction Pumps.

7. Development of Spectrometer M-108 with Labjack, Spectrometer M-1008-AS2, Wire Holder (for 3mm 13mm dia sample), Pedestal for M-108N and Mould for Aluminium

8. Development of Magnetic Shutter Lock for vehicles.

9. Development of Ignition Switch & Door Lock for vehicles

10. Development of Front & Rear Door Handle Genetal Motor Beat model.

11. Development of RoboPlazma I beam, tube, channel cutting with fully integrated material handling & laser measuring device. This robotic system uses two Kuka robots with special insulation and customized software

12. Development of Intelligent RoboSwift software that compensates for inaccurate input data and job variations, making RoboPlazma virtually hands free.

13. Development of Roboplazma Hot plate cutting solution is developed for cutting the online hot plate for the requirement of the Steel Plant

14. Development of Hydrostatic transmission Back Hoe Loader, Compact utility Tractor with 4 Wheel Drive, Single Seater Formula Cars,Driving Simulator for Road Safety, Performance enhancement, 2 Cylinder Engine etc

15. Development of Forged shackles, Chain connector link and Ratchet Lashing.

16. Development of High accuracy Micromachined Axis for Measuring Instruments.

17. Development of First prototype of Portable, fluorescence based detection system with all optics and analog electronics developed in-house.

18. Development of Heavy Duty Conveyor Belt Winders Coiler – Decoile

19. Development of Clover Patch fitting, Structural casting Joint, Special high tensile fabric structures with steel cables & glass.

20. Development of Fabric Pattern Cutting, Fabric Clamp and Machined & fabricated structural nodes.

21. Development of Chromium-Molybdenum Alloy reinforced rubberized lifter bars for high impact resistance and durability.

22. Development of Glass cord insert wind shields, seal hood and door seals.

23. Development of Colour door seal for vehicles.

24. Development of Twin tube door seal

25. Development of Two way Grid 3D Joint, Spider assembly (Welded), Tie Rod Cast End, Cable with crimped end connection

26. Development of Valve Assemblies for Switchgear and Flow Control Industry.

27. Development of Dropout Fuse cut Unit, Indoor Load Break Switch, Power Connectors,12KV Partial load Break Switch-IS 9920 420KV, 2000 Amps Double Break Switch for 50KA/3 Sec, 36KV Isolator 220KV, 2000 Amps Center Break Isolator with replaceable contacts and stud terminals for 40KA/3Sec Motorised MOM Boxes

28. Development of 60Kv Metal Oxide Surge Arrester Polymer Lighting Arresters, 12KV Pole Mounted Virtual Circuit Breaker and 33KV PC Virtual Circuit Breaker Solar System

Information and Communication Technology (ICT)

1. Development of Roof Top GPS IPS-66 Enclosure, Roof Differential Pulse for Slave Drive IP-66 Enclosure, Alarm Annunciator, SMPS Power Supply, Low Cost Master Slave Clock System, IRIG-B BCD Convertor, NTP/SNTP Network Time Synchronization Products, Large Display 100mm size for Power and Process Industry

2. Development of Numerical 3OC plus IEF Protection Relay, Numerical Differential Protection Relay, Numerical Motor Protection Relay and Numerical 3 Phase Distance Relay

3. Development of EziBuilder V1.0 and SOA Accelerator Pack

4. Development of Software for auto line finding & autobase detection and Multi-line software for calibration.

3.7 Imports Made by In-house R&D Units

The recognised in-house R&D units have imported a variety of equipment, raw materials and samples for their R&D activities. These include: HPTLC, FTIR, GCMS, Polymerase Chain Reaction(PCR) equipment, Hydrogenator, Stability Chamber, Aflotoxin analyzer, X-ray defractometer, Salt Spray test chamber, Vickers hardness tester, Microplate reader, Medical photography equipment, Nitrogen generator, Abrasion loss testing machine, viscosity testing machine, Load cell, Universal testing machine, 30 ton capacity pully block , Ginning machine,Spares for Rota vapor chiller and extraction system, Polymer microscope, Oscillation granulator, Automatic potentiometric titrator, DSC (PerkinElmer), etc

3.8 Other Benefits Availed by the Recognised R&D Units

The Department provides assistance to recognised in-house R&D units in a number of ways, such as cases of industrial R&D units requiring allotment of special controlled materials for R&D, permission to export of

specialised products reserved for small scale industries by medium scale industries for test marketing in other countries and disposal of imported R&D equipment/instruments and pilot plant produce are examined for making suitable recommendations to concerned agencies.

4. SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATIONS (SIROs)

4.1 Recognition of Scientific and Industrial Research Organisations

The DSIR had launched a scheme of granting recognition to SIROs in 1988. SIROs recognised by DSIR are eligible for Customs Duty Exemption and Central Excise Duty Waiver in terms of notification Nos. 51/96-Customs dated 23.7.1996 and 10/97-Central Excise dated 1.3.1997 respectively.

In order to simplify the processing of application and augment the transparency, DSIR has commissioned online filing of application for both fresh and renewal of recognition. Many of existing SIROs have applied online for recognition/renewal of recognition. So far about 500 SIROS have already applied on line.

The DSIR has brought out Guidelines for Recognition of SIROs, which give procedural details and application proforma for seeking recognition under the SIRO Scheme. Functional SIROs having broad based governing council, research advisory committee, research personnel, infrastructural facilities for research, well defined, time bound research programmes and clearly stated objectives of undertaking scientific research, are considered eligible for recognition by DSIR. The investments of surplus funds not needed for immediate research should be in accordance with the Income-tax Act, 1961.

Applications for seeking recognition under the SIRO scheme are considered in DSIR by an Inter-departmental Screening Committee with members from Council of Scientific and Industrial Research (CSIR), Indian Council of Medical Research (ICMR), Indian Council of Agricultural Research (ICAR), Indian Council of Social Sciences Research (ICSSR) and University Grants Commission (UGC). The recommendations of the Screening Committee are put up for approval of Secretary, DSIR. The recognition is effective from the date of approval of Secretary. Retrospective approval is not granted.

During the period January 2013 to March 2014 the Screening Committee met 15 times and recommended 41 cases for recognition as SIROs. These include cases in the natural and applied sciences, agricultural, medical sciences and social sciences. List of these SIROs is furnished at **Annexure-6.** Recognition granted to SIROs is for duration ranging from 1 to 3 years.

The SIROs are advised to apply for renewal of recognition well in advance (3 months prior to the date of expiry of recognition). Such applications received for renewal of recognition are examined by Research Review Groups by involving representatives from ICAR, ICMR, CSIR and ICSSR depending on the area. Based on the evaluation made by the Research Review Groups, renewal of recognition is granted to SIROs. During the year, DSIR has considered the renewal of recognition of 185 SIROs for the period beyond 31.03.2013. out of these, renewal was granted to 167 SIROs.

At present, there are 626 SIROs duly recognised by DSIR; of these, 250 are in the area of natural and applied sciences, 251 are in the area of medical sciences, 39 are in the area of agricultural sciences and 86 are in the area of social sciences.

The SIROs have employed qualified scientists and researchers and have also established good infrastructural facilities for research. They have developed new processes, procedures, techniques and technologies and also filed several patents. They have also organised seminars/symposiums/workshops and published research papers/reports/books.

5. FISCAL INCENTIVES FOR SCIENTIFIC RESEARCH

Government has evolved, from time to time, fiscal incentives and support measures to encourage R&D in industry and increased utilisation of locally available R&D options for industrial development. New incentives to encourage investments in R&D by industry are announced in the Union Budget.

Fiscal incentives and support measures presently available include:

- Income-tax relief on R&D expenditure (capital & revenue);
- Weighted tax deduction U/s 35(2AA) of IT Act 1961 for sponsored research programs in approved national laboratories, universities and IITs;

- Weighted tax deduction u/s 35(2AB) of IT Act, 1961 on in-house R&D expenditure for any company engaged in the business of biotechnology or in any business of manufacture or production of any article or thing not being an article or thing specified in the list of the eleventh schedule of IT Act, having R&D facility approved by Secretary, DSIR.

- Customs duty exemption on capital equipment, spares, accessories and consumables imported for R&D by approved institutions/SIROs;

- Customs duty exemption on specified goods (comprising of analytical and specialty equipment) for use in pharmaceutical and biotechnology sector;

- Central Excise duty waiver on items purchased from the domestic market by approved institutions/ SIROs for R&D;

- Ten year tax holiday for commercial R&D companies approved upto 31.03.2007

- Central Excise duty waiver for 3 years on goods produced based on indigenously developed technologies and duly patented in any two of the countries out of India, European Union (one country), USA and Japan;

- Accelerated depreciation allowance on plant and machinery set-up based on indigenous technology;

- Customs duty exemption on imports for R&D projects supported by Government.

Information on some of these fiscal incentives is given in the following paragraph.

5.1 Depreciation Allowance on Plant and Machinery Setup Based on Indigenous Technology

Secretary, DSIR, is the Prescribed Authority to certify expenditures where higher rate of depreciation can be allowed for the plant and machinery installed for the manufacturing of products using indigenous know-how as per the provisions of rule 5(2) of IT Rules. Certificates are issued for eligible expenditure after a detailed examination in the department. During the period under report, no certificate was issued.

5.2 Investment Allowance Under Section 32A(2B) of Income Tax Act –Old case

A certificate was issued to M/s Grasim Industries Ltd., Mumbai (earlier M/s Gwalior Rayon & Silk Mills Ltd.) under section 32A(2B) of Income Tax for claiming enhanced investment allowance @35% (as against 25% normal) on plant and machinery installed for the manufacture of caustic soda by using Titanium Substrate Insoluble Anodes (TSIA) developed and patented by CSIR-Central Electrochemical Research Institute (CECRI), Karaikudi in compliance with the order of Hon'ble High Court of Delhi dated 7th November, 2013.

5.3 Central Excise Duty Waiver for Three Years on Patented Products

Government of India, Department of Revenue, vide Notification No. 13/99-CE dated 28th February 1999 as amended by Notification No. 22/99 had exempted goods designed, developed and manufactured by a wholly owned Indian company provided they were patented in any two countries from amongst India, USA, Japan and any one of the European Union as specified in the notification from Central excise for 3 years. This excise duty exemption is permissible subject to a certificate to be issued by DSIR as per the provisions in the notification. In order to operationalise the scheme of excise duty exemption on patented goods, department has evolved guidelines and application form for issuance of a certificate.

Department had received 2 applications during the year, which were processed as per the established procedures and custom duty exemption certificates were issued after seeking approvals from Secretary, DSIR. List of these companies and the technologies is furnished at **Annexure - 7.**

5.4 Reference on Expenditure on Scientific Research Under Section 35 (3) of Income-Tax Act, 1961.

Section 35(3) of Income-tax Act, 1961 provides that if a question arises as to whether and, if so, to what extent any activity constitutes or constituted or any asset is or was being used for scientific research, the Central Board of Direct Taxes would refer the question to the Prescribed Authority. Director General Income-tax (Exemptions) in concurrence with Secretary, DSIR is the Prescribed Authority for deciding such cases.

5.5 Approval of Commercial R&D Companies

In order to promote research and development activities in the commercial research and development companies, the Finance Act, 2000 provided for a ten-year tax holiday from income-tax under section 80-IB(8A) of the Income-tax Act, 1961, to approved companies, whose main objective is undertaking scientific and industrial research, Secretary, DSIR is the Prescribed Authority vide Gazette notification no. S.O. 85(E) dated 31 January, 2001, issued by Department of Revenue, Ministry of Finance for granting approval under section 80-IB(8A) of the IT Act. The notification was valid upto 31st March, 2007 and this scheme was not extended further by the Government.

The approval to commercial R&D companies is given initially for a period of 3 years, which can be extended up to 10 years based on evaluation of its performance. The tax exemption is available to a company, which is accorded approval by the Prescribed Authority at any time after the 31st day of March 2000 but before the 1st day of April 2007.

Out of 45 companies approved till 31st March 2007, **seventeen** companies are availing benefit under the section at present. The list of **17** companies is given at **Annexure 8**.

5.6 Customs Duty Exemption to Recognised SIROs

All SIROs recognised by DSIR other than hospitals are eligible for Customs Duty Exemption on the import of scientific equipment, instruments, spares, accessories as well as consumables for research and development activities and programmes.

The department was issuing the essentiality certificates to SIROs for obtaining the customs duty exemptions. As per the notification No. 24 /2007 dated 1st March, 2007 the Director or Head of the institute/organization is empowered to sign the essentiality certificate.

5.7 Central Excise Duty Exemption to Recognised SIROs

All SIROs recognised by DSIR other than hospitals are eligible for Excise Duty Exemption on purchase of scientific and technical instruments, apparatus, equipment (including computers); accessories and spare parts thereof and consumables; computer software, Compact Disc - Read Only Memory (CD-ROM), recorded magnetic tapes, micro films, microfiches; and prototypes for research and development activities and programmes.

This provision was introduced by Ministry of Finance (Department of Revenue) vide notification No. 10/97-Central Excise dated 1st March, 1997. The department was issuing the essentiality certificates to SIROs for obtaining the central excise duty exemptions. As per the notification No.10/ 2007 dated 1st March, 2007 the Director or Head of the institute/organization is empowered to sign the essentiality certificate.

5.8 Customs and Central Excise Duty Exemption to Recognised in-house R&D units

Ministry of Finance has issued notification no. 24/2007 – Customs dated 01/03/2007 and 16/2007 – Central Excise dated 01/03/2007 amending the basic notifications under customs and excise. As per the above amendments all DSIR recognized in-house R&D units other than hospitals can avail customs and central excise duty exemption on their procurements for research purposes. All the eligible in-house R&D units recognized by DSIR have been issued the certificates of registration.

5.9 Registration of Public Funded Research Institutions, Universities etc.

Public funded research institutions, universities, IITs, IISc., Bangalore; Regional Engineering Colleges (other than a hospital) are eligible for availing customs duty exemption on import of equipment, spares and accessories and consumables for research purposes through a simple registration with the DSIR. The heads of the public funded research institutions / organisations duly registered with DSIR can certify the R&D goods for duty free import as per the notification No. 51/96-Customs dated 23 July 1996. As per the Government notification No. 10/97-Central Excise dated 1.3.1997, the above Public Funded Research Institutions registered with DSIR are also eligible for Central Excise Duty Waiver on purchase of indigenously manufactured items for scientific research purposes.

Coinciding with the presentation of Union Budget for the year 2004, Ministry of Finance amended the notification No. 51/96-customs vide notification No. 28/2003-Customs dt. 1.3.2003. As per the amendment, departments & laboratories of central government and state governments (other than a hospital) are not

required to register with DSIR for availing the customs duty exemption. They can clear the consignments by producing a certificate from the Head of the institution certifying that the said goods are required for research purposes only. Another significant change in the notification is that Regional Cancer Centres have been included in the list of institutions eligible for DSIR registration for importing goods for research purposes at a concessional rate of customs duty.

Under the e-governance initiative of DSIR, department has started online application submission facility for greater accessibility and transparency of the department programmes/schemes. For the purpose of registration / renewal of registration of Public Funded Research Institutions (PFRIs) and others, submission of online application facility started in the year 2012 through the department website (www.dsir.gov.in). Details about the schemes are available on department website. So far about 150 institutions have already applied online. The applications received are scrutinized for their completeness in DSIR by a Sub-Committee constituted by the competent authority. The complete applications are then considered by an Inter-departmental Screening Committee constituted by the department for considering the requests from various institutions. Presently the committee is chaired by a former Secretary of DSIR, The Screening Committee met once during the period under report and considered 16 applications received from various public funded research institutions.

During the period under report, 14 registration certificates were issued to such public funded research institutions for availing customs duty exemption on import of scientific equipment, spares and accessories, consumable items and Central Excise Duty exemption on indigenous purchases for Scientific Research Purposes.

The registration to public funded research and other institutions mentioned in the notification is granted for maximum period of five years / ten years (for all institutions of national importance, CSIR, ICAR & ICMR labs, IITs, NITs, etc.). The registered institutions are advised to apply for renewal of registration well in advance of the date of expiry of the registration.

During the period under report, 139 institutions were due for renewal of registration. The department received 109 renewal applications. These were processed on individual files and approval of Competent Authority was obtained and 107 renewal certificates were issued. The remaining 2 applications are under process.

5.10 Approval of In-house R&D Centres under Section 35(2AB) of I.T. Act 1961

In order to encourage R&D initiatives of industry, the finance bill 1997 introduced a sub section (2AB) in section 35 of the IT Act, 1961. The provision introduced initially was for select sectors of industry i.e. drugs, pharmaceuticals, electronic equipment, computers, telecommunication equipment, chemicals and provided weighted deduction of 125 per cent on expenditure on in-house research and development facility as approved by the prescribed authority i.e. Secretary, DSIR. Subsequently, a number of other sectors were added to the list of eligible sectors. From the year 2009 the benefits have been extended to all sectors of industry with a select list of non-priority items. Rate of weighted tax deduction was raised from 125 per cent to 150 per cent subsequent to the year ending March, 2000. The rate of weighted tax deduction was further enhanced to 200% from 1st April 2010. Initially the provision was introduced up to 31st March, 2000. The provision was extended from time to time initially till 31st March, 2005 and then upto 31st March, 2007, further up to 31st March 2012. In the Union Budget 2012, the provision has been extended up to 31st March 2017.

During the period under report, 197 new applications were received for approval under the provision. New approvals were accorded to 207 companies in Income Tax prescribed Form 3CM. Further, the detailed R&D expenditure of the approved companies were also examined and 321 reports valued at Rs. 7515 crores forwarded to DGIT (E) in Form 3CL as prescribed in IT Act. A list of companies approved under Section 35(2AB) of IT Act, during the year 2013 is furnished in **Annexure-9.**

(C) ASIAN PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY (APCTT)

1. PREAMBLE

The Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology (MOST), Government of India has been the national focal point of APCTT since its inception in 1977. Matters pertaining to the APCTT and UN-ESCAP are dealt with in cooperation with the Ministry of Commerce and Industry and the Ministry of External Affairs, Government of India. DSIR also plays an active role in

APCTT's functioning, particularly relating to its programmes and policies. India being the host country, has been providing institutional support to APCTT. During the period under report, institutional support of US$ 200,000 in Indian Rupees was provided to APCTT for meeting local costs. In addition, funding for building repairs, renovation work, and municipal taxes was also provided. DSIR has also extended programme support towards the APCTT project entitled, "Promotion of National Innovation Systems (NIS) in Countries of the Asia-Pacific Region – Phase II". Among other Government of India support received by APCTT, the Ministry of New and Renewable Energy (MNRE) has funded another project entitled, "Establishing an Institutional Cooperation Mechanism to Promote Renewable Energy" in Asia and the Pacific. This project was successfully completed in 2012.

The revised Statute of APCTT, adopted by the Commission at its Sixty-first session in May 2005, through its resolution 61/4, stipulates among other things, that the Centre shall have a Technical Committee consisting of experts from members and associate members of ESCAP and from inter-governmental and non-governmental organizations. Members of Technical Committee shall be appointed by the Head of APCTT in consultation with the Executive Secretary of ESCAP. The Technical Committee shall be responsible for advising on the formulation of the programme of work and on technical matters concerning the operations of APCTT. The 9th Technical Committee of APCTT held at Kuala Lumpur, Malaysia was attended by departmental representative. It is also stipulated that the Centre shall have a Governing Council consisting of a representative designated by the Government of India and no fewer than eight representatives nominated by other members and associate members of ESCAP elected by the Commission. The members and associate members elected by the Commission shall be elected for a period of three years, but shall be eligible for re-election. The members of APCTT's Governing Council for the period 2011-2014 are Bangladesh, China, Fiji islands, India, Indonesia, Islamic Republic of Iran, Malaysia, Nepal, Pakistan, Philippines, Samoa, Sri Lanka, Thailand and Viet Nam. The 9th Governing Council held at Bangkok during the year was attended by the departmental representative.

2. ACTIVITIES OF APCTT

Science, Technology and Innovation; Technology Transfer; and Technology Intelligence were identified as three focus programme areas in the five year Strategic Plan (2013-2017). These activities focused on: promotion of national innovation systems; technology transfer support services for SMEs; the promotion of critical emerging technologies such as renewable energy technologies, biotechnology and nanotechnology; and the provision of information, networking and the sharing of experiences relating to the management of technology, and enhancing technology intelligence through the provision of technology information services.Under these thrust areas, the Centre has undertaken a range of programmes of immediate relevance to the region in 2013 and following are the activities that have been implemented during the current year:

1. APCTT organized more than 23 capacity building activities with participants from 20 countries namely Afghanistan, Bangladesh, Bhutan, Cambodia, China, Fiji, India, Japan, Lao PDR, Indonesia, Islamic Republic of Iran, Myanmar, Malaysia, Mongolia, Nepal, Philippines, Republic of Korea, Thailand, Sri Lanka andViet Nam. APCTT's activities were jointly organized in cooperation with more than 35 partner institutions that included government ministries, national institutions and international agencies.

2. APCTT continued to facilitate and promote networking of institutions of specific industrial sectors (biotechnology, nanotechnology, traditional medicine and renewable energy) in member countries for R&D cooperation, development of human resources, joint ventures and other forms of technological cooperation among the participating institutions. The Centre also focused on institutional capacity building in member countries to assist their SMEs in identifying, acquiring and adopting technologies and promote IT-enabled mechanisms to facilitate technology transfer and related intermediary services.

3. During the reporting period, APCTT carried out several activities under the second phase of the project on strengthening of national innovation systems (NIS) in the Asia Pacific Region (2010-2013), funded by the Department of Scientific and Industrial Research (DSIR), of the Ministry of Science and Technology, Government of India. Under this project, APCTT in collaboration with the Science and Technology Policy Institute (STEPI) of the Government of Korea jointly implemented activities with strong participation of LDC partners in order to help them to develop customized STI initiatives.

(a) APCTT organized a *Workshop on National Technology Innovation System of Lao PDR with Emphasis on Technology Transfer, 19–20 December 2012, Vientiane, Lao PDR.* The workshop was attended by about forty participants from various ministries, departments, national agencies and SME support organizations in Lao PDR. The participants enhanced their knowledge and understanding of the importance of national technology innovation policy framework to promote technology transfer and commercialization by key-actors (academia, R&D institutions and industries) of Lao PDR, and the institutional mechanisms to promote linkages and partnerships among R&D institutions which would eventually catalyze technology transfer and commercialization. Experts from the Philippines, Thailand and Viet Nam shared best practices and lessons learned in their respective countries.

(b) APCTT participated in the *ART Programme 2013 – STI strategy Development in Practice, 28 January – 1 February 2013, Jakarta Indonesia,* organized by STEPI, Republic of Korea under the APEC Research and Technology (ART) Programme in cooperation with the Indonesian Institute of Sciences (LIPI). The workshop that deliberated on STI policy approaches based on comparisons of development experiences in newly industrialized countries such as the Republic of Korea. During the programme, 18 countries shared their STI policy approaches. Lao PDR and Nepal, the two participating countries in the APCTT-STEPI joint activities also participated in the workshop and shared their current STI approaches and planned implementation strategies.

(c) APCTT organized and conducted two sessions *at the Myanmar Business and Development Week on 23 and 24 September 2013, Yangon, Myanmar.* The sessions were on: (1) Promotion of Techno-entrepreneurship and Technology Innovation to Enhance SME Competitiveness: Best Practices; and (2) National Innovation Systems – Policies, Institutional Framework and Programmes to Enhance the Technological Capacity of SMEs. Resource persons from OECD and the Ministry of Science and Technology, Government of Thailand invited by APCTT made presentations on relevant topics. More than 80 participants from emerging enterprises, government agencies and academics were benefited from this activity.

(d) APCTT updated its On-line NIS Resource Centre *(www.nis.apctt.org)* with the outputs of the activities organized in 2012-2013 under the second phase of the NIS project. As specified in letter of agreements between ESCAP and partner institutions in Indonesia and Nepal, they have embarked on developing their own national NIS Resource Centre. While Indonesia has already launched its web-based Indonesia NIS resource center, a partner institution in Nepal developed and tested a pilot version of the Nepal NIS Resource Centre.

(e) APCTT participated in the *Experts Group Meeting on the significance of Marine Science and Technology for small island developing states (SIDS) and the importance of Capacity Building and Marine Technologies Transfer to SIDS, 14-17 May 2013, New York, USA.* The EGM assessed the status of marine science and technology situation in the SIDS region, identified capacity building gaps and framework for technology transfer including north-south and south-south cooperation. Recommendations of this EGM contributed to the preparatory process towards the 2014 Third International Conference on SIDS.

(f) APCTT organized a *Consultative Workshop on Open Innovation Platform, 13-14 November 2013, Kuala Lumpur, Malaysia,* in cooperation with and support from Ministry of Science, Technology and Innovation (MOSTI), Government of Malaysia and the MIMOS, the National R&D Centre in ICT, Government of Malaysia. Experts from fourteen countries participating in the Technical Committee meeting of APCTT attended this workshop to (i) Delineate and discuss the concept of Open Innovation and development of a platform/mechanism from the perspective of developing countries, especially in the context of south-south cooperation; (ii) Review the current practices/ideas of Open Innovation Platform in the Asia-Pacific countries, and elsewhere; (iii) Deliberate on the OIP in the ICT sector and evolve its potential framework and working mechanism under the leadership and support from member countries, and (iv) Identify the need and relevance of OIP in other sectors and participating countries.

(g) At the meeting on South-South Cooperation in STI Capacity Building, held on 18 November 2013 in ESCAP, Bangkok, experts from the International Science, Technology and Innovation Centre (ISTIC), World Association of Small and Medium Enterprises (WASME), Indonesia, Islamic Republic of Iran, Malaysia, Philippines and Thailand identified the following areas of importance to APCTT in promoting south-south cooperation: women in STI and open innovation in technologies that enhances the competitveness of SMEs and contributes to the

upliftment of society. ICSTIC and WASME extended their cooperation to APCTT in implementing programmes and activities of mutual interest.

(h) APCTT provided inputs to ESCAP for the *Report of the Secretary-General on Human Resources Development for the United Nations General Assembly, 68th Session* covering the following aspects: (i) Defining the contribution of Science, Technology and Innovation (STI) to human resource development; (ii) Experiences in using STI systems and strategies to promote human resources development; (iii) Imperatives for building STI and HRD capacities (iv) conclusions and recommendations.

(i) As part of efforts to continue to assist least developed countries in the area of STI diagnosis and strategy development, APCTT and STEPI carried out a joint *Field Study Visit for STI diagnosis and Strategy Development, 5-8 March 2013, Lao PDR.* This field study was organized by the Department of Technology and Innovation, Ministry of Science and Technology, Lao PDR. The study team engaged in-depth discussions with various ministries, academia and industries to learn about the country's socioeconomic setting with an objective to identify STI structural bottlenecks that may require interventions from the Government.

(j) APCTT and STEPI jointly organized a *National Workshop on National Innovation System of Lao PDR Diagnosis and STI Strategy Development, 22-23 October 2013, Vientiane, Lao PDR,* in cooperation with the Department of Technology and Innovation, Ministry of Science and Technology, Lao PDR. The preliminary findings of earlier field visit coupled with feedback received through a questionnaire and desk research were presented in this national workshop. Two experts from Bangladesh and Nepal shared their national STI implementation strategies and the necessity of STI development respectively.

(k) APCTT in cooperation with the Department of Innovation, Ministry of Science and Technology, Lao PDR, organized a*Training on Development and Management of Online Lao PDR National Innovation System Resource Centre, 24 October 2013, Vientiane, Lao PDR* for officials from the Department. APCTT introduced the various APCTT developed ICT based resources and specialized technology. The Asia-Pacific NIS On-line Resource Centre developed and managed by APCTT was used to demonstrate the salient design elements and content aspects of the Resource Centre. Discussions were held on how to assemble and provide access to latest information on policy measures, support mechanisms and technology intermediaries; promote innovation in Lao PDR and assist target users in their efforts to transform innovation into commercial products or services. APCTT is in discussion with the Department of Innovation to develop an on-line Lao PDR NIS Resource Centre under a Letter of Agreement and link it up the Asia-Pacific NIS Resource Centre.

(l) In cooperation with the Department of Technology Innovation of the Ministry of Science and Technology, APCTT organized a national workshop under the United Nations funded project on affordable and accessible sustainable energy In Lao PDR. At this workshop a draft national assessment framework on enabling environment and technology innovation ecosystem for making sustainable energy options and affordable and accessible in Lao PDR was presented to obtain feedback from the stakeholders. It was emphasized that steps have to be initiated now towards transitioning to sustainable energy options for an energy secure future and sustainable development.

(m) This workshop was organized by APCTT in cooperation with the Indonesian Institute of Sciences (LIPI) with similar objectives as that of Lao PDR workshop held in February 2014. Chairman, LIPI opened the workshop expressing his continued cooperation with APCTT in areas that contributed to sustainable development of Indonesia. The concept of sustainable energy and its role in sustainable development was appreciated by the national stakeholders. They deliberated and provided feedback on the draft national assessment framework on enabling environment and technology innovation ecosystem.

(n) APCTT in cooperation with and assistance by the national focal points in Thailand and Nepal, along with the project international consultant arranged a series of meetings with policy makers, regulators, sustainable energy businesses and non-governmental organizations as well as field visits in these countries from 21-28 February 2014.

(o) APCTT organized a "National Workshop on Strengthening R&D Management Capacity of Researchers and Research Managers in the Area of Nanotechnology" on 25-26 February 2014 in Tehran, Islamic Republic of Iran. The workshop was co-organized and hosted by the Iranian Research Organization for Science and Technology (IROST), Islamic Republic of Iran. The workshop was attended

by about 100 target Iranian participants (e.g. policy makers, senior researchers, research managers and industry stakeholders) from various government ministries/departments, R&D institutions, universities, technology promotion agencies, and technology transfer intermediary agencies.

(p) As part of its capacity building activities in South Asia through the SATNET Asia project, APCTT organized training programmes on "Bio-intensive Pest Management in Economically Important Agricultural Crops" 24-25 February 2014 in Thimphu, Bhutan in partnership with National Plant Protection Centre (NPPC) of the Ministry of Agriculture and Forest (MoAF) in Bhutan. The training was attended by nearly 27 participants from various department and divisions of Agriculture of Bhutan. This training programme was aimed to strengthen the capacity of key stakeholders involved in plant protection and quarantine related aspects in the Ministry of Agriculture and Forests in Bhutan. The training was delivered by the external resource persons invited by APCTT from National Institute of Plant Health Management (NIPHM, Govt. of India) and CABI South Asia of India.

(q) APCTT conducted training on "Mass Scale production of Bio-control Agents and Establishing a Bio-control Laboratory" under the objective of SATNET Asia project held from 26-28 February 2014 in Thimphu, Bhutan in collaboration with National Plant Protection Centre (NPPC) of the Ministry of Agriculture and Forest (MoAF). The program was attended by nearly 28 participants having background of agricultural scientist and technical officers in Bhutan.

(r) SATNET facilitates knowledge transfer through the development of a portfolio of best practices on sustainable agriculture, trade facilitation and innovative knowledge sharing. Based on this documented knowledge, APCTT organized a 2 days training program on the "Cost Benefit Analysis of Agricultural Technologies" from 3-4 March 2014 in Kathmandu, Nepal. This workshop was organized in partnership with Nepal Agricultural Research Council (NARC) of the Ministry of Agriculture Development.

(s) APCTT organized this 3 days training program of SATNET Asia project on "Biological Control of Agricultural Pests and Diseases Techniques" from 5-7 March 2014 in Kathmandu, Nepal. This workshop was also organized in partnership with Nepal Agricultural Research Council (NARC) of the Ministry of Agriculture Development.

(t) APCTT organized 2 days training program on the "Cost Benefit Analysis of Agricultural Technologies" from 17-18 March 2014 in Islamabad, Pakistan. This workshop was organized in partnership with Pakistan Agricultural Research Council (PARC) of Ministry of National Food Security and Research at NARC campus in Islamabad.

(u) APCTT organized this 3 days training program of SATNET Asia project on "Biological Control of Agricultural Pests and Diseases" from 19-21 March 2014 in Islamabad, Pakistan. This training workshop was organized in partnership with Pakistan Agricultural Research Council (PARC) of Ministry of National Food Security and Research at NARC campus in Islamabad.

4. During the reporting period, APCTT was an implementing partner of ESCAP project (2013-2014) funded by the Development Account of the United Nations with a goal to assist policymakers in developing a national strategy for strengthening their national enabling environment and innovation ecosystem to promote and develop sustainable energy options that would bring about improvement in the economic livelihood within the context of sustainable development. The activities carried out under this project are:

(a) APCTT participated in the *Expert Group Meeting on the Regional Assessment on Increasing the Affordability of Sustainable Energy Options 19-20 February 2013, Bangkok, Thailand & Suva, Fiji*, which reviewed the conceptual framework in developing the assessment framework, successful delivery models (policy, business and technology) and their adoption to promote sustainable energy options in selected countries, preferably in the least developed and Pacific island countries. This Framework would be used by the pilot countries to carry out an assessment of their own national enabling environment and develop a national strategy paper on sustainable energy options with the assistance of an international expert.

(b) APCTT is in the process of engaging an international consultant to finalize the assessment framework that could be used in carrying the assessment in Lao PDR and Indonesia for developing a national strategy report. The national assessment and strategy development would be carried out in cooperation with and support from the Department of Innovation, Ministry of Science and Technology, Government of Lao PDR and the Centre for Innovation,

Indonesian Institute of Sciences, Government of Indonesia.

5. Under the project titled, "Promotion of a regional network among R&D institutions in the Asia-Pacific to strengthen their research and development (R&D) management capacity in new and emerging areas of technology", APCTT carried out several key activities during the reporting period:

(a) APCTT developed a '*Manual on Critical Issues in Nanotechnology R&D Management: An Asia-Pacific Perspective.*' focusing on various critical aspects of R&D management that were identified at an expert group meeting held in 2011. The *Manual* includes four chapters namely: (i) Nanosafety, standardization and certification; (ii) Protection and valuation of nanotechnology intellectual property; (iii) Best practices on the commercialization of nanotechnology R&D results; and (iv) Case studies on the development and commercialization of nanotechnology-based value-added products from the Asia-Pacific region.

(b) APCTT in cooperation with and hosted by theIndonesian Institute of Sciences (LIPI) organized a *National Workshop on Strengthening R&D Management Capacity of Researchers and Research Managers of R&D Institutes in the Area of Nanotechnology, Jakarta, Indonesia, 26-27 June 2013*. The workshop was attended by about 78 participants representing various ministries, departments, research and development institutes, universities, national technology and innovation promotion agencies and SMEs in Indonesia. Experts from India, Indonesia, Malaysia and the Republic of Korea shared their knowledge and experiences with the participants at the workshop. The participants were trained by international experts on critical aspects of nanotechnology R&D management such as: health and safety implications and risk governance of nanotechnology; protection and valuation of intellectual property rights in nanotechnology; testing, standardization and certification of nanoproducts; and the commercialization of research results by research and development institutes in the field of nanotechnology.

(c) APCTT developed a website to serve as regional information network on nanotechnology for providing relevant information to member country stakeholders. The website houses meeting reports, presentations made by experts, study reports, guidebook / training manual, databases on nanotechnologies, R&D institutions and researchers, and upcoming and past activities under the nanotechnology capacity building programme of APCTT. The website also includes databases on nanotechnology opportunities, R&D collaborations, nanotechnology researchers, and R&D institutes from participating member countries who are engaged in nanotechnology R&D activities.

6. Under its programme of work on the promotion of a technology transfer network for small and medium-scale enterprises in the Asia-Pacific region, APCTT continued to facilitate technology transfer and business cooperation in the Asia-Pacific region through its web-based portals: Technology4sme (www.technology4sme.net); and Business Asia (www.business-asia.net). As of October 2013, SMEs and technology transfer intermediaries across the Asia-Pacific region used www.technology4sme.net website to disseminate information on more than 1000 technologies as well as cross-border business partnership related requirements. As of now, APCTT's Asia-Pacific Technology Information Tracking and Unified Data Extraction search engine (APTITUDE) continued to assist users to search and retrieve information from a total of 20 technology databases across the Asia-Pacific region and beyond. In addition, APCTT also provided support to SMEs through its networks of focal points and technology transfer intermediaries.

7. APCTT has initiated several efforts to identify potential partner organizations for mobilizing resources and partnerships to revitalize the activities of its Asia-Pacific Traditional Medicine and Herbal Technology Network. As recommended by the Consultative Forum held in Changsha, China during 24-25 September 2012 establishment of an with the active involvement of APTMNET member countries. APCTT is currently exploring establishment of an Asia-Pacific Consortium for Subhealth Intervention Technology (APCSIT) in 2014.

8. APCTT during its mission to the Republic of Korea in July 2013 deliberated with the Department of External Cooperation and Affairs of Korea Research Institute of Bioscience and Biotechnology (KRIBB) about revitalizing Biotechnology Information Network for Asia (BINASIA) by focusing specific application area of biotechnology. KRIBB expressed its interest to support activities focusing on the advanced bio-energy technology innovation. The Centre is developing a concept paper for a two year project to be funded by the Government of the Republic of Korea.

9. With project funding from the Ministry of New and Renewable Energy (MNRE) of the Government of India, APCTT implemented several programmes during June 2010 – October 2012 that focused on strengthening capacity of member countries to adopt multiple approaches to promote the utilization of renewable energy resources to meet their energy needs and foster sustainable development. APCTT is currently exploring the possibilities of initiating the Phase-II of the Renewable energy Cooperation project with a specific focus on renewable energy resource assessment as well as expanding the membership base of RECAP network with support from prospective funding partners including the Ministry of New and Renewable Energy, Government of India, the funding partner of the recently concluded RECAP project.

10. During 2012, APCTT initiated work on a project entitled, "Network for Knowledge Transfer on Sustainable Agricultural Technologies and Improved Market Linkages in South and Southeast Asia (SATNET Asia)" in partnership with Centre for Alleviation of Poverty through Sustainable Agriculture (CAPSA), a Regional Institution of ESCAP based in Bogor, Indonesia. This three year project funded by European Union (EU) focuses on dissemination of technologies and facilitation of market access for poor farmers in the following South and Southeast Asian countries: Afghanistan, Bangladesh, Bhutan, Cambodia, Indonesia, Laos, Myanmar, Nepal, Pakistan and India. As part of its responsibility to implement the South Asia component of this project, APCTT carried out various activities in participating member countries in South Asia during this reporting period:

(a) APCTT in partnership with the United Nations Disaster Management Team – India (UNDMT, India), organized *SATNET Regional Workshop on Climate Resilient Small Holder Agricultural Farming Systems in South Asia, 24-27 June 2013, New Delhi, India,* which focused on reviewing the latest global and regional developments in the area of climate change adaptation and strengthening the capacity of key stakeholders for promoting climate resilient farming systems for the benefit of small holder farmers in countries in South Asia. Participants from 8 South Asian countries namely Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka actively participated in this Regional Workshop and contributed to knowledge sharing on best practices related to climate resilient agriculture.

(b) APCTT in partnership with CAPSA, Bogor, Indonesia, and the Pakistan Agricultural Research Council (PARC), Pakistan organized a workshop on *Identifying Sustainable Agricultural Technologies and Translating Research Findings into Information Accessible to Extension Workers and Farmers, 1-5 July 2013, Islamabad, Pakistan.* The workshop focused on building the capacity of researchers in Pakistan to identify sustainable technologies and recognize the most compelling findings from their research, process, present and disseminate these findings to development practitioners. It also offered an opportunity to enhance participants' analytical and communication skills, share best practices, learn to write targeted knowledge products and better engage in policy dialogue to influence their key stakeholders.

(c) APCTT in partnership with the Food and Agriculture Organization of the United Nations (FAO) Afghanistan, Ministry of Agriculture, Irrigation and Livestock (MAIL) of Afghanistan, and the Centre for Alleviation of Poverty through Sustainable Agriculture (CAPSA) organized *Training on Integrated Pest Management Practices, 17-19 September 2013 and* Training on Bio-intensive Pest Management, 21-26 September 2013*, Kabul Afghanistan*. These two in-country training programmes were held for relevant stakeholders in Kabul, Afghanistan. The training focused on strengthening the capacity of key national stakeholders in the application of biological methods of pest control to promote crop productivity and sustainability. The participants were senior officials of MAIL, Provincial Directors of Plant Protection and Extension Directorates, and field level officers of MAIL involved in the control of specific pests and diseases of economically-important crops and fruits in Afghanistan that significantly contribute to the national economy.

(d) APCTT in partnership with the Trade and Investment Division (TID) of the United Nations ESCAP and the Agricultural and Processed Food Products Export Development Authority (APEDA), India, organized *South Asia Regional Training on Electronic Traceability and Market Access for Agricultural Trade Facilitation, 24-26 September 2013, New Delhi, India*. The training focused on building capacities of public and private sector stakeholders on 'electronic traceability' to facilitate trade in agricultural or food products. The training also included a hands-on session on technology transfer and establishing market linkages for facilitating cross-border trade in the agriculture and processed foods sectors. Over 40 participants from South Asia, including from Afghanistan, Bangladesh, Bhutan, India, Nepal and Pakistan participated in this training.

(e) APCTT in partnership with the Council for Renewable Natural Resources Research of Bhutan (CoRRB) of the Ministry of Agriculture and Forests in Bhutan, would be organizing *SATNET National Training Programme on Cost-Benefit Analysis of Agricultural Technologies, 25-27 November 2013, Thimphu, Bhutan.* It is envisaged that this national training programme to be held in Bhutan will train research scientists and extension workers in Bhutan on performing Cost Benefit Analysis (CBA) analysis for choosing appropriate productive enhancing agricultural technologies for adoption and deployment by relevant stakeholders.

11. APCTT continued to organize "training of trainers" programmes to develop critical mass of trained personnel in member countries who can help SMEs to plan and implement technology transfer projects in a holistic manner. At these training programmes the APCTT developed Training Manual on "Planning and Implementing Technology Transfer Projects" is used to train master trainers in member countries.

(a) APCTT organized *Training of Trainers Programme on "Planning and Implementing Technology Transfer Projects" in Bangkok, Thailand during the 15-17 July 2013,* in partnership with the King Mongkut University of Technology Thonburi (KMUTT), Bangkok, Thailand. The workshop attracted the participation of officials representing senior management from more than 35 SMEs who were trained on various aspects of planning and implementing technology transfer projects. APCTT also received a proposal to organise a sector specific training programme for SMEs in Thailand in the food-processing sector during 2014 in partnership with KMUTT.

(b) On the invitation of the International Centre for Environmental Technology Transfer (ICETT), Japan and Ministry of Economy, Trade and Industry (METI), Japan, APCTT co-delivered a workshop on transfer of climate friendly technologies for Japanese SMEs during September 1-2, 2013 in Tokyo, Japan. The workshop focused on strengthening the capacity of Japanese SMEs in managing technology transfer as well as to undertake some business matching activities between Japanese technology companies and technology buyers in other Asia Pacific countries. APCTT trained about 25 Japanese SMEs as well as officials from METI, Japan on key issues related to managing cross-border technology transfer projects. APCTT was also requested to develop a set of guidelines for preparing an effective technology offer dossier for the use of technology offering firms in Climate Technology Initiative (CTI) member countries, which was subsequently developed by APCTT and submitted to CTI Secretariat for consideration.

12. APCTT provided keynote addresses to industry conferences in the Islamic Republic of Iran, India and China on issues related to technology transfer and disseminated information about APCTT's technology transfer services: (1) *First International Conference on IT Industry and Exports* organized by IROST, Tehran, June 9 2013; (2) Global India MSME Summit organized by Confederation of Indian Industries, Delhi, 9 October 2013; and (3) Nanjing International Technology Transfer Conference, organized by the Nanjing International Technology Transfer Centre, 28 October 2013.Under the technology intelligence programme, APCTT continued to publish online periodicals, namely the Asia-Pacific Tech Monitor and the Value Added Technology Information Service (VATIS) Update series on Biotechnology, Food Processing, Non-conventional energy, Ozone Layer protection and Waste management. These periodicals disseminate a range of technological information on latest technological innovations, technology policies, technology market, innovation management, technology transfer and events. During the reporting period, APCTT published four issues of Asia-Pacific Tech Monitor and 16 issues of VATIS Updates, all of which were published on-line at www.techmonitor.net. In addition, about 1,500 printed copies of each issue of VATIS Update on Ozone Layer Protection were also disseminated to SMEs, policymakers, intermediary agencies and related stakeholders in India. APCTT partnered with prominent institutions to jointly publish two of the VATIS Update periodicals. VATIS (Ozone Layer Protection) was co-published with support from the Ozone Cell of the Ministry of Environment and Forests of the Government of India. VATIS (Biotechnology) was also co-published with the Biotech Consortium India Limited (BCIL), a Government of India Undertaking. As part of its technology intelligence activities, APCTT carried out a combination of normative and analytical studies of regional relevance to identify trends highlight good policies and practices, and foster regional cooperation. During the reporting period, the following results were achieved under the normative and analytical work:

(a) Manual on Critical Issues in Nanotechnology R&D Management: An Asia-Pacific Perspective

(b) Nepal STI Diagnosis and Strategy Development report

(c) National Assessment Framework on enabling environment, including technology innovation eco-system that makes sustainable energy options affordable and accessible (Under a project jointly implemented with the Environment and Development Division of ESCAP)

(d) Training Manual on Biological Control of Pests and Diseases for Apples, Apricots, Grapes and Pomegranate as part of the SATNET Asia project (Under preparation)

(e) Desk Study Report on "Comparative Study of Policies and related Best Practices in the Asia-Pacific Region for Promoting the Adoption and Utilization of Renewable Energy Technologies" for the benefit policy makers and other relevant stakeholders involved in the promotion of renewable energy in countries in the Asia-Pacific region

(f) Concept Paper as well as Background Paper for the ECOSOC Annual Ministerial Review - Regional Consultation on Science, Technology and Innovation that focused on science, technology and innovation for sustainable development for promoting renewable energy technologies for sustainable development in Asia and the Pacific held in Bangkok, Thailand during 13 March 2013.

13. APCTT also organized several activities in the CSN countries. Policy makers and other STI stakeholders from these countries also participated in the capacity building programmes organized in other countries of the region. CSN countries that benefitted from APCTT activities during the reporting period include Afghanistan, Bhutan, Bangladesh, Mongolia, Myanmar, Nepal and Lao PDR. The activities include the following:

(a) The Centre enhanced the understanding of the importance of national technology innovation policy framework to promote technology transfer and commercialization by key-actors (academia, R&D institutions and industries) of Lao PDR at a programme organized in December 2012. Experts from the Philippines, Thailand and Vietnam shared their best practices and lessons learned.

(b) At the national workshop held in October 2013, STI stakeholders of Lao PDR were enriched with the knowledge of the importance of key components of NIS and presented the findings of the NIS diagnosis based on the desk and field studies undertaken during March 2013, and facilitated discussions on the strategy development.

(c) At the one day training programme held in October 2013, the technical staff members of the Department of Technology Innovation (DTI), Ministry of Science & Technology of Lao PDR were briefed about and demonstrated the various web-based mechanisms to promote and facilitate technology innovation by providing access to various national policies, support mechanisms and potential partners for STI cooperation.

(d) With assistance from APCTT, Nepal has successfully developed its own NIS Resource Centre during this reporting period.

(e) APCTT in cooperation with TID-ESCAP organized two special sessions during the Myanmar Business and Development Week in September 2013. At these sessions, participants gained knowledge on various aspects of techno-entrepreneurship and emphasized the need to promote technology innovation to enhance competitiveness of SMEs in Myanmar.

(f) Under the SATNET Asia project, APCTT organized two capacity building programmes in the area of biological control of agricultural pests and diseases in partnership with CAPSA and Food and Agriculture Organization (FAO) in Kabul, Afghanistan during 17-26 September 2013. Through these programmes, APCTT provided training for about 60 officials and experts affiliated to the Ministry of Agriculture, Irrigation and Livestock (MAIL), Afghanistan on various strategies and best practices related to biological control of agricultural pests and diseases of economically important crops in Afghanistan.

(g) APCTT organized two regional workshops for South Asian countries on climate resilient agriculture as well as electronic traceability and market access for agricultural trade facilitation in New Delhi, India. A total of 20 participants from Afghanistan, Bangladesh and Nepal were trained on key themes such as climate resilient agriculture as well as market access for agricultural commodities.

(h) APCTT co-delivered a workshop on transfer of climate friendly technologies for Japanese SMEs during September 1-2, 2013 in Tokyo, Japan in partnership with the International Centre for Environmental Technology Transfer (ICETT), Japan and Ministry of Economy, Trade and Industry (METI), Japan.

As part of this workshop, some technology needs were identified for Mongolia and Japanese SMEs were afforded the opportunity to undertake business matching with the Mongolian representatives. It is envisaged that following the business-matching meetings, the Japanese SMEs will undertake a visit to Mongolia to further explore possibilities for technology-based business cooperation with the interested stakeholders in Mongolia.

14. APCTT participated in various ESCAP programmes during the reporting period:

(a) APCTT was invited to participate in the *Regional Training Workshop on Widening Access to Energy Services through Pro-Poor Private-Public Partnership, 25-27 September 2013, Bangkok Thailand*, to share its perspectives for enhancing the national outputs and also assisted in preparation of the training handbook by contributing to and reviewing contents of the handbook.

(b) APCTT together with TID organized the Regional Consultation Meeting on Science, Technology and Innovation for Promoting Renewable Energy Technologies for Sustainable Development in Asia and the Pacific in support of the *ECOSOC Annual Ministerial Review Meeting, 13 March 2013, Bangkok, Thailand* 2013. Hosted by the Royal Government of Thailand, the meeting drew together more than 70 participants from across the ESCAP region and explored regional perspectives on using STI to promote renewable energy technologies. APCTT developed a concept paper on the role of STI for sustainable development to frame the discussions at the meeting.

(c) APCTT also participated in the Second Year Meeting of the SATNET Asia Network as well as the High-level Policy Dialogue on Technology Transfer for Smallholder Farmers organized by CAPSA-ESCAP during 12-13 February 2013 in Bogor, Indonesia.

15. APCTT continued to work with other United Nations agencies in India through various channels. During the past year, APCTT engaged with different UN agencies in India on a range of areas relevant to its work programme:

(a) Under the United Nations in India on its United Nations Development Assistance Framework (UNDAF), APCTT is currently involved in the activities related to Outcome 6 "Government, industry and other relevant stakeholders actively promote a more sustainable environment and enhanced resilience of communities in the face of challenges of Climate Change, Disaster Risk and natural resource depletion". APCTT continued to share information on technologies, best practices and it's "Guidebook of Technologies for Disaster Preparedness and Mitigation" with other UN Agencies.

(b) During the reporting period, APCTT served to be a member agency of the United Nations Disaster Management Team (UNDMT) which functions under overall umbrella of UNDAF. APCTT regularly participated in the UNDMT India meetings and provided inputs related to technology transfer aspects of disaster risk reduction (DRR) and shared information related to best practices in the region based on APCTT project outputs. APCTT in partnership with UNDMT India organized training on *'Climate Resilient Small Holder Agricultural Farming Systems in South Asia'* from 26-27 June. As part of UNDMT India, APCTT participated at the launch of the India National Platform for DRR (NPDRR) 13-14 May, New Delhi, India. On 13th May 2013, APCTT participated in the UNDMT-organized meeting with Ms. Helena Molin Valdes, Deputy Director of UN office for Disaster Risk Reduction (UNISDR) who was on mission in New Delhi, India. During the meeting, APCTT shared its regional experiences on technology transfer capacity building and relevant DRR-related activities.

(c) APCTT engaged in dialogue with the United Nations Industrial Development Organization (UNIDO) India office to explore possibilities of cooperation in the area of sustainable energy towards meeting the goals of UN Secretary General's Sustainable Energy for All (SE4ALL) initiative. APCTT contributed to the compendium of sustainable energy activities across all UN agencies in India which is currently being developed.

(d) In April 2013, APCTT joined the Research and Knowledge Team (RKT) which has been established as one of the UNCT's Core Committees, to promote creation and sharing of knowledge and research by the United Nations entities active in the country. In the first meeting of the Research and Knowledge Team on 10 April, 2013, APCTT shared information about various activities, information and knowledge products, periodicals/publications and normative and analytical works being undertaken by the Centre.

(e) APCTT, as a member of the UN Communication Group (UNCG), India participated in the advocacy and inter-agency communication meetings organized by UNCG time to time and also contributed inputs to the

following issues of UN Development Supplement (UNews) published by United Nations Information Centre for India and Bhutan.

(f) APCTT participated in the International Labour Organization (ILO) Country Programme meeting on 18 September 2013 and shared its views on ILO's "Decent Work Country Programme for India (DWCP-India) 2013-17". The Centre also shared its experience with ILO and other UN agencies on the role of technology in decent work.

16. The Centre strengthened its continued partnerships in new areas and also developed new partnerships with key institutions in the Asia-Pacific region as listed below:

(a) Science and Technology Policy Institute (STEPI), Republic of Korea - To carry out a joint field study on STI diagnosis in the Lao People's Democratic Republic from 5 to 8 March 2013 organized by the Department of Technology and Innovation, Ministry of Science and Technology.

(b) King Mongkut University of Technology Thonburi (KMUTT), Bangkok, Thailand - To organise a Training of Trainers Programme on "Planning and Implementing Technology Transfer Projects" in Bangkok, Thailand during 15-17 July 2013.

(c) Indonesian Institute of Sciences (LIPI) – To organise the National Workshop on Strengthening R&D Management Capacity of Researchers and Research Managers of R&D Institutes in the Area of Nanotechnology, Jakarta, Indonesia, 26-27 June 2013.

(d) International Centre for Environmental Technology Transfer (ICETT), Japan and Ministry of Economy, Trade and Industry (METI), Japan - To co-deliver a workshop on transfer of climate friendly technologies for Japanese SMEs during September 2-3, 2013 in Tokyo, Japan.

(e) University of Tokyo, Japan - To meet (on September 4, 2013) with senior officials from: Policy Alternatives Research Institute, The University of Tokyo; Office of Intellectual Property, the University of Tokyo; Center for Intellectual Property Strategies, Japan Science and Technology Agency (JST); Japan Intellectual Property Association (JIPA); and Toudai Technology Licensing Office (TLO).

(f) IOR-ARC Regional Centre for Science and Technology (RCSTT), Tehran, Islamic Republic of Iran - To participate in the 5th FAJR International Inventions & Innovation Exhibition (FINEX 2013), February 4-7, 2013, Tehran, Islamic Republic of Iran.

(g) Agricultural and Processed Food Products Export Development Authority (APEDA), New Delhi, India - To organize a South Asia Regional Training on Electronic Traceability and Market Access for Agricultural Trade Facilitation in partnership in New Delhi, India during 24-26 September 2013.

(h) Food and Agriculture Organization of the United Nations Afghanistan, Ministry of Agriculture, Irrigation and Livestock of Afghanistan, and the Centre for Alleviation of Poverty through Sustainable Agriculture (CAPSA) - To organize two in-country training programmes on biological control of agricultural pests and diseases in Kabul, Afghanistan during 17-26 September 2013.

(i) Council for Renewable Natural Resources Research of Bhutan (CoRRB) of the Ministry of Agriculture and Forests in Bhutan - To organize a National Training Programme on Cost-Benefit Analysis of Agricultural Technologies for the benefit of agricultural researchers and extensions workers in Bhutan during 25-27 November 2013 in Thimphu, Bhutan.

17. The Centre works closely with the Business and Development Section of Trade and Investment Division (TID)of UNESCAP due to the emphasis placed by this section on the development of small and medium enterprises. In accordance with ESCAP embarking on a "Programmatic Approach" for the development of the programme of work for the biennium 2012-2013, APCTT worked closely with TID in developing the Capacity Development Project Document to ensure greater synergy and more effective backstopping support.

18. The Human Resources Management Section (HRMS) of UNESCAP organized several training programmes for APCTT staff during the reporting period:

(a) International Public Sector Accounting Standards (IPSAS) – Delivery Principle on 10th October 2013 delivered via WebEx. As of 1 January 2014, the UNESCAP will adopt the IPSAS which will effectively replace United Nation System Accounting Standard (UNSAS).

(b) Training week, New Delhi, India, 3 - 7 June 2013 delivered by an international management consultant

engaged by ESCAP. The week-long training covered various topics such as: Performance Management for Managers/Supervisors; Collaborative Negotiation Skills; Team Building; Ethics; and Competency-based Interviewing Skill.

(c) Training session on "UN documentation: Searching Official Document System of United Nations (ODS) and other research tools" organized by a UNESCAP Library on 11 March 2013 deliveredvia VTC.

19. In 2013, APCTT placed a renewed focus on the use of ICT tools to assist in increasing the impact and reach of its program delivery efforts. The initiatives under its Digital Strategy include the redevelopment of the APCTT website, a digital communications strategy and a digital knowledge center project.

(a) Website redevelopment: In 2013 APCTT completed a major overhaul of its website, www.apctt.org. This involved migrating the content to a new platform using Content Management System and a redesign of the appearance and functionality of the website. This upgrade allows faster and more efficient web authoring and updates by APCTT staff. The intention is to utilize the APCTT website to a greater extent to disseminate information and knowledge resources for stakeholders. In 2014 it is proposed to examine the subsidiary websites of APCTT developed in previous years, such as technology4sme.net and binasia.net for opportunities to also upgrade their appearance and functionality.

(b) APCTT Digital Communications Strategy: APCTT initiated developing a digital communication strategy for implementation in 2014. The purpose of the strategy is to use social media and other ICT tools to increase the impact of APCTT's activities by making the outputs available to a wider audience. The strategy will cover the use of platforms such as Twitter and Facebook to publicize APCTT's key events, to engage the attention of stakeholders on important technology transfer issues and drive users towards APCTT's websites, technology intelligence products and online technology transfer platforms.

(c) Digital Knowledge Centre: APCTT completed an extensive e-archiving project, to digitize all of its publications which have been produced since 1977. These are currently available internally to APCTT staff. Access to this digital knowledge center would be made available to STI stakeholders through the APCTT website allowing them read and download the documents free of cost.

20. In keeping with broader UN goals to reduce the environmental impact of its operations, APCTT has begun an initiative to measure its emissions of greenhouse gases. During the reporting period, the total emission was estimated to be about 133 tonnes – mainly from air travel (47%) and electricity (51%). Work to be done in 2014 to reduce carbon footprint. Efforts would be made to reduce the Centre's carbon footprint by the next reporting period.

APCTT Technical Committee and Governing Council Meetings

The Ninth Meeting of the Technical Committee of APCTT was held from 11-12 November, 2013 in Kuala Lumpur, Malaysia and the 9th Session of the Governing Council of APCTT was held on 19 November, 2013 in Bangkok, Thailand.

Foreign Deputations in APCTT activities from DSIR and Its organizations

Senior Officers of DSIR and its organizations were deputed as resource persons/participants to various events.

(D) INFORMATION TECHNOLOGY AND e-GOVERNANCE

1. INTRODUCTION

'Information Technology and e-Governance'(IT-eG), group was formed during mid of the 10th Plan period in order to create an IT enabled work environment in the Department through accelerated usage of various Information Technology opportunities. Primarily aims to convert the existing procedures and processes into *citizen centered,* IT-eG division implements e-Governance in the department progressively that need be in conformance to the National eGovernance Action Plan. For the implementation of an IT Action Plan IT-eG Division operates on a separate IT Budget Head that came into effect in DSIR since FY 2004-05.

2. IT ACTION PLAN

For IT and e-Governance activities a comprehensive IT-Action Plan in the department as formulated in line with the Government directions issued during Tenth Plan remains

- *Infrastructure Development:* Provide and maintain Personal Computers (PCs) and other essential IT- equipment and software to all the functionaries.

- *Networking:* Up gradation, extension and maintenance of the Local Area Network (LAN).

- *Office Automation:* Implement various applications software that not only maintain records of receipt, issue of letters and movement of files but also offer enhancement in accountability, responsiveness and transparency in governance.

- *IT Training:* Provide relevant training courses to the officers/ staff that enable them to work on computers by using application software developed.

- *e-Reports*: Convert the Acts, Rules, Circulars and other published materials of interest or relevance to the public, in the electronic form.

- *Website*: Enrich the contents of the DSIR website by including downloadable forms and guidelines relevant to various citizen services that Department provides.

- *IntraDSIR*: Enrich the contents of the IntraDSIR by including downloadable forms and circulars relevant to employees of the Department.

3. AUTOMATION OF DSIR OPERATIONS

DSIR essentially focuses on enabling Indian industry to reach state-of-the-art innovation excellence and competitiveness through research & technological interventions. Information Technology and e-Governance (IT-eG) group within DSIR has developed and implemented an IT enabled work environment and Enterprise Resource Planning (ERP) application to automate all the operations of DSIR and link it to providing online services to the Industries and relevant stakeholders. Incidental benefits include reduction of costs / efforts in seeking and obtaining information and services and minimization of administrative overheads.

Conforming to each points under the set Action Plan, the highlights on achievements through automation of DSIR operations are as follows:

3.1 Program Implementation and e-Service Delivery

The system implemented engagement of Scientific & Industrial Research Organisations (**SIRO**), In-house R&D Industrial units (**RDI**), Public Funded Research Institutions (**PFRIs**) and also strategic sectors, academic institutions and innovators/ technopreneurs to (i) disseminate awareness and encourage technology development, pursue relevant patent acquisition, access resources and services facilitating technology development leading to manufacturing (ii) prospect, source technologies, explore and leverage opportunities for pursuing innovations for manufacture, (iii) facilitate technology acquisition, transfer, negotiation of terms, evolving strategies/approaches for exploitation of opportunities, (iv) facilitate augmenting of capacities for manufacture of products and (v) disseminate effective practices for management of operations and risks. The project was developed and delivered in sequential phases for all modules and functionalities with coverage of authorization and authentication of portal users.

Intervention

Electronic knowledge-based workplace that offers effective B2G & G2B services has been achieved through:

(i)	Analysis of Industry Requirements, feedback from Programmes implemented by DSIR in the past, and Inputs during workshops and engagement with the industries
(ii)	Design, Deployment and Validation of Solutions that meet expectations and provide value to the Industries to leverage opportunities for Technology Development and R&D innovation
(iii)	Continuous enhancement in the quality of services with institution of systems to address challenges posed by industries
(iv)	Disseminate practices that can facilitate industries in their efforts to move up in the value chain from ideation to product manufacturing and export

Specific innovative ideas implemented in ERP and their impact on services has been:

- The ERP Solution encompasses On-line submission of applications by industries, SIROs

& PFRIs in web-enabled form in alignment with the schemes, programs being implemented and as per prescribed business processes, business rules, requirements and guidelines as disseminated & made available on DSIR Website in secure mode.

- On-line processing of applications within DSIR involving stakeholder/industry.
- Provision of entering legacy data into the system.
- Analytics and Decision Support to discern performance gaps and develop appropriate action plans for industry engagement.
- Design Description, SRS, User Documentation, Quality Assurance and various reports as per the IEEE Standards for the purpose of maintenance & management, trouble shooting, compliance with protocols and standard operation procedures.
- The applicant has the flexibility of knowing the status of his application, making the process of scrutiny, decision making more transparent and making the Officers more accountable for performances and results.
- The outcome/decision made is automatically generated from the ERP solution and communications are auto-dispatched as emails avoiding word processing, communication delays etc.
- Electronic transfer of funds to the applicant is made upon approval and sanction.
- Online Analytics and Dashboards indicate information such as quarterly progress reports from the applicants, conveying acceptance of the reports by the competent authority, on-line status updates to the applicant.
- ERP Software ensures that the data once captured is not re-entered. Also data gets validated during entry.
- Required hardware and ICT Infrastructure is IPv6 Compliant.

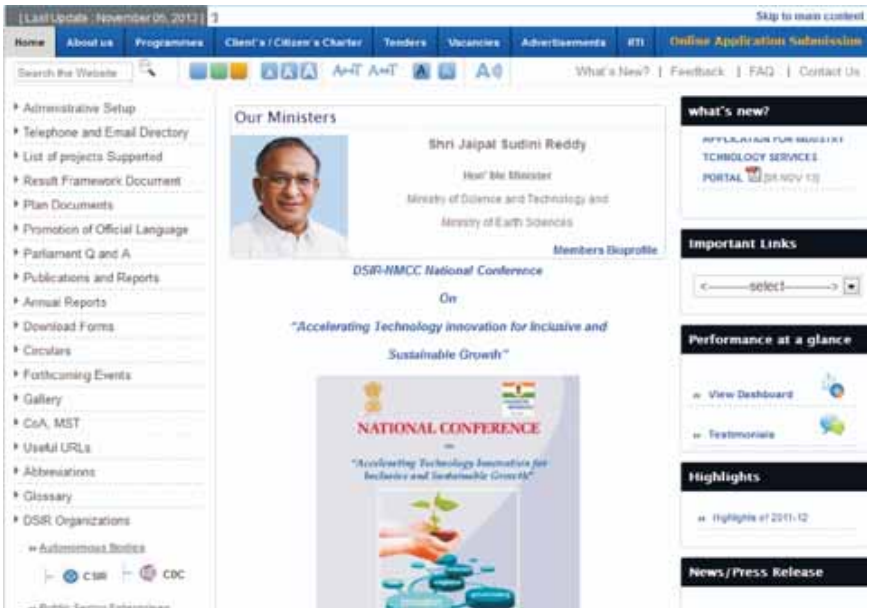
RFP1 – Status of Milestones

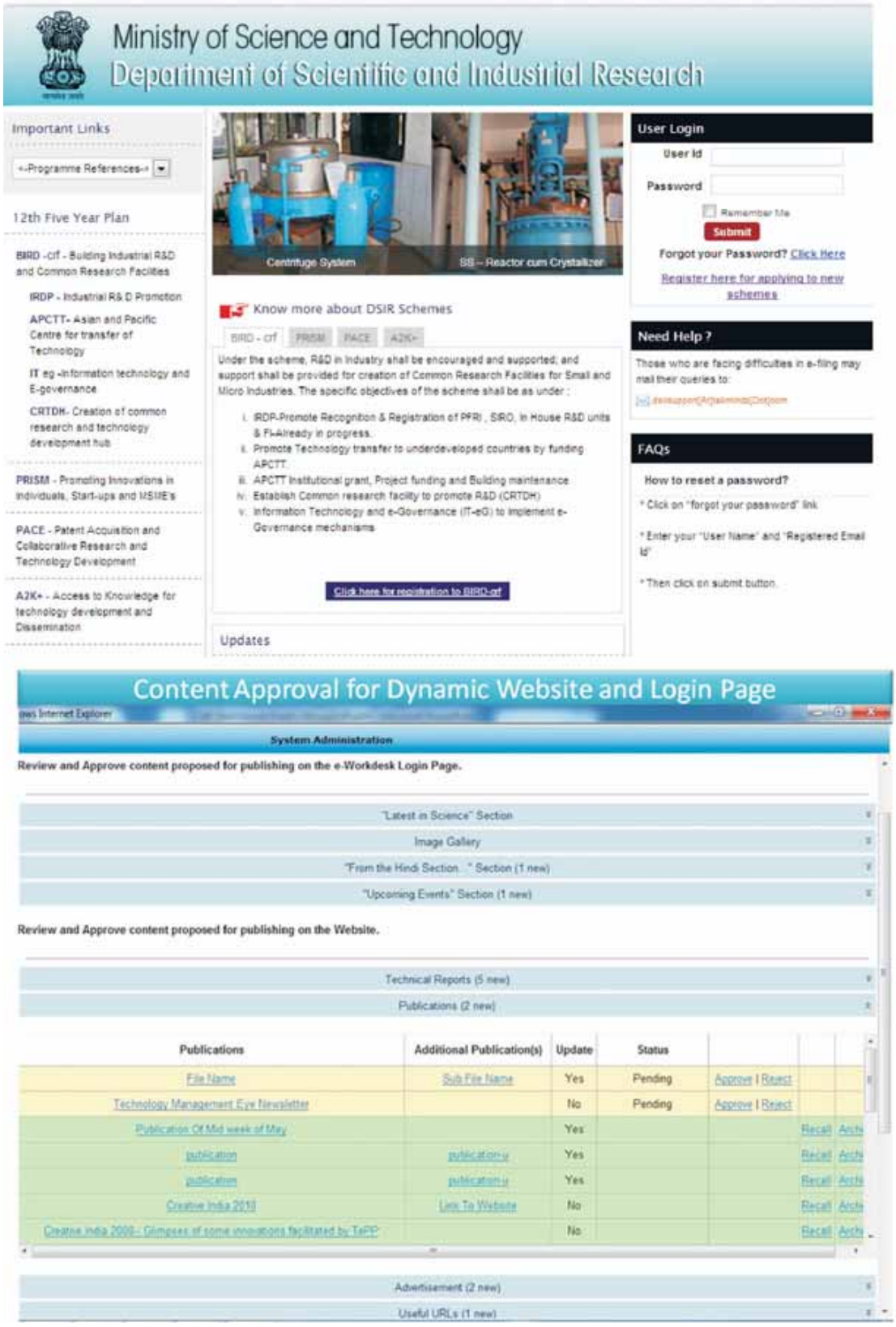
Milestones	Module	Process Documentation	Mock Ups /Prototype	DSIR Review	System Requirement Documents	Design Documents	Software Development	User Acceptance Testing	Integration with e-workdesk	Software/ Users Manuals	Go-Live	Remarks
PRISM	-Individual -MTS/TPF -Phase II	√	√	√	√	√	√	√	√	√	√	•Application forms have been made live and users are filling the data - Backend development is also completed and made live
	Incubatee	√	√	√	√	√	√	√	√	√	√	
	MSME Startup	√	√	√	√	√	√	√	√	√	√	
PACE	Technology Acquisition	√	√	√	√	√	√	√	√	√	√	•Application forms have been made live • Backend development is also completed and made live
	TDDP	√	√	√	√	√	√	√	√	√	√	
A2K+	Journals &Survey form	√	√	√	√	√	√	√	√	√	√	Survey forms were made live but due to non-approval of this scheme by the competent authority, the guidelines are not yet finalized by DSIR
	Industrial research	√	WIP									
	TDUPW	√	√	√	√	√	√	√	√	√	√	UAT completed & Application is Live
BIRD	IRDPP	√	√	√	√	√	√	√	√	√	√	UAT received & Application is Live. More than 3500 applications filled and processed so far
	APCTT	√	√	√	√	√	√	√	√	√	√	UAT received & Application is Live.
	CRTDC	√	√	WIP								CRTDH guidelines are under approval by the competent authority
	ITeG	√	√	√	√	√	√	WIP				Development of DSIR inputs is in-progress

* WIP -Work In Progress

3.2 DSIR Website

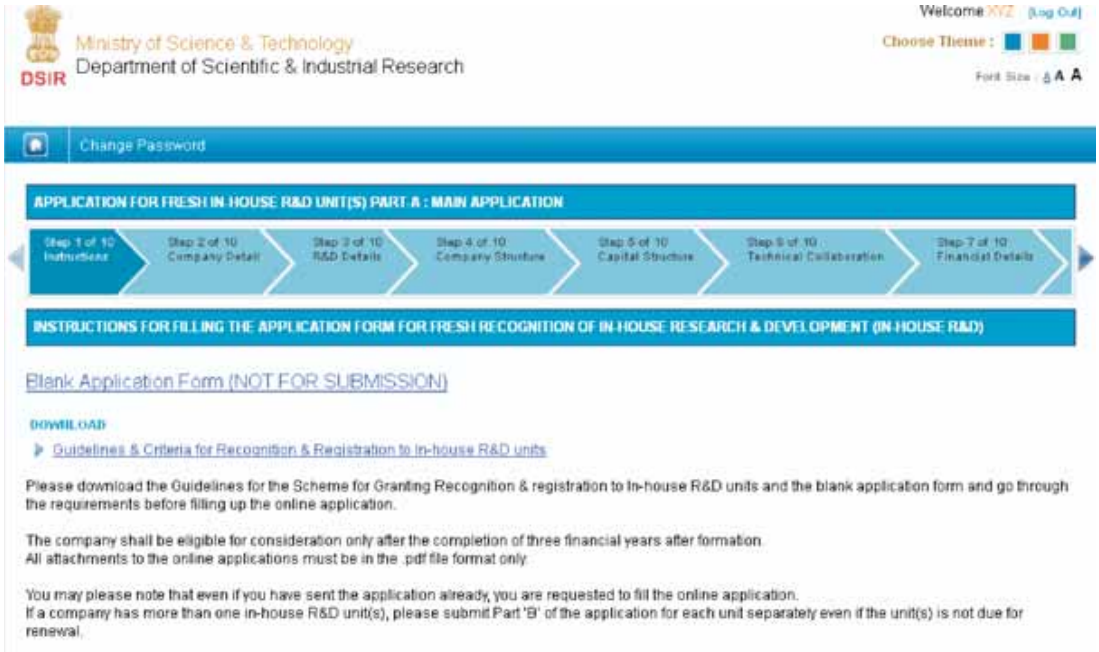
Landing Page of DSIR website for clients is shown below (Figure 1). The users when they log in to the ERP Portal, are presented with a customized adaptive landing page and electronic desktop with links related to tasks to be performed by them. The previous website of DSIR was a 'static' one with no provision for CMS. The new website is 'dynamic' one launched. The Graphical User Interface (GUI) of this re-designed website is user-friendly and rich in appearance since uses superior graphics, self-explanatory, promptly guiding the user to different sections, offer appropriate navigation assistance to user in the form of tooltips, messages, images etc. wherever required / applicable. The user can switch between different themes / color schemes, and choose the font-size out of a number of pre-defined sizes as per their convenience. Once fully developed it would be compliant to Standards & Guidelines namely as (1) UUU Trilogy – Usable, User Centric, and Universally Accessible (2) Government of India Web Guidelines (GOIWG) issued by the Government of India and offer an easy-to-understand navigation and would be bilingual - supporting English and Hindi languages. Count of 'hits' on the DSIR new website for 2012-13: 70248.




Ministry of Science and Technology
Department of Scientific and Industrial Research
Important Links
<-Programme References->
12th Five Year Plan
BIRD -cif - Building Industrial R&D and Common Research Facilities
IRDP - Industrial R& D Promotion
APCTT- Asian and Pacific Centre for transfer of Technology
IT eg -Information technology and E-governance
CRTDH- Creation of common research and technology development hub
PRISM - Promoting Innovations in Individuals, Start-ups and MSME's
PACE - Patent Acquisition and Collaborative Research and Technology Development
A2K+ - Access to Knowledge for technology development and Dissemination
Centrifuge System
SS – Reactor cum Crystallizer
Know more about DSIR Schemes
BIRD - cif
PRISM
PACE
A2K+
Under the scheme, R&D in Industry shall be encouraged and supported; and support shall be provided for creation of Common Research Facilities for Small and Micro Industries. The specific objectives of the scheme shall be as under :
i. IRDP-Promote Recognition & Registration of PFR) , SIRO, In House R&D units & FI-Already in progress.
ii. Promote Technology transfer to underdeveloped countries by funding APCTT.
iii. APCTT Institutional grant, Project funding and Building maintenance
iv. Establish Common research facility to promote R&D (CRTDH)
v. Information Technology and e-Governance (IT-eG) to implement e-Governance mechanisms
Click here for registration to BIRD-cif
Updates
User Login
User Id
Password
Remember Me
Submit
Forgot your Password? Click Here
Register here for applying to new schemes
Need Help ?
Those who are facing difficulties in e-filing may mail their queries to:
FAQs
How to reset a password?
* Click on "forgot your password" link
* Enter your "User Name" and "Registered Email Id"
* Then click on submit button
Content Approval for Dynamic Website and Login Page
System Administration
Review and Approve content proposed for publishing on the e-Workdesk Login Page.
"Latest in Science" Section
Image Gallery
"From the Hindi Section..." Section (1 new)
"Upcoming Events" Section (1 new)
Review and Approve content proposed for publishing on the Website.
Technical Reports (5 new)
Publications (2 new)
Publications
Additional Publication(s)
Update
Status
File Name
Sub File Name
Yes
Pending
Approve | Reject
Technology Management Eye Newsletter
No
Pending
Approve | Reject
Publication Of Mid week of May
Yes
Recall
publication
publication-u
Yes
Recall
publication
publication-u
Yes
Recall
Creative India 2010
Link To Website
No
Recall
Creative India 2009:- Glimpses of some innovations facilitated by TePP
No
Recall
Advertisement (2 new)
Useful URLs (1 new)

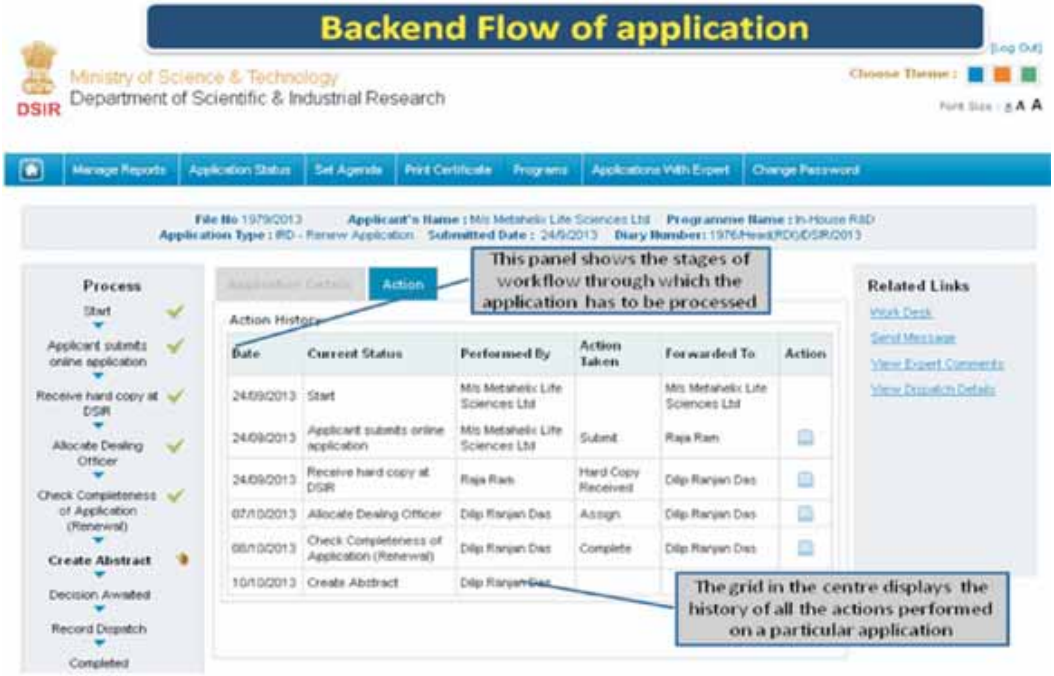
3.3 Industrial Research and Development Programme (IRDP)

A user friendly online application form submission for recognition to SIRO, PFRI and Fiscal Incentives to Industry for Submission of report in FORM 3CK, generation of 3CM certificate & submission of yearly returns in the FORM 3CL has been developed.



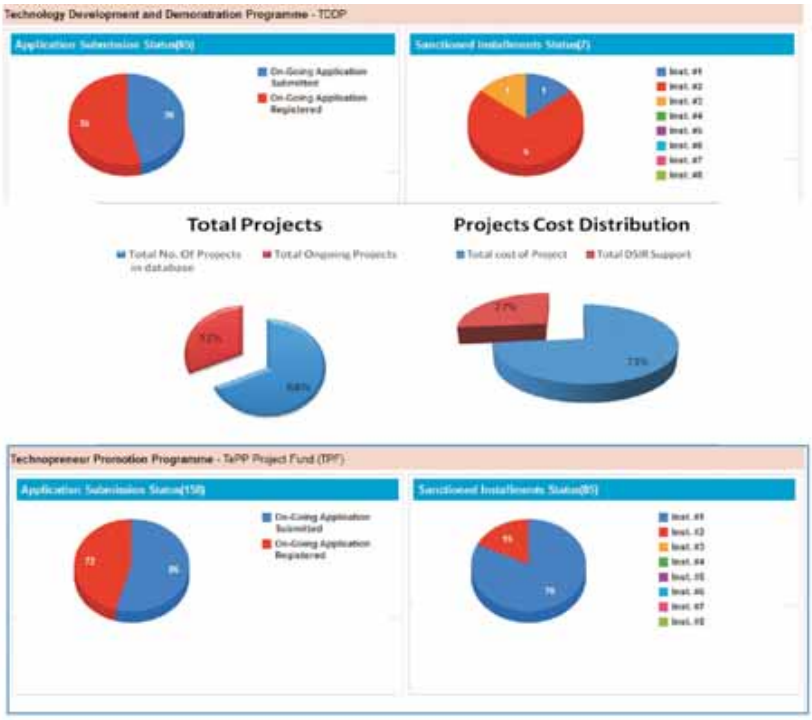
User friendly and time efficient backend application approval process has been developed. The workflow for each scheme has been configured as per the hierarchy in the department.

The clients and businesses of DSIR have successfully benefitted by ERP application in IRDP programme as shown in the following Table and charts below:



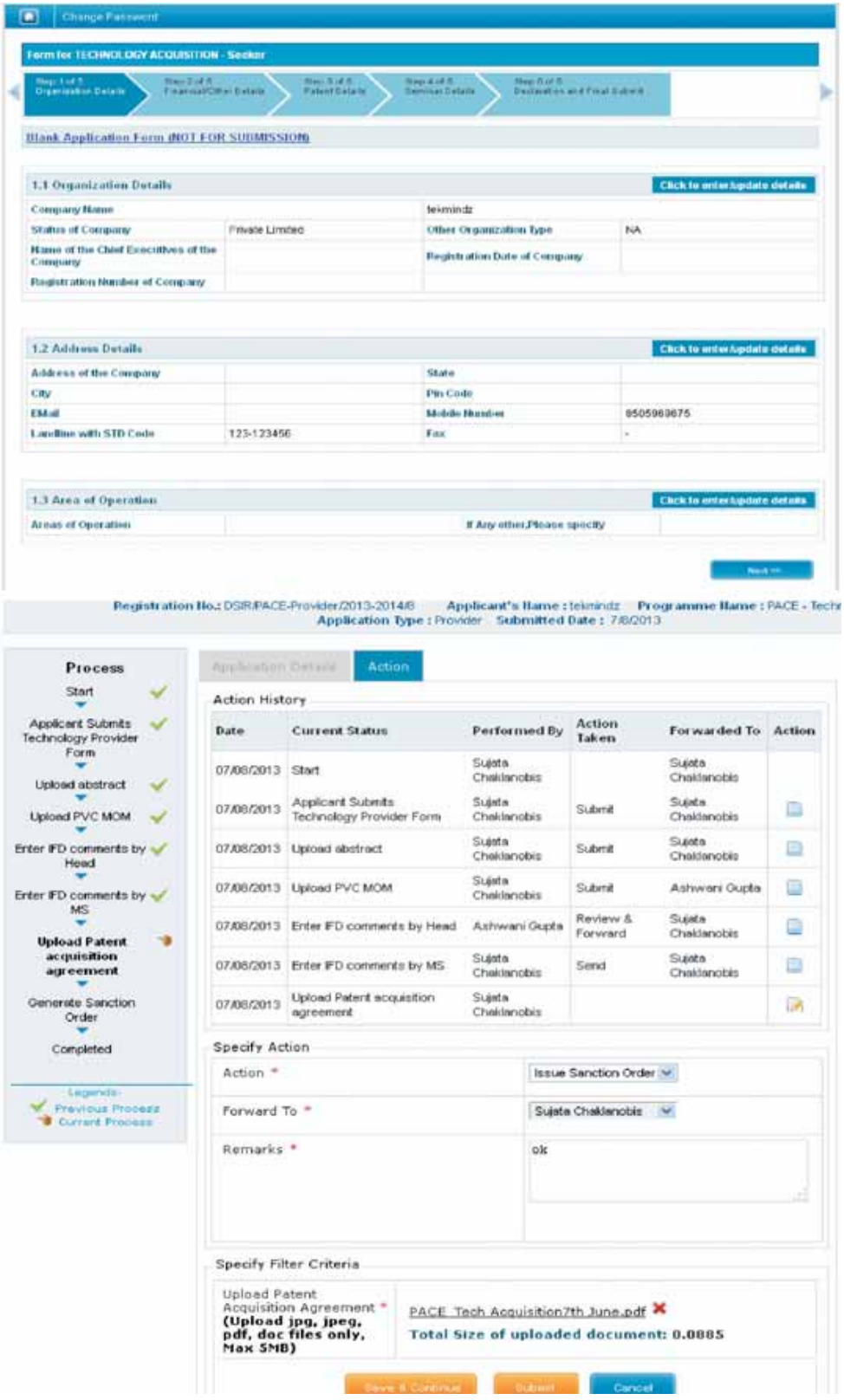
3.4 Legacy Data Entry

The application has provision of entering legacy data into the system. The status of TDDP & TePP legacy data is shown below:



3.5 Patent Acquisition and Collaborative Research & Technology Development (PACE)

System for on-line submission of application in web-enabled form as per the prescribed application format has been developed for technology providers and seekers. Time efficient backend application approval process has also been developed.

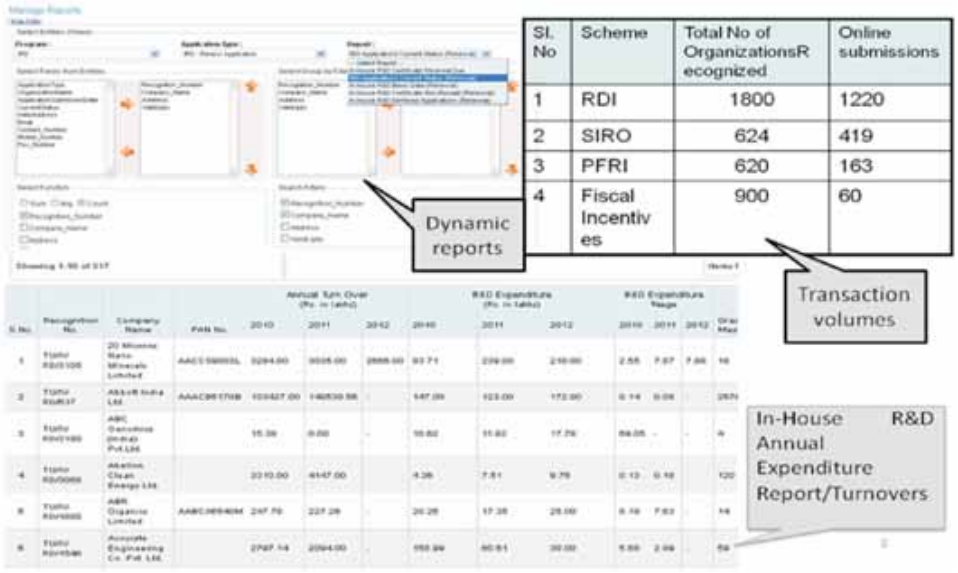

Change Password
Form for TECHNOLOGY ACQUISITION - Seeker
Blank Application Form (NOT FOR SUBMISSION)
1.1 Organization Details
Click to enter/update details
Company Name
tekmindz
Status of Company
Private Limited
Other Organization Type
NA
Name of the Chief Executives of the Company
Registration Date of Company
Registration Number of Company
1.2 Address Details
Click to enter/update details
Address of the Company
State
City
Pin Code
EMail
Mobile Number
9505983675
Landline with STD Code
123-123456
Fax
1.3 Area of Operation
Click to enter/update details
Areas of Operation
If Any other,Please specify
Registration No.: DSIR/PACE-Provider/2013-2014/8
Applicant's Name : tekmindz
Programme Name : PACE - Techn
Application Type : Provider
Submitted Date : 7/8/2013
Process
Start
Applicant Submits Technology Provider Form
Upload abstract
Upload PVC MOM
Enter IFD comments by Head
Enter IFD comments by MS
Upload Patent acquisition agreement
Generate Sanction Order
Completed
Legends:
Previous Process
Current Process
Application Details
Action
Action History
Date
Current Status
Performed By
Action Taken
Forwarded To
Action
07/08/2013
Start
Sujata Chaklanobis
Sujata Chaklanobis
07/08/2013
Applicant Submits Technology Provider Form
Sujata Chaklanobis
Submit
Sujata Chaklanobis
07/08/2013
Upload abstract
Sujata Chaklanobis
Submit
Sujata Chaklanobis
07/08/2013
Upload PVC MOM
Sujata Chaklanobis
Submit
Ashwani Gupta
07/08/2013
Enter IFD comments by Head
Ashwani Gupta
Review & Forward
Sujata Chaklanobis
07/08/2013
Enter IFD comments by MS
Sujata Chaklanobis
Send
Sujata Chaklanobis
07/08/2013
Upload Patent acquisition agreement
Sujata Chaklanobis
Specify Action
Action *
Issue Sanction Order
Forward To *
Sujata Chaklanobis
Remarks *
ok
Specify Filter Criteria
Upload Patent Acquisition Agreement * (Upload jpg, jpeg, pdf, doc files only, Max 5MB)
PACE_Tech Acquisition7th June.pdf
Total Size of uploaded document: 0.0885
Save & Continue
Submit
Cancel

3.6 Promoting Innovations in Individuals, Start-ups and MSMEs (PRISM)

System for on-line submission of application in web-enabled form as per the prescribed application format has been developed along with backend application approval and workflow for grant release

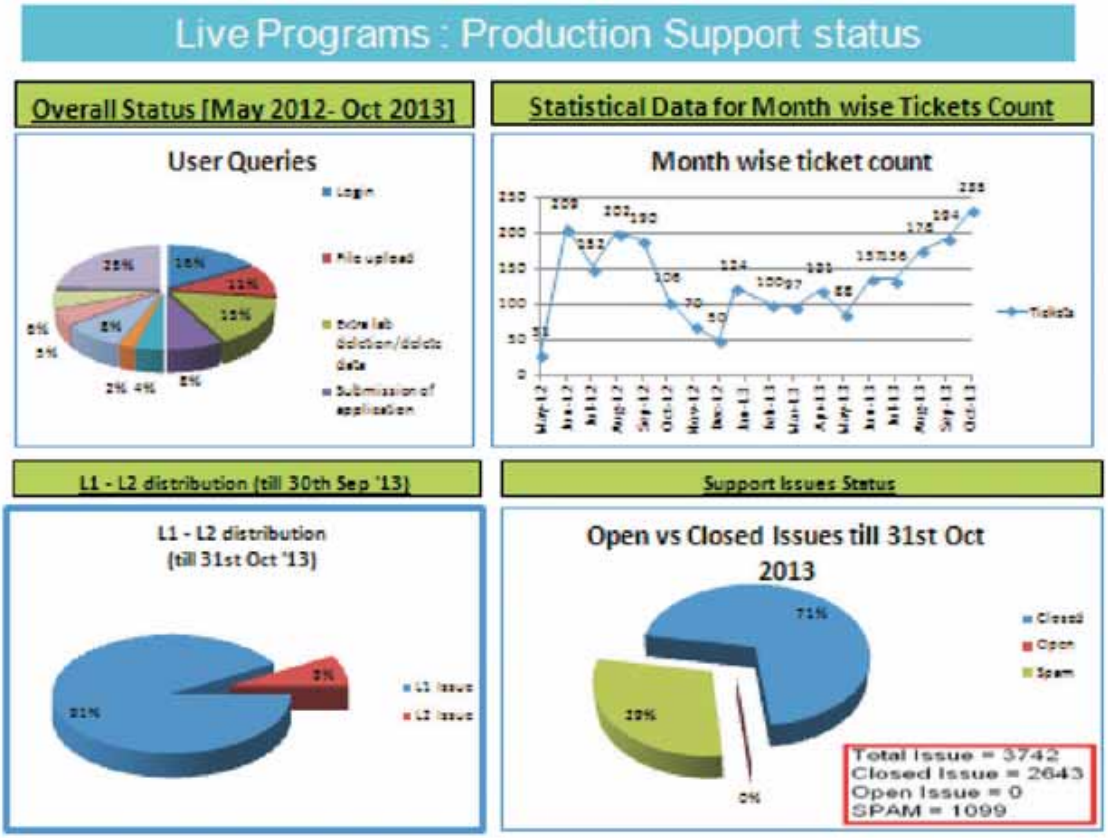
3.7 Dynamics, e-reports, Analytics

In addition to several technical reports, various directories of RDI, SIRO and PFRI; along with departments Annual Reports of the years 1991-2013 are accessible to the citizen. Scientists of department can access analytics, business reports, dynamics and dashboards of various schemes and link it with business output and decision support.



3.8 Production Support for Live Programs

This ERP solution is a bespoke application which has been built using Internal Capacity giving the ownership to DSIR itself unlike SAP or ORACLE solution products where the organization is dependent on external source. All Portal operations are built in-house with specific services for ICT Hardware Infrastructure with Data center secured as external services. Maintenance Service Support (MSS) including End-User Support is provided by consultants. A platform is designed for continuous tracking of issues across users. The usage of the system can be monitored through logs, system reports and electronic traces across transactions.



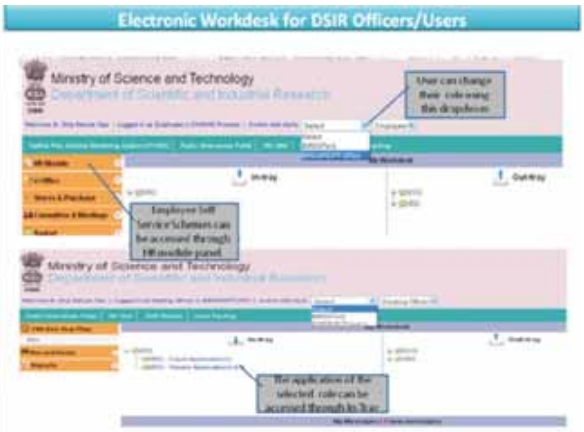
3.9 Office Automation Solution, Workflow Management, Record Management, and Data Warehousing

Scope of ERP included Office Automation Solution, Workflow Management, Record Management, Data Warehousing and additional modules such as HR Management and processes, Store and Purchase, Requirements of Planning, Budget and Audit, revamping of existing website bilingual and also m-governance compliance, Smart Card based Attendance System, RFID implementation in record room and implementation of Exchange Server. For achieving these objectives, value added through Document Management and Business Process management solution designed, developed and tested to suit and adequately addresses the requirements within any Government environment. Data collection and population for this module is in progress.

A list of automated Processes, transactions and files for office automation:

3.9.1 IntraDSIR (eWorkdesk)

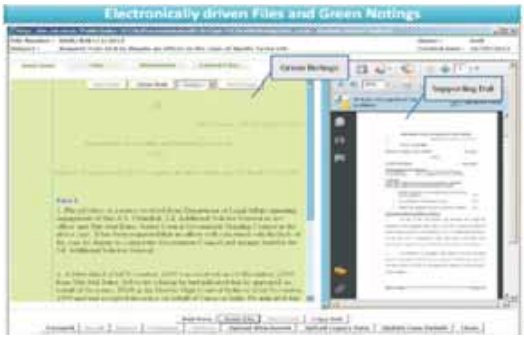
An e Workdesk has been created; this IntraDSIR is a platform wherein all the employees of DSIR can communicate with each other as well as the electronic workdesk of all the employees of DSIR. It can be logged in through a username and password and an employee



can perform plethora of activities there. e.g. if an employee has been assigned multiple roles he has the facility of switching the roles and hence his area of functioning will be displayed to him. He can work upon his pending tasks which come as a request in his In-tray and all the completed tasks are the items in his out-tray. The employee has online access to his Self services such as Medical Claim, LTC, Leave, GPF, ACR information etc.

3.9.2 RFID

For harmonization of physical and online file processing RFID tagging (long range type having intelligent chip and antenna) is being implemented. RFID is being attached on every file/record stored in record room. RFID No. will be auto generated and will be mapped with the File No. by the Record Room In charge manually. RFID No. /File No. will be used for tracking.



3.10 Training and Workshops

Progress made under ERP project is being reviewed regularly through PCTB meetings. Trainings, demonstrations and application hand holdings are organised periodically for DSIR employees for modules which are being developed and are ready to go live. Employees submit a feedback form on completion of these trainings.

Milestone	Training Status	Date
Audit		
Store & Purchase	Completed	19th July 2013
Court Case	Completed	4th July 2013
Planning	Completed	17th July 2013
Record Room	WIP	31st July 2013
Committee and meeting	Completed	12th July 2013
R5		
e-workdesk	Completed	23rd July 2013
Budget	Completed	8th July 2013
Parliamentary	Completed	25th June 2013
R6		
Deployment		June 2013

3.11 CSI-Nihilent e-Governance Award for 2012-13

DSIR Nomination of "Automation of DSIR Enterprises Operations & Industrial S&T Services Portal" was awarded 'Award of Recognition' by prestigious CSI-Nihilent e-Governance Awards instituted by the Computer Society of India's Special Interest Group on e-Governance and sponsored by Nihilent Technologies. The award, now into its second decade, is a gold standard for evaluating e-Governance projects in the country.

Shri J. Satyanarayana, Secretary, DeitY, Government of India was chief guest for the awards function and presented the award to DSIR team at a grand ceremony of 48th Annual Convention of CSI held in Visakhapatnam.

DSIR ANNUAL REPORT

Patent Acquisition and Collaborative Research and Technology Development (PACE)

1. Preamble

2. Objectives

3. Projects/Activities during 2013-14

V

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V. PATENT ACQUISITION AND COLLABORATIVE RESEARCH AND TECHNOLOGY DEVELOPMENT (PACE)

1. PREAMBLE

The scheme Patent Acquisition and Collaborative Research and Technology Development (PACE) aims at facilitating acquisition of early stage technologies from academic and research institutions, including industry and other sources in India and abroad by Indian industries on an exclusive or a non-excusive basis with a view to manufacture "Made in India" products. The scheme also aims at supporting up-scaling of a lab-scale technology for development and demonstration of innovative products and processes that can be commercialized. Support is provided for proposals which give clear evidence of existence of proof-of-concept and aim at developing an innovative content for fulfilling an unmet need. Development and demonstration of technologies can be undertaken by industries alone (including in-house R&D centres of the industry recognized by DSIR) or in collaboration with Universities, Public Funded Research Institutions or academic institutions in India or abroad. The technology development projects supported under the scheme aim at development of a new product or a process with attractive market potential which will result in significant benefits to the industry concerned in terms of raising its technological level, turnover, energy and material savings/recovery, export sales etc. Focus sectors are (i) Energy & Environment, (ii) Affordable healthcare including Drugs & Pharmaceuticals, (iii) Agriculture, food & nutrition, (iv) Engineering (auto-components, machine tools & foundry) etc.

Standing Finance Committee (SFC) Memo of the PACE scheme was first approved by the Hon'ble Minister on 4th March, 2013, which was revised and the final SFC Memo was approved on 24th October, 2013. The scheme guidelines were approved by the competent authority on 31st October, 2013.

2. OBJECTIVES

The objectives of the scheme are:

- To support Indian industries to acquire patented technology at an early stage from within the country or overseas on an exclusive as well as non-exclusive basis, add value to the acquired technology for exploitation in Indian/foreign markets and develop "Made in India" innovative and socially relevant products for public consumption in India and abroad;
- To encourage and accelerate development and demonstration of indigenous product / process technologies by in-house R&D centres of the industry for commercialization;
- To create enabling environment for collaborative research between Indian Industry and R&D organizations/ academic institutions/ universities in India or abroad and formulate collaborative projects for development and demonstration of lab scale technologies aimed at commercialization of new products and processes;
- To develop a dynamic database on existing expertise and IPs available in the R&D organizations/academic institutions/universities

in India or abroad to facilitate PPP and tie-ups with Indian industry for collaborative projects.

3. PROJECTS/ACTIVITIES DURING 2013-14

Details of important projects/activities that were completed or were in progress during the year under report are given below:

3.1 Workshops on Facilitating Technology Acquisition

In order to ascertain the areas in which SMEs would be interested in acquiring patents so that such patents can be acquired by DSIR and the same may be made avalable to the SMEs on a non-exclusive basis, DSIR entered into dialogues with the stake holders and organized workshops in different parts of the country. The workshops provided a forum to the stake-holders, viz. technology providers (academic and research institutions) and technology seekers (SMEs and start-ups) to explore the complex process of technology-patent acquisition, its pitfalls, steps of acquisition, resolution of infringement issues with other patents etc., besides providing an opportunity to the stakeholders to listen to case studies of companies who have acquired and successfully commercialized a patent.

Eight such Workshops were organized during the FY 2013-14, viz. at Pune, Hyderabad, Coimbatore, Ludhiana, Kolkata, Ahmedabad, Bangalore and Jaipur. Besides discussing the details of the scheme "PACE", the workshops provided a platform to Technology Seekers *viz.* Industry & Entrepreneurs and Technology Providers *viz.* R&D Institutes, Universities, to explore technology transfer opportunities. The Technology Providers showcased the technologies on offer and the Technology Seekers discussed their requirement of technologies.

i. Workshop at Pune:

The first workshop on Technology Acquisition was jointly organized by DSIR & CII on 30th April, 2013 in Pune. The workshop provided a platform for Industry (Technical Seekers) & Technology Providers (R&D Institutes, Universities, Entrepreneurs, Industry, etc.) to explore technology transfer opportunities. The workshop was attended by around 75 industry participants from companies such as Thermax, Tata Chemicals, Reliance Innovations, Lupin, Kinetic Engineering, Realty Automation, Biotechnology Embio Research, Arrow Coated Products, Kirloskar Integrated Technologies, Cummins Research, Intelux Electronics, Forbes Marshall, Sanjay Techno Plast, Kudale Instruments and R&D and academic institutions such as CSIR-NCL and IIT Bombay.

(ii) Workshop at Hyderabad:

The second workshop on Technology Acquisition was jointly organized by DSIR and Foundation for MSME Clusters (FMC) on 28th June 2013 in Hyderabad. The workshop was attended by around 115 industry participants from companies such as: Smilax Laboratories Ltd., Celestial Biolabs Ltd., Issar Pharmaceuticals Pvt. Ltd., Unique Biotech, Royal Lifesciences, Gyantech Informations Systems Pvt. Ltd.,, Suraksha Pharma, Clonz Biotech Pvt. Ltd., Kwality Photonics Pvt. Ltd., Omega Scientific Instruments Pvt. Ltd., Laurus Labs, Ricon Pharma India Pvt. Ltd., Virchow Biotech Pvt. Ltd., Suren Lifesciences, Imagnex, Caltech Engg. Co. Pvt. Ltd., Merck Specialities Pvt. Ltd., Sanzyme Ltd., Genomix Biotech Inc, Relisys Medical Devices Pvt. Ltd., Pragati Biopharma Global Wedge India Ltd., Shri Balaji Graphics, AAS Technologies Pvt. Ltd., Zen Technologies Ltd., Vasuda Pharma Chem Ltd., Sapala Organics Pvt. Ltd., Kamineni Lifesciences Pvt. Ltd., etc.

R&D and Academic Institutions such as CSIR-IICT, Directorate of Oil Seeds Research, Centre for Knowledge Management for Neuroscience & Technology – DST, Life Sciences Incubation – IKP Knowledge Park, CSIR-CFTRI, National Research Development Corporation, Bhabha Atomic Research Center, International Advanced Research Center for Powder Metallurgy & New Materials, International Crop Research Institute for the Semi-Arid Tropics, Small Industries Development Bank of India Innovations & Incubations Centre, Indian Institute of Technology Kanpur, etc. also participated as Technology Providers.

(iii) Workshop at Coimbatore:

The third workshop on Technology Acquisition was jointly organized by DSIR and Confederation of Indian Industry (CII) on 13th August 2013 in Coimbatore. The workshop was attended by around 80 industry participants from companies such as: Park Layer Pvt. Ltd., PTRGST Industries, KG Fabriks Ltd., ATE Enterprises (P) Ltd., Fluidics, Angel Starch & Food Processors, Faraday Instruments, MAG Solvics Pvt. Ltd., Indus Electronics India Ltd., eClouds, OEN India Ltd., V Guard Industries, PSG Foundry, Autoprint Machinery Mfg. Pvt.

Ltd., Lakshmi Machine Works, KOB Textiles Ltd., Seforge Ltd., Velan Values India, KG Design Services Pvt. Ltd., Ringmann, KGK Industries, Salzer Electronics Ltd., Olive Life Sciences Pvt. Ltd., Avaneetha Textiles Pvt. Ltd., Suguna Technologies Ltd., etc.

R&D and Academic Institutions which attended the workshop included: IIT, Chennai; ISRO, Bangalore; SITRA, Coimbatore; Coimbatore Institute of Technology, PSG College of Arts & Science, PSG College of Technology, PSG Institute of Advanced Studies, etc.

(iv) Workshop at Ludhiana:

The fourth workshop on Technology Acquisition was jointly organized by DSIR and Foundation for MSME Clusters on 14th November, 2013 in Ludhiana. The workshop was attended by around 101 industry participants from companies such as: J.K.Cycles, Ambika Cycles, Sabharwal Cycle Industries, Ludhiana Alloys Pvt. Ltd., Knitwear Club, Ludhiana Foundry Cluster, Eveline International, Netcandy Solutions, Sudha Rania Clothing Co., Chaman Knit Pvt. Ltd., Advance Mechanical Tools, Kashmir Mechanical Works, Delux Mechanical Works, Barnala Industries, PVM Enterprises, Punjab Metal Industries, Atul Industries, Aristo Industrial Corporation, Suresh Industries, Bharat Industries, Bull Forge Pvt. Ltd., Kiran Foundry Works, GSC Castings Ltd., LUB, Phagwara, GVS Biotech, Banga, Shiv Shakti Engineers, Daljit Fasteners & Mechanical Tools etc.

R&D and Academic Institutions which attended the workshop included: PEC University, UICET, Punjab University, Chandigarh, Lovely Professional University, Jalandhar, GSSDGS Khalsa College, Patiala, GHG Khalsa College of Pharmacy, PAU, Chandigarh, NIT, Jalandhar, PSCST, Chandigarh, GNDEC, Ludhiana, etc.

(v) Workshop at Kolkata:

The fifth workshop on Technology Acquisition was jointly organized by DSIR and Foundation for MSME Clusters on 19th December, 2013 in Kolkata. The workshop was attended by around 110 participants from various Pvt. Sector Companies, Industry Associations, Technology Transfer Organizations, R&D Labs and Academic Institutes. There were 40 Technology Providers and 57 Technology Seekers who participated in the Workshop.

(vi) Workshop at Ahmedabad:

The sixth workshop on Technology Acquisition was jointly organized by DSIR and CII on 24th January, 2014 in Ahmedabad. The workshop was attended by around 150 participants from various Pvt. Sector Companies, Industry Associations, Technology Transfer Organizations, R&D Labs and Academic Institutes. There were 18 Technology Providers and 120 Technology Seekers who participated in the workshop.

(vii) Workshop at Bangalore:

The seventh workshop on Technology Acquisition was jointly organized by DSIR and CII on 21st March, 2014 in Ahmedabad. The workshop was attended by around 120 participants from various Pvt. Sector Companies, Industry Associations, Technology Transfer Organizations, R&D Labs and Academic Institutes.

(viii) Workshop at Jaipur:

The eighth workshop on Technology Acquisition was jointly organized by DSIR and Foundation for MSME Clusters on 27th January, 2014 in Jaipur. The workshop was attended by around 80 participants from various Pvt. Sector Companies, Industry Associations, Technology Transfer Organizations, R&D Labs and Academic Institutes.

3.2 Technology Development and Demonstration

Advertisement in the National Dailies were released in March 2013 calling for I batch of technology development and demonstration proposals, in November, 2013 calling for II batch of proposals and in March, 2014 for III batch of proposals from industries and research institutions. A Technical Advisory Committee (TAC) with following terms of reference was constituted to consider the proposals:

- To examine fresh technology development and demonstration proposals, received from industry (with or without collaborations with academic or research institutions) for development of an innovative process/ product.
- To recommend to the department, regarding funding and supporting the projects in accordance with the guidelines of the PACE scheme.
- To assist and guide the department in reviewing and monitoring the execution of projects under the PACE scheme.
- To review the outcome of the completed projects.

The TAC held two meetings on 5th December, 2013 and 7th February, 2014 and recommended the following 9 proposals for support by DSIR:

S. No.	Name of Company & Collaborator, if any	Title of Project
1	Natural Remedies Pvt. Ltd., Bangalore	Technology up gradation of pelletization facility for herbal veterinary feed supplements: Demonstration in terms of value addition to produce quality supplements at low cost
2	Sanzyme Ltd. Hyderabad & ICT Mumbai	Development of Controller Release [CR] Formulation of Natural Highly-Purified Human Chorionic Gonadotropin [hCG]
3	D-Espat Pvt. Ltd., Chennai	Development of Portable Power Supply (Desktop Model) using Lithium Ion battery
4	Kaypeeyes Biotech Pvt. Ltd., Mysore	Development of Genetically Engineered Cellulose-free Alkaline Xylanase through submerged fermentation process (SMF)
5	ICPA Health Products Ltd., Ankleshwar & Govt. College of Pharmacy, Amravati	Chitosan Based Drug Delivery system for Dental and Oral Diseases
6	Paras Flowform Engineering Ltd., Mumbai	Design, Manufacturing, Proving, Supply of Three Roller Flow Forming Machine
7	Avasarala Technologies Limited, Bangalore	High end integrated anesthesia delivery system
8	AquAgri Processing Pvt. Ltd., New Delhi & DBT-ICT Centre for Energy Biosciences &CSIR-CSMSRI, Bhavnagar	Macroalgal Biorefinery for CO_2 Sequestration and Production of Biofuel and Value-Added Compounds
9	Rudraksha Allied Chemicals Pvt Ltd., Nagpur	To manufacture Magnesium Hydroxide from Dolomite mineral and Calcium Nitrate as by product

Implementation of RTI Act 2005

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VI

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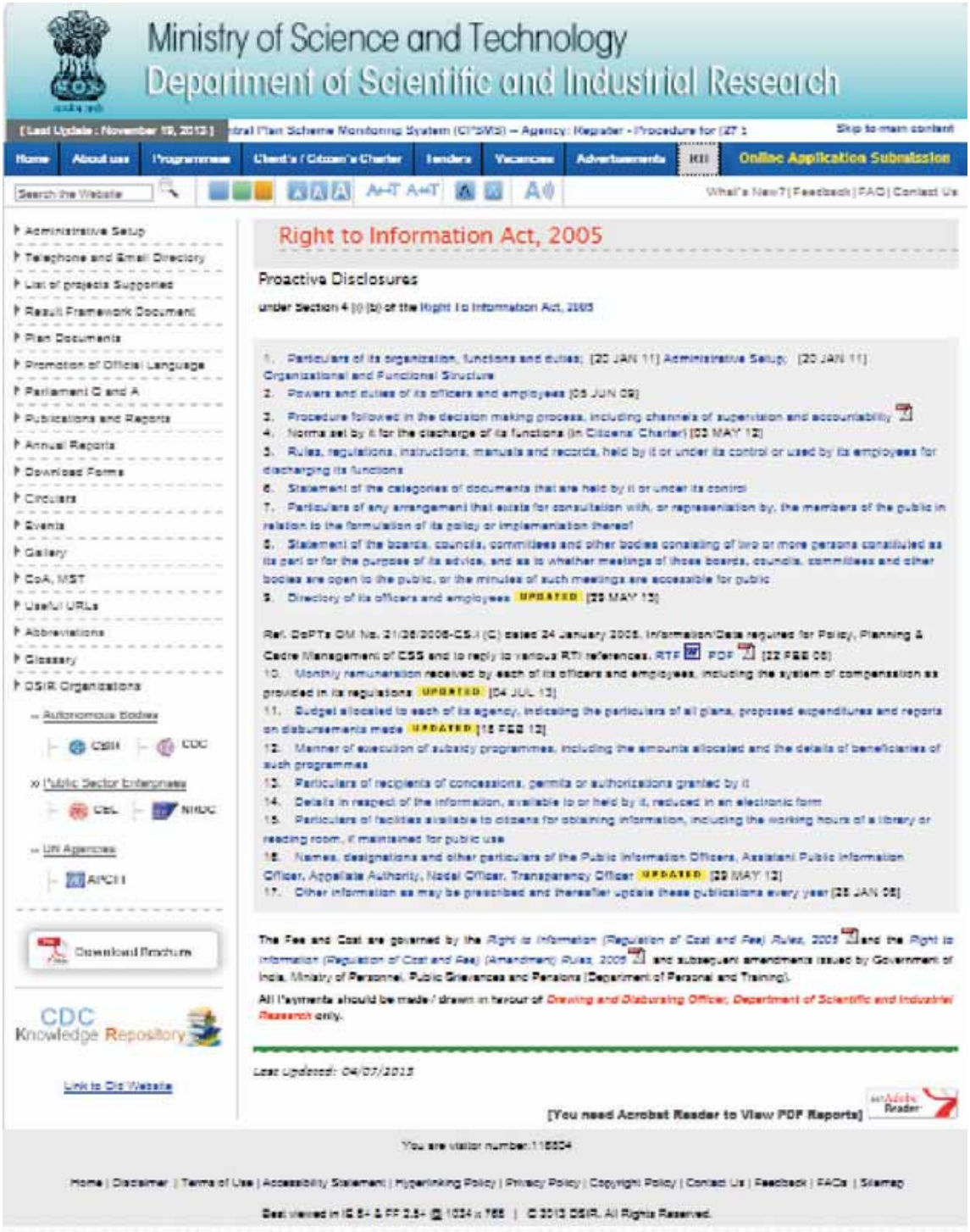
VI. IMPLEMENTATION OF RTI ACT 2005

The Right to Information Act 2005, enacted on 15th June 2005, has been implemented successfully in the department. As per the provisions of the Act, following officers are designated:

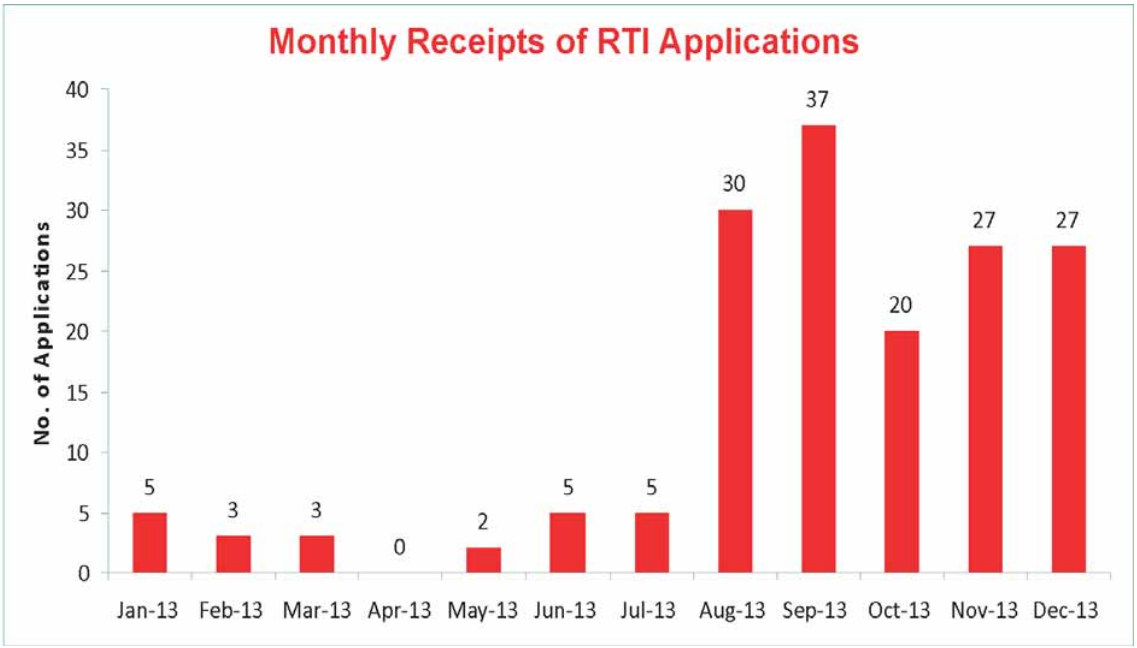
Appellate Authority	Dr (Smt) Jyoti SA Bhat Scientist 'G'	Administrative Block Technology Bhawan New Mehrauli Road New Delhi-110016	Tel: 26960098, 26590256 Fax: 26960098 jsabhat[at]nic[dot]in
Transparency Officer	Shri G M Bagai Scientist 'G'	Room No. 6, Hall B Technology Bhawan New Mehrauli Road New Delhi-110016	Tel: 2660 2185 Fax: 26960629 gbagai[at]nic[dot]in
Nodal Officer and Central Public Information Officer	Shri Vimal Kumar Varun Scientist 'F'	5 & 5A, Lower Ground Floor Vasant Sqaure Mall Sector B, Pocket 5 Vasant Kunj New Delhi-110070	Tel: 26516078, 26590416 TeleFax: 26516078 Fax: 26960629 vkv[at]nic[dot]in
Central Assistant Public Information Officer	Dr Sujata Chaklanobis Scientist 'E'	Room No.15, Hall - B Technology Bhawan New Mehrauli Road New Delhi-110016	Tel: 26520887, 26590277 Fax: 26960629 priya[at]nic[dot]in
Central Assistant Public Information Officer	Dr Prabhat Kumar Dutta Scientist 'E'	Room No. 43 TIFAC Building Technology Bhawan New Mehrauli Road New Delhi-110016	Tel: 26590394 Fax: 26960629 pkdutta[at]nic[dot]in

The proactive disclosures under Section 4 (1) (b) of the RTI Act 2005 enacted on June 15, 2005 are regularly updated and available on the DSIR Website at *http://dsir.gov.in/rti/rti-dsir.htm*.



DSIR has complied with the directives received from Central Information Commission.

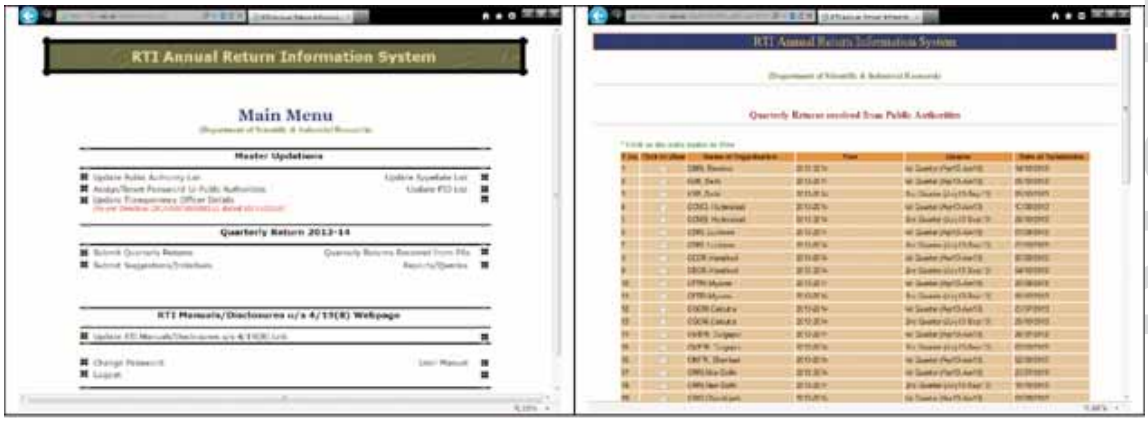
DSIR has received 164 Applications during 2013 [01/01/2013 to 31/12/2013] and all the Applications were registered and disposed off on RTI Request & Appeal Management Information System, http://164.100.42.72/rrmis/ and http://www.rtionline.gov.in/RTIMIS. The monthly receipt of the Applications is given below:



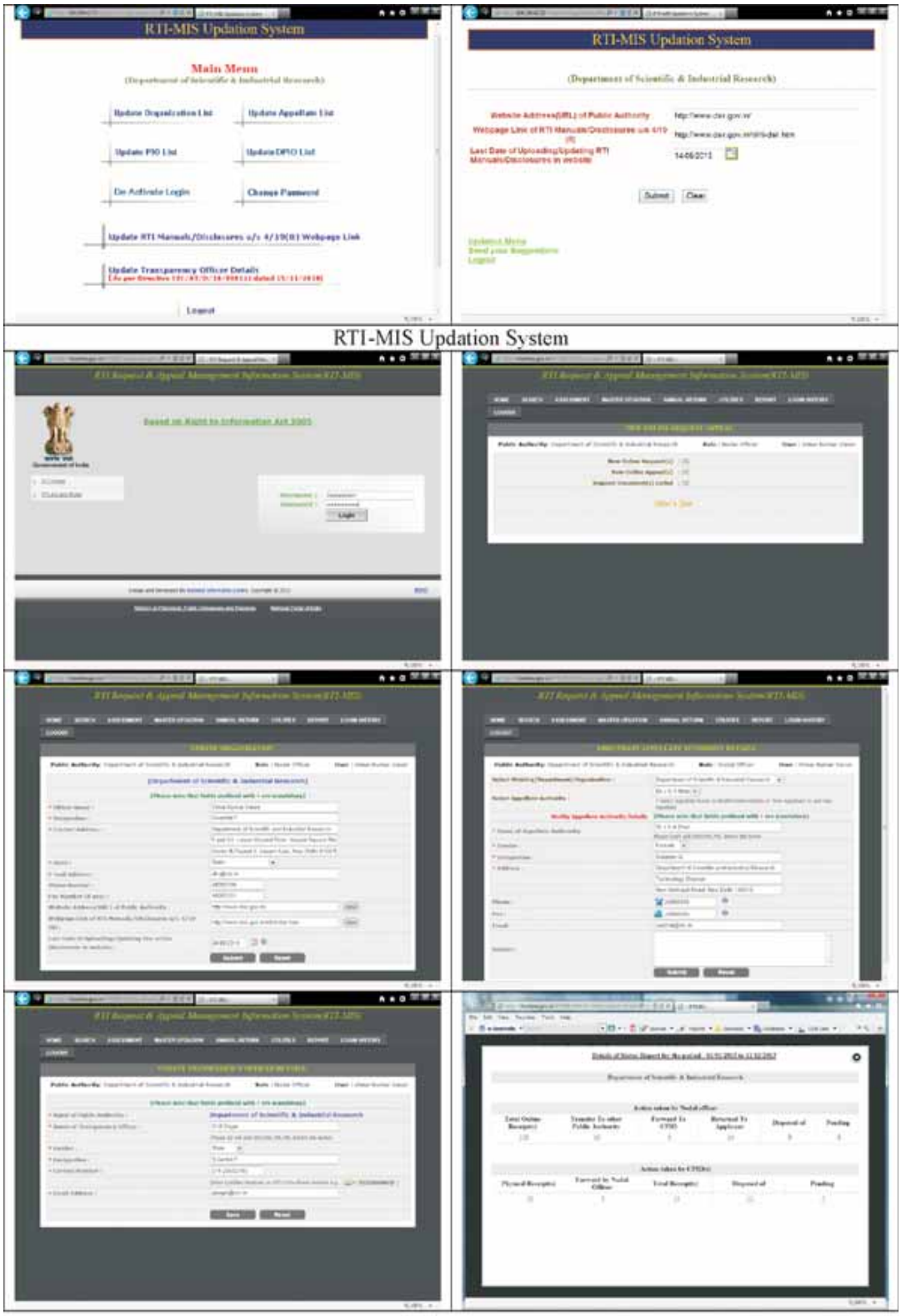
During 2013 [01/01/2013 to 31/12/2013], seven applications were registered as first appeal and two applications were registered as second appeal.

Provided technical support by way of lectures ssssse of 'RTI Annual Return Informaton System, RTI Request & Appeal Management Information System and RTI-MIS Updated System' during a Programme on 'Effective Implementation of RTI Act for Transparency Officer/ Appellate Authorities and PIOs in the CSIR System' organized by Council of Scientific and Industrial Research at CSIR-Human Resource Development Centre, Ghaziabad on 31/05/2012.

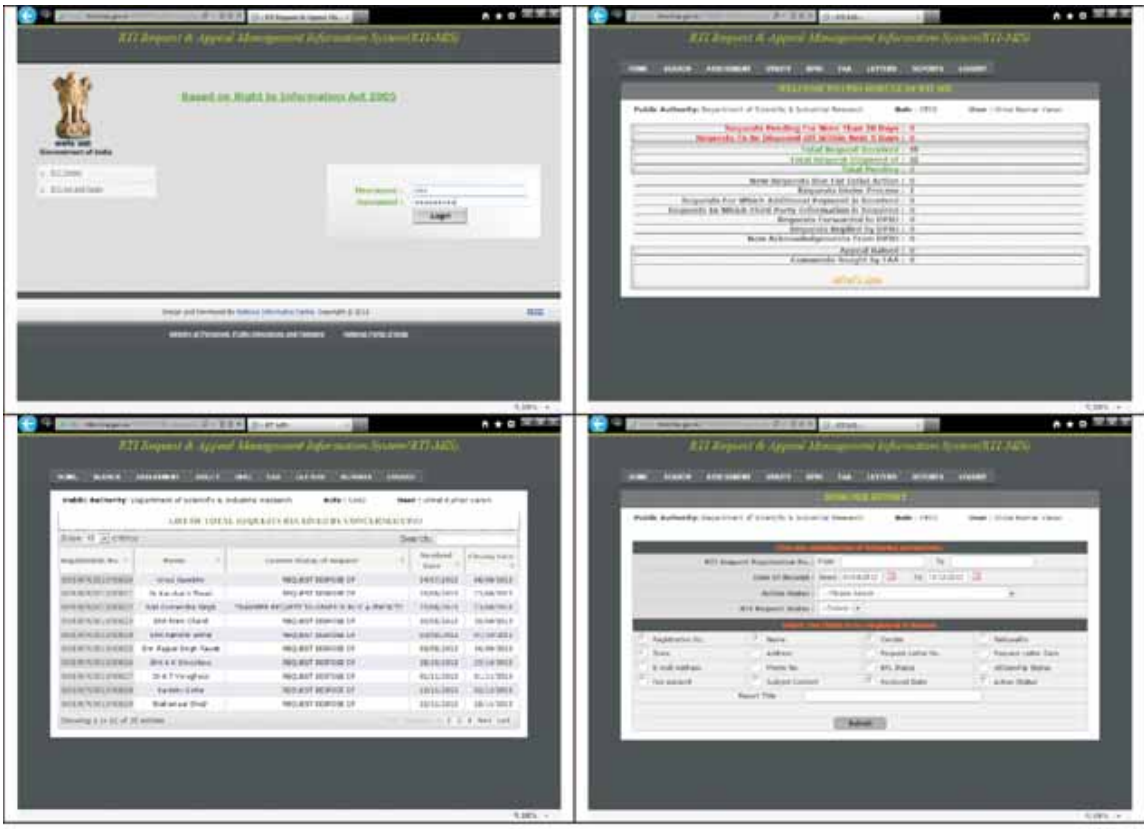
DSIR has been effectively using various IT applications like RTI-MIS Updation System at *http://164.100.42.72/rtiupd/,* RTI Request & Appeal Management Information System at *http://164.100.42.72/rrmis/* and *http://www.rtionline,gov.in/RTIMIS,* RTI Annual Return Information System at *http://rtiar.nic.in.* The quarterly returns were uploaded on RTI Annual Return Information System at *http://rtiar.nic.in*.



RTI Annual Return Information System



RTI Request & Appeal Management Information System (Nodal Officer)



RTI Request & Appeal Management Information System (CPIO)

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Autonomous Bodies

A. Council of Scientific & Industrial Research (CSIR)

S &T CONTRIBUTIONS

1. Biological Sciences
2. Chemical Sciences
3. Engineering Sciences
4. Information Sciences
5. Physical Sciences
6. CSIR 800

B. Consultancy Development Centre (CDC)

1. Plan Schemes/ Activities
2. Funded Projects
3. Educational Programmes
4. Financial Performance

VII

सत्यमेव जयते

VII. AUTONOMOUS BODIES

VII-A. COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

S&T CONTRIBUTIONS

A. Biological Sciences

New Gene Discovered for Early Onset Chronic Pancreatitis

Over last decade, CSIR-CCMB is working on the genetics of Tropical Calcific Pancreatitis (TCP), a common form of chronic pancreatitis in Indians. CSIR-CCMB led the multi-centric study involving 4 centres from India and sequenced carboxypeptidase 1 gene (CPA1) in ~300 TCP patients and normal subjects each. Interestingly, they identified one founder mutation in this gene only in the patients, which is different compared to Europeans and other Asians. The Indian mutation causes complete loss of function of this protein, which is involved in the degradation of trypsinogen. Identification of mutations in CPA1 gene drives the point that pathway of trypsinogen activation and deactivation is important overall and assume immense importance since Indian patients do not carry cationic trypsinogen mutations. Since this mutation is also predictive of early onset pancreatitis, early detection and modification of the course of the disease by appropriate counseling will be of tremendous help to these patients and their families. These observations have been recently published in the prestigious international journal "NATURE GENETICS".

Indian origin of the European Romani populations

Roma populations are distributed widely within Europe including the Balkans and Scandinavia as well as throughout the Near East. Linguistic studies established that the various dialects spoken by the Roma derive specifically from North India. Presence of Indian specific Y-chromosome haplogroup H1a1a-M82 and mtDNA haplogroups M5a1, M18 and M35b among Roma has corroborated that their South Asian origins and later admixture with Near Eastern and European populations. CSIR-CCMB performed a detailed phylogeographical study of Y-chromosomal haplogroup H1a1a-M82 in a data set of more than 10,000 global samples to discern a more precise ancestral source of European Romani populations. The phylogeographical patterns and diversity estimates indicate an early origin of this haplogroup in the Indian subcontinent and its further expansion to other regions. Tellingly, the short tandem repeat (STR) based network of H1a1a-M82 lineages displayed the closest connection of Romani haplotypes with the traditional scheduled caste and scheduled tribe population groups of northwestern India.

Identification of Molecular level mechanisms that lead to glaucoma

In a significant finding, scientists have identified molecular level mechanisms that lead to glaucoma, the fourth main cause of blindness in India: Glaucoma is a slowly progressing disease and is more prevalent in the elderly. Unlike in cataract, which is the leading cause for blindness, loss of vision caused by glaucoma cannot be regained by therapeutic intervention. CSIR-CCMB studied the molecular mechanism of glaucoma in collaboration with L.V.

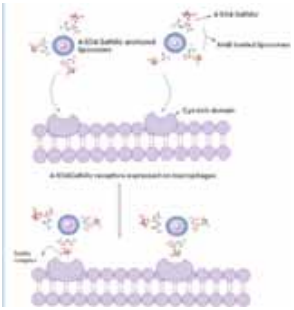
Prasad Eye Institute, Hyderabad. One of the mutated genes causing glaucoma was OPTN which codes for protein optineurin. An alteration in this gene (M98K) was earlier associated with glaucoma only in South Asian population. OPTN was one of the genes associated with glaucoma where intra-ocular pressure was not involved. The gene was studied in detail as the molecular mechanism of how it causes glaucoma was not known. Understanding the molecular mechanism would go a long way in devising strategies for treating and preventing further damage. The mechanism of how this alteration causes the disease was studied and the alteration induces cell death in retinal ganglion cells.

However, the mutation affected only the retinal ganglion cells and not other neuronal and non-neuronal cells. So by arresting ganglion cell death, further damage can be arrested and residual vision saved even after the onset of glaucoma. It was found that the cell death occurs due to enhanced autophagy (the process that removes damaged proteins and organelles in the cells by degradation). Any change in this - either increase or decrease - could lead to cell death. The work also enhanced the understanding of the process of autophagy, which was essential to maintain healthy cells. For instance, the scientists were able to stop cell death by blocking the enhanced activity of autophagy using chemical inhibitors. CSIR-CCMB is currently studying the role of optineurin in transporting materials like proteins and lipids from one cell compartment to another within the same cell (membrane vesicle trafficking) and in signalling involved in gene expression. The work showed that regulating one of the trafficking processes known as endocytic recycling was fundamental to the uptake of iron by the cell. A mutation in optineurin (E50K) causes a defect in endocytic recycling and leads to death of retinal ganglion cells.

Investigations into an alternate approach to target mannose receptors on macrophages using 4-sulfated N-acetyl galactosamine more efficiently in comparison with mannose-decorated liposomes: An application in drug delivery

CSIR-CDRI has investigated the potential of 2 different ligands, i.e., palmitoyl mannose (Man-Lip) and 4-SO(4)GalNAc (Sulf-Lip) to target resident macrophages after surface decoration of Amphotericin B (AmB) loaded liposomes. Flow cytometric data reveal enhanced uptake of Sulf-Lip in both J774 and RAW cell lines in comparison with the uptake of Man-Lip. Intracellular localization studies indicate that the fluorescence intensity of Sulf-Lip was much higher in comparison with that of Man-Lip and Lip formulations. Sulf-Lip and Man-Lip showed significantly higher localization of AmB at all time points in comparison with Lip ($P < 0.05$) after intravenous (IV) administration. The studies provide evidence that 4-SO(4)GalNAc possesses a promising feature for targeting resident macrophages and its application in the conditions of leishmaniasis is in the offing.

Cascade [4+1] annulation via more environmentally friendly nitrogen ylides in water: Synthesis of bicyclic and tricyclic fused dihydrofurans



CDRI has described A novel imidazolium ylide activated [4 + 1] annulation approach for the diastereoselective synthesis of bicyclic and tricyclic fused dihydrofurans in water. This cascade annulation presumably proceeds *via* a Michael reaction triggered zwitterion enolate followed by concomitant intramolecular cyclization. The methodology has distinction of being the first report on imidazolium ylide mediated [4 + 1] annulation in water as a unified greener approach involving an *in situ* base regeneration system and an alternative to pyridine ylide.

Withaferin A: a proteasomal inhibitor promotes healing after injury and exerts anabolic effect on osteoporotic bone

CSIR-CDRI has demonstrated increased bone mass results from proteasome inhibition by *Withaferin A*. *Withaferin A* stimulates osteoblast growth and differentiation, accelerates bone healing following injury and exerts an anabolic effect on osteoporotic bone. Given the lack of uterine estrogenicity and intrinsic bioavailability of Withaferin A, these investigations provide important findings pertaining to Withaferin A -induced bone anabolic effect at 10 mg/kg/day. Data suggest that Withaferin A can reach an optimum therapeutic concentration *in vivo* that can be anabolic in nature. The present study supports the usefulness of natural proteasomal inhibitor Withaferin A, making it an attractive alternative anabolic candidate as a new treatment of post-menopausal osteoporosis.

Plant Derived Single Molecule (K058) from CSIR-CDRI as Rapid Fracture Healing Oral Drug

CSIR-CDRI has isolated a novel lead molecule K058 from a plant source and found rapid bone fracture healing anabolic activity that represents a new strategy in addressing primary and secondary osteoporosis.

CSIR-CDRI has signed a Research and licensing agreement on 28 September 2012 with M/s Kemxtree LLC, USA (a Nostrum Group company) during CSIR 70 year celebration at IGIB campus, New Delhi for further development of the molecule as a novel candidate drug for the treatment of osteoporosis and fracture healing.

Licensing of L-PAC, ephedrine and pseudoephedrine technology

L-PAC, ephedrine and pseudoephedrine technology developed earlier by CSIR-CDRI was licensed to BVM Pharma Ltd., Bulandshahar, UP on 11.03.2013. Full and final amount of Rs. 24,26,600.00 inclusive of service tax received towards licensing of the above technology on "As is Where is Basis".

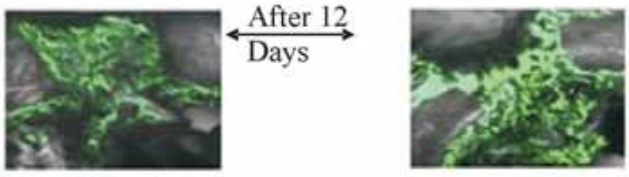
Transcriptome of the omega 3 rich plant, chia (*Salvia hispanica*)

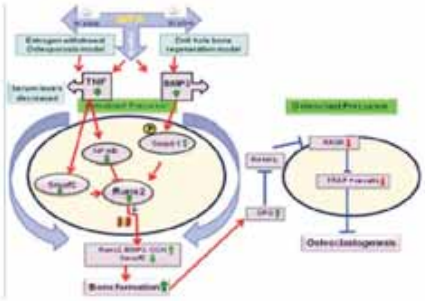
Chia is a Mexican plant, finding growing importance in every day diet of the West due to its high content of alpha linoleic acid (ALA), an essential fatty acid required by humans for the production of the other most important poly unsaturated fatty acids (PUFAs) like Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA) that are associated with cognitive behavior and intelligence. Chia, although has found its way into bakery products and energy drinks and many other food products, not much has been done in terms of research.

For the first time CSIR-CFTRI has shown that Chia can be grown well in South Indian conditions and has also evolved agronomic practices for the same, apart from coming out with a high yielding variety. Considering the fact that this is probably the only plant source for such high content of ALA, we wanted to study the seeds through the different developing stages to understand if there was a specific stage at which the unsaturation increased. Towards this, we have also completed the de novo transcriptome of developing Chia seeds for the first time in the world and have deposited the data at http://www.ncbi.nlm.nih.gov/bioproject/196477. Analyses of the data revealed some important lipid genes; amplifying, cloning and characterization of which is underway.

Effect of extraction solvent on oil and bioactives composition of commercial Indian niger *(Guizotia abyssinica (L.f.)* Cass.) seed

Commercially available niger *(Guizotia abyssinica (L.f.)* Cass.) seed was investigated to evaluate the effect of





Schematic diagram outlining the potential molecular targets and in vivo effect of WFA leading to bone anabolic effect in osteogenic cells and osteoclast precursor induced by proteasome inhibition

Progress made in the further development of Candidate Drugs

Diseases / Disorders	Candidate Drugs	Clinical Status	Licensees & Collaborators
Malaria	**97-78** Antimalarial	Phase-I clinical pharmacokinetic studies have been completed in 16 healthy male volunteers at PGIMER, Chandigarh in collaboration with IPCA Labs, Mumbai. Samples analyzed & report sent to IPCA.	IPCA Lab., Mumbai 2004
Diabetes & Dyslipidemia	**CDR134D123** Anti-hyperglycemic	Detailed quality monograph on the Epicarp of the plant *Xylocarpus granatum* as per the specifications of DGCCRAS has been submitted. The matter is awaiting DGCCRAS clearance for inclusion in the Extra Ayurvedic Pharmacopia	TVC Sky Shop Ltd., Mumbai 2008
	CDR134F194 Anti-hyperglycemic	The preparations for the drug formulation to be used in Phase-I Single Dose and Multiple Dose Clinical Trial studies from a GMP certified company is in progress and the clinical trial would commence soon	

Progress made in the further development of potential leads

Diseases / Disorders	Lead & Efficacy	Current Status	Licensees & Collaborators
Osteoporosis	**CDR914K058** Osteogenic	Synthetic process developed by CSIR-IICT. Licensed to Kemxtree, USA for further development and commercialization	Kemxtree, USA 2012
	S007-1500 Rapid fracture healing	Compound found safe in single dose toxicity study by oral route in rat and mice and by IM route in rat. Two year stability study completed	Under negotiation
	CDR4744F004 Osteoprotective & bone anabolic	Standardized fraction found to have bone anabolic effect in osteopenic rats; Principal component analysis of bioactive markers completed. Further studies are under progress	
Cancer	**S007-1235** Anti-leukemic	IC_{50} in K562, HL-60, U937, Kasumi1, Vero, & NIH3T3 respectively: 3.61 µM, 5.99 µM, 6.78 µM, 8.12 µM, >25 µM, > 20 µM. Activity is better than Imatinib (first gen) and Dasatinib (2nd gen). Possible mode of action established. Detailed mechanism, including identification of target and *in vivo* studies are planned further	Open for licensing

Thrombosis	**S007-867** Antithrombotic	Compound found safe in single dose toxicity study by oral route in rat and mice and by IM route in rat; No adverse effect on CVS, CNS and respiratory parameters.	Under negotiation
	S002-333 Antithrombotic	Compound found safe in single dose toxicity study by oral route in rat; Patent Granted. There was no significant effect on CNS, CVS and respiratory system up to 1000 mg/kg, po in rats.	
Diabetes & Dyslipidemia	**CDR267F018** Antidyslipidemic	Compound found safe in 28 day repeat dose toxicity study in Rh monkey	Open for licensing
Tuberculosis	**S006-830** Antituberculosis	Efficacy established *in vivo* in the mouse model of TB. Large scale synthesis completed. Pilot Pharmacokinetic Study of S006-830 in Male SD Rats completed and compound showed better bioavailability	Being developed under OSDD

extraction solvent on oil and bioactives composition. For this purpose, niger seeds were subjected to solvent extraction using solvents of different polarity, viz., hexane, petroleum ether, chloroform, acetone, methanol and ethanol. Oil content of niger seeds obtained after extraction with solvents of different polarities was in the range of 31.8–41.3 g/100g. The extracted oil was characterized by the following parameters: color (40.0–95.0 Lovibond units), free fatty acids (3.6–12.3 g/100g), peroxide value (3.2–7.8 meqO2/Kg), iodine value (137.6–140.3 cgI2/g), saponification value (177.3–185.9 mg KOH/g) and unsaponifiable matter (1.3–4.3 g/100g). Among fatty acids, linoleic acid (69.4–73.2%) was the major fatty acid and trilinolein (31.2–33.4%) was the major triacylglycerol. The composition of bioactive molecules was 171.9–345.8 of total tocopherols ppm; 247.1–2647.7 ppm of total phenolics; 1249.6–6309.3 ppm of total sterols and 18.9–181.0 ppm of total carotenoids. Among the tocopherols, á – tocopherol was the major component with 154–276 ppm. Of the total phenolics, vanillic acid with 176–1709 ppm was the major phenolic compound in the oil extracted using different solvents. Ethanol-extracted oil showed 13.9 fold better oxidative stability and a higher radical scavenging activity (IC50 value of 9.2 mg/mL) compared to hexane-extracted oil (IC50 value of 40.3 mg/mL). This is probably the first report of its kind on solvent extractability of bioactives of niger seed.

Functionalized aptamers as nano-bioprobe for ultrasensitive detection of bisphenol-A in water samples

Bisphenol-A (BPA) is a food and environmental contaminant which causes various health problems to humans especially children, fetus and infants at a concentration as low as 0.23 ng/mL. A novel functionalized aptamer based 'turn-off' fluorescent biosensor for ultra-sensitive detection of small molecules like BPA in water samples. CSIR-CFTRI proposed and performed a novel assay for detection of BPA using the 'turn-off' biosensor with a functionalized aptamer tagged with FAM (carboxyfluorescein) and BHQ (Black hole quencher) where the detection is based on the quenching of fluorescence emission upon binding of BPA with the functionalized aptamer. In this study we were able to detect up to 0.01 pg mL-1 of BPA. This novel concept will be helpful in designing aptasensors for the ultrasensitive detection of various analytes with respective aptamers.Aptamer and gold nanoparticle based biosensing system can be used for affordable diagnostics with field applicability at economic cost.

Algae-mediated carbon dioxide sequestration for climate change mitigation and conversion to value-added products - food, feed and fuel grade

In the global effort to combat and mitigate climate change, several CO_2 capture and storage technologies are being deliberated. One of the most promising future-proof CO_2 sequestration technologies can be

microalgal cultivation integrated with CO_2 sequestration and its conversion to value-added food and fuel-grade precursors/products.

CSIR-CFTRI has isolated five indigenous microalgal strains of *Scenedesmus, Chlorococcum, Coelastrum,* and *Ankistrodesmus genera*, from Indian fresh water habitats, were studied for carbon-dioxide tolerance and its effect on growth, lipid and fatty acid profile. Scenedesmus dimorphus strain showed maximum growth (1.5 g/L) and lipid content (17.83% w/w) under CO_2 supplementation, hence selected for detailed evaluation. The selected strain was alkaline adapted but tolerated (i) wide range of pH (5–11); (ii) elevated salinity levels (up to 100 mM, NaCl) with low biomass yields and increased carotenoids (19.34 mg/g biomass); (iii) elevated CO_2 levels up to 15% v/v with enhancement in specific growth rate (0.137 d_1), biomass yield (1.57 g/L), lipid content (19.6% w/w) and CO_2 biofixation rate (0.174 g L^{-1} d^{-1}). Unsaturated fatty acid content (alpha linolenic acid) increased with CO_2 supplementation in the strain.

Palm fat containing natural palm oil nutraceuticals and emulsifier property

Crude palm oil is fractionated into a liquid olein fraction and then refined, bleached, deodorized to get a colourless odourless oil which is traded internationally. But, crude palm oil (CPO) is a source of unique natural antioxidants such as â-carotene (provitamin A), tocotrienols and coenzyme Q10. These antioxidants are lost during refining of crude RPO (CRPO). CSIR-CFTRI has deacidified CRPO containing 11.7% free fatty acids value (FFA) using different methods for nutraceutical retention, solid consistency and emulsification property which was used for the preparation of food spreads. The food spread does not require colour addition and the product provides palm oil nutraceuticals to consumers and may provide health benefits.

The incorporation this palm fat in foods can provide the nutrients such as vitamin A, vitamin E, tocotrienols, coenzyme Q10, phytosterols present in palm oil to the malnourished children, aged patients and women and the general public to improve their health through consumption of such a type of food. Food spreads are easy to prepare and can preserve the nutrients for a long time. This may be useful for national programmes dealing with health improvement.

A nutraceutical enriched palm fat prepared and used for the preparing of nutrient rich butter spread

Shelf stable dehydrated egg paneer/cubes and egg crunchy bites

CSIR-CFTRI has developed Egg paneer/cube which is a ready -to -use product for the preparation of curry, which provides convenience. The product can be made available in different flavours like onion, garlic, and pepper and is rich in high quality protein. The product can be stored at ambient temperature for six months. The product contains all natural food ingredients and does not contain any chemicals or synthetic preservative. The process can be adopted on a cottage scale also.

Shelf stable egg albumin and yolk paneer

New Varieties of Medicinal and Aromatic Plants

Following high yielding varieties of medicinal and aromatic crops have been developed and released to farmers by CSIR-CIMAP:-

- **CIMAP Sil-9** is an improved variety of *Silybum marianum* having shorter plant height of (80-90cm), higher (>8%) silymarin content, and seed yield (10 quintal seeds/ha).

- **CIMAP Bio-G-171** is an improved variety of scented geranium (*Pelargonium graveolens*) which was released for the commercial cultivation having significantly higher oil content (0.24%) and oil yield (45kg/ha) against the checks Bourbon and CIM-Pawan.

- **CIMAP-Khus 22** of *Vetiver zizanioides* which is an high essential oil yielding variety having higher oil yield (28kg/ha) and average oil content (1.8%).

- **CIMAP-Khus15** of *Vetiver zizanioides* is another high oil yielding variety having oil content of about 2.0% and oil yield of about 35 kg/ha with specific adaptation potential.

Enhanced bioavailability of estramustine (EM) and natural podophyllotoxin (PODO)

The synthetic estramustine (EM) and natural podophyllotoxin (PODO) anti-mitotic agents that inhibit tubulin polymerization are known anticancer agents. As low bioavailability limits their anticancer properties CSIR-IHBT developed conjugation with PAMAM dendrimer (D) to enhance the activity of D-EM and D-PODO by altering their release pattern. Release kinetics indicated synthesized conjugates to be stable against hydrolytic cleavage and showed sustained release characteristics. However, release of D-EM was slow compared to D-PODO conjugate. Antitumor effect of these conjugates on glioma cells revealed (i) increased cell death and cell cycle arrest (ii) decreased migration and (iii) increased tubulin depolymerization as compared to free drug. Importantly, the effects of natural PODO conjugate on glioma cell survival and migration is more pronounced than D-EM.

Deciphering the molecular mechanism of survival of *Caragana jubata* in the harsh climate of high altitude

The harsh and hostile environment of the cold desert in Spiti valley of Himachal Pradesh is characterized by high radiation, temperature and extreme scarcity of water. CSIR-IHBT has deciphered the molecular mechanism that confers survival tness to *C. jubata*, a perennial shrub of this region and found the dominance of genes encoding chaperones. Genes associated with growth and development and 11 late embryogenesis abundance protein genes (LEAs) belonging to six groups were observed at low temperature (LT). While some showed constitutive expression, others were over-expressed within 3 h of exposure to LT. The sustenance of the species in the harsh environment of high altitude was attributed to the simultaneous up-regulation of six groups of LEAs. Genes associated with growth and development such as early light inducible protein, CjABA inducible, CjCDPK, indole acetic acid inducible protein, auxin responsive factor 7, MYB transcription factor 133, rare cold inducible 2A (CjRCI2A), cold acclimation responsive2, cold acclimation specic and mammalian cell entry family protein were also regulated in response to LT. Expression of all these genes was observed in the species growing in its natural habitat of Kibber-Gete area of Lahaul & Spiti district, HP.

Kinetics of gene expression suggested rapid adjustability of the *C. jubata* cellular machinery in less than an hour in its niche environment. This was reected in LT mediated photosynthetic acclimatory response. Probably such molecular and physiological plasticity allowed *C. jubata* to survive the harsh environment of Himalayan cold desert.

Genome-wide expression proling of NAC transcription factor family in potato (*Solanum tuberosum L.)*

NAC (NAM, ATAF1/2 and CUC2) proteins belong to one of the largest plant-specic transcription factor (TF) families. They play important roles in plant development processes, biotic and abiotic stress response and hormone signalling. On exploiting the available potato genome data and the genome-wide analysis by CSIR-IHBT, 110 StNAC genes encoding for 136 proteins were identied in potato. Phylogenetic analysis of StNACs and their arabidopsis and rice counterparts divided these proteins into 18 subgroups. Interestingly, 36 StNAC proteins clustered in NAC-q subgroup were potato-specic). Insilico expression analysis using Illumina RNA-seq transcriptome data revealed biotic and abiotic stress as well as hormone-responsive expression prole of StNAC genes. Quantitative real-time PCR analysis also conrmed the expression prole of StNAC genes revealed by RNA-seq data. The data provides valuable leads towards putative functions of several StNAC TFs.

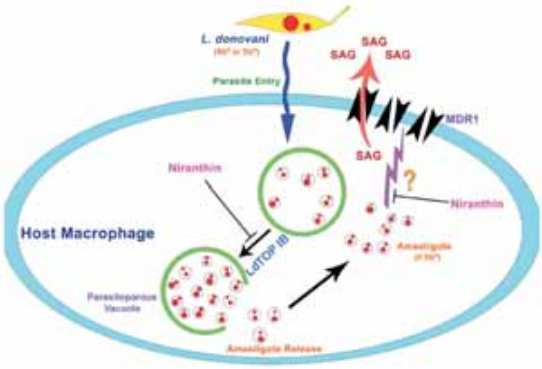
Over-expression of PaSOD in transgenic potato enhances photosynthetic performance under drought

Potato (*Solanum tuberosum*) is an important tuber crop, which is susceptible to drought stress. CSIR-IHBT has made an attempt to improve the plant performance under drought stress by modulating super oxide radical ($O_2^{\cdot -}$) content in potato cv. Kufri Sutlej by over-expressing superoxide dismutase (SOD), the enzyme

involved in the scavenging of ($O_2^{\cdot -}$). Over-expression of a cytosolic copper-zinc SOD, cloned from *Potentilla atrosanguinea* (PaSOD) resulted in enhanced net photosynthetic rates (PN) and stomatal conductance (gs) compared to that in the wild type (WT) plants under control (irrigated) as well as drought stress conditions. Decline in leaf water potential, PN, gs, photosystem II activity and chlorophyll content, but increased proline and ($O_2^{\cdot -}$) content was more in WT than transgenic potato plants (SS5). Signicantly lower proline and ($O_2^{\cdot -}$) content but enhanced SOD activity in SS5 compared to WT under drought stress probably generated lower stress signal for stomata to close. This was indicated by significantly higher gs in SS5 as compared to the WT. Since gs also regulates substomatal concentration of CO_2, SS5 plants exhibited signicantly higher PN. Manipulation of ($O_2^{\cdot -}$) content could be a new way of modulating drought stress tolerance in plants.

Development of a Topoisomerase 1B Targeted Anti-leishmanial Agent

Niranthin, a lignan isolated from a plant *Phyllanthus amarus* is a potent anti leishmanial agent. CSIR-IICB has found that the compound induces topoisomerase 1- mediated DNA-Protein adduct formation inside Leishmania cells and triggers apoptosis by activation of cellular nucleases. Niranthin treatment in infected experimental mice favours a Th1-immune response. The results have been published in EMBO Molecular Medicine.



Schematic diagram showing Niranthin act as a dual inhibitor. It stabilizes DNA – topoisomerase 1B adduct and abrogates essential life processes like replication, transcription etc. On the other hand niranthin inhibits P-glycoprotein (a transporter that is linked to clinical resistance Sodium Antimony Gluconate (SAG)

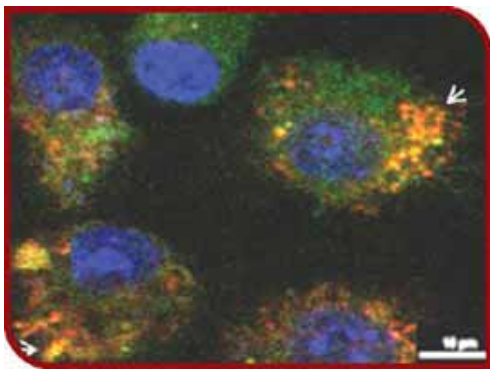
Wnt Signaling Stimulates Phagocytosis

Phagocytosis is a primary defense program orchestrated by monocytes/ macrophages. But, unregulated phagocytosis can lead to pathological conditions. CSIR-IICB has shown that Wnt5a stimulates phagocytosis of bacteria and associated cell activation. Wnt5a mediated augmentation in phagocytosis may result in uncontrolled inflammation and sustained infection. The results have been published in Proceedings of National Academy of United States of America.

Games parasites play: how drug resistant Leishmania donovani evades the effect of antimonial drugs

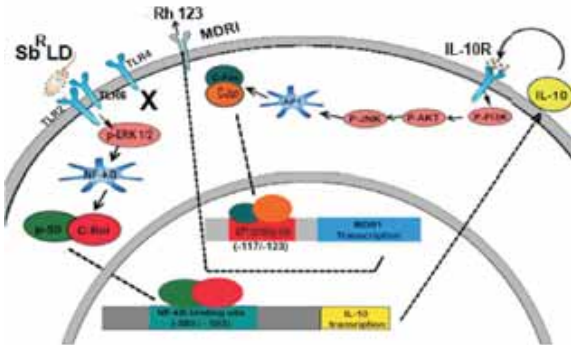
Kala-azar or visceral leishmaniasis , caused by the protozoan parasite *Leishmania donovani* , has re-emerged and is spreading worldwide due to resistance to drugs such as pentavalent antimonials, which were introduced in the Indian subcontinent almost nine decades ago with dramatic clinical success. Despite their initial promise, antimonials were officially abandoned in 2005 because of toxicity issues, a progressively high (up to 65%) treatment failure rate, and the emergence of drug resistance.

The cell surface of *L. donovani* is covered with complex sugar molecules known as glycoconjugates or glycans. Here, we explore another domain of the parasite/host cell interaction and decipher the complex interaction between antimony resistant parasite-specific parasite surface glycoconjugates, infectivity, IL-10 production, overexpression of Multidrug resistant protein 1 (MDR1) in the macrophage, and efflux of antimonial drugs from the host cell.



Endosomal/lysosomal trafficking of GFP-E.coli depicting orange-yellow hue (green of GFP-E.coli and red of Lysotracker Red) in recombinant Wnt5a after 4 hours bacterial internalization

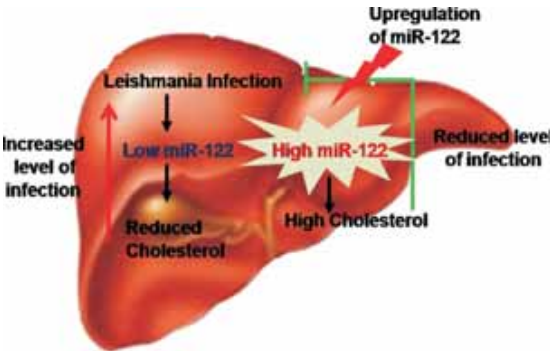
CSIR-IICB, after a systematic study, has revealed that antimony resistant Leishmania donovani-specific glycans induce IL-10 production from macrophages, which, in turn, upregulates expression of host MDR1 and might eventually contribute to drug resistance and increased pathogenicity. These findings broaden the view on the panel of molecular mechanisms involved in antimonial resistance. The findings suggest that further studies on drug resistance should not only focus on the parasite, but also explore its direct interface, the macrophage. Finally, CSIR-IICB study raises concern about the impact of major molecular adaptations on the outcome of the few available drugs that have been implemented to control kala azar in the Indian Subcontinent also.



Antimony resistant parasite (Sb^RLD) driven IL-10 overproduction and subsequent Multidrug resistant protein -1 (MDR1) upregulation in infected macrophage. Interaction of unique terminal sugar of Sb^RLD with host TLR2 results in the activation of ERK and NF-?B subunits, p50/c-Rel. Nuclear translocation and binding of these subunits to the specific IL-10 promoter site results in IL-10

The power of small RNA: Identification of mi-RNA as a potential therapeutic molecule against Kala-azar

Visceral Leishmaniasis (Kala-azar) caused by the pathogenic parasite Leishmania donovani is a deadly disease affecting a large portion of Bihar and adjoining areas. In patients, with progress of infection, downregulation of serum cholesterol was noted. Investigating the mechanism of this change, CSIR-IICB has discovered the role of a host micro-RNA regulating the infection process. This tiny RNA, miR-122 is a liver specific micro-RNA that gets reduced in the liver of infected animals. Restoration of miR-122 level in infected animals reverted serum cholesterol level and cleared parasite load from infected subjects. From this study, a therapeutic potential of miR-122-



Schematic diagram showing Leishmania parasites modulate liver miRNA for its survival. High miRNA-122 in liver causes high serum cholesterol which prevents leishmania infection. To invade the hosts, the parasite counters it by reducing liver miR-122 to lower serum cholesterol. On contrary, manipulation of liver miRNA-122 level to increase cholesterol production clears parasites and reduces infection levels

the tiny RNA wonder- in curing this parasitic diseases is evident. This is important particularly when other drugs are failing due to increased drug resistivity of the pathogen that has emerged recently.

Function of an Alba-family protein (PfAlba3) from human malaria parasite *Plasmodium falciparum*

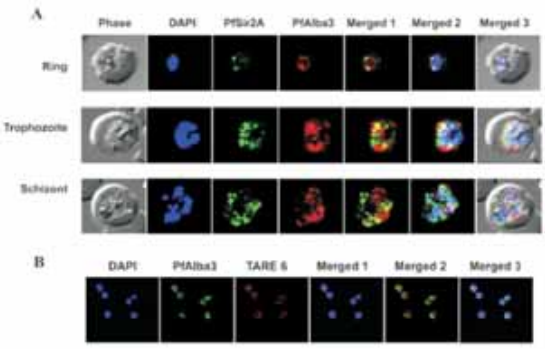
CSIR-IICB has investigated the DNA-binding nature as well as the function of a putative Alba (Acetylation lowers binding affinity) family protein (PfAlba3) from *Plasmodium falciparum*. PfAlba3 binds to DNA sequence non-specifically and acetylation lowers its DNA-binding affinity. The protein is ubiquitously expressed in all the erythrocytic stages of *P. falciparum* and it exists predominantly in the acetylated form. *Plasmodium falciparum* Sir2 (PfSir2A), a nuclear localized deacetylase interacts with PfAlba3 and deacetylates the lysine residue of N-terminal peptide of PfAlba3 specific for DNA binding. PfAlba3 is localized with PfSir2A in the periphery of the nucleus (Fig.A). Fluorescence in situ hybridization studies revealed the presence of PfAlba3 in the telomeric and subtelomeric regions (Fig.B). PfAlba3 is involved in coordinated expression of Virulence Aggressive Resistance (Var) gene.

Inhibitors of IL-4 and IL-5 for the Treatment of Bronchial Asthma

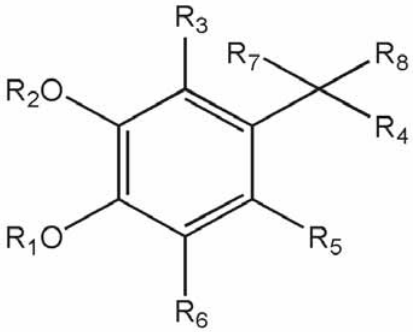
The incidence of asthma and respiratory allergy is increasing in epidemic proportion throughout the world. It is one of the most critical, torturous diseases,

which is threatening human civilization. Current studies shows that the loss due to asthma and other respiratory disorders is more that 30-34% of the total man-days. Even today there is no clear curative therapy for the disease. Moreover, currently available remedial drugs i.e., bronchodilators and steroids, are with undetermined responsiveness, and hazardous to health, with severe side effects.

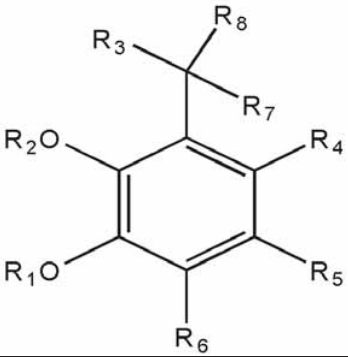
CSIR-IICB, CSIR-IGIB and CSIR-IITR scientists have come up with pharmaceutical compositions including a compound of formula I or formula II (substituted catechols, as given herein below), for the treatment of bronchial asthma. These conditions may be treated by inhibition of IL-4 and IL-5.



PfAlba3 co-localize with PfSir2A (deacetylase) at the periphery of nucleus



(Formula I)



(Formula II)

In this technology a method is provided for inhibition of IL-4 and IL-5 and for the treatment of bronchial asthma by administering an active compound of formula I or II or a composition containing such an active compound to a mammal in need thereof. The compounds of formula I or formula II are used in the manufacture of a medicament for the treatment of bronchial asthma. Development of therapeutics for the treatment of bronchial asthma has significant commercial importance in drugs and pharmaceutical sector. The present invention relates to inhibition of IL-4 and IL-5 by hydroxychavicol (purified from natural sources or prepared synthetically) and its analogues and shows anti-asthmatic efficacy in vivo in mouse model.

An Improved Process for the Isolation of Organic Compounds Useful for the treatment of Cancer

CSIR-IICB has isolated two main component molecules from an edible herb, abundantly available in our country, for the treatment in glioblastoma and cervical carcinoma. The molecules induced apoptosis by activation of mitochondria-mediated death cascade both in glioma and cervical cancer cells. C-3 hydroxy group and NH group in the ring are two potential contributing groups for their cytotoxic effect. O-methyl derivative of one compound and N-methyl derivative of other compound are more or less inactive with respect to native molecules. The compound(s) reduced the effective doses of cisplatin and paclitaxel in cervical cancer showing better efficacy and therefore can be used as an adjunct chemotherapeutic agent to reduce toxicity of known toxic anti-cancer drugs. A new low cost process for the preparation of these two molecules was established. Both compounds are highly available in EtOAc extract and this extract is significantly active against glioma and cervical cancer cells.

Glioma cannot be cured. The prognosis for patients with high-grade gliomas is generally poor, and is especially so for older patients. Temozolomide is an orally active alkylating agent that is used for persons newly diagnosed with glioblastoma multiforme. Cervical cancer is the second most common malignancy among women worldwide. In India, cervical cancer ranks as the first most frequent cancer among women. The standards of treatment of cervical cancer include radiation therapy, chemotherapy and surgery. Chemotherapy uses either cisplatin alone or combination of two drugs, hycamtin and cispltin. But all the available drugs are very cytotoxic and very costly for middle class family. Both of the compounds in this invention are non toxic, easily available and yield is high, so cost will be less.

Groundwater contaminated with hexavalent chromium [Cr (VI)]: a health survey and clinical examination of community inhabitants

CSIR-IITR has assessed the health effects of hexavalent chromium groundwater contamination (from tanneries and chrome sulfate manufacturing) in Kanpur, India. The health status of residents living in areas with high Cr (VI) groundwater contamination (N = 186) were compared to residents with similar social and demographic features living in communities having no elevated Cr (VI) levels (N = 230). Subjects were recruited at health camps in both the areas. Health status was evaluated with health questionnaires, spirometry and blood hematology measures. Cr (VI) was measured in groundwater samples by diphenylcarbazide reagent method.

Residents from communities with known Cr (VI) contamination had more self-reports of digestive and dermatological disorders and hematological abnormalities. GI distress was reported in 39.2% vs. 17.2% males (AOR = 3.1) and 39.3% vs. 21% females (AOR = 2.44); skin abnormalities in 24.5% vs. 9.2% males (AOR = 3.48) and 25% vs. 4.9% females (AOR = 6.57). Residents from affected communities had greater RBCs (among 30.7% males and 46.1% females), lower MCVs (among 62.8% males) and less platelets (among 68% males and 72% females) than matched controls. There were no differences in leucocytes count and spirometry parameters. Living in communities with Cr (VI) groundwater is associated with gastrointestinal and dermatological complaints and abnormal hematological function. Limitations of this study include small sample size and the lack of long term follow-up. The research findings have been published in 'PLoS One.'

Analysis of imidacloprid residues in fruit, vegetables, cereals, fruit juices and baby foods and daily intake estimation in and around Lucknow

CSIR-IITR has collected and analysed a total of 250 samples-including fruits, fruit juices, and baby foods (50 samples each), vegetables (70 samples), and cereals (30 samples)- from Lucknow for the presence of imidacloprid residues. The QuEChERS (quick, easy, cheap, effective, rugged, and safe) method of extraction coupled with high-performance liquid chromatographic analysis were carried out, and imidacloprid residues were qualitatively confirmed by liquid chromatography-mass spectrometry. Imidacloprid was not detected in samples of fruit juices and baby foods. It was, however, detected in 38 samples of fruits, vegetables, and cereals, which is about 15.20% of the total samples. Of samples of fruits, 22% showed the presence of imidacloprid, and 2% of samples showed residues above the maximal residue limit. Although imidacloprid was detected in 24% of vegetable samples, only 5.71% showed the presence of imidacloprid above the maximal residue limit. However, 33% of cereal samples showed the presence of imidacloprid, and about 3% of samples were above the maximal residue limit. The calculated estimated daily intake ranged between 0.004 and 0.131µg/kg body weight, and the hazard indices ranged from 0.007 to 0.218 for these food commodities. It is therefore indicated that lifetime consumption of vegetables, fruits, fruit juices, baby foods, wheat, rice, and pulses may not pose a health hazard for the population of Lucknow because the hazard indices for imidacloprid residues were below one.

Edible oil adulterants, argemone oil and butter yellow, as aetiological factors for gall bladder cancer

CSIR-IITR has investigated the potential aetiological factors of gall bladder carcinoma (GBC) in the Indo-Gangetic basin. Twice weekly intraperitoneal (ip) administration of AO (5 ml/kg body wt) and BY (25 mg/kg body wt) to Swiss albino male and female mice for 30 and 60 days indicated that females were more vulnerable to these adulterants in terms of responses to inflammatory markers. Subsequent experiments with dietary exposure of AO (1%) and BY (0.06%) for 6 months in female mice showed symptoms related to cachexia, jaundice and anaemia. High levels of total cholesterol, low density lipoprotein (LDL), TG, bilirubin and low level of high density lipoprotein (HDL) as well as gallstone formation was shown by AO exposure only, leading to the development of adenocarcinoma. BY exposure resulted in adenoma and hyperplasia without stone formation. The cyclooxygenase (COX-2) overexpression was found to be related to prostaglandin E2 (PGE2) production in AO treated mice but not in BY exposed animals, thereby indicating a differential pathway specific carcinogenicity. PGE2 stimulates the secretion of secreted mucins (MUC5AC), which is involved in stone formation following AO exposure. Enhanced secretion of membrane bound mucins (MUC4) in BY and AO exposed mice resulted in the activation of ErbB2 and downstream signalling such as p-AKT, p-ERK and p-JNK, which ultimately affects the target proteins, p53 and p21 leading to adenoma and adenocarcinoma, respectively. The study suggests that AO and BY are responsible for producing GBC in mice along with stone formation in the AO exposed animals.

Removal of hexavalent chromium from contaminated ground water using zero-valent iron nanoparticles

CSIR-IITR has conducted batch experiments were conducted on ground water samples collected from a site contaminated with Cr(VI) to evaluate the redox potential of zero-valent iron (Fe(0)) nanoparticles for remediation of Cr(VI)-contaminated ground water. For this, various samples of contaminated ground water were allowed to react with various loadings of Fe(0) nanoparticles for a reaction period of 60 min. Data showed 100% reduction of Cr(VI) in all the contaminated ground water samples after treatment with 0.20 gL^{-1} of Fe(0) nanoparticles. An increase in the reduction of Cr(VI) from 45% to 100% was noticed with the increase in the loading of Fe(0) nanoparticles from 0.05 to 0.20 gL^{-1}. Reaction kinetics of Cr(VI) reduction showed pseudo first-order kinetics with rate constant in the range of 1.1×10^{-3} to 3.9×10^{-3} min^{-1}. This work demonstrates the potential utility of Fe(0) nanoparticles in treatment and remediation of Cr(VI)-contaminated water source.

Particulate matter concentration in ambient air and its effects on lung functions among residents in the National Capital Region

The World Health Organization has estimated that air pollution is responsible for 1.4 % of all deaths and 0.8 % of disability-adjusted life years. NOIDA, located at the National Capital Region, India, was declared as one of the critically air-polluted areas by the Central Pollution Control Board of the Government of India. Studies on the relationship of reduction in lung functions of residents living in areas with higher concentrations of particulate matter (PM) in ambient air were inconclusive since the subjects of most of the studies are hospital admission cases. Very few studies, including one from India, have shown the relationship of PM concentration and its effects of lung functions in the same location. CSIR-IITR has studied the effect of particulate matter on centration in ambient air on the lung functions of residents living in a critically air-polluted area in India. PM concentrations in ambient air (PM(1,) PM(2.5)) were monitored at residential locations and identified locations with higher (NOIDA) and lower concentrations (Gurgaon). Lung function tests (FEV(1), PEFR) were conducted using a spirometer in 757 residents. Both air monitoring andlung function tests were conducted on the same day. Significant negative linear relationship exists between higher concentrations of PM(1) with reduced FEV(1) and increased concentrations of PM(2.5) with reduced PEFR and FEV(1). The study shows that reductions in lung functions (PEFR and FEV(1)) can be attributed to higher particulate matter concentrations in ambient air. Decline in airflow obstruction in subjects exposed to high PM concentrations can be attributed to the fibrogenic response and associated airway wall remodeling. The study suggests the intervention of policy makers and stake holders to take necessary steps to reduce the emissions of PM concentrations, especially PM(1,) PM(2.5), which can lead to serious respiratory health concerns in residents.

Development of new synthetic methods and its application towards the synthesis of bio-active scaffolds

Simple and inexpensive iron and copper based catalysts present an environmentally friendly alternative to expensive and toxic metal and attracted the attention of chemist all over the world for the construction of C-C/C-X/C-N bond formation as well as synthesis of bio-active molecules. In this area, a very general iron-catalyzed methods for the cross coupling of electron-deficient heterocycles and quinone with organoboron species *via* innate C-H functionalization was developed, in addition, this new method was successfully utilized for the synthesis of anticancer marine pyrazine alkaloid Botryllazine A.

Further, novel tandem multi-component protocols for synthesis of therapeutically important compounds were also developed viz. flavans (*Org. Biomol. Chem.* **2012**, 10, 5143), pyrrolidinone alkaloids (*J. Org. Chem.* **2012**, 77, 8821), imidazo[1,2-a]pyridines (*RSC Adv.*, **2013**, DOI: 10.1039/C3RA42046A), 3,5-disubstituted isoxazoles (*Tetrahedron Lett.* **2013**, 54, 3558) and 1-aryl-1,2,3-triazoles (*Tetrahedron* **2012,** *68*, 8156). The first method for C-devinylation of aromatic systems has been established (*Tetrahedron Lett*. **2013**, 54, 2913). The total synthesis of marine natural product fascaplysin and its anti-cholinesterase activity has been achieved (*Med. Chem. Commun.* **2012**, 3, 1098). Meridianins and 3,3'-diindolylmethanes have been identified as potent antimalarial and antileishmanial agents (*Eur. J. Med. Chem.* **2013**, 63, 435 (*Med. Chem. Commun.* **2013**, *4*, 1042).

Societal Benefits due to CSIR-IMTECH's Streptokinase
After introduction of CSIR's streptokinase, prices have dropped (by 65 percent, to less than one month of per capita income), availability has increased, access to a life-saving medicine has risen, and patients have realized a worth of over Rs. 16,000 crores due to the CSIR-IMTECH/licensees Streptokinase. The economic

impact, or the additional benefit that would be lost if this CSIR-IMTECH Streptokinase technology intervention had not been there, is assessed based on medical impact of Streptokinase and using per capita income to be Rs. 2180 crores. The Lab itself accomplished net earnings valued at Rs.1.8 crores and the Industry partners together realized value addition of Rs. 17 crores.

Phenotypic characterization of Streptomyces strains

Antimicrobial positive Streptomyces strains were observed under light microscope for acid-fastness and Gram-staining properties. Morphological characters were observed on CSPY agar plate. Physiological criteria such as the ability to degrade casein and tyrosine as substrates by various Streptomyces strains were used for genus confirmation. The utilization of different carbon sources and production of melanin pigment and utilization of urea were studied so as to characterize species level classification.

Based on antimicrobial activity total 33 strains putatively Streptomyces spp. was selected from CSPY agar plates. Optimal growth temperature for the strains was recorded as 25°C, growth can occur below 6°C, no growth recording at 35°C or above. Most of these strains show typical morphology of Streptomyces, they had branched and non-fragmented substrate mycelia, abundant aerial hyphae and short or long spore chains with or without pigmentation. All the colonies of the strains were slow growing, aerobic, glabrous or chalky, heaped with substrate mycelia of colors and possessed an earthy smell. The strains were acid-fast negative and gram positive, degraded the substrates casein, however, degradation of tyrosine was variable according to each isolate. Microscopically, it was revealed that the spore chain morphology differed depending on the species, showing straight and flexuous forms, hooks, open loops and coils.

Based on the aerial mycelium colour, the strains could be grouped into - grey and white. Different colours of mycelia were also observed, the shades light brown and ivory colour being the predominant. Few of them had substrate mycelia in violet, purple or red-violet. Utilization of several carbohydrates varied according to each strain. Maximum, i.e. 11 nos. of strains had capacity to utilize L-arabinose, followed by (8 strains) sucrose, D-mannitol, raffinose and L-rhamnose. Only two strains were able to use D-fructose as carbon source. Majority of the strains (22 out of 33) could degrade urea, and 13 nos. of strains could produce diffusible pigments in the surrounding medium.

Silicon mediates arsenic tolerance in rice (Oryza sativa L.) through lowering of arsenic uptake and improved antioxidant defence system

CSIR-NBRI has grown two contrasting rice (*Oryza sativa L.)* cultivars i.e. Triguna (As tolerant) and IET-4786 (As sensitive) hydroponically to study the effect of silicon (Si) supplementation on As accumulation, growth, oxidative stress and antioxidative defence system in shoots during arsenite [As(III)] stress. Rice seedlings were exposed to three As(III) levels (0, 10 and 25 ìM) and three silicic acid levels (0, 0.5 and 1 mM Si) in solution culture experiments. Addition of 1 mM Si during As(III) exposure significantly lowers shoot As accumulation in both the cultivars, but more prominently in Triguna (Pd”0.01) than IET-4786 (Pd”0.05). However, addition of Si during As(III) stress had no significant effect on shoot length and dry weight (P<0.01) of both the cultivars, compared to their As(III) treated plants. In contrast to IET-4786 (Pd”0.05), Triguna tolerated As-induced oxidative stress through elevated level of cysteine, enhanced antioxidant enzyme activities and their isozymes. Upon Si supplementation lower 3 conglomeration of oxidative stress parameters viz., superoxide and peroxide radicals, lipid peroxidation and electrolyte leakage coincides with increased antioxidant activities and enhanced level of thiols, more effectively in shoots of Triguna than IET-4786 during As(III) stress (Pd”0.05). In conclusion, 1 mM Si addition, significantly ameliorates As-induced oxidative stress in Triguna cultivar by lowering the As accumulation and improving antioxidant and thiolic system compared to IET-4786, implying genotypic differences with Triguna being less susceptible to stress dependent membrane lipid peroxidation.

Influence of arsenic-resistant bacteria on growth and arsenic uptake in *Brassica juncea*

CSIR-NBRI has isolated an arsenic hypertolerant bacterium from arsenic contaminated site of West Bengal. The bacterium was identified as *Staphylococcus arlettae* strain NBRIEAG-6, based on 16S rDNA analysis. It was able to remove arsenic from liquid media and possesses arsC gene, responsible for arsenate reductase activity. An experiment was conducted to test the effect of S. arlettae inoculation on concurrent plant growth promotion and arsenic uptake in Indian mustard plant [*Brassica juncea (L.) czern.* Var.R-46] when grown in arsenic spiked (5, 10 and 15 mg kg-1) soil. The microbial inoculation significantly (p<0.05) increased biomass, protein, chlorophyll and carotenoids contents in test plant.

The plant growth promoting bacteria NBRIEAG-6 has the ability to help *Brassica juncea* to accumulate As maximally in plant root, and therefore it can be accounted as a new bacteria for As phytostabilization.

HMPR based genic enriched genomic sequencing

CSIR-NBRI has adopted a modified Hypo-Methylated Partial Restriction (HMPR) approach for the genic-enrichment in cotton genome, which employs complete digestion of genomic DNA with methylation sensitive restriction enzymes (ClaI and HpaII). The genic-enriched sequencing data was mined for various genomic resources like genes, transcription factors, promoters, non-coding RNAs, and molecular markers.

Six diverse genotypes of *G. hirsutum* (JKC703, JKC725, JKC737, JKC770, MCU5, and LRA5166) were selected on the basis of their genetic differences. Two individual genic-enriched libraries (using ClaI fragments and HpaII fragments) were made from genomic DNA of each of the genotypes. After the sequencing of all six genotypes, a total of 18,368,939 genomic reads representing 5,298,872,511 bases (approx. 5.29 Gb) were generated. A total of 717,694 mitochondrial reads, 3,680,762 plastid reads and 244,023 short reads (<50 bp) were filtered out from the raw data. The quality filtered ClaI and HpaII reads (14,280,525) from all the genotypes were assembled using 454 gsAssembler v2.5.3 to generate 4,095,128 super-assembled sequences, including 533,271 contigs and 3,561,857 singletons (1.27 Gb).

A total of 422,617 SNPs in all 15 possible combinations of six genotypes were identified. Under-represented SNPs (in less than 3 reads from a genotype), paralogous SNPs and redundant SNPs were removed across all the 15 combinations and identified a total of 66,444 unique SNPs, which were distributed among 24,612 genic (15,648 exonic and 4518 intronic) and 41,832 non-genic SNPs. Further, 2,604 synonymous and 6,506 non-synonymous SNPs were identified. In addition, 66,444 unique SNPs were checked for their novelty against all the 29,234 Gossypium SNPs submitted to NCBI dbSNP (http://www.ncbi.nlm.nih.gov/snp?term=gossypium%20hirsutum) and identified 66,364 novel SNPs (80 redundant SNPs). A frequency of 1 SNP per 388 bases of sequence analyzed was observed. Most of the coding SNPs were enriched in protein kinase (292 SNPs), hydrolase (254 SNPs), Cytochrome P450 (234 SNPs), AAA domain (216 SNPs), AP endonuclease family (166 SNPs) and NB-ARC domain (108 SNPs). The study added significant number of resources for cotton community.

Improved Betelvine Production Technology

Betelvine (*Piper betle L.*) is a shade loving creeper, native of tropics and prevails best under humid conditions and mild temperature. In northern India, it is cultivated in closed structures, termed as 'Bareja, Bheet', constructed with the locally available materials like bamboo stems, jute sticks, paddy straw etc. Diffused light and humid conditions are conducive to pathogens viz. fungi and bacteria. These diseases sometimes lead to 100% damage to the crop and huge quantities of plant protection chemicals are used to save the crop. Mahoba district of Bundelkhand region of U.P. is known for excellent quality betel leaves, which are exported for their superior quality. During recent years, the area and production of betel leaves have sharply declined as the cultivation is labour intensive, capital demanding and highly risky due to its sensitivity to vagaries of weather. To address these issues, CSIR-NBRI initiated need based R&D and extension services for betelvine growers of U.P., considering it most important to educate the farmers intensively and advocate eco-friendly practices for pest and disease management. The traditional bareja is temporary, costly and prone to damage by natural vagaries. The crop growing in these barejas is severely damaged by extremes of temperature and frost, often resulting in total destruction of the crop. CSIR-NBRI has developed a "model barjeja", a modified shade net house, with raised, nutrient rich beds and fertigation system. This model is cost effective in terms of sustainability and production of betel leaves per unit area/year. This translational effort of CSIR-NBRI will benefit the farmers at large particularly poor betelvine growers and will play an important role in cultivation and conservation of betelvine.

Development of cosmaceutical products

- **Herbal colour for cosmetics**: Lipophilic strawberry red colour has been isolated from the plant NBR-R1 and standardized along with safety studies for application in lip balm. This technology has been licensed to M/s Himalaya Drug Company, Bangalore.

- **Natural Lip-Balm**: CSIR-NBRI & CSIR-CIMAP jointly developed technology for natural lip balm. Herbal colour and natural ingredients used in lip balm protect the lips and leaves the lips hydrated and nourished by preventing moisture loss. Natural lip balm is non toxic. Technology transferred has been to M/s Chiara Herbals Pvt. Ltd., New Delhi.

Strawberry red herbal colour for lip balm

Natural Lip balm

Lipophilic Yellow colour for cosmaceuticals

- **Technology developed for yellow colour**: Lipophilic yellow colour was also isolated from the plant NBR-Y for its application in lip butter/ balm. Mango flavoured, vitamin-E enriched yellow lip balm developed jointly with CSIR-CIMAP. It keeps the lips healthy and colour is safe.

DNA Fingerprinting of Endophytic Actinomycetes Isolated protected Forest Areas of Assam and Mizoram

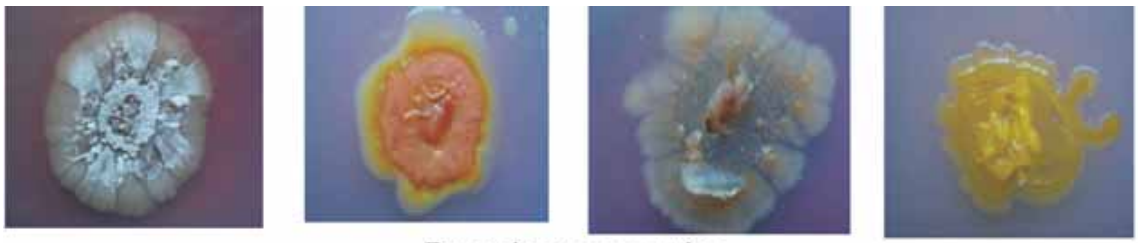
Isolation of Actinomycetes: CSIR-NEIST has collected some medicinally and economically important plant species from protected forest areas like Kaziranga National park, Gibbon forest and Dibru Saikhuwa Reserve Forest. More than 200 strains of endophytic actinomycetes were isolated. The actinomycetes strains were observed under compound microscope for their acid fastness and gram staining properties. It has been found that all the actinomycetes are gram positive. The morphological characters of their colony have been recorded.

Screening for antimicrobial and enzyme activities: From the isolated endophytic actinomycetes strains most of them were screened for their activities against some test pathogens (fungi and bacteria). Among them fungal pathogens are viz. Candida albicans MTCC3017, *Fusarium oxysporum* f. sp. ciceri NCIM1281, *Aspergillus niger* and Rhizoctonia solani and bacterial strains are viz. Staphylococcus aureus MTCC96, E. coli MTCC739 and *Pseudomonas aeruginosa* MTCC2458. On the other hand the activities for production of different enzymes viz. lipase, amylase and cellulase were done in specific media prepared according to protocol provided.

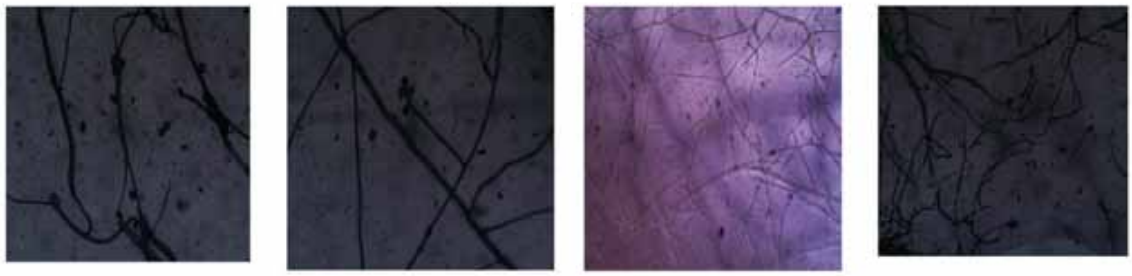
B. Chemical Sciences

Development of reversible anionic redox chemistry in high-capacity layered-oxide electrodes

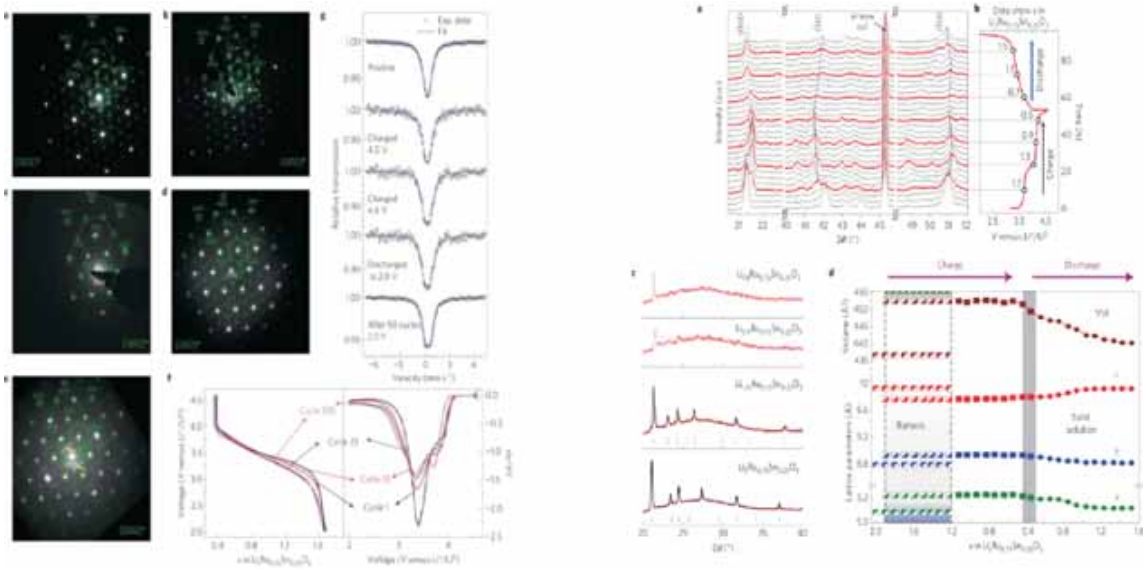
Li-ion batteries have contributed enormously to the



Few actinomycetes strains



Microsopic view of few endophytic actinomycetes



Microscopy and Mössbauer measurements for spotting the evolution of $Li_2Ru_{1-y}Sn_yO_3$ electrodes on cycling
Li-driven structural behaviour on cycling

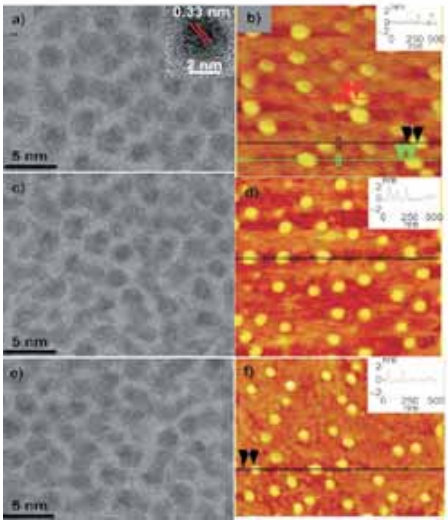
commercial success of portable electronics and may soon dominate the electric transportation market with possible major scientific advances including new materials and concepts. Classical positive electrodes for Li-ion technology operate mainly through an insertion–deinsertion redox process involving cationic species. However, this mechanism is insufficient to account for the high capacities exhibited by many new generation of Li-rich layered oxides that present unusual Li reactivity. In an attempt to overcome both the inherent composition and the structural complexity of this class of oxides, CSIR-CECRI has designed a structurally related $Li_2Ru_{1-y}Sn_yO_3$ material igned that exhibits sustainable reversible capacities as high as 230mAhg^{-1}along with good cycling behaviour with no signs of voltage decay.

In addition to unravelling the fundamental mechanisms of these high-capacity electrodes, this work is also important for practical applications despite the use of Ru for good cycle life and the elimination of the voltage decay on cycling make a significant impact on performance. The present finding also provides a final answer to the long debate about the need for composite as opposed to single phases in high-capacity electrodes, as one single phase is sufficient to make it. Many other superior compounds can be made, including sodium-based ones, thereby opening a wide window within the periodic table from which it will be relevant to find the best combination having the proper elements in terms of sustainability. The research findings has been published in Nature Materials which has Impact factor as high as 35.705.

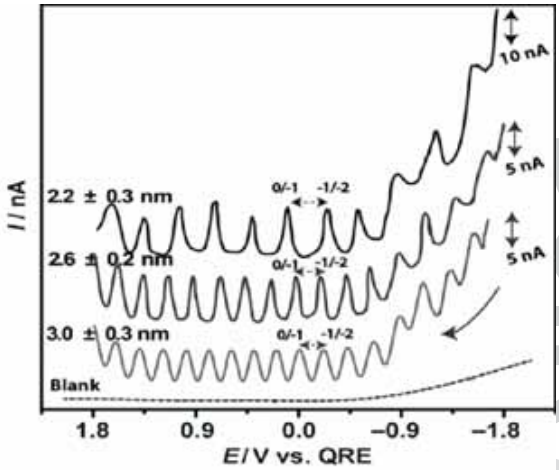
Electrochemical Resolution of Multiple Redox Events for Graphene Quantum Dots

Metallic and semiconducting nanoclusters stabilized by a variety of organic monolayers, such as thiols, amines, and carboxylic acids, have received considerable attention in the past decade because of their size- and shape-dependent electronic, chemical, and electrochemical properties, especially because of the ease with which they show discrete single-electron transfer behavior. This intriguing behavior is specially seen as a stair case in the current–voltage behavior even at room temperature, when prepared below a critical threshold size (about 1–3nm), having a narrow size distribution. CSIR-CECRI has prepared a green luminescent, GQDs with a uniform size of 3, 5, and 8. (±0.3) nm in diameter through an electrochemical method from MWCNT using propylene carbonate and $LiClO_4$ at 90°C, at 30°C display this remarkable behavior below a critical threshold size.

Graphene Quantum Dots (GQDs) of tunable sizes of 2.2±0.3, 2.6±0.2, and 3±0.3nm can act as multivalent redox species presenting exciting opportunities for a variety of applications including single-electron transistors, molecular switches, and resonant tunneling diodes. This could also be important for biomimetic applications like artificial muscles, batteries, smart membranes, and smart drug-delivery



Typical TEM images of dodecyl-aminecapped GQDs



Differential pulse voltammetric responses of GQDs in 0.5mMTBAHFP as supporting electrolyte in CH_2Cl_2 for particle sizes of 3±0.3, 2.6±0.2, and 2.2±0.3nm on a Pt ultra-microelectrode (20ìm) at a typical scan rate of 25mVs^{-1} at 273K

devices. The research findings have been published in International journal Angewandte Chemie-International Edition with Impact factor 13.734.

High quality NMP exfoliated graphene nanosheet–SnO2 composite anode material for lithium ion battery

CSIR-CECRI has prepared a graphene nanosheet–SnO_2 (GNS–SnO_2) composite is using *N*-methylpyrrolidone as a solvent to exfoliate graphene from graphite bar with the aid of CTAB by single phase co-precipitation method NMP exfoliated GNS is made composite with GNS–SnO2 and well characterised physically and electrochemically. The 'd' value obtained is in the range of 5.54 and 2.37 Å for the 002 plane of GNS and the formation of tetragonal SnO2 in the composite is also confirmed by XRD. The SEM and TEM images give information about the sandwich type morphology of the GNS–SnO_2The capacity retentions at the end of the first 10 cycles is 57% (100 mA g^{-1} rate), the second 10 cycles is 77.83% (200 mA g^{-1}), and the final 10 cycles (300 mA g^{-1}) is 81.5%. Moreover the impedance analysis clearly explains the low resistance pathway for Li^+ insertion after 30 cycles when compared with the initial cycle. This superior characteristic of GNS–SnO_2 composite suggests that it is a promising candidate for lithium ion battery anode.

The cover page of PCCP highlighting research work

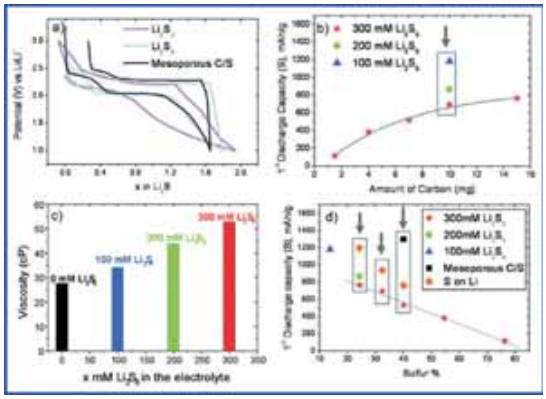
The GNS–SnO_2 composite delivers a capacity of 1060 mA g^{-1} and retains 57% of initial capacity after 10 cycles at a current density of 100 mA g_1. Even at a high current density of 300 mA g^{-1}, the composite retains 81% of initial capacity (305.8 mA g^{-1}). This excellent performance is due to the sandwich morphology in between GNS layers which act as a building block and sustains volume expansion of SnO_2 during cycling, which assists for a better cycling performance. The research findings have been appeared on the cover page of an International journal 'Physical Chemistry Chemical Physics'.

Li–S batteries: simple approaches for superior performance

Although promising improvements have been made in the field of Li–S rechargeable batteries, they are

still far from reaching the market place due to several drawbacks. To combat the solubility of polysulphides, confinement approaches aiming to trap sulphur within the cathode side have been pursued, but success has been limited. CSIR-CECRIdrastically deviates from this approach and used a liquid cathode obtained either by dissolving polysulphides within the electrolyte or by placing sulphur powders in contact with the Li negative electrode. Such approaches are shown to result in greater performance than confinement approaches. Such a strategy eliminates the detrimental Li_2S formation inside a porous carbon matrix and moreover leads to the formation of a protective SEI layer at the Li electrode, as deduced by impedance spectroscopy and XPS, which seems beneficial to the cycling performance.

Targeting the origin of the rapid capacity decay in Li–S batteries is a must if one wants this system to become a reality for load leveling and transport. To address this issue two different approaches have been reported enlisting the use of either polysulphides as active materials or S deposited on Li, both aiming to eliminate the detrimental formation of Li_2S at the porous carbon matrix. Besides leading to performance improvements in terms of capacity retention, these approaches have also led to better insights regarding the impact of sulfur deposited on the Li surface. This SEI layer seems to combine attractive features, hence the crucial importance to understand both its nature and composition and to pursue more intensive chemical/physical analysis enlisting combined XPS-NMR surface analytical techniques. Although not fully understood, such a finding, which somewhat mimics what happens in Li–thionylchloride primary cells, holds some promises regarding the feasibility to build Li–S cells differently for sustainable performance. The research findings have been published in International Journal 'Energy & Environmental Science' with an Impact Factor of 11.653.



(a) First discharge–charge profile of the chemically synthesized Li_2S_2 and Li_2S_8 as active materials and the mesoporous C–S composite. (b) the impact of the carbon amounts on the first discharge capacity, (c) the viscosity of the electrolyte/catholytes at different concentrations, (d) the impact of the sulphur content on the first discharge capacity

Lithium Economy

CSIR-CECRI has made a rev iew on Lithium Economy. The dramatic explosion of the portable electronics market owes much to the ubiquitous batteries that power them. However, the days of the conventional battery systems seem numbered. The performance levels of conventional batteries are often found wanting for projected applications, be it in the burgeoning electronics industry or in the transportation sector. A shift in gears from the internal combustion engine vehicles (ICEVs) to electrically operated vehicles is in the cards. Much of the groundwork for this transformation in the way that we move about came through the U.S. government's Hybrid and Electric Vehicle Act of 1976. However, there is a lingering fear that battery technology has not lived up to the demands of the electric vehicle. An immediate choice, therefore, seems to be the plug-in hybrid electric vehicle (PHEV).

A PHEV could be powered with batteries that can be charged conveniently by using electricity from the grid or a fuel such as gasoline, ethanol, and hydrogen, or both

Ramifications of peak oil and the urgency to save the environment are driving a new course for transportation. The course being charted will give rise to a new energy order and is to be based on the economics and technologies of lithium, the gray gold. Although the metal is not scarce, deposits of its minerals are concentrated in politically turbulent regions such as Afghanistan and Bolivia. While countries such as Bolivia are trying to cash in on this bounty without interference from the developed world, they lack the technical expertise to exploit the resources. However, all of the heated projections on electric/hybrid electric vehicle production have cooled due to economic recession and high vehicle prices. While switching our addiction from the soon-to-be-drained out oil to lithium is projected to make way for technologies with low carbon footprints and, therefore, a cleaner environment, large-scale mining and exploitation of lithium is not without environmental fallouts. The grass always looks greener on the other side, but alternative technologies should be carefully examined for their long-term sustainability. The research findings have been published in an International Journal 'Journal of Physical Chemistry Letters'.

Giant Magnetoresistance in Electrodeposited Films

Electrodeposition of some alloys and multilayer exhibits the giant magneto resistance (GMR) effect with a great potential for technological applications, such as magneto resistive sensors and magnetic recording devices. GMR effect is more usually seen in multilayer and alloys structure, when two magnetic layers are closely separated by a thin non-magnetic spacer layer. CSIR-CECRI studied effect of electrodeposition of alloys and multilayer for GMR applications. The effect of thickness of magnetic, non-magnetic layers, number of bi-layers, electrolyte pH, electrolyte temperature, additives and annealing process on GMR properties has been analyzed.The impact of this work is obvious from the predictive ability since this is based on an overview on the current status of electrodeposited multilayer films exhibiting GMR. Although nearly 160 reports have been published on electrodeposition GMR multilayer films this is the first attempt to critically evaluater each multilayer system accessible for preparation by electrodeposition.

Reversible anionic redox chemistry in high-capacity layered-oxide electrodes

Li-ion batteries are one major contributor for commercial success of portable electronics. Overcoming the issues related to capacity enhancement, the story would soon repeat for success of electric transportation. CSIR-IICT has made an attempt to overcome both the inherent composition and the structural complexity of Li-rich ($Li_{1+x}Ni_yCo_zMn_{(1-x-y-z)}O_2$) layered oxides. Structurally related $Li_2Ru_{1-y}Sn_yO_3$ materials that have a single redox cation and exhibit sustainable reversible capacities as high as 230 mAh g^{-1}. They have good cycling behaviour with no signs of voltage decay and a small irreversible capacity. Because Li_2MO_3 is a large family of compounds, this study opens the door to the exploration of a vast number of high-capacity materials. The work has been published in 'Nature Materials'.

Synthetic Aviation Lubricants

India is totally dependent on developed countries for its aviation lubricant requirements which are of immense strategic importance in the defence-preparedness necessitating self-reliance in this field. A Task Force involving CSIR-IICT as Nodal Agency, IOCL, CSIR-NAL, HAL, GTRE, CEMILAC was formed for developing indigenous capabilities in aviation lubricants. The Task Force shortlisted lubricants OX-27 meeting MIL PRF-23699F and OX-38 meeting DEF STAN 91-98 specifications for development.

CSIR-IICT has developed two lubricants, SVS11 and SVS21. A specialized bench & pilot scale facility, and a sophisticated analytical testing facility were established at CSIR-IICT. The Rolling Element Bearing Test Facility, a first of its kind in India, was established at CSIR-NAL. The developed lubricants have passed all the mandatory tests. With this landmark development, India has joined the select group of countries having capabilities in aviation lubricant technologies. Provisional Certificates for Airworthiness Approval has been granted by CEMILAC for SVS11 and SVS21 lubricants, which is essential for their commercial exploitation.

Process for the preparation of 4-tert-butyl toluene and 4-tert butyl benzoic acid

CSIR-IICT has developed two processes: (i) Process Development for Alkylation of Toluene to get 4-ter-butyl toluene (PTBT), and (ii) Process Development for Oxidation of Para-tert-butyl toluene to Para-tert-Butyl benzoic Acid (PTBBA). In both the processes, the yields and purity of the product was obtained around 90% and < 99% respectively. The technologies have been

transferred to M/s Vinati Organic Limited, Mumbai. and entered into an agreement with Vinati Organics Ltd, Mumbai for scale up and pilot plant studies for a contract value of Rs 50 lakhs and a royalty of Rs 50 lakhs.

Process knowhow for preparation of Profenofos

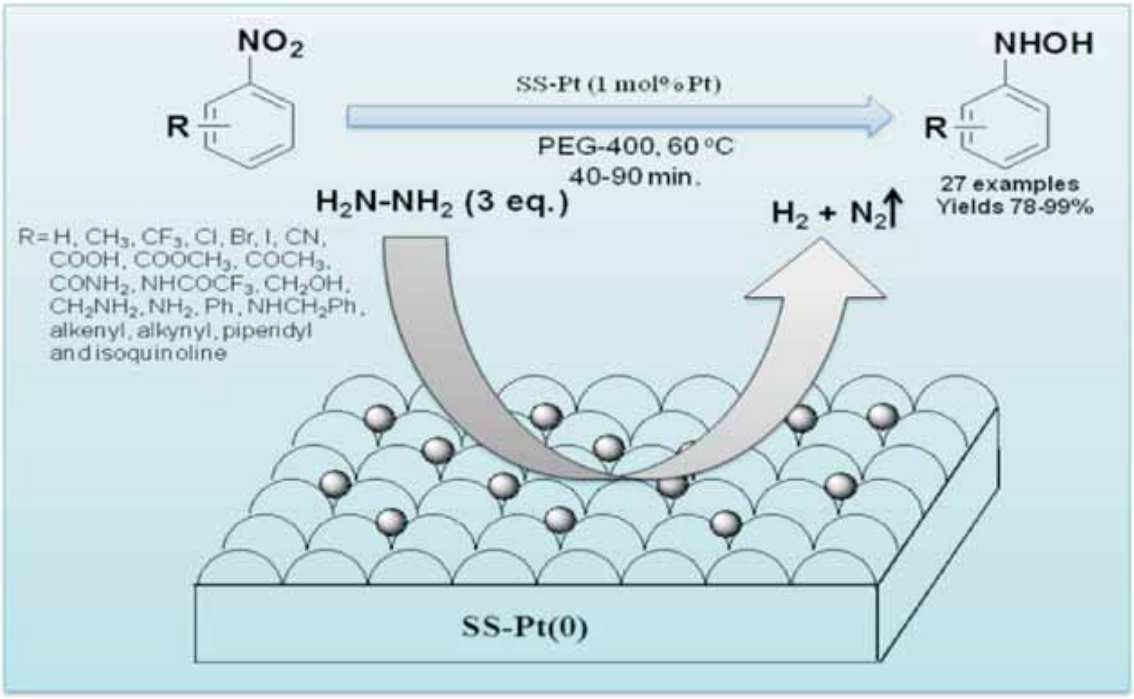
Profenofos is an important member of the Organothiophosphate class of insecticides, introduced under trade name CURACRON by CIBA-GIEGY in 70's. Profenofos is very effective in control of *Lepidoptera* insects and *Mites* in cotton, tobacco, sugar beet, soya beans, vegetables etc. Realising the importance of this product, CSIR-IICT had developed an environmentally-friendly process to produce profenofos. The process has been transferred to M/s India Pesticides Limited, Lucknow at half-a-kilogram level. Few other companies are also showing their interest in taking this technology.

Self Organizing Maps (SOM): A Novel Technology to Minimize Mosquito Borne Diseases

Self Organizing Map (SOM) an innovative clustering technique and first of its kind has been developed by CSIR-IICT. This clustering technique enables the health officials to prioritize the diseases endemic zones and plan their control operations so as to minimize the mortality and morbidity occurring due to the onset of vector borne diseases. SOM can be used effectively for prioritization of the disease endemic regions which can be attained as per the severity of the parameters governing the disease in the respective villages. Once prioritization is done, the control operations can be launched effectively, with the knowledge gained by SOM and all the villages can be mapped in a more precise way. Based on the effectiveness of the technique National Vector Borne Disease Control Program (NVBDCP), Ministry of Health, Govt. of India, has taken up the technology for its field application in phase wise manner. The preface action will be implemented in Gujarat, Arunachal Pradesh, Manipur, Assam and Mizoram.

Solid supported platinum(0) nanoparticles catalyzed green approach for n-arylhydroxylamine synthesis

CSIR-IHBT developed Solid supported platinum(0) (SS-Pt) nanoparticles as a heterogeneous catalyst following a reduction-deposition method and characterized by SEM, TEM, EDX and XRD analysis. The SS-Pt catalyst was applied in the chemo-selective reduction of nitroarenes to N-arylhydroxylamines using hydrazine hydrate as a hydrogen source. A wide variety of reducible functional groups such as halides,



Schematic of reduction-deposition method for Solid supported platinum(0)

carboxylic acids, esters, amides, nitriles, keto, alkenes, alkynes and N-benzyl were well tolerated under the reaction conditions. This process was further successfully employed in 10 g scale reactions. N-arylhydroxylamines were further applied for catalyst free synthesis of azoxybenzenes. Moreover, use of PEG-400 as cheap reaction medium, additive free methodology and the recyclability of SS-Pt catalyst up to ten times without significant loss of catalytic activity evidently follow the principles of green chemistry.

Air and moisture stable ligand free low cost heterogeneous nano-catalyst has been developed and applied for milligram to gram scale N-arylhydroxyl amines synthesis having huge application as intermediate for valuable molecules and fine chemicals synthesis. Due to lower catalyst loading, negligible metal contamination with product and high recyclability, it makes the process atom-economic and cost-effective which could attract both academic as well as industrial interest in the coming years.

Simultaneous Production of US Grade Gasoline and Pure Benzene from FCC C6 Heart Cut

CSIR-IIP has carried out substantial experimental and simulation studies with feedstock provided by M/s Reliance Industries Limited (RIL) and demonstrated that US grade gasoline and pure benzene can be simultaneously produced from a FCC C6 heart cut stream using extractive distillation (ED) route with aqueous NMP as the solvent. The gasoline thus produced has sulphur content <10ppm and benzene <0.3%. The technology has been transferred to RIL which is setting up 600,000 MTPA unit costing Rs. 160.00 crore. The annual gasoline production from this unit would equal to a prospective export monetary value of around 682 Million USD per annum with an additional profit of around 102 Million USD per annum from the sales of the recovered high purity benzene (Current market Value of Gasoline and Benzene ~ 1400 US $/ MT).

Advanced Soaker Visbreaking Technology

The CSIR-IIP developed advanced soaker visbreaking technology has been transferred to M/s Hindustan Petrochemicals Limited (HPCL) and M/s Indian Oil Corporation Limited (IOCL). Test run has successfully been carried out at HPCL and the one at IOCL is expected to be completed very soon. It is expected to increase the profit of HPCL by Rs. 935 lakh per annum and that of IOCL by Rs. 845 lakh per annum. CSIR has earned a fee of Rs. 270 lakh.

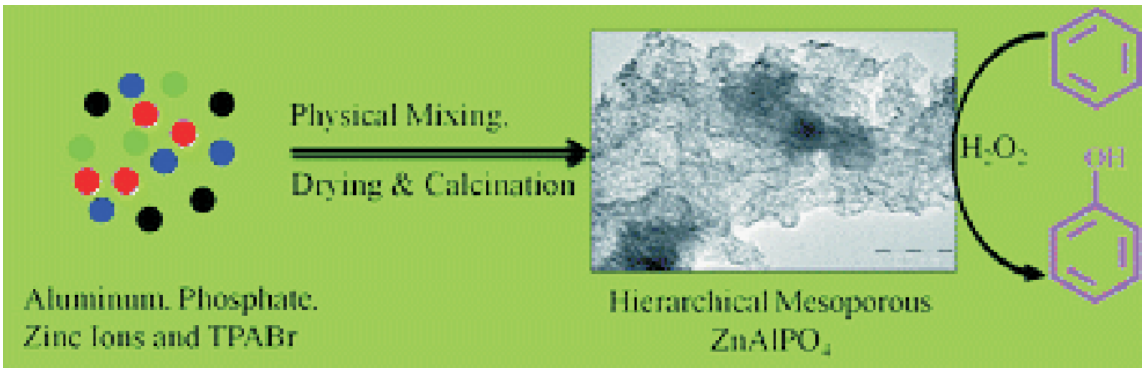
Nanoparticle emissions and volatility of particles emitted by modern diesel and CNG transit buses

CSIR-IIP has tested two compressed natural gas (CNG) and two diesel transit buses on road to measure the particulate emissions and gas phase emissions under real world driving conditions. Both CNG buses as well as one diesel bus were tested in Calgary, Canada while the second diesel bus was tested in Dehradun, India. For the evaluated buses in Canada, the particle number concentration was measured using a condensation particle counter along with a dilution system in order to simulate the real world conditions. A thermodenuder was also employed to condition the sample to determine the non-volatile particles. The diesel bus evaluated in Canada was equipped with a diesel particulate filter (DPF) and an oxidation catalyst and the CNG buses were equipped with three-way catalyst. The particle size distribution and total number concentration were measured using a differential mobility spectrometer (DMS50) for the diesel bus without DPF which was equipped with an oxidation catalyst.

The results show that 72% and 7% of the particles from the diesel bus with the DPF are volatile particles in transient and steady state operating conditions, respectively. The CNG bus produces more volatile particles, and 84% of the particles were volatile in transient tests and 95% were volatile particles in the steady state tests. On average the CNG buses produce about 200 times less particles than the diesel bus without a DPF while they produce 35 times more particles than the diesel bus with a DPF.

Synthesis and catalytic applications of hierarchical mesoporous $AlPO_4$/$ZnAlPO_4$ for direct hydroxylation of benzene to phenol using hydrogen peroxide

CSIR-IIP has provided a simple and novel method for the synthesis of hierarchical mesoporous $ZnAlPO_4$ through a solvent-free, single organic template method. The material exhibited promising benzene conversion for the efficient production of phenol by the selective hydroxylation of benzene. Furthermore, the material shows its reusability with an excellent catalytic performance even after three reaction cycles. The subject opens up a new property of the metal $AlPO_4$ materials as suitable catalysts for selective oxidation reactions and has scope in the improvement of the catalytic activity through the optimization of the synthesis procedure of $ZnAlPO_4$ for expansion of its applications to other selective hydroxylation reactions and hence it is expected to find potential industrial applications.



Journal of Materials Chemistry A 1 (2013) 3268-3271 (Cited as Hot Article)

Acid functionalized carbon–silica composite and its application for solketal production

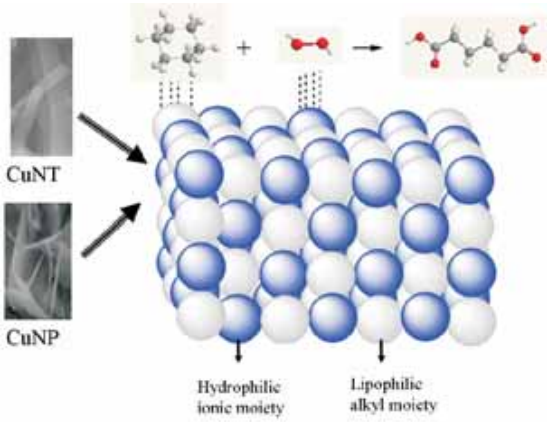
CSIR-IIP has reported for the first time the synthesis of sulfonated carbon-silica-meso composite materials with tuneable acidity and porosity by adopting simple one step method of simultaneous carbonization and sulfonation. The simplicity involved in the material synthesis using low cost glucose as a carbon source as well as structure directing precursor makes the present method novel to those relevant works reported in the prior art. The materials exhibited excellent catalytic activity solketal production thus provides an efficient heterogeneous catalyst for the value addition of the undesired bi-product glycerol obtained in the biodiesel synthesis and hence it is expected to find potential industrial applications.

Synthesis of hierarchical ZSM-5 using glucose as templating precursor

CSIR-IIP has synthesized the hierarchical ZSM-5 zeolite samples by using the low-cost template precursor "glucose" in basic medium that can directly get converted to hard template during heat treatment of the gel to give glucose dependent porosity patterns in the samples. This method also provides scope in using other kinds of sugars as template precursors for the synthesis hierarchical materials. The synthesis method provides an economical path for the production of hierarchical aluminosilicates with tailored meso/macroporosity (controlled by glucose) for various industrial applications and could be extended for the synthesis of other types of zeolites and hence it is expected to find potential industrial applications.

Synthesis and catalytic applications of amine interacted $Cu_2(OH)PO_4$ nano plates (copper NPs) and tubes (copper NTs)

CSIR-IIP has demonstrated a simple method for the selective synthesis of desired nano structure (Copper NTs/ Copper NPs) by controlling the concentration of structure directing amine, HDA, in the initial synthesis mixture. In other words, the present method provides a simple technique of variation of amine composition for the synthesis of a specific nano structure; Copper NTs at lower HAD concentrations and Copper NPs at higher HDA concentrations, which is a novel concept reporting first time to the best of our knowledge. To the best of institute's knowledge, the copper hydroxyl phosphate nanostructures were exploited for the first time in the present study for the direct oxidation of cyclohexane to adipic acid using hydrogen peroxide as an oxidizing agent This theory may also applicable for the synthesis of other metal/non-metal containing nano structures and hence it is expected to find potential industrial applications.



Schematic of Copper nanoparticles and nano tubes

Solvent De-oiling plant at Numaligarh Refinery Limited (NRL)

Numaligarh Refinery Limited (NRL) - a subsidiary of BPCL is setting up a wax deoiling plant using updated

CSIR-IIP & Engineers India Ltd (EIL) process know-how at a capital outlay of '753.72 crores including a foreign component of '86.49 crores for specialized patent equipment like Scraped Surface DP Chillers and Rotary Vacuum Filters. This facility will produce 50,000 tons per annum of different grades of petroleum waxes by processing waxy streams available at NRL. The design of the unit is based on indigenous technology developed at CSIR-IIP. Design & engineering work is completed. All site contracts awarded and construction activities are in progress. Overall 80% physical progress of the project is achieved so far. Mechanical is exptected to complete soon and pre-commissioning /commissioning activities are expected to be completed by the first quarter of 2014.

High Energy Density Fuel Production

CSIR-IIP has developed a process for the production of high energy density fuel similar to the Russian origin T-6 fuel as per GOST 12308-89. Various blends of different kerosene range cuts were made and analysed for obtaining the desired characteristics and requirements. The optimized blend thus obtained was then dehydrogenated at high pressure and temperatures to obtain product similar to that of T-6 fuel specifications. The product has been characterised for GOST 12308-89 standard and then around 100 liters of fuel was supplied to DRDL Hyderabad for testing performance at their facility. The fuel supplied by CSIR-IIP is found similar in performance to the T-6 fuel and also met the desired standards as per GOST 12308-89.

Software package 'Virtual Casting' for simulation of metal casting

CSIR-NIIST has developed software called 'Virtual Casting' for the simulation of solidification process of industrial castings. The software makes it possible to shift the trials from the shop floor to the computer, saving time, effort, energy and material.

Virtual Casting has been integrated with AutoCAST-X of 3D Foundry Tech and released as AutoCAST X1 which now has the capability to predict both flow related and solidification defects like misruns, cold shuts and shrinkage porosity. This software was launched during IFEX - 2013 at Kolkata. Virtual Casting won the second place in the Computer Society of India IT Excellence Awards for 2012 at Kolkata in the Engineering Solutions and Product Manufacturing Category.

Process for production of potassic fertiliser by selectively precipitating potassium from aqueous solutions

Earlier, technologies available in Indian context relied upon production of mixed salt from bittern through solar evaporation which is further processed to recover K-fertilizer or Magnesium of Potash (MOP). This process is based on selectively precipitating potassium directly from bittern without taking recourse to solar evaporation for production of mixed salt and thereby eliminating the risk associated with unseasonal & unpredictable weather conditions frequently encountered in recent years. In this process K is precipitated from bittern in the form of K-bitartare & subsequently one can produce the desired K-salt for e.g. potassium sulfate, potassium nitrate and potassium chloride along with recycling of the tartaric acid for next cycle of potassium precipitation.

Economical utilization of solid wastes from tanning industry

CSIR-CSMCRI has developed to a process for the preparation of a novel ketene oligomer. The process is patented. The process is simple and the raw materials for process can be sourced from solid wastes generated by different processing industries including tanning industry. Due to its unique properties, it also has a potential for application in pharmaceutical industries as a delivery system through microencapsulation.

Commercial plant for producing synthetic hydrotalcite (SHT)

Synthetic hydrotalcite (SHT), which has profound industrial applications due to its intercalation properties, is another such compound whose know how has been developed by CSIR-CSMCRI. The technology has been licensed to M/s Heubach Colour Ltd., Ankleshwar, part of the Multinational group famous in the pigment industry and well known for producing the base pigment for Ferrari red.

M/s Heubach Colour Pvt. Ltd. has installed a commercial plant for producing 1000 tonnes per annum synthetic hydrotalcite (SHT) employing knowhow developed at CSIR-CSMCRI.

Technology Upgradation of Ethiopian Tanneries

Ministry of Trade and Industry (MoTI), Federal Democratic Republic of Ethiopia (FDRE) had enrolled

the services of the CSIR-Central Leather Research Institute (CLRI) by invitation for the Bench Marking Program aimed at the Technology Upgradation of selected Ethiopian tanneries. With the technological interventions of CSIR-CLRI through two consultancy projects, the Ethiopian tanneries are emerging as reliable suppliers of quality finished leather in the International market.

Seaweed sap trial as liquid fertilizer

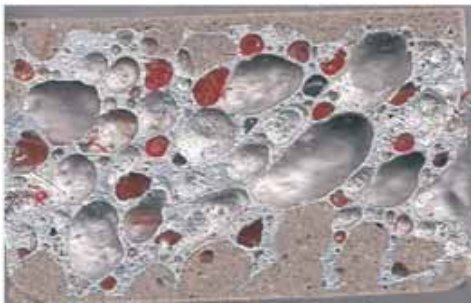
Seaweed sap trial as liquid fertilizer was successfully tried on multiple crops at 45 agricultural Universities all across India with improved crop yield. The sap is being marketed as "PARAS" by Tata Chemicals produced by CSIR-CSMCRI's licensee.

C. Engineering Sciences

Aluminum foam core Sandwich Panels

The recent development of aluminium foam with density ranges from 0.42 g/cc to 0.70 g/cc shows potential applications in the areas of crashworthiness, noise and vibration attenuation and thermal management. CSIR-AMPRI has evolved a process to synthecise aluminium alloy foam core sandwich panels with epoxy resin filled with flyash and cenosphere as face sheet. Aluminium foam core of thicknesses ranging from 10 mm to 30 mm was used for making the panels. The polymer sheet thickness varies from 1.5 mm to 2.5 mm. The sandwich panels were tested in terms of three point bending and the stress-strain diagram shows the ultimate flexural failure stress around 2.5 MPa, 7 MPa, and 170 MPa and elastic deflection was noted around 0.14 mm, 0.43 mm and 0.50mm for epoxy resin, flyash and cenosphere sandwich panels respectively. The young modulus was measured using sonic modulus unit and found 7.26 GPa for flyash filled polymer panel, 3.30 GPa for cenosphere filled polymer panel and 0.43 GPa for epoxy resin sheet panels. The collapse mechanism map was generated using non-dimensional axes c/l (c=core thickness, l=span length) and t/c (t=sheet thickness). The calculated non-dimensional collapse load of panels was found in the range of $3.5x10^{-2}$ - $4.2x10^{-2}$, which falls under the region of indentation failure in the contour map. These panels could be used as an integral part of the doors in the automobile and other similar applications to reduce the noise and vibrations to a great extent.

Aluminium foam Sandwich Panels



Aluminium foam Sandwich Panels

Effect of milling duration on the evolution of shape memory properties in a powder processed Cu–Al–Ni–Ti alloy

CSIR-AMPRI has described the effect of milling duration on the properties of a powder metallurgy processed Cu–Al–Ni–Ti shape memory alloy employing mechanical alloying. Powder mixtures milled for different durations were sintered in order to investigate the formation of solid solution and evolution of martensitic structure. The idea was to optimize the duration of milling (mechanical alloying) to obtain chemical homogeneity as well as shape memory properties in the processed material without undergoing extensive post homogenization treatment. The martensitic structure was noted to evolve in the powder mix milled for at least 16 hrs, whereas complete transformation to martensite occurred after milling for 40 hrs. Interestingly, the dissolution of alloying elements (to form the â phase prior to the formation of martensite) was noted to complete partially only during mechanical alloying for 40hrs and remaining during subsequent sintering for 1hr. The hot pressed compacts of the powders milled for 40 hrs were chemically homogeneous and consisted of fully martensite phase, which is essential for the realization of shape memory properties. Almost 100% shape recovery at the applied pre-strain levels of 1 and 2% has been observed. The research work has appeared on the cover page of the Journal "International Journal of Materials Research'.

Process for making Advanced Ligno – Silico – Aluminous (LSA) Materials

A novel process for making Advanced Ligno – Silico – Aluminous (LSA) Materials processing very broad applications spectrum ranging from cementitious materials to advanced functional materials has been developed. A cement free reinforced green concrete structure has been demonstrated successfully in CSIR-AMPRI campus.

Fly ash based cementitious materials

Knowhow on development of a novel process for making fly ash based cementitious materials useful for making cement free concrete of varying grades depending on the characteristics of fly ashes and aggregates for nonstructural applications has been transferred to M/s Jindal Steel & Power Ltd, Raigarh on the occasion of the Technology Day, 2013 i.e. on 11th May, 2013. The developed geopolymeric cementitious are resistant to heat, alkaline and acidic environment and also adoptable for conventional Ready Mix Concrete system and can be made at desired level of production. The developed novel process enables bulk utilization of fly ashes, savings of lime stone- non replenishable natural resources, fuel, water which is among one of the precious commodity and also addressing global warming issue and earning carbon credits as production one tonne of cement generates one tone of carbon dioxide. Apart from this, the process also enables savings of huge capital investments in terms of fuels, rotary kiln, machineries. The optimized composition of developed geopolymeric cementitious materials can be used for making on site and in–situ cast concrete as well as for making prefabricated and pre-engineered materials. The process has been successfully demonstrated at the site M/s JSPL for captive nonstructural applications.

CSIR-AMPRI's research work on the cover page of the Journal

Development of anti-termite barrier for new buildings

CSIR-CBRI has developed anti-termite barrier material to support structural units or foundations and to protect structure from termites. Some of the specifications of desirable material calculated so far are raw material- any suitable hard material or stone type, desirable particle size-1.4 to 2.36 mm (60% approx.), 1.0 to 1.4 mm (30% approx.), and 0.7-1.0 mm (10% approx.), particle shape-irregular and sharp edged, fineness modulus-3.5 to 4.5, desirable thickness of anti-termite layer 100 to 150 mm specific gravity of material 2.5 to 3.5. This termite barrier may be used to resist, prevent, delay, inhibit or otherwise obstruct entry of termite into variety of structures including house, shed, patio, pergola, garage or any other building structure that are directly in contact with ground or otherwise potentially prone to entry, infestation and / or damage by subterranean termites.

Development of Fire Safe Polymeric Composite Panels

CSIR-CBRI has developed fire retardant material based on diisocyanate, polyether polyol, catalyst, surfactant,

Fire retardant cake

water and physical blowing agent. The fire performance evaluation of additives incorporated core material and comparison with control samples was carried out as per BS: 4735. The results showed that additives incorporation is very effective to render core material fire retardant. Samples were also exposed to vertical flammability test which is more severe condition than the standard test.

Construction technologies and materials

CSIR-CBRI has developed construction technologies and materials like Concrete Masonry Blocks, Precast Roofing Components for Roofs and Under Reamed Pile Foundation in Black Cotton Soil are repeatedly being used in construction of thousands of houses by NGOs, Central and State Government Departments and private builders at various rural and urban locations of the country. Several Building Centres and Rural Building Centres are in regular production of precast concrete/ ferro cement components by engaging local artisans and labour. CSIR-CBRI licensees at Yamuna Nagar & Ahmedabad are regularly manufacturing CSIR-CBRI designed clay brick extrusion machines of 2500 to 4000 bricks per hour. Fixed Chimney Brick Kilns and Gravity settlement chamber have been adopted by more than 30,000 brick manufactures to reduce consumption of fuel and environmental pollution.

CSIR-CBRI is providing technical guidance in the design and construction of 1000 low cost houses in Bur-kina Faso, Africa to be funded by Govt. of India.

Host mediated synthesis of cobalt aluminate/g-alumina nanoflakes

CSIR-CGCRI has developed a simple, facile, and scalable synthetic procedure for the preparation of high surface area $CoAl_2O_4$/ã-Al_2O_3 composite nanopowder which can be used as self-cleaning blue pigments. In this procedure, a stable cobalt aluminate has been synthesized at low temperature (500°C) compared to the conventional high temperature methods. It has been established that when boehmite powders impregnated with Co salt was heated at 500°C, the conversion of boehmite to ã-Al_2O_3 facilitated the formation of iso-structural (spinel) $CoAl_2O_4$. For the first time it could be shown that the $CoAl_2O_4$ spinel composite could act as an efficient reusable catalyst for the decomposition of H_2O_2 for releasing oxygen that may oxidize a wide range of organic and inorganic pollutants.

TiB-TiN composite coatings for implant applications

Titanium and its alloys are widely used in aeronautical, chemical, defense and biomedical applications due to their high specific strength, excellent corrosion resistance and biocompatibility. Earlier studies on the laser fabrication of Ti-TiB/TiB_2 composites have provided a good understanding of their microstructural evolution, mechanical and tribological properties. *In situ* synthesized reinforcements (TiB + TiN) and the resultant composites exhibit superior mechanical and tribological properties due to their fine size, homogeneous distribution and, in particular, their clean, strong and damage-resistant matrix–reinforcement interface. The presence of TiN in combination with TiB in Ti_6Al_4V alloy matrix is important as it is expected to enhance the toughness and biological properties of these composites. However, no attempts have been made on laser processing of simultaneous *in situ* synthesized TiB + TiN reinforced composite coatings on Ti alloys. Using Laser Engineered Net Shaping (LENS), a laser-based additive manufacturing technology, CSIR-CGCRI has made a novel attempt to create *in situ* formed TiB–TiN-reinforced Ti_6Al_4V alloy matrix composite coatings on commercially pure (Cp) Ti. These hard composite coatings showed lowest *in vitro* wear rate of 1.90 x 10^{-6} mm^3/Nm in 15BN coating, which is an order of magnitude lower than 5BN coating and 2-3 orders lower than Ti substrate.

Development of Si-nano-particles doped silica glass based optical fibre by MCVD process for use as light source near IR

CSIR-CGCRI has developed a new-type of Silicon nano-particles (Si-n/p) doped silica fibre, applying entirely the MCVD process, with no solution-doping technique. The formation of Si-n/p in the fibre was confirmed by the TEM, EPMA, Raman, optical absorption, and fluorescence spectral measurements. Si-n/p doped fibres were formed basically due to the excess of Si phase in the fibre's core region. Among the other features, the Si-n/p fibre demonstrated a nonlinearity, much higher in magnitude than the conventional Si-free fibres. Generation of super-continuum in the Si-n/p fibre at 1.6 microns excitation showed interesting results.

Development of diamond thick film for RF transparent window

CVD diamond solves the problem of megawatt windows to the thermonuclear reactor. CSIR-CGCRI

has achieved a notable breakthrough by developing large area, uniform and high quality polycrystalline diamond thick films for Radio Frequency (RF) window component using microwave plasma enhanced chemical vapor deposition (MPCVD) process in a 915 MHz, 15 kW microwave cavity reactor. By suitable manipulation of the reactor parameters, it was possible to deposit whitish translucent quality freestanding diamond coating as well as to grow black color opaque quality thick circular plates of dimension 60 mm diameter/0.6 mm thick for thermal management and other high end applications.

Mine plan and EMP for Karwar project of Indian Navy

Indian Navy has constructed a naval base at Karwar in the western coast near Panaji. The mine plan and the EMP were provided by CSIR-CIMFR for the same. It was proposed to make available the various sized material for the construction purpose by mining the nearby hills.

Design & Development of Remotely Operated Vehicle (ROV)

Remotely operated vehicles (ROVs) are robot submarines that are tethered to a ship, where "pilots" control their movement and actions. ROVs are often equipped with manipulator arms for grabbing, moving, or placing items in the sea. High-definition video and still cameras on the vehicles record images of sea life, geology, and experiments. The vehicles carry a variety of sampling equipment and sensors for collecting information about the ocean and seafloor. CSIR-CMERI has designed, developed and conducted successful sea trial of a Remotely Operated Vehicle christened ROV-500 at a depth of 500m on 27.08.13 with active support, cooperation and close association of National Institute of Ocean Technology (NIOT), Chennai. It is capable to operate at 500 m under the sea with a speed of 2- 4 knots and collect the photographs of the underwater environment on line as well as other useful information.

On 24th August 2013, the ROV system was loaded onboard research vessel ORV Sagar Nidhi to carry out sea trial off the Chennai coast of the Bay of Bengal with active support of NIOT

Research Vessel Sagar Nidhi

ROV onboard Sagar Nidhi ready for deployment

ROV Launching with Winch from Sagar Nidhi

Overall observations emanating from the sea trials conducted for ROV-500 are summarized as follows:

- ROV-500 is very well balanced and qualified for soak and buoyancy test;
- Winch and Opto-electro-mechanical cable can withstand the ROV load (which indicates that launching and retrieval of ROV have been performed safely);
- Dry testing and other functionality test were all right;
- ROV system Qualified the specified depth of 500 m on 27.08.13 evening; and
- Sensors related to Depth information, Altimetry, Positional information, Underwater camera and Acoustic Positioning worked satisfactorily. Underwater Lamps worked well.

Development of 100% Biofuelled Tractor

Shortage of petroleum products and their rising international prices has drawn interest towards the exploration of alternate fuels. Moreover, there is renewed attention on controlling vehicular and other emissions. Among different alternate fuels, Biodiesel has proven to be the best candidate. In India, tractors comprise a versatile prime mover in farm as well as on the road; the only problem with their proliferation is the fact that they run on diesel and contribute significantly to vehicular emissions. As of now, no tractor is available indigenously to run fully on biodiesel. CSIR-CMERI has tested a 35 hp, 3 cylinder, Direct Ignition Sonalika tractor (engine) on B100 on a test bed to assess its performance. The engine has run on B100 on the test bed with the modified engine for 800 hrs without any complications. The trials have further exhibited equally comparable performance in terms of power developed, thermal efficiency, bsfc, etc. as compared to diesel. The biodiesel required for the long duration test has been produced from the semi-continuous Biodiesel plant (600l/day capacity) designed and developed by CMERI and all the fuel properties have been tested to meet BIS/ASTM standards. Presently the tractor with modified engine is being run in field condition to assess its performance.

Design & Development of Biomimetic Frog Robot for Multimode Locomotion

Many locomotion principles adapted in robotics have been inspired by nature. Frogs constitute one species where multimode locomotion comprising walking, swimming and flying are all utilised. Mimicking locomotion of frogs can thus be adapted for robots working in unknown environments, particularly for tasks demanding locomotion in land, semi aquatic hazardous environment and in water.

CSIR-CMERI has studied different aspects of a live swimming Indus Valley Bullfrog. It was observed that jumping/crawling movements involves motion of the legs primarily on the sagittal plane whereas swimming locomotion involves motion of the legs in the frontal plane. Frogs utilise drag-based propulsion for swimming. Propulsive forces are further generated by the hindlegs terminating in webbed feet. Kinematic and morphological data pertaining to a swimming frog were obtained with the help of cine-film records. Joint trajectories for one complete swimming cycle was extracted, which helped in the design of the robotic frog and modeling of the thrust force characterization. Different limbs of the robotic frog was also designed from the morphological data. The design of the hind and forelegs was inspired by the musculoskeletal system of a frog. For the movement of hindlegs, two coupled motions were introduced for the four joints by means of tendon-pulley arrangement. Webbed feet for the robot for supporting locomotion in water was also designed. An additional DOF was incorporated for changing the configuration of hindlimbs when the mode of locomotion changed from an aquatic one to a terrestrial one. For the design of the forelegs, two simple segments with two DOF was used. Prototype of the robotic from is being fabricated on the basis of the design.

Basic engineering and technical backup for commercial beneficiation of low grade iron ore

Beneficiation of low grade iron ore fines with 55% Fe has been taken for Bhushan Steel Ltd, New Delhi, for their proposed plants having the feed capacity in the range of 4-15 MTA. Basic engineering package along with material balance, particle size distribution and other related physical data for each stream has been provided. CSIR-IMMT will provide necessary technical backup for the proposed beneficiation plants.

Tailor made process flow sheets

CSIR-IMMT released tailor made process flowsheets to over 20 industrial clients. Extensive studies carried out to enrich the ore quality and obtain valued added products from industrial wastes involving the processing of iron ore, manganese ore, copper, rock

50 kW arc plasma reactor

phosphate, zircon, bauxite and limestone. The effort has a direct bearing in strengthening industrial rupee.

Tungsten carbide cast composites for neutron shielding of tokamak type fusion reactor walls

CSIR-IMMT in association with Board of Research in Fusion Science and Technology (BRFST), Institute for Plasma Research, Gandhinagar has designed and commissioned a down draft plasma reactor to produce good quality tungsten carbide cast ingots. An arc plasma melting process is utilized in this reactor to melt-cast tungsten carbide for application in the walls of tokamak type fusion power reactor. Tungsten carbide is a good neutron absorbing material at higher energy level (2-14 MeV, fast neutron). The high Z value of tungsten and its association with light element like carbon, brings down fast neutron energy to thermal energy level by a combination of inelastic and resonance scattering of tungsten nucleus and elastic scattering of carbon nucleus. Due to the high melting point of tungsten carbide (>2750^{0}C), its melt casting to produce porosity free substrate/ingot is a difficult task.

Tungsten carbide cast composite products

In the developed process, composite mixtures of WC and W_2C were produced with carbon variation in the range of 30-50%. TiC and B_4C were also added to WC to produce WC+TiC and WC+WB composites which exhibited up to 26% neutron absorption per cm of thickness. The process has been developed at kg scale with a reactor capacity of 50 kW

High temperature diffusion conducting ceramic coatings on steel/high strength steel by Electrophoretic deposition (EPD) for active corrosion protection

Ceramic coating on metal is generally non-adherent resulting into delamination of the deposits during drying and sintering because of the large difference in their thermal expansion coefficients. CSIR-IMMT has adopted a novel strategy based on EPD (at 100 V for 30 sec from a stable TiO_2 suspension of 0.5 wt% in ethanol in presence of methyl hydrogen silicon fluid KF-99) to obtain thin, well adhered and crack-free coating of TiO_2 on steel that can withstand a temperature of 500 °C and exhibit high resistance to corrosion. The presence of KF-99 filled and bridged the micro-cracks, developed during drying and sintering, leading to increased adhesion. Adhesion was tested using scotch adhesion test and corrosion test was performed using salt spray test in 3.5 wt% NaCl solution as well as by electrochemical measurements. Adhesion and corrosion resistance was improved further by dipping the coated sample in KF-99 immediately after deposition followed by drying and sintering. The time to initiate pitting increased from 24h for coating in absence of KF-99 to 1200h in presence of KF -99. Improvement in corrosion resistance was due to increase in hydrophobicity of the coating (water contact angle: 100 -105°) in presence of KF-99 which prevented wetting by the corrosive liquid. The coating delaminated above a temperature of 500 °C because of removal of organic component KF-99.

The coating service temperature could be improved to 750°C with Al2O3 coating on steel substrates phosphate using aluminium phosphate. Experiments are underway to establish the mechanism of improved adhesion in this case with the help of FTIR analysis.

TiO_2 coating on steel developed- 1200 hrs. salt spray test, withstand 500°C and 90 degree bend test

Production of ferro-nickel from chromite overburden/nickel laterite ore by thermal plasma process

CSIR-IMMT has developed a state-of-the-art technology for complete utilization of nickel bearing lateritic ore/ chromite over burden (COB) containing nickel for commercial production of ferro-nickel, which can be used for manufacture of stainless steel. The nickel bearing lateritic ore/ COB is in a complex state that cannot be beneficiated only by physical means. The physical beneficiation process does not provide any up-gradation of nickel or elimination of iron present therein due to its complex and finely disseminated nature. To overcome this inherent problem, an eco-friendly and zero waste innovative process know-how has been developed by CSIR-IMMT to convert goethite phase present in ore bodies into magnetite phase so that iron and nickel present therein can be easily separated from other gangue materials, viz. silica, alumina etc. by employing the reduction roasting technique followed by magnetic separation. The magnetic concentrate, which is rich in nickel, can be smelted to produce Fe-Ni containing 6-10% Ni. This process is well comparable with any of the processes available elsewhere in the world for commercial Fe-Ni production.

Development of magnesia galaxite/hercynite bricks for cement rotary kiln

Magnesia chrome bricks are used in the burning and transition zone of rotary kiln, the main equipment for the production of Portland cement. Here, chromite poses a great environmental problem due to its carcinogenic nature. Development of alternate refractory materials is the key to overcome this problem.

Magnesia-galaxite and magnesis-hercynite bricks can replace magnesia chrome brick due to their thermo-elasticity property and compatibility with molten cement clinker. Galaxite and hercynite are spinel group of minerals which are not available in nature and have to be synthetically prepared by sintering as well as fusion route in electric arc furnace (EAF). Magnesia-galaxite and –hercynite bricks have been produced by CSIR-IMMT by using synthetically prepared fused galaxite/hercynite through plasma fusion route to replace magnesia chrome bricks in cement rotary kiln.

The chrome free bricks can be used in the burning zone of cement rotary kiln in place of conventional magnesia chrome bricks. The product showed high spalling resistance, excellent coating formation and better chemical resistance to alkalis.

Recertification of Hans-3

The restored Hansa 3 received Certificate of Airworthiness from DGCA on 20 August 2013. Two HANSA aircraft at CSIR-NAL (VT-HBL, VT-HOA) have been re-registered for flying under experimental category. These will be extensively used as test bed for R&D purposes as part of the 12th Five Year Plan project 'Platform Development for Testing Civil Aircraft Technologies' which is under the consideration of CSIR.

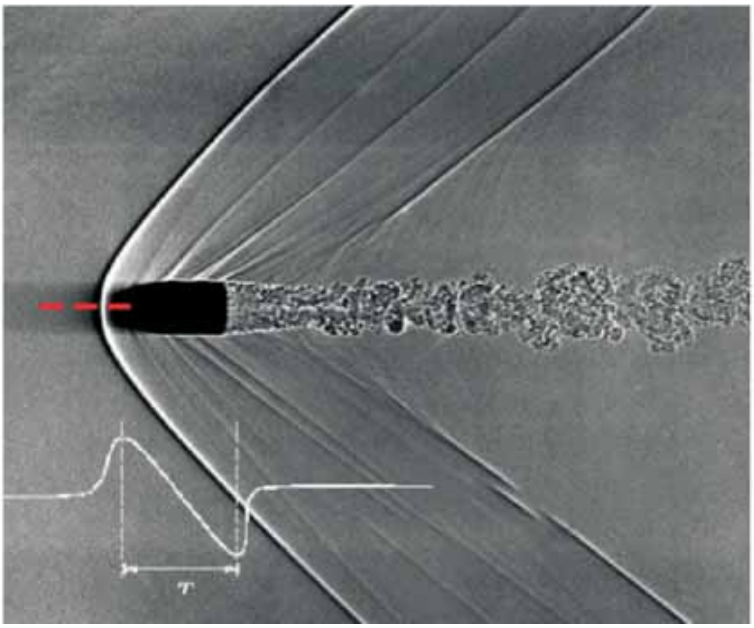
The Engine Bay Door for LCA

As a part of LCA series production, new production standard tools were designed and fabricated through private partner M/s Tata Advanced Materials Ltd. One set of Centre Fuselage parts (7 nos.) were delivered to the production group of LCA for series production (SP1) assembly. This contribution is a major step in taking LCA from Limited Series Production (LSP) phase to series production (SP) phase. In an another achievement, the Engine Bay door (middle) of LCA using high temperature Carbon/Bismaliemide prepreg system, with a service temperature of 200°C, was developed using a novel vacuum bag technique which is currently undergoing testing.

DHVANI - An indigenous advanced target training system for the Indian Army

CSIR-NAL has developed a system for Detection and Hit Visualization using Acoustic N-wave Identification (DHVANI) for locating bullet hits on targets. This involved the deployment of an array of acoustic sensors at pre-specified location under the general flight path of such projectiles, acquiring and analyzing the signal in real-time and instantaneous display of results in a graphical form at the shooter's end. Detection of the N-wave is carried out by an in-house algorithm which was inspired by approaches to detecting irregular heartbeats (which are also like N-wave shapes). It is further recognized that the intersection of the shock wave with the ground results in a hyperbola, the center of which can be realized by the solution of a pair of simultaneous equations which essentially capture the time-delay of arrival of the wave at each sensor. This is accomplished by a multitude of sensors (six) in two rows to also obtain the velocity of the projectile. The results of field trials using INSAS rifle and 5.56 caliber bullets at Iblur firing range showed an accuracy of better than 7mm. Typical processing times per shot are lesser than 50ms which allows a fire rate of up to 900 rounds per minute implying that tracking can also be done for a light machine guns.

The system is now being ruggedized to withstand all environmental conditions and acceptance trials at the Infantry School are in progress.



N-wave' associated with passage of bullet

The 'DHVANI' system

Drishti Systems at Main Runway 28-10 of IGI Airport

Based on the excellent performance of Drishti installed at IGI Airport (New Delhi) in December 2011, Indian Meteorological Department requested NAL to install three more systems on a priority basis at the main Runway 28 of IGI Airport. The systems were needed to handle the urgent requirement of the winter season of 2012-13. In a record time of three weeks, three systems were fabricated and installed at the touchdown, mid & takeoff points of runway 28 in the first week of January 2013. Presently there are five Drishti systems

Drishti at Main Runway 28-10 of IGI Airport

at IGI airport, the only Cat III B airport in the country wherein aircrafts have to land under conditions of lowest visibility of 50 meters. Drishti system is capable of measuring visibility down to 5 meters and meets all the stipulations of International Civil Aviation Organisation (ICAO) & World Meteorological Organisation (WMO).

One more system was installed in Netaji Subhash Chandra Bose International Airport, Kolkata in December 2012. The systems have been awarded International Class I certification. As on today, seven latest state of the art Drishti systems are working in three international airports viz., Lucknow, IGI (New Delhi) and NSCBI (Kolkata).

Certificate for Limited Series Production of a Wankel Engine

The second flight test of the indigenous 55 hp Wankel Rotary Combustion Engine (WRCE) was carried out on 20 June 2012 on the Aeronautical Development Establishment's (ADE), NISHANT UAV at Kolar airfield. This engine was the second flight worthy prototype delivered to ADE by CSIR-NAL. Two out of three engines produced by DRDO based on the CSIR-NAL design, through a private partner, were also flight tested and shown to meet the requirements of the mission. Based on the performance, CEMILAC accorded the Certificate for 'Limited Series Production' on 7 February 2013.

High speed permanent magnet alternator rotor

DWR for ISRO at Cherapunji

CSIR-NAL has successfully installed 12.88m diameter composite spherical Doppler Weather Radome (DWR) protecting the weather radar belonging to BEL/ISRO at IMD campus Cherrapunji within a record time. The IMD campus is at a distance of just 30kms from the Indo-Bangla border.

The radome will protect the 12 Crores worth antenna installed by ISRO from the rains and other harsh environments that are impending. It is a matter of great pride for CSIR-NAL as the indigenously developed ground based DWR Radome has for the first time reached this remote part of the country. The fructification of the efforts in the development of the radome manufacturing technology has been all the more satisfying as it caters to the societal needs of N-E India. CSIR-NAL has received a technology fee of Rs.2 crore.

Glimpse of DWR at Cherapunji

High Speed Permanent Magnet Alternator

CSIR-NAL has developed a high speed permanent magnet alternator with a power rating of 4.5 kW at 30,000 rpm rated speed for Gas Turbine Research Establishment (GTRE), DRDO. An integrated test set-

up with alternator and air turbine drive was designed, fabricated and used for the performance testing of the alternator. The alternator mainly consisted of a rotor and a stator. The rotor was constructed with a main cylindrical iron core, several magnets arranged circumferentially over the core and sleeve containment over the magnets in a concentric manner. The containment sleeve is the most critical component in the rotor assembly as it experiences very high circumferential stress resulting from the centrifugal loads of the magnets and its inertia due to high speed of rotation. A high degree of interference is required in the rotor assembly between the core, magnets and the sleeve in order to avoid slippage at high speed. A novel concept introduced relaxes the interference requirement leading to easier assembly. Moderate interference was achieved using temperature differential during assembly with rotor cooled in liquid Nitrogen and the sleeve with induction heating. Special fixtures were developed to keep the 24 magnets together into the rotor.

Coatings for Solar Selective Absorber Surfaces

CNT-based solar absorber coatings were grown on Co/Al_2O_3/Ti coated SS substrates by atmospheric pressure chemical vapor deposition method. The transition of carbon nanotube forest from near perfect blackbody absorber to solar selective absorber was achieved by varying the thickness of CNTs. For thickness greater than 10 µm, the CNT forest acts as near perfect blackbody absorber (á = 0.99; á = 0.99), whereas, for thickness less than 500 nm, the infrared reflectance of the coating decreased drastically (á = 0.20) with slight decrease in the absorptance (á = 0.95). These coatings can be used for solar thermal power generation.

Lab Scale Autoclave for Academics

CSIR-NAL has conceived, designed and an affordable lab scale autoclave developed to meet the requirements of Academic and Research Institutions working in the area of polymer composites. Orders for this autoclave have been received from premier educational and research institutes such as IIT Kanpur, MIT, Manipal and VSSC.

Integrated Global Bus Avionics Processing System & Advanced Display System

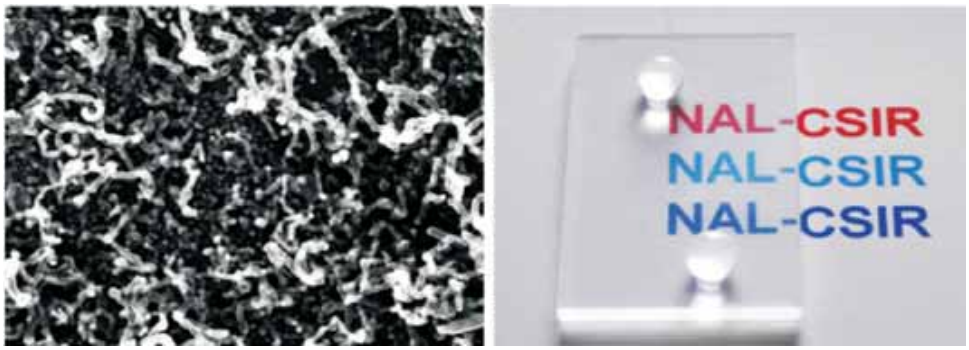
The Integrated Global bus Avionics Processing System (IGAPS) with features like Avionics Full Duplex Ethernet, ARINC 653 compliance and wide bandwidth for communication has been successfully designed, developed and integrated for the first time in India by CSIR-NAL. It has been integrated with sophisticated real time Automated Test Station for simulation, debugging and application integration. Further, the widescreen high resolution AMLCD and Advanced Display System (ADS) has been successfully realized and integrated with state of the art avionics suite for Regional Transport category aircraft. A Memorandum of Cooperation has been signed with Astronautics, USA for worldwide commercial exploitation.

Treatment and safe disposal of effluent

CSIR-NEERI provided a technological solution to M/s Mahindra Vehicle Manufactures Limited (MVML), Pune for treatment and safe disposal of its effluent using high rate transpiration system. The designed HRTS model was implemented in the field at M/s MVML, Pune. The HRTS design consists of filter media which provides more surface area for interaction of pollutants and also removes the suspended solids present in the wastewater was prepared.

CETP scale electro oxidation plant

The first ever CETP scale electro oxidation plant has been designed in India for treatment of highly recalcitrant chemical industry effluents, based on the



FESEM image of CNT and (b) ZnO multifunctional coating on glass substrate

technology developed by CSIR-NEERI. This technology helps to meet the effluent discharge norms (COD of 250 mg/l) with low foot print area (4m x4 m per reactor) and is easy to install, operate and cost-effective.

Setting up an Industrial scale Column (2.5 m dia.) to Andhra Baryte Corpn. Pvt. Ltd, Cuddapah

CSIR-NML has developed and provided process, technological and engineering inputs in designing, fabrication, commissioning and stabilziation of industrial flotation column to M/s Andhra Baryte Corporation Pvt Ltd. Chennai for the beneficiation of low-grade barytes of Mangampet, Kadapa, Andhra Pradesh. Fabrication and erection of A 2.5 m diameter flotation column has been fabricated and erected and related instruments have been installed. The plant commissioning is in progress.

Flotation Column (2.5m dia) erection work in progress at Andhra Baryte Corporation Pvt Ltd, Mangampeta, A.P. for the beneficiation of low grade barytes

Development of a process and design of a closed cell for production of sodium metal by fused salt electrolysis of sodium chloride

Sodium metal is used as a coolant in fast breeder reactors. Being a strategic metal with no indigenous production facility presently available in India, it is imperative to be self-sufficient in the production of Na in view of India's fast breeder reactor programme. CSIR-NML, in association with Heavy Water Board (DAE), Mumbai, made an attempt to develop indigenous technology for production of sodium metal through molten salt electrolysis of sodium chloride. CSIR-NML has successfully designed, fabricated 500A closed cell, which was operated continuously for three weeks at CSIR-NML and produced about 20Kg of sodium metal. The purity of the metal was between 98 to 99%. Scaling up activity for operation of 2000A cell is under progress.

Operational view of 500A closed cell

Storage of Sodium Metal in Kerosene

Molybdenum, tungsten and nickel rich alloy and alumina rich slag obtained from catalyst residue by smelting

Recovery of metallic alloys and slag as valuable product from spent catalyst residue

The hydro processing catalysts used in the petroleum refining process deactivate with time and become spent when the activity of the catalyst declines below the acceptable level. The waste catalyst is required to be processed not only to prevent environmental pollution but also to obtain economic advantage by recovering the valuable metals. The hydrometallurgical recovery process at M/s Rubamine Ltd. generate a leach residue containing about 3.5% Ni, 1.0% Co, 3.0% Mo, 1.5% W, 1.5% P in alumina matrix. CSIR-NML has developed a process treatment of waste catalyst to recover metal values in the form of alloy and high grade alumina as slag. Various smelting parameters were optimized on a 3kg scale to maximize the metal recovery and to get the desired alumina grade. More than 96% of different metals such as Mo, Ni, W, V were recovered in the alloy. The result was validated at a 10 kg scale with repeat smelting experiments.

Studies on the non-linear behaviour of shear walls:

CSIR-SERC has evaluated the seismic performance of shear walls of medium aspect ratios have been carried out in the project. The experimental program includes; Monotonic load test on shear wall, Cyclic load tests on shear walls and Shake table test on shear wall. Analytical models based on the axial-force dependent moment curvature relationship of the section are developed to verify the experimental results. Elastic and plastic rotational capacities of shear wall structures as stated by ATC-40 and other documents are verified with reference to the results of the experiments and suitable improvements are suggested. Comparison between the ductilities exhibited by the shear wall specimen during monotonic, cyclic and seismic motions is carried out. A guideline towards seismic design of shear wall structures is written. A programme has been developed for the design of shear wall.

It is established through a study that addition of shear wall throughout the height of the structure is found to be the most effective as a retrofit option for open ground storey structures. Enforcement of diaphragm wise displacement compatibility due to rigid in-plane stiffness of diaphragm ensures majority load share by shear wall element even after formation of hinges in the shear wall. This makes the soft storey mechanism totally untenable. A guideline towards seismic retrofit of open ground storey structures with shear walls is documented.

A bio-inspired algorithm based on emotional learning is studied and implemented for semi active control. This algorithm is called “BELBIC-Brain Emotional Learning Based Intelligent Controller”. This algorithm is widely used in automation and aerospace applications. The performance of BELBIC algorithm in structural control application is investigated with the help of numerical simulations.

Experimental investigation on strengthening of Reinforced Concrete beam with Carbon Fibre Reinforced Polymer(CFRP) plate bonding

The repair and rehabilitation of concrete structures has become a necessary measure for deficient structures. The deficiency of structure is generally due to the unexpected loads, corrosion and upgradation of load standards. The visual damages can be observed during visual inspection, but the damages occurred internally needs examination through

experimental and / or analytical investigation. These methods also have their own limitations. CSIR-SERC has made an attempt to evaluate percentage of damage in reinforced concrete beam from its stiffness degradation. A repair mechanism for concrete beam with a particular percentage of damage has been attempted. CFRP which is a well accepted and efficient material for repair and rehabilitation is used in this study. The reinforced concrete beam has been tested and the performance under cyclic load has been observed. The stiffness degradation in each cycle has been observed for an equivalent damage assessment. The information on damage level from the results is used to predict the loading required to simulate the required percentage of damage. In a set of experiments, beams were subjected to different levels of loading to create damage and then the damaged beams were repaired with CFRP. The undamaged control beam has been strengthened with CFRP laminates and the repaired / strengthened beams were tested under monotonic load for comparison. The study has confirmed the applicability of cyclic loading method to evolve the stiffness degradation and damage assessment. The bonding strength of CFRP governs the strength of the repaired beams in most cases. The bonding of CFRP is better in the cracked beams than in the un-cracked beam. The results have also shown that the repaired damaged beams outperformed than the undamaged control beam strengthened with CFRP. The above method can be used to assess the damages in RC beams and repair the damaged reinforced concrete beam with CFRP plate bonding to restore the strength and enhance the performance utilising the reserve strength

Development of distributed damage diagnostic techniques for sustainable SHM using Wireless Smart Sensor Network (WSSN) and Laboratory level demonstration of the SHM scheme

Though the smart wireless sensor technology has been rapidly improving, there still remain serious limitations in hardware, software, and energy supply technology. Hardware issues to be improved may be wireless communication range, data transmission rate, and high frequency sampling capability. However, it is expected that hardware problems may be solved relatively fast owing to the speedy advance of electronics technology. Software technology for the full utilization of the hardware and for the complete assessment of structural health has been progressing slower than the hardware technology. CSIR-SERC has developed, a comprehensive distributed software technology based on Imotes and Tiny OS environment for sustainable SHM using smart sensor networks. The development mainly comprises of various distributed strategies for damage diagnostics and decentralization schemes for Structural Health Monitoring. Since the structural health monitoring schemes are heavily based on the measurement data recorded during a long period, the sensor faults if goes undetected, may misrepresent as a structural fault. Hence thorough investigation is required for the long-term reliability, robustness, and calibration of these sensors, and develop robust algorithms that can provide a reliable damage detection capability even under malfunction of some sensing nodes of the global SHM system. A sensor fault diagnostic scheme based on AR-ARX models is developed. The development has led to a new research domain of sustainable remote health monitoring of civil engineering structures like bridges using WSSN , reduce the off chip computation and communication weight in WSSN, increases the robustness and speed of the damage detection algorithms and takes care of environmental variabilities and measurement noises in the signal to provide the robust detection.

Development of a rail defect detection technique

Conventional rail defect detection systems use contact type sensors for detecting the defects in the rail in which the inspection rate is lower. Development of non contact ultrasonics is in the primitive stages. CSIR-SERC has made an attempt to implement non contact type ultrasonic sensors for detecting any defects in the rail. Algorithm was developed for identifying the defects in the rail using ultrasonic sensors. The research pursued was a step towards building up of a new research domain. From the research carried out, it was found that the non contact type ultrasonic sensors were unable to create ultrasonic surface waves of higher frequencies (2Mhz). The waves produced were attenuating and it was difficult to capture these waves. Hence further research may be focused towards getting a better external source of excitation for creating such higher frequency ultrasonic surface waves so that these waves can be detected by the non contact ultrasonic sensors for detection of defects in railway tracks.

S&T Services provided

The National Trisonic Aerodynamic Facility (NTAF)

As in previous years, NTAF provided S&T support to the major national aerospace projects of the

Departments of Space, ADA, Defense and CSIR-NAL using the 1.2m Trisonic wind tunnel. Another notable achievement was an all-time record productivity of 2015 blow-downs. The tunnel time was utilized for projects from VSSC (1175), DRDO (729), ADA (68) and NAL (43). Apart from contributing to the National security, during the year 2012-13 the NTAF carried out blow-downs worth Rs.18.55 crore.

Acoustic Test Facility

The Acoustic Test Facility (ATF) continues to play a crucial role in environmental qualification of satellites, launch vehicle inter-stages and their subsystems for the Indian Space Programme. During the year ATF successfully completed acoustic test programmes on the GSLV as well as gsLVM3. The new state-of-the-art, nitrogen-based, acoustic test facility built by NAL at ISRO's ISITE Complex was fully commissioned and completed the acoustic test on GSAT 7, GSAT 10, GSAT 14 and SARAL spacecraft. The ATF received a cash flow of Rs.4.15 crore during 2012-13.

Failure Analysis and Accident Investigations

CSIR-NAL is recognized as India's premier organization for carrying out failure analysis and accident investigations, and it has been doing this with distinction for more than 40 yaers. During the year 2012-13, fifty seven investigations were taken up and completed. Majority of these investigations were under taken for Indian Air Force, India Navy, HAL, ADA, DGCA etc. The laboratory contributed significantly in identifying the causes of failures and suggesting recommendations for prevention of similar failures in future. The recommendations suggested encompassed design modification, selection of appropriate material and fabrication methodology, maintenance and inspection schedule as applicable depending on the nature of failure.

Static Structural Strength Testing of Active Antenna Array Unit (AAAU)

Full Scale Static Structural Strength Testing of Active Antenna Array Unit (AAAU) was successfully completed. The objective of the test was to demonstrate compliance with the strength and deformation requirements for airworthiness certification (RBHA/FAR 25) for selected critical flight and ground load cases (limit and ultimate). There were 6 limit load cases and 7 Ultimate load cases for which the AAAU was tested and qualified. The complete test set-up is shown in Fig. The test article was mounted and the test fixtures for applying the loads were designed and developed in-house. Displacement sensors at various locations were identified by FEA results. The SST of AAAU for all the 13 test load cases was successfully completed and measurements made. The static strength tests were witnessed by ANAC certifying agency, Brazil, for the FAR 25 certification.

Static structural strength test setup for AAAU

Supercontinuum Light Source based on the Photonic Crystal Fiber

Under CSIR-NMITLI, M/s Vinvish Technology Ltd., Trivandrum along with CSIR-Central Glass & Ceramics Research Institute (CSIR-CGCRI) has developed Supercontinuum Light Source based on the Photonic Crystal Fiber. The developed product is powered by +24 VDC power supply and is affordable and relatively simple to operate. It has wide range of applications in the fields of industrial, medical, bio-photonics, nano-photonics, imaging, confocal microscopy etc. The Supercontinuum Light Source was launched by Hon'ble Minister, S&T and ES and Vice President, CSIR, Shri S. Jaipal Reddy on CSIR Foundation Day 2013.

Technology for production of tellurium metal powder from copper refinery anode slime - A technology developed by CSIR-IMMT, Bhubaneswar for Hindalco Ind. Ltd. (Birla copper unit), Dahej, Gujarat

The application of tellurium includes Cadmium telluride solar panels, free machining additives in metallurgy, catalysts, colour ceramics, etc. Massive commercial production of Cadmium telluride solar panels and Bismuth telluride in refrigeration technologies in recent years has significantly increased tellurium demand. The selling price of tellurium is ~US$ 200/kg. Average world production of tellurium is estimated at 450-500 tonnes per year.

The world reserve of tellurium is around 24,000 tonnes contained mostly in copper resources.

Worldwide, more than 90% of tellurium is produced from anode slimes collected from electrolytic copper refining, and the remainder is derived from skimmings at lead refineries and from flue dust and gases generated during the smelting of bismuth, copper and lead ores. The anode slimes of copper and lead refineries normally contain about 3% tellurium. World refinery capacity is concentrated in USA, Japan, Canada, Belgium, Germany, Peru and Philippines. Hindalco Ind. Ltd. at their Birla copper unit produces ~2600 tpa anode slime. Presently a fraction of the tellurium resource is utilized for production of copper telluride. The present process developed by CSIR-Institute of Minerals and Materials Technology (CSIR-IMMT) utilizes the secondary material-anode slime, from copper refinery plant of Hindalco Industries Ltd. - A Birla copper unit, located at Dahej, Gujarat, for production of tellurium powder.

At present, there is no plant producing tellurium in the country. Process know-how and basic engineering is provided by CSIR-IMMT for a plant capacity of 60 tpa tellurium (~13% of world tellurium production). By-products of 300 tpa copper cathode and 600 tpa lead sulphide will be produced. The process is a close loop process and hence will not produce any solid/ liquid effluents. The residue after recovery of tellurium will be used for recovery of precious metals using existing process. Plant construction approval has been obtained. The plant is expected to be commissioned by June, 2014.

Iron ore beneficiation

- **Commercial plant of Brahmani River Pellets Ltd.**

Iron ore beneficiation plant was set up by Brahmani River Pellets Ltd. (BRPL) at Barbil (Odisha) on the process flowsheet developed at CSIR-Institute of Minerals and Materials Technology (CSIR-IMMT), Bhubaneswar, to operate 6 million tonnes of low grade iron ore to produce 4.5 million tonnes of iron ore concentrate. This concentrate is to be transported through pipeline to their pellet plant which is situated at a distance of 250 km. The plant has been commissioned after getting the environmental clearance.

- **Commercial plant of Essar Steel India Ltd.**

Iron ore beneficiation plant was set up by Essar Steel India Ltd. on the process flowsheet developed at CSIR-Institute of Minerals and Materials Technology (CSIR-IMMT), Bhubaneswar. The plant is located at Barbil (Odisha) to process 16 million tonnes of low grade iron ore to produce 12 million tonnes of iron ore concentrate. This concentrate is to be transported through pipeline to their pellet plant which is situated on the coast at Paradeep at a distance of 260 km. The plant is under erection and commissioning after getting the environmental clearance from Ministry of Forest & Environment, Govt. of India.

D. Information Sciences

High Performance Supercomputing Facility

CSIR-4PI has established 360 Tera Flop (peak) High Performance Supercomputing facility at which is the largest CPU based installation in the country and 82nd in the world as per the November 2012 list. The system riding over the National Knowledge Network, will provide the much needed boost to the computational scientists of CSIR in all disciplines. It is a CSIR central facility catering to more than 200 computational scientists across all CSIR laboratories.

Co_2 and Ocean Modulles

CSIR-4PI has commissioned continuous measurement stations at Pondicherry and Port Blair. In addition to a Picarro instrument measuring CH_4 and CO_2 at very high precision, Port Blair has a LGR instrument which measures NO_2 and CO. A new Picarro instrument was installed in Hanle. The robust inversion of CO_2 fluxes from Temperate Asia by our group, perhaps the first paper from India on this topic, has been published in Current Science recently. We have completed climatological and inter-annual simulations of the biogeochemistry of the global oceans using the TOPAZ model embedded within the Modular Ocean Model. Analysis of these simulations have revealed interesting insights into the interannual variablilty of chlorophyll, primary production, pCO_2 etc. in the Indian Ocean.

Increase in Impact Factor of CSIR Journals

CSIR-NISCAIR has been providing scholarly research communication links to the scientific community through its 19 journals of international repute, covering all major disciplines of science and technology. CSIR-NISCAIR journals notched up an increase of >41% in Impact Factor (IF) over that from the previous year, according to the *Journal Citation*

Reports 2011. Two journals, viz. *Indian Journal of Experimental Biology* and *Indian Journal of Biochemistry & Biophysics* have even crossed an Impact Factor of 1.0 – a rarity for Indian Journals.

Online Training Course for SAARC Countries

In view of the SAARC Documentation Centre's request to CSIR-NISCAIR to develop an online training course on Information Retrieval, CSIR-NISCAIR has started the process of developing course material on various aspects of information retrieval, which will be delivered electronically.

CSIR-NISCAIR Tube

CSIR-NISCAIR Tube has been launched to serve as a repository of science videos, photographs, presentations, etc. which could serve as an important information and archival resource for CSIR scientists. The site has recorded more than 25000 hits. About 75 photographs and more than 100 videos have been uploaded by various members/agencies. The participating members are from CSIR laboratories like CLRI, IICT, CECRI, NAL and NML. Efforts are on to popularise the CSIR-NISCAIR Tube within the wider scientific community as well.

CSIR Outreach

The two newsletters brought out by CSIR-NISCAIR – *CSIR News* (in English) and *CSIR Samachar* (in Hindi) – serve as effective links between various CSIR constituents and purveyor of information regarding CSIR's S&T achievements for other R&D organizations, university departments, industry and other users. Both the monthly newsletters have been given a new look and their contents reorganized in keeping with CSIR's corporate ambitions.

Video Recording Studio

The Video Recording Studio established at CSIR-NISCAIR which is equipped with latest HD technology, working shooting floor with HD recording facility and editing bays for film quality HD editing capability. The Studio will promote the objective of science communication through multimedia taken up recently by the Institute. Three documentary films have already been made on CSIR-NPL, CSIR-IHBT and CSIR-NISCAIR and proposals from about 10 labs have been received.

Indian ISSN Centre

The Indian ISSN Centre at NSL is one of a network of over 80 national centers worldwide. It is responsible for assigning ISSNs free of charge to serials published in India. To date, over 23,500 Indian periodicals have been assigned ISSNs. The Centre is also responsible for contributing Indian records to the world database of ISSN numbers, known as the ISSN Register, maintained by the ISSN International Centre in Paris. ISSNs assigned during 2012-13 & 2013-14 are summarized as under:

Year	ISSN Assigned
2012-13	2991
2013-14	2250 (till October 2013)

- **Popularization of Science**

Building up on its aim of science popularization through its well-acclaimed popular science magazines (Science Reporter, Vigyan Pragati & Science ki Duniya), and promotion of Scientific Temper, CSIR-NISCAIR took up the cause further by organizing an international conference on Vaigyanik Drishtikon Tatha Chetna Jagane Mein Sanchar Madhyamon ki Bhumika par Antarrashtriya Sammelan in May 2012 in New Delhi. This was on lines of the National Workshop and International Conference held earlier.

CSIR-NISCAIR launched two new facilities during the year – Data Information Resource Facility (DIRF) and Video Recording Studio at Science Communication through Multi-Media Division.

National Science Library (NSL)

National Science Library was set up in 1964 at CSIR-NISCAIR to provide a wide range of S&T documentation and information services. NSL subscribes to almost all Indian S&T periodicals and 200 foreign S&T periodicals. The library has more than 2, 51,670 monographs and bound volumes of periodicals. It continues to subscribe to PCT (Patent Cooperation Treaty) Minimum journals. It has also started providing e-access to more than 5000 foreign periodicals to its patrons.

- **Library Acquisitions**

During the year 2012-13, 875 books were acquired and catalogued.

NSL has access to a number of e-resources including:

Essential Science Indicators;Journal Citation Reports (JCR);Web of Science –Expanded; Indian Journals.com:

Access is extended to all CSIR labs; Emerald database; Ulrich online; Library and Information Science Abstracts; Springer; and Sage

- **Library Automation**

E-Granthalaya, a web-enabled library automation software from NIC, was successfully installed and data transferred from GRANTHALAYA TO E-GRANTHALAYA and new books/Journals were entered in E-GRANTHALAYA.

- **Information Retrieval Service**

With the rich collection of S&T information resources and online access to a large number of international databases, NISCAIR provides comprehensive bibliographies on any topic in any discipline of science and technology, by searching periodicals, patents, standards, technical reports. During the year, preliminary searches were carried out and information in terms of references in databases was supplied to a large number of customers. The orders registered from academic, scientific, business and industry communities were executed.

- **Contents, Abstracts and Photocopy Service (CAPS)**

The main objective of CAPS is to fill the gap created by sharp decline in the availability of foreign periodicals to the Indian S&T community. This service is of great help to scientists who do not have access to foreign periodicals. On a yearly subscription, one can get contents of journals (15 for individual subscribers and 30 for institutional subscribers) (12 monthly dispatches) of one's choice from about 7300 Indian and foreign periodicals pertaining to different disciplines on paper, diskette or through e-mail. On browsing the contents, one can place order for abstracts and/or photocopies of full articles.

'India S&T'

CSIR-NISTADS published 'India S&T (Volume II)' through Cambridge Foundation. The book was released by the Ministry of S&T and the first copy presented to H.E. the President of India on Technology Day 2013.

CSIR – Traditional Knowledge Digital Library (TKDL) Unit

TKDL database has been created in five international languages i.e. English, French, German, Spanish and Japanese from the codified traditional knowledge texts to prevent misappropriation of India's Traditional Knowledge at International Patent Offices. During the period from April 2012 to March 2013, 20,854 numbers of medicinal formulations of Ayurveda, Unani, Siddha and Yoga have been added to the TKDL database. 250 Yoga techniques videographed, have been incorporated in the TKDL database along with the details of the prior art.

Status for the Period : 2012-13		
S. No.	**Stream**	**Transcription**
1.	Ayurveda	1,330
2.	Unani	16,657
3.	Siddha	2,862
4.	Yoga	5
	Total:	**20,854**

Unit for Research and Development of Information Products

CSIR-URDIP has provided IP search and analysis were provided to number of clients in public and private sector including research institutions, Indian private sector companies, MNCs, SMEs and academic institutions.

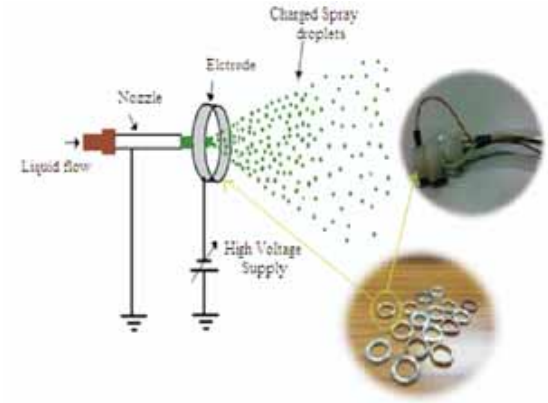
The Unit also assisted few of the CSIR laboratories to set up Institutional Repositories. CSIR-CENTRAL – the open archives harvester also harvested the repositories in to the Central Harvester System.

E. Physical Sciences

Electrostatic Sprayer for Agricultural Applications

Pesticides are applied in fields as per recommended doses for healthy crop growth. It is one of the common methods to protect crops and trees against diseases and insects in agriculture/horticulture. Pesticides include insecticides, fungicides, herbicides and various other microbes. More than 90% of these pesticides are applied as sprayers mostly using hydraulic and conventional spray nozzle systems. Due to non-uniformity of droplet size and off-target drift, target deposition efficiency of less than 30% is quite common in agricultural pesticide spraying.

CSIR-CSIO were conducted experiment in an air atmosphere at ambient conditions (T=16±2 °C, RH= 57±3%), with air feed rate of 140 l/min with pressure variation range of 50-70 psi, liquid feed rate of 110



Electrode position in the nozzle and the principle of drop charging

Prototype of Air-Assisted electrostatic sprayer for agricultural applications

ml/min with liquid pressure variation in the range of 5-10 psi.

Charge-to-mass ratio is a term which measures the performance of the sprayer. Higher charge-to-mass ratio is required and the developed sprayer covers almost all the liquid based pesticides with full efficiency of the sprayer. The unit is ready for field level deployment by the users.

Aqueous Synthesis of L-Cysteine Stabilized Water-Dispersible CdS:Mn Quantum Dots for Biosensing Applications

A protocol for the aqueous synthesis of L-cysteine (2-amino 3-mercaptopropionic acid) capped manganese-doped cadmium sulphide quantum dots (QDs) has been developed by CSIR-CSIO. Nanoparticles of the average size of 3±0.5 nm are synthesized. Depending upon the size, the QDs exhibit emissions such as585, 610, 660 nm. The proposed L-cysteine capped CdS:Mn QDs can be termed as multi-functional crystals, which are useful for the assembly of fluorescent molecular probes for clinical analysis and disease diagnosis. The proposed nano-crystals can also be potentially used as contrast agents in the magnetic resonance imaging due to the presence of manganese.

Extraction of Nano-diamonds from waste materials

Nano diamonds (NDs) are nontoxic materials and have potential applications in Bioimaging, drug delivery, biomedical sensing and lubrication. NDs were extracted from a novel source by CSIR-CSIO. These fluorescent nanomaterials were synthesized from waste material deposits of Indian villages. The raw material was purified by acid and thermal treatment. The purified material was characterized by various techniques like Raman spectroscopy, FTIR, TEM, SEM, Confocal, PL measurements etc.

Head-up displays for Aircraft variants: *Tejas-Navy light combat aircraft*

To meet the requirements of Tejas-Navy light combat aircraft, CSIR-CSIO in collaboration with Aeronautical Development Agency (ADA) has developed Head-up display (HUD) technology. The HUD for the naval version is a further development of the HUD produced earlier for the Air Force version of the Tejas. The Air Force version has already been integrated into the cockpit and several units have been installed in the Tejas aircraft. HUD for the naval version is technologically more advanced and has different technical specifications than the air force version and its operating parameters, cockpit configuration and the pilot's field of vision are different. This includes advanced features customized for Naval requirements like enhanced instantaneous field of view in the vertical direction, additional electrical specifications like RS03 compliance for electric field of 200V/m, additional environmental compliance etc customized for the cockpit of LCA-Navy Aircraft. The developed system has been designed to withstand the impact of arrestor landing process on the aircraft carrier deck. The designed system is at par with the contemporary systems available all over world with its display brightness performance being the best in the world.

After completion of qualification test as per MIL STDs 704D, 461C and 810D, first two airworthy units are extensively being evaluated. The custom built bore sighting tool for harmonizing the HUD in the LCA-Navy Aircraft along with dedicated simulator-cum-test

setup has also been approved by CEMILAC-RCMA for harmonizing, testing and formal evaluation of these HUD systems.

Head-up display for Hindustan Jet Trainer Aircraft

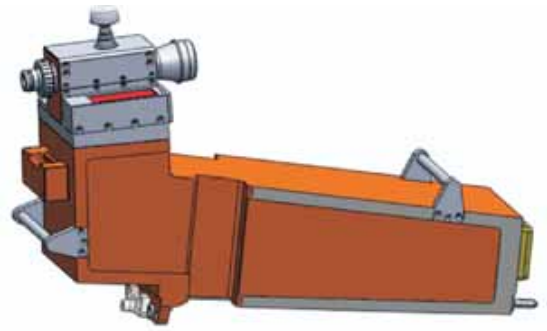
Head-up display has been custom built for Hindustan Jet Trainer - 36 Aircraft with new opto-mechanical layout, size, and electrical requirements of HJT-36 Aircraft Cockpit. Its salient features include low weight, lower power consumption, compact size, customized optical and photometric characteristics. The Real Data Entry Panel (RDEP) meant for interface with HUD Repeater has been upgraded as per the pilot's new recommendations.

Successful completion of 1st Phase of flight trials with indigenous HUD involved day and night flight trials and it resulted in valuable feedback to meet the pilot's final expectations.

Detailed Slope Stability Analysis of Jhakri (Bari Village) Landslide Site & Developing Early Warning System

Landslides are one of the critical natural hazards affecting the mankind. The incidences of landslides have increased tremendously in recent times mainly due to large scale unplanned construction activities and other geo-physical factors. In this context, it is important to monitor potentially unstable slopes based on time dependent deformation to understand the nature and pattern of slope movements. The systematic monitoring of the slope provides valuable information, which is utilized for the design of control measures as well as developing an early warning system for forecasting the major failure which may occur in that area.

Head-up Display System for HJT-36 Aircraft



Bore Sighting Tool

HUD Flight Symbology

CSIR-CSIO has carried out a detailed analysis of an active landslide in Jhakri (Bari Village), Distt Shimla (HP). The data acquisition system installed at site is monitored & controlled from CSIR-CSIO Chandigarh through GSM/GPRS interface. Recorded data is

Snapshot of HUD Display captured during 1st phase of flight trials

analyzed for finding causative landslide trigger parameters.

As per the field investigations carried out at the selected site at Bari village, Jhakri (H.P.) along with results of various index tests carried out on strata samples collected during borehole drilling, it is observed that strata is overburden slipped mass which is predominantly comprised of quartz mica schist big slipped boulders, mica schist broken rock pieces set in matrix of sand, silty sand and mica schist fines.

View of instrumented landslide site from Rampur side hill

A movement at 7.5 m depth along EW axis has also been observed in inclinometer casing. Further, the sub soil water level in the drill holes *viz* DH-01 & DH-02 have not been encountered up to the drilled depths of 50.10m & 50.20m in DH-01 & DH-02 respectively. No significant change in pore pressure is observed by piezometer installed at 50 meter depth throughout the monsoon season.

Active Tectonics & Paleoseismic studies,using Geophysical Parameters, along the mountain frontal part of Eastern Syntaxial Bend, Lower Dibang Valley and Lohit Districts, Arunachal Pradesh

CSIR-NEIST has juxtaposed northwestern trending lithotectonic units of the Mishmi block with the almost N-S trending eastern Himalayan lithotectonic units along the Siang fracture. Earthquakes occurring on the Indian peninsula are the outcome of the Indian plate under thrust towards the Eurasian continent. A large window in the Siang river section exposes Paleocene rocks interbeded with Abhor volcanic as the subthrust package and MBT as the roof thrust. Mishmi block, tectonically separates the eastern Himalayan and the Indo-Myanmar mobile belts and form 'a linkage' in between. Active faulting along the Himalayan Front is observed. Left-lateral strike slip faults displacing Mishmi Thrust Zone had been observed. Morphological and sedimentary records at Siang, Dibang and Lohit rivers at Pasighat, Dambuk, Roing, Tezu and Parsuramkund areas in the NE Himalaya were studied with the help of terraces, for the evidences of the climate-tectonic interplay. Drainage maps were prepared and structurally controlled drainages were observed in the study area. Mishmi Thrust zone is found to be tectonically active with the uplifting of the Quaternary fluvial sediments for a height of about 40m from the present day river channel

Seismic Vulnerability Assessment of Shillong city

CSIR-NEIST Analyzed Microearthquakes spectra from Shillong region to observe the effect of attenuation and site on these spectra. The spectral ratio method is utilized in order to estimate the Q values for both P and S-wave in subsurface layer wherein the ratio of spectral amplitudes at lower and higher frequencies are taken into consideration for three stations at varying epicentral distances. Average estimates of QP and QS are 178 and 195. The ratio of QS to QP was estimated to be greater than one in major parts of Shillong area which can be related to the dry crust prevailing in Shillong region. The variation in corner frequencies for these spectra is inferred to be characteristics of the site. Simultaneously, observation from spectral content of local earthquakes recoded at two stations with respect to reference site yields greater amplification of incoming seismic signal in the frequency range of 2 to 5 Hz which is found to be well supported by the existing local lithology pertinent to that region.

First find of Native Gold Grains from the chromitites of Nuggihalli Schist Belt, South India

Occurrence of native gold in ultramafic (high magnesium rich) rocks is rare. We report, probably for the first time, occurrence of native gold from the chromitite samples from the Mesoarchaean Tagadur Mines of the Nuggihalli Schist Belt (NSB), south India. Our findings are based on Electron probe micro-analyser (EPMA) analysis of the thin sections of some rock samples. We observe distinct spectra of native gold grains, silver, copper, iron and tin as well as Fe-Ni-Cr-Cu alloys. These Tagadur Chromitites extend along a strike length ~1-2 km north of Tagadur Mines

in a narrow zone of 50-90 m. The current findings warrant a re-evaluation of the economic potential of chromitite ores by mapping lateral and depth extent of this formation by detailed geophysical and geochemical exploration.

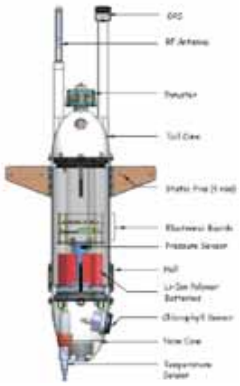
Study of estuarine systems

Extensive multidisciplinary measurements made at different time and spatial scales in Mandovi and Zuari estuarine systems in Goa, Gautami-Godavari system in Andhra Pradesh, and Backwaters of Kochi in Kerala by CSIR-NIO. The studies suggest that the monsoon driven estuaries of India do not reach steady state with respect to water and salt balances. The Indian estuarine systems experience very strong short-term and small-spatial scale variations that are driven by strong seasonality driven by monsoon regimes.

Autonomous Vertical Profiler

The AVP (Autonomous Vertical Profiler) technology (US Patent #6,786,087) developed by CSIR-NIO has been transferred to M/s CT Control Technology India Pvt. Ltd., Bengaluru, Karnataka. Weighing about 15 kg, made of aliminium alloy and having a speed upto 1m/s, the AVP offers a fast, cost effective, optimized approach to profiling in coastal waters. It consists of hands-free, motor driven in-situ robot profiler that requires no operator skill or deployment gear, while fulfilling the requirement of repetitive sampling. It uses standard oceanographic sensors to measure parameters such as chlorophyll, conductivity, temperature, radiance, dissolved oxygen at high resolution in water depths ranging from 5-200 m. It can also be used for surveying in dams, lake and estuaries.

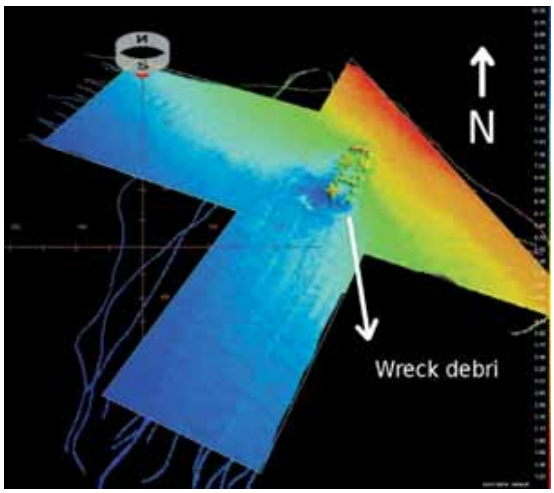
AVP under sea



Schematic of AVP

CSIR-NIO survey revealed large remnant of a grounded vessel off Candolim Beach, Goa

A geophysical survey off Candolim Beach, Goa was carried out from 25 to 31 October 2012 where the then MV River Princess was grounded, at the request of Dept. of Tourism, Govt. of Goa. The survey comprised of bathymetric, magnetic, sonographic and sub-bottom profiling. This was further backed up by underwater diving operations. Integrated interpretation of geophysical data supported by visual observations clearly showed the presence of large remnants of a grounded ship at water depths approx. between 3 to 10 meters located off Candolim Beach. While the penetration of the wreck into seabed could not be ascertained, a large part of the metallic structure was found to be exposed to water, protruding several feet above the seabed.



Reconstructed image of the seafloor with observed location of ship debris

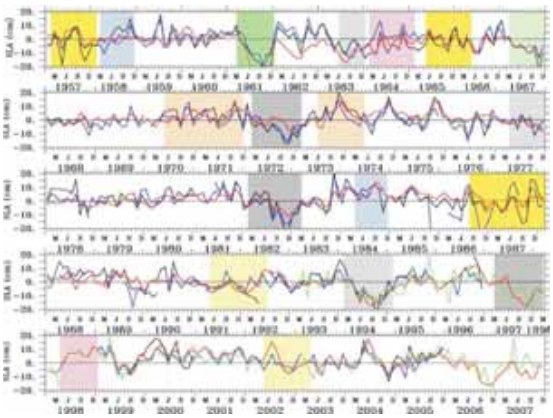
With the launching of new multi-disciplinary Oceanographic Research Vessel RV Sindhu Sadhana, on 31 July 2012, at ABG Shipyard, Surat, in the presence of Prof. Samir K Brahmachari, Director General, CSIR, the CSIR-NIO achieved an important milestone in the history of CSIR. This is one of the ambitious and prestigious projects of the CSIR taken up at a cost of Rs. 226.51 crores.

The new Oceanographic Research Vessel will greatly enhance the capabilities of Indian oceanographers to make multi-disciplinary observations, with adequate spatial and temporal resolution, enabling them to understand the oceanographic process in the seas around India and to translate this knowledge to benefit the nation.

Prof. Samir K Brahmachari, Seretary, DSIR and Director General, CSIR (third from right), Dr. S R Shetye, Director, CSIR-NIO (sixth from right) with others posing in front of RV Sindhu Sadhna

Signatures of Indian Ocean dipole and El Nino-Southern Oscillation events in sea level variations in the Bay of Bengal

CSIR-NIO has investigated The impact of the Indian Ocean Dipole (IOD) and El Nino Southern Oscillation (ENSO) on sea level variations in the North Indian Ocean during 1957-2008. Using tide-gauge and altimeter data, it was shown that IOD and ENSO leave characteristic signatures in the sea level anomalies (SLAs) in the Bay of Bengal. During a positive IOD event, negative SLAs were observed during April-December, with the SLAs decreasing continuously to a peak during September-November. During El Nino, negative SLAs were observed twice (April-December and November-July), with a relaxation between the two peaks. SLA signatures during negative IOD and La Nina events are much weaker. A linear, continuously stratified model of the Indian Ocean to simulate their sea level patterns of IOD and ENSO events was used. Later solutions were separated into parts that correspond to specific processes: coastal alongshore winds, remote forcing from the equator via reflected Rossby waves, and direct forcing by interior winds within the bay. During pure IOD events, the SLAs are forced both from the equator and by direct wind forcing. During ENSO events, they are primarily equatorially forced, with only a minor contribution from direct wind forcing. Using a lead/lag covariance analysis between the Nino-3.4 SST index and Indian Ocean wind stress, we derive a composite wind field for a typical El Nino event: the resulting solution has two negative SLA peaks. The IOD and ENSO signatures are not evident off the west coast of India.



Monthly SLAs at Visakhapatnam (black) and Chennai (blue) during 1957–2007; the model SLA is shown only for Visakhapatnam (red) becausethe SLAs at Chennai were almost the same (unlike in the climatology). Altimeter SLAs (green) at Visakhapatnam are shown for 1993–2007. The strong (dark color) and moderate (light color) positive IOD and El Niño events are shown in back- ground shades. Pure positive IOD events are in green shade, pure El Niño in yellow shade, and combined events (positive IOD and El Niño events) in grey shade. Pure negative IOD events are in light blue shade and pure La Niña events in ivory (cream) shade and combined events (negative IOD and La Niña events) are in pink shade. The correlation coefficients at Visakhapatnam and Chennai are 0.6 and 0.5, respectively. The regression coefficients a (intercept) and b (slope) at Visakhapatnam (Chennai) are 0.47 (À0.1) and 0.85 (0.7), respectively.

New developments in Carbon Nano Tubes

An invention relating to the development of light weight carbon nanotubes (CNT) reinforced polymer composites in the form of composite for electromagnetic interference (EMI) shielding applications has been filed by CSIR-NPL for securing IP. The technique enables up to 50 wt% of CNTs to be uniformly dispersed in the polymer. This makes these CNT-polymer composites more advantageous than metals and other carbon-based polymer composite materials as EMI shielding materials in range 8.2-18 GHz covering X and Ku band of the electromagnetic spectra.

Materials development

Metal-insulator-semiconductor devices have been fabricated by CSIR-NPL using dielectric material SiO_2 and organic semiconductor DH4T and trap charge

density at insulator/semiconductor interface has been calculated. Existing 2.45 GHz microwave-PECVD system has been modified for high temperature and high pressure. Graphene oxide has been synthesized at room temperature using C_2H_2 and Ar gases. Graphene has been synthesized using a- C films deposited by filtered cathodic vacuum arc (FCVA) technique with post annealing at high temperatures.

Development of Fuel cell components

Two important carbon components of the fuel cell has been developed by CSIR-NPL viz. Porous conducting carbon paper and composite bipolar plate matching the performance of commercially available components. Technology for porous conducting carbon paper has been commercialized and is being used in the fuel cells. The development of carbon based anodes for Li-ion batteries is also being used at CSIR-NPL.

F. CSIR 800

CSIR 800 Fresh Orders for Setting up of RO desalination Plants in Rajasthan

Based on the proven performance of the RO desalination units in Rajasthan and the quality of service rendered, CSIR-CSMCRI received order from DST, Govt. of Rajasthan for setting up 50 indigenously designed RO plants during 2013-2014. The distinguishing feature is the high recovery of product water and management of fluoride in reject stream.

CSIR 800 Training video on rural housing 'Unnat Gramin Awas'

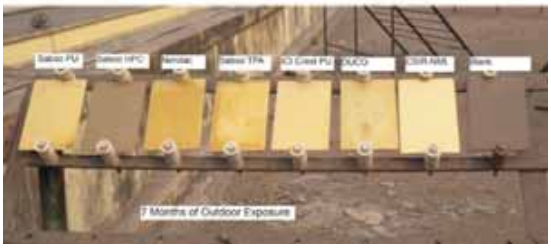
A training video on rural housing 'Unnat Gramin Awas' has been developed and distributed by CSIR-CBRI to about 70 agencies working in the area. Ministry of Rural Development has posted the video on their Web site. It is also available on U-tube.

Rehabilitation of Affected School Buildings during Kedarnath Disaster, Uttarakhand

CSIR-CBRI has played a major role in Rehabilitation of Affected School Buildings during Kedarnath Disaster, Uttarakhand by organizing Workshop cum Demonstration Programme for Engineering Staff of SSA, Uttarakhand, providing Technological Options for School Buildings, Whole School Development Planning, Site Selection, Foundation & Slope Protection for Hilly Terrains, Vulnerability, Repair & Retrofitting of School Buildings, Quality in Construction of School Buildings; Demonstrating Stone Block Masonry, Rat Trap Bond, EQ Resistant Measures etc.

Formulation of an anti-tarnishing lacquer for copper and its alloys

Metal work and handicrafts made from copper and its alloys (brass, bronze) tarnish (surface becomes black) when exposed to the environment resulting in the loss of aesthetic appeal. This has led to a decrease in the sale of brass/bronze handicrafts made in India in the international and domestic markets. The livelihood of the brass artisans of India and the survival of the age old profession of brass artifacts production are threatened. Lacquers can be used to prevent tarnishing of the brass, bronze or copper handicrafts for long durations. A novel polymeric corrosion inhibitor based lacquer has been developed at CSIR-NML which can be used as a coating to prevent tarnishing of copper and its alloys for several years. The lacquer is more efficient, cost effective and user friendly compared to those available in the market. The advantages of the developed lacquer over the existing lacquers available in the market are: the lacquer takes 2 to 4 times less time to dry; no baking is needed; has 50 times more storage life; provides low gloss (natural metal) finish rather than high gloss finish (plastic like); can be applied as dip, brush and spray coating. The lacquer was implemented at CSIR-NML. Field trial of the lacquer was successfully carried out at the brass cluster, Moradabad, Uttar Pradesh in collaboration with National Innovation Council of India. The target is to commercially produce the lacquer so that the brass artisans of India are able to produce better quality brass handicrafts in



terms of surface finish and longevity. Also, these products of aesthetic appeal are available at a cheaper price and are able to compete internationally.

Development of process for producing high purity steviol glycosides from Stevia rebaudiana

CSIR-IHBT in its continuous endeavor has earlier developed and patented a simple, eco friendly, green process for extracting total SGs with a purity of 75% in the final product. In view of recent European Union approval of total SGs purity >95%, the process has been further improved and purity of total SGs in the final product has been achieved > 90 % on lab scale. Further improvement and optimization of the various process parameters are being carried out.

SGs powder developed with the improved process was further used to develop formulations namely table top sweetener 'HIM Stevia' and as a sweetener alternative to sugar in Tea product developed by the institute named 'READY TO DRINK TEA'. Optimization of various process parameters is under progress. The product stability and other essential quality parameters analysis is under way.

Him Sphurti (CSIR-IHBT-T-01) a high yielding cultivar of China hybrid tea

CSIR-IHBT has developed a tea cultivar Him Sphurti through selection approach from the century old Kangra tea plantations. The cultivar has excellent nursery performance both in rooting and early establishment. It is an early flushing clone by (8-12 days), vigorous in growth and has wide adaptability. It recorded over 1,500 kg made tea/ha yield (4-year cycle average) which was 50 % higher than the recommended cultivars for this region. It has a yield potential of 2,500 kg/ha in the second cycle, 25 % higher than its counterparts. In quality, it has better aroma than recommended cultivars i.e. Kangra Asha, Kangra Jat and UPASI-09, but astringency, brightness and briskness are at par. This cultivar is moderately resistant to blister blight (10-20 % disease severity). HimSphurti has captured moderate to high level of genetic diversity

Tea cultivar Him Sphurti

An additional net income of '20,000/ha through the sale of green leaf to the tea factories can be achieved by getting 25% high yield with this cultivar over the existing plantation.

Thornless Rose

CSIR-IHBT has developed novel rose cultivars namely Himalayan Wonder and Himalayan Glory. Himalayan Wonder is thornless and the fully open flower is 10.23 cm, it has a vase life of 7 days. While in Himalayan Glory, the outer petals are of Tyrian purple coloured. The fully open flower is 10.65 cm. it has a vase life of 8 days. Both of them are genetically distinct. Being unique in colour and feature both would fetch good returns at farmer level.

Himalayan Wonder

Himalayan Glory

Nutritionally enriched food products to combat malnutrition

CSIR-IHBT has identied certain bioresources with nutritional value having potential to be incorporated into food products. Calcium and iron rich products such as Mango Bar and Puffed Rice Bar were developed using low cost affordable technology.

Mango Bar

Puffed Rice Bar

Mango Bar and Puffed Rice Bar meets 40 and 60% of RDA requirement of iron and calcium, respectively. These products will be disseminated in a single serve pack under national mission programme of S&T intervention to combat malnutrition with the help of NGOs and other organizations closely link.

- **CSIR-CIMAP Vetiver (Khus) bio-village for rural income enhancement**

The roots of Vetiver, commonly known as Khus, are the source of high value essential oil used in perfumery, cosmetics and flavour industries. Vetiver is normally cultivated as 18-20 months crop. CSIR-Central Institute of Medicinal and Aromatic Plants (CSIR-CIMAP) has developed a new variety CIM-Vridhi with reduced growth cycle of 10-12 months as compared to18-20 months. With a root yield of about 18 quintals/ha and oil content of 1.69%, the crop gives an yield of about 30 kg/ha of essential oil enabling a farmer to earn about Rs 1,50,000 as net profit per hectare. Reduction in cropping duration has provided flexibility to CIM-Vridhi to be accommodated in various kinds of crop-rotations (rice-vetiver; rice-wheat and vetiver; maize-potato-vetiver) as well as its co- cultivation with food (wheat and lentil) and medicinal aromatic crops (mints and Ocimum) which ultimately led to increased profits/ unit area over a period of time. Thus, it has provided a new dimension to diversification in agriculture (suitable to agro-forestry too) as well income augmentation of the farming community.

The demand of the crop has increased so high that participating farmers also started getting additional benefits by the sale of planting material. A farmer from Barabanki district could sell around 5,00,000 slips of this variety to other farmers interested in cultivation of vetiver (khus). CSIR-CIMAP's technological interventions through development of short duration (annual-12 months) and high yielding cultivar CIM-Vridhi with quality oil and potential to grow over a vast varying agro-climatic conditions, has attracted large number of farmers and has become popular among the farmers of U.P., Bihar, Chhattisgarh, Jharkhand, Karnataka, Orissa state in last couple of years. Farmers of Vidarbha, Assam, Meghalaya and Nagaland have shown keen interest in cultivation of Khus and have started cultivating Khus for higher incomes.

Efforts are being made to popularize the cultivation technology of vetiver crop variety CIM-Vridhi through bio-village mode, extending to more than 10000 ha area of the country and about 22000 numbers of farmers are engaged in cultivation of this crop in U.P., Bihar, and Karnataka etc. It is estimated that about 115000 kg good quality oil is being produced per annum based on the technology and variety developed by CSIR-CIMAP which is valued at about Rs 150 crore with an employment generation of about 15,00,000 mandays.

- **Cultivation of medicinal and aromatic plants in Jammu and Kashmir: S&T interventions by CSIR-Indian Institute of Integrative Medicine (CSIR-IIIM), Jammu**

i. Srinagar

CSIR-IIIM, Jammu is responsible to introduce cultivation of medicinal and aromatic plants such as Rose, Lavender, Clarysage, Rosemary and Geranium in Kashmir region. Improved varieties of these plants have been developed which find use in pharma, aroma, flavor and fragrance industry. Seven companies have come up in Kashmir region to cultivate aromatic plants as an industry and more than 40 farmers have been roped in as contract farmers of these plant varieties. The value added products isolated from these plant varieties find good market outside India that fetches them premium prices. The cultivation of these varieties has provided self employment to many rural and underprivileged farmers.

ii. Gurez

Gurez valley remains snow bound for six months. Field demonstration centre have been established in the Gurez area for providing planting material to the farmers for medicinal and aromatic plants generating employment and revenue. Mint, lavender, *Rosa demascena* and *Monarda citriodora* are best suited crops for this area and were successfully introduced.

iii. Pahalgam

Lavender Park has been developed in Pahalgam in collaboration with Pahalgam Development Authority (PDA) where it has shown profuse growth. The area which is thronged by a very large number of domestic and international tourists, Lavender park has resulted in popularizing Kashmir lavender as a brand in the International Market.

iv. Bhaderwah, Jammu

Medicinal and aromatic plant garden was developed in village Dardu (Bhaderwah) in collaboration with Bhaderwah Development Authority and local farmers. Field demonstration and Training programmes and kissan melas were held in collaboration with KVK Bhaderwah. *Lavendula officinalis and Rosemarianus officinalis* crops which are alternative high income crops, are slowly replacing traditional low income crops in the area by rural farmers for their self employment and additional revenue.

- **Fresh Orders for Setting up of RO desalination Plants in Rajasthan**

Based on the proven performance of the RO desalination units in Rajasthan and the quality of service rendered, CSIR-CSMCRI received order from Department of Science & Technology, Govt. of Rajasthan for setting up 50 indigenously designed RO plants during the current year. The distinguishing feature is the high recovery of product water and management of fluoride in reject stream.

VII-B. CONSULTANCY DEVELOPMENT CENTRE (CDC)

In the Twenty Seventh year of operation, Consultancy Development Centre (CDC) an Autonomous Institution of Department of Scientific & Industrial research (DSIR), Ministry of Science and Technology, Government of India has continued to advance its mission to "*To improve business climate and promote consultancy profession through capacity building, sharing best practices and incorporating quality, integrity and sustainability in Professional services*".

During the year 2012-13, CDC carried out both developmental and revenue generating activities. This Report captures details & achievement of CDC in various activities. Some of the new initiatives undertaken during the year are as follows:

- Project Report for setting up "Indian Institute of Consultancy Management (IICM)"
- Development of virtual network and a portal for clients & consultants to interact & transact
- Scheme on "Financial Assistance to Micro, Small & Medium Enterprises for availing consultancy support"
- Design & Development of new certificate programmes in HR & IT consulting

PLAN SCHEMES/ ACTIVITIES

During the year plan support of Rs. 316.00 lacs was received from DSIR for carrying out following schemes/ activities/ projects in each cluster:

Sr. No.	Cluster	Activities/Projects
1	**Programme for Promotion & Innovation in Consultancy**	Preparation of Project Report for Setting up Indian Institute of Consultancy Management (IICM)
		"Consulting Ahead"- Publication for and by the consultancy professionals
2	**Programme for facilitation to Consultant/Clients**	Designing and Developing a virtual network through a portal for clients and consultants to interact and transact
		Study on Consultancy Procurement Guidelines for States and Capacity Building for use of consultancy services by Ministries/Departments of Central/State Governments and Client organizations
		Capacity Building Programmes on "Selection of Consultants" with TCOs
		Scheme on 'Financial Assistance to Micro, Small & Medium Enterprises for availing consultancy support" (FACS-MSME)
		Study on building Consulting Practic es – Experiences of leading consultants
3	**Programme for Research in Consultancy**	Study on "Developing Models, Mechanism, and Framework for monitoring and quality assessment of services provided by consultants"
4	**Programme for Competency Development**	Defining Competency Standards, Process Capabilities and Development of Methods, Models and Learning Resources for Acquisition of Skills and their Certification for Business Process Automation
		Accreditation Scheme for Consultants and Consulting Firms
5	**Programme for Technology Delivery, Transfer & Commercialization**	Technology Mapping for development and transfer of technology
		Advocating Green Shelter and Energy Efficient Habitat Eco-System
6	**National Programme for Knowledge Management**	Programme on "Buildin g Capacities for Consultancy Development and Knowledge Management with Partner Institutions (KMPI)"
7	**Programme for Consulting Education**	Design and develop new Certificate Programmes in HR & Talent Management Consulting
		Fellowship Scheme
8	**Programme for Export Promotion & International Collaborations**	Study on Export of Consultancy Services - Middle East Countries, African countries/ Asia Pacific & SAARC Countries, CIS Countries
		Scheme for Exposure of Consultants & Client's to International Consulting Practices through Seminars and Conferences
		Scheme for Exposure of Women Consultants to International Consulting Practices through Seminars and Conferences
9	**Economic Assessment Studies**	Report on Anti- Microbial Resistance in Livestock
		Economic Impact Assessment Survey of CSIR 'Ukraine Clay Substitute for Vitrified Tiles'

FUNDED PROJECTS

During the year, following new projects were secured from various Government Ministries/Departments:

Study on Development of Strategic Roadmap for Translational Research and Innovative Science through Ayurgenomics (TRISUTRA) and output mapping of IGIB

Objective:

- To benchmark with best practices by identifying and studying similar multidisciplinary systems/ translational research areas in India and global arena.
- To assess the market landscape of opportunities that may arise from Ayurgenomics.
- To define a strategy for collaborations and alliances with other institutions/ organizations.

- To develop capacity building model(s) to achieve sustainability and multiplying factor to enhance outreach to the community.

Facilitation in Selection of Agency for Design Consultancy Services for setting up of Clean Rooms and related Infrastructure for Advanced Facility for Nano-Electronics at CSIR –CEERI, Pilani

Objectives:

To provide the Consultancy Services to CSIR – Central Electronics Engineering Research Institute (CSIR – CEERI), Pilani in selection of a suitable agency for carrying out a Design Consultancy for setting up of Clean Rooms and related Infrastructure for Advanced Facility for Nano-Electronics at CSIR-CEERI, Pilani. This involves the following advisory services:

- Preparation of Expression of Interest (EOI) / Request for Proposals (RFP)
- Inviting Proposals
- Evaluation and finalization of the Agency
- Final recommendation based on Techno-Financial considerations

Impact Assessment Study of various 11th Plan Schemes of Directorate of Forensic Science Services (DFSS), Ministry of Home Affairs, Government of India.

Objective:

The objective of the impact assessment study was to assess the impact of various 11th Plan Schemes of DFSS and to evaluate their performance in terms of financial and physical progress made, thereby, assessing the benefits accrued and making recommendations/suggestions for improvement based on the same.

Conducting Capacity Building Awareness Programmes on QMS/QTT in MSME Sector in India.

Objective:

The objective of the assignment was to conduct 15 nos. of Capacity Building Awareness Programmes on Quality Management Systems/ Quality Management Tools (QMS/QTT) for MSME Sector in India.

Training and Consultancy Services for Implementation of ISO 9001: 2008 Quality Management System (QMS) at National Institute of Hydrology, Ministry of Water Resources, Roorkee

Objective:

The objective of the assignment was to facilitate National Institute of Hydrology (NIH), Ministry of Water Resources, Roorkee in Implementation of ISO 9001:2008 Quality Management System (QMS) at their organization.

Training and Consultancy Services forImplementation of ISO 9001: 2008 Quality Management System (QMS) at Department of Scientific & Industrial Research (DSIR), Ministry of Science & Technology, Govt. of India

Objective:

The objective of the assignment is to facilitate Department of Scientific & Industrial Research (DSIR), Ministry of Science & Technology in Implementation of ISO 9001:2008 Quality Management System (QMS) at their organization.

Digitization and Updation of Employee Records and Creation of Job Profile for IES Division, Ministry of Finance, Govt. of India

Objective:

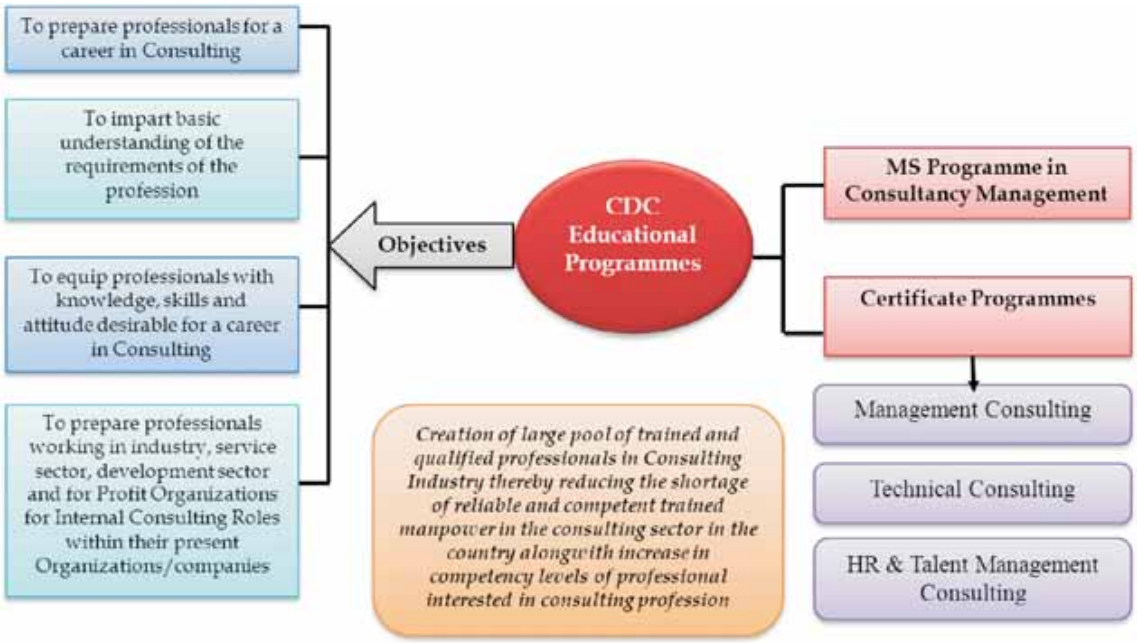
The objective of the assignment is to digitize the existing employee records of all the IES officers of Ministry of Finance and to create Job Profiles for the various posts/ designations held by an IES officer.

EDUCATIONAL PROGRAMMES

Financial Performance

During the financial year 2012-13, Centre was provided Plan funds of Rs. 316.00 lakhs for carrying out various activities relating to consultancy development and promotion.

Expenditure of Rs. 541.96 lakhs was incurred and the total revenue generation from various programmes& activities during the year was Rs. 340.95 lakhs.


To prepare professionals for a career in Consulting
To impart basic understanding of the requirements of the profession
To equip professionals with knowledge, skills and attitude desirable for a career in Consulting
To prepare professionals working in industry, service sector, development sector and for Profit Organizations for Internal Consulting Roles within their present Organizations/companies
Objectives
CDC Educational Programmes
MS Programme in Consultancy Management
Certificate Programmes
Management Consulting
Technical Consulting
HR & Talent Management Consulting
Creation of large pool of trained and qualified professionals in Consulting Industry thereby reducing the shortage of reliable and competent trained manpower in the consulting sector in the country alongwith increase in competency levels of professional interested in consulting profession

DSIR ANNUAL REPORT

Public Sector Enterprises

A. National Research Development Corporation (NRDC)

B. Central Electronics Limited (CEL)

VIII

सत्यमेव जयते

VIII. PUBLIC SECTOR ENTERPRISES

VIII-A. NATIONAL RESEARCH DEVELOPMENT CORPORTION

1. INTRODUCTION

The National Research Development Corporation (NRDC) is a premier organisation, under Department of Scientific & Industrial Research (DSIR), Ministry of Science & Technology, engaged in the development, promotion and commercialisation of the R&D results/technologies emanating from Research Institutes/Universities/Industries, etc. The Corporation provides comprehensive technology transfer services and acts as a catalyst for transforming innovative research into marketable industrial products. NRDC is a unique organisation because it is the only public enterprise wholly dedicated to transfer of technologies developed at R&D laboratories to industry. During the past six decades of its existence, the Corporation has developed strong links and network with various R&D organisations in the country as well as abroad for transfer of technologies. Its operations cover the entire spectrum of industrial technologies ranging from chemicals to metallurgy, mechanical engineering, electrical engineering, electronics, biotechnology and so on.

2. PROFIT

During 2012-13, the Corporation continued to face leadership crisis and hardship and as a result could not maintain all round progress in its activities. The dedicated, hard and sincere work of the employees of the Corporation could not fetch enough revenue earnings to overcome the financial obligation. The Corporation's gross income was Rs. 709.86 lakhs, as compared to Rs 1073.32 lakhs in the previous year.

During 2012-13, the Corporation ended up with Deficit before Tax of Rs. 247.60 lakhs as compared to a deficit of Rs. 61.81 lakhs in the previous year.

The Department of Public Enterprises has given 'Fair' rating to the Corporation for its MoU performance during 2012-13.

3. PROCESS ASSIGNED AND LICENCE AGREEMENTS CONCLUDED

The Corporation continued to lay emphasis on broadening and strengthening the technology resource base by nurturing long-term relationships with R&D institutions as well as universities, technical organizations, industries and also individual inventors. This endeavor is reflected in the Corporation signing Memorandums of Understanding/Agreements with several new organizations for assignment of technologies developed by them. These organizations are indicated below :

- Calcutta University, Kolkata
- Devi Ahilya Vishwavidyalaya, Indore
- Tea Research Association, Kolkata
- National Institute of Spices Research, Thiruvananthapuram

PROCESS ASSIGNED

During the year, 66 new processes were assigned to the Corporation as compared to 32 no. of processes in the previous year. Some of the commercially important processes assigned to the Corporation from various research institutes, universities were:

Indian Agriculture Research Institute (IARI), Pusa, New Delhi

- A novel formulation of the plant growth promoting rhizobacteria with enhanced shelf-life and the method of its preparation
- A slow or controlled release mosquito larvicidal composition and a process for its preparation thereof
- Improved neem larvicidal compositions

Govind Ballabh Pant University of Agriculture & Technology, Pantnagar, Uttrakhand

- Polymeric seed coat based on bioactive botanicals

Vivekananda Parvatiya Krishi Anusandhan Sansthan (VPKAS), Mall Road, Almora, Uttarakhand

- Bacterial entomopathogen based biocontrol agent for management of white grubs

All India Institute of Medical Sciences, Ansari Nagar, New Delhi

- Novel topical natamycin formulation for ocular antifungal therapy

Central Coir Research Institute (CCRI), Kalavoor, P.O. Alleppey, Kerala

- A mobile coir fibre extraction machine
- A mild steel metallic handloom 'ANUGRAHA' for weaving coir geotextiles
- Apparatus and process for extraction of biopesticide from cassava bio-wastes

Central Sericultural Research & Training Institute (CSR&TI), Mysore, Karnataka

- A semi-synthetic diet for rearing young instar tropical tasar silkworm, antheraea mylitta

Tea Research Association, Kolkatta, West Bengal

- Tea tablet

MAJOR TECHNOLOGIES LICENSED

The Corporation managed to sign 28 licence agreements during the year compared to 33 number of licence agreements signed in the previous year. Some of the major technologies licensed by the Corporation in the financial year were :

Indian Agriculture Research Institute (IARI), Pusa, New Delhi

- A novel superabsorbent hydrogels

University of Agricultural Sciences, Bengaluru, Karanataka

- Production of Karnataka Rice Hybrid-2 (KRH-2)

Central Sericultural Research & Training Institute (CSR&TI), Mysore, Karnataka

- POSHAN–a multinutrient formulation for correcting the nutrient deficiencies in mulberry

The Neyveli Lignite Corporation Limited, Neyveli, Tamil Nadu

- Manufacture of potassium humate from lignite

Central Mechanical Engineering Research Institute, Durgapur

- Soleckshaw

National Dairy Research Institute, Karnal, Haryana

- New colour based method for detection of detergents in milk

Vector Control Research Centre, Pudducherry

- Mosquito larvicidal formulation of *Bacillus Thuringiensis Var. Israelensis*

Central Council for Research in Ayurveda and Siddha, New Delhi

- Balarasayana
- Ayush ghutti

Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, Uttarakhand

- Bacterial entomopathogen based biocontrol agent for management of white grubs

During the 12th five year Plan the Corporation has taken up two new schemes viz.

1. Programme for Inspiring Inventors and Innovators (PIII)

2. Programme for Development of Technologies for Commercialisation (PDTC)

4. PROGRAMME FOR INSPIRING INVENTORS AND INNOVATORS (PIII)

Prize Award for Meritorious Inventions

The activity is aimed at stimulating the spirit of inventiveness not only among scientific and technical personnel and industrial workers but also among technicians, artisans, craftsmen and the merging youth force in the community, so that the creative talent which lies hidden in individuals or groups outside the organized R&D System could be harnessed for the benefit of the nation.

Since 2007, the Corporation has teamed up to create a unique annual event **"Innovate India"**. This event is organized for the distribution of NRDC Prize Awards for Meritorious Inventions followed by a conference. The Corporation organized this year event "Innovate India 2013" at Mohali in association with National Institute of Pharmaceutical Education and Research (NIPER).

The Award Ceremony was followed by a two days Conference on "Innovation for Equitable Growth" at Convention Centre, NIPER Mohali, Punjab on February 21st & 22nd, 2013. The event provided a strong platform to entrepreneurs, corporates, academicians, researchers and students for an exchange of ideas on latest technological innovations and developments addressing the multidimensional challenges and interrelated characteristics of science and innovation for sustainable development. It was inaugurated by Dr. Girish Sahni, Director, Institute of Microbial Technology (IMTECH), Chandigarh and attended by a large number of young innovators, scientists, students, researchers, industrial personnel and entrepreneurs.

On this occasion Director, IMTECH presented the NRDC Meritorious Invention Awards (2011) to the inventors/ innovators. He also presented World Intellectual Property Organization (WIPO) Gold Medal for the year 2011 for best inventor and best woman inventor. A total of 17 lakhs were given to twelve inventors for five inventions out of a total number of 225 applications received by the Corporation for the year 2011.

Prize award ceremony was followed by a two-day summit which deliberated on areas of innovation that drive equitable growth. Presentations on the awarded inventions by the awardees were made at the conference in the last session of the first day. In other sessions presentations were given on: Product Design and Technological Innovation, Innovation in Knowledge Delivery System, Culture of Innovation for MSMEs, Skill Development, Innovations in Food Sector, Affordable Healthcare and IPRs *vs.* Open Source.

Intellectual Property and Technology Facilitation Centres

The Micro, Small and Medium-sized Enterprises (MSMEs) are often the driving force behind such innovations. Their innovative and creative capacity, however, is not always fully exploited, as many MSMEs are not aware of how these emerging trends can help and safeguard them. To help MSMEs to fully utilize the emerging trends in their business activities, NRDC has established a facilitation center at Bangaluru with support of MoMSME. The objective of the Intellectual Property Facilitation Centre for MSME is to focus on protection and management of IP for the MSME by facilitating IP protection and innovation management in changing economic environment.

The cente is now functional at the campus of M.S. Ramaiah School of Advanced Studies located in Peenya Industrial Estate which is one of Asia's largest small-scale industrial hub.

The IPFC has been catering to the micro, small and medium enterprises in the region providing consultation and facilitation services for protection of their intellectual properties like patent, trademark, design registration, copyright and geographical indication. The industries in the region are being sensitised regarding their intellectual properties and protection of the same by way of organizing awareness programmes, IPR workshops, participation in industrial meets, etc. The Centre has facilitated filing of ten patent applications, three trademark applications and one copy right application. Research and documentation work for filing of one geographical indication from Karnataka is in progress. Several patent search and analysis has been carried out for various industry clients from Karnataka.

Intellectual Property & Innovation Facilitation

With increase in development of new processes/ technologies at various research institutes,

universities, laboratories, small and medium enterprises, the protection of the Intellectual Property and its management has become the most important activity amongst the research organizations and universities. Realizing the importance, the Corporation continued its drive to create mass awareness about IP Protection and Management among all the sections of the society.

In order to promote indigenous inventive activity, the Corporation provides financial and technical assistance to the inventors working in R&D organizations, academic institutions and universities, etc for patenting of their inventions in India without any obligation of the assignment of the patent to the Corporation. During the period under review, the Corporation has provided financial assistance to 47 applicants for filing of their Patent Applications in India in various sectors of technologies.

The success of the Corporation in securing Indian Patents is phenomenal as the Corporation before filing any patent application, ensures the novelty aspect of the invention by conducting Patent Search. The Corporation conducted 81 Patent Searches during the year.

The Corporation has also provided patent consultancy services to large Public Sector Enterprises of Governmentt of India like The Neyveli Lignite Corporation Ltd, Neyveli, The BEML Ltd, Bengaluru and The National Thermal Power Corporation Ltd, Greater Noida.

The Corporation in its endeavour to spread the knowledge on various issues of IPR across the country has collaborated with various organizations and organized 10 workshops in different parts of the country on 'Intellectual Property & Innovation Management in Knowledge Era'. All these workshops were widely appreciated.

Knowledge Management Programme for Promotion of Innovation/Technologies

The Corporation introduced the Knowledge Management for promotion, development and commercialization of technologies. It is a self-propelled mechanism for systematic identification and evaluation of the technologies, by a team of experts, who deliberate and suggest value addition required for making a complete technology package for commercialization of technologies, so that the chances of success become high. During 2012-13, 18 technologies related to Biotechnology, Agriculture, Ayurveda & Herbal were discussed in 4 meetings of expert panel/s. The Committee suggested various value additions required for the technology(ies) including market survey, field trials, preparation of technology document/feasibility report etc. The Corporation as per advice and suggestions undertook development projects, and other value addition activities, which helped the Corporation in licensing of technologies.

5. PROGRAMME FOR DEVELOPMENT OF TECHNOLOGIES FOR COMMERCIALISATION (PDTC)

Basic Engineering Design Package (BEDP)

The activity of developing a Basic Engineering Design Package (BEDP) was initiated for value addition and making a complete technology package for the entrepreneur, so that setting up of the commercial plant becomes easier and its chances of success become high. In order to take the process to a pilot scale or to a commercial level, it requires a detailed study for working out the final process scheme, which can be obtained through series of simulation of the laboratory scale process and then incorporating required engineering input so that the process is workable. Once the BEDP is prepared based on the data the feasibility study and Detailed Project Report (DPR) can be prepared. With these reports it becomes easy for the Entrepreneur to carryout detailed engineering for setting up the commercial plant. The reports also help the Corporation in planning of the marketing of its technologies.

The BEDP was prepared for the following technologies assigned to the Corporation during the financial year 2012-13 :

1. Osmotic dehydration of amla/anola, mango, papaya and pineapple

2. Polymeric seed coat based on bioactive botanicals

3. Equi herpabort vaccine

Market Survey

The Corporation carried out Market Surveys for the assigned technologies to adjudge its market potential. These Market Survey Reports have played an important role in finding out the commercial potential of the technologies and demand of the product. The

following market surveys were conducted during the financial year 2012-13:

1. Dried flower technology

2. Development of oligonucleotides for detection of XDR-TB and rapid detection of MDR-TB

3. Novel primers for a PCR-RFLP assay identification of pathogenic mycobacteria

4. Dried blood spot collection kit for sub-clinical deficiency of Vitamin-A

5. Preg-mare kit for pregnancy diagnosis in horse mares

Development Projects

The commercialisation of research work carried out at Research Institutes, Universities (Lab scale technologies) requires further development work like upscaling, pilot plant study, authentication/ validation of the product, etc. The Corporation identifies projects on the basis of workability of assigned technologies, their market potential, technical viability, foreign collaborations/ collaborating agencies etc. and sponsor time bound technically viable development projects. Accordingly, during the year the Corporation completed the project on "application of Pusa-Hydrogel in selected disposable absorbent hygiene".

Programme for Innovation in Rural and North-Eastern States

To identify the S&T needs of the people in backward, rural and north-eastern region of the Country in relation to their basic needs and to facilitate new avenues of employment generation through technological intervention, the Corporation supported the endeavour of developmental agencies to use technologies for employment generation during the financial year 2012-13 through two separate Programmes, i.e., Promotion of Entrepreneurship in Backward and Rural Areas through Innovative Appropriate Technologies (PEBRT) and Programme for North-Eastern Region (PNER) under NERD Programme. Under PEBRT programme, the Corporation developed linkages with Centre of Advanced Studies in Marine Biology, Faculty of Marine Sciences, Annamalai University, Tamil Nadu; Rural Community Trust, Mugaiyur, Villupuram District, Tamil Nadu; Science Technology and Development Initiative, Hauz Khas, New Delhi; Shristi, Vikaspuri, New Delhi; and United Sports Association, Dist. Khurda, Orissa and popularized technologies on Spirulina Algae, Low Cost Bio Toilets, Agarbatti Production from Agrowaste and Apricot Processing Unit in rural areas with their support

In north-east region the support was extended to North-Eastern Industrial and Technical Consultancy Organization Limited (NEITCO), Guwahati, for conducting an entrepreneurship cum skill development training programme for rural youth on Electrical Wiring & Goods Repairing under PNER Programme at Aizawl, Mizoram.

Exhibitions and Publicity

Participation in exhibitions, seminars, workshops and entrepreneurship development programs are of vital importance for the creation of awareness about the role of the Corporation in technology transfer and technologies available with the Corporation for transfer. With this objective in view, the Corporation participated in 19 exhibitions, seminars and get-togethers.

Publications

NRDC continued to publish its Hindi science magazine (monthly) "Awishkar". The publication is aimed at propagating information and creating awareness about new technologies, inventions, innovations, IPR issues etc. amongst the masses and fostering the spirit of inventiveness, innovativeness and entrepreneurship amongst the students, scientists, budding entrepreneurs, students, etc. Some of the important topics covered are : Indian Space Programme–a journey of 50 years; CSIR-National Botanical Research Institute; India at Large Hadron Collider; Centenary Year of Indian Science Congress; Aakash-2 tablet computer, India at International Thermonuclear Experimental Reactor; Astronomy of Kumbh; various applications of Microwaves; Nano-liquids; Cloud Computing; Climate change; and Green Computing.

6. HUMAN RESOURCE DEVELOPMENT

The thrust for better utilisation of Human Resource and improvement in work practice continued during 2012-13. Training and development at all levels of employees was given due priority by the Corporation to increase

effectiveness. Special emphasis was given to organisation building and shaping right attitudes, team building and work culture, besides preparing employees to understand the trends in fast changing technology and switching over to latest technology for achieving higher results in productivity and profitability. During 2012-13 15 training programmes were organised for the officials of the Corporation to further develop their skills in various areas of management, communication, vigilance and advancement of technology.

7. TECHNOLOGY ABSORPTION, ADAPTATION AND INNOVATION

While a major objective of the corporation is the development and commercialisation of indigenous technology, the Corporation itself does not carry out any R&D. However, it promotes and finances R&D on a selective basis in both laboratories and industry. Hence the requirement to furnish information in respect of Technology Absorption, Adaptation and Innovation under Rule 2(B) of Companies (Disclosure of Particulars in the Report of Board of Directors) Rules, 1988, is not applicable to the Corporation.

8. IMPLEMENTATION OF OFFICIAL LANGUAGE

The Corporation continued to make efforts to fulfil the targets prescribed by Govt. of India in the Official Language Act and Rules framed there in with regard to increasing the use of Hindi Rajbhasha in office during the year 2012-13. Employees were motivated to use their working knowledge of Hindi in day-to-day official work. All the Standard Forms, Files, etc are bilingual. Significant progress has been made in the field of correspondence, noting and drafting in Hindi. All Hindi letters are being replied in Hindi only. The Annual Report of the Corporation is being published in diglot form in both Hindi & English since 1986-87. The Corporation also publishes a popular Science & Technology monthly magazine in Hindi, entitled 'Awishkar'.

To enrich Hindi vocabulary of the employees of the Corporation as well as visitors, an English word with its Hindi meaning is written daily on a writing board as 'Today's word' at the reception of the Corporation.

VIII-B. CENTRAL ELECTRONICS LIMITED

1. INTRODUCTION

Central Electronics Limited (CEL) is a Public Sector Enterprise under the Department of Scientific and Industrial Research (DSIR), Ministry of Science & Technology, Government of India. It was established in 1974 with an objective to commercially exploit the indigenous technologies developed by National Laboratories and R & D Institutions in the country. CEL is one of the companies that utilized home grown technologies during all these years of its existence. The Company is primarily engaged in production of strategic components for defence applications of national importance, equipment for railway safety and solar photovoltaic modules and systems.

The Company has developed a number of products for the first time in the country through its own R & D efforts and in close association with the premier National & International Laboratories including Defense Laboratories. In recognition of all these efforts, CEL not only have the distinction of being a DSIR recognized R & D Company, but also has been honored a number of times with prestigious awards including **"National Award for R & D by DSIR"**.

CEL holds a unique position among the family of Public Sector Enterprises in the country, with its emphasis on indigenous technology inducted both from its in-house developments and from the National Laboratories, for its production programme in diverse high-technology areas of national importance. CEL has facilitates networking with leading research laboratories and leading institutions in India (IIT, IICT, NCL, NPL etc.) and abroad (UNSW, Georgia Institute of Technology, EPFL etc.). The company is already approved from the year 1994 as an R & D centre from the DSIR.

CEL has already established partnerships and linkages with various state-holders and business associates in the areas of railways, telecom, police, power generation and distribution companies, service providers in the energy sector, public funded institutions and even rural communities through the state governments. The existing marketing channels are being consolidated and expanded harnessing the unique advantage CEL has in terms of its Government backing.

The renewed mandate of CEL includes development and harnessing technology for **(i)** Solar Energy Systems and Solutions **(ii)** Strategic Electronic Components and systems required for Defense, Space, Atomic Energy and other Science & Technology Mission **(iii)** Signaling and Safety in Public Transport Systems **(iv)** Infrastructure, Eco-systems management and energy conservation and **(v)** Security and Surveillance in strategic establishments.

CEL has been the pioneer in the country in the different areas of manufacturing & proprietary manufacturer of the many strategic electronic components for use by defense organizations in the country.

2. OPERATING RESULTS (2012-13)

During the year (2012-13) the Company recorded production of Rs. 183.92 Crores and sales of Rs. 192.13 Crores against the previous year (2011-12) production of Rs. 151.49 Crores and sales of Rs. 160.02 Crores.

During the year (2012-13) under review company incurred a net loss of Rs. 2.41 Crores as against the net loss of Rs 15.91 Crores in the previous (2011-12) year.

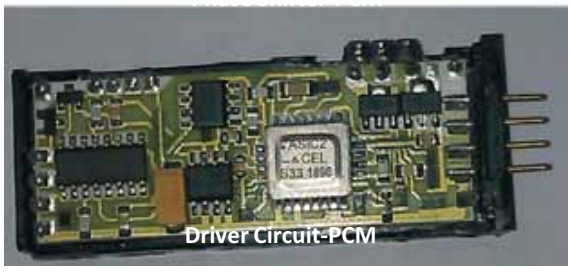
2.1 Exports

During the year 2012-13, exports have been Rs. 25.88 Crores, as against Rs.7.0 Crores in 2011-12.

2.2 Major Achievements (2012-13)

- During the year, company has supplied 29,977 nos of Phase Control modules (PCMs) worth Rs. 4456 Lakhs. Company has enhanced capacity to 40,000 Nos PCM/year and exported PCMs to European countries in substantial quantities.

Phase Shifter PCM



Driver Circuit-PCM

- Company has implemented ERP for cost effective management
- Company has successfully transferred the approx 15 MW/year module manufacturing facility in Mozambique
- Company has developed large size Cadmium Zinc Telluride (CZT) substrate
- Company has expand production for three new products for railways High Availability Single Section Digital Axle Counter (HASSDAC), Multi Section Digital Axle Counter (MSDAC) and Block Proving by Axle Counter using Universal Fail Safe Block Interface (UFSBI)

- Company has enhanced Business with introduction of SPV channel partners
- Company has successfully exported SPV products to different countries such as Sudan, Namibia, Afghanistan, Mali etc. During the year,

Rs. in Crore

	2012-13	2011-12
Production	183.92	151.49
Sales	192.13	160.02
Gross Margin	5.20	(-)8.55
Gross Profit	2.51	(-)11.05
Net Profit before tax and extra ordinary items	(-)2.41	(-)15.65
(+) Net Profit/(-) Net Loss after tax and extra ordinary items	(-)2.41	(-)15.91

company has successfully installed various power plants at different locations such as Central Building Research Institute (CBRI) Roorkee, SSB Uttrakhand and different academic Institutions/Universities/Colleges in the country.

Gynanpeeth College, Assam

Khoirabari College, Assam

Dhudhnoi College, Assam

- Company has improve the solar cell efficiency approx 1 % by strong R & D support
- Company has installed 100 KW PV power plant to reduce the light load
- Company has started strong R & D collaboration with National labs for reduction of product rejection
- Company has successfully completed first year of M. Tech programme in two stream namely (i) Solar Photovoltaic and Renewable Energy and (ii) Operational Management and Lean ERP jointly started with SRM University.
- Company has introduces a six months certificate training course for diploma holders in two branches (i) Solar, Photovoltaic, System–Installation, Commissioning, Operation & Maintenance (ii) Manufacturing of Solar Photovoltaic Cells & Modules
- During the year, company has provide the summer training of 670 B. Tech/M. Tech/MBA students of different Universities/Colleges

3. FUTURE STRATEGY

As a Public Sector Undertaking (PSU) of the Government, Company programmes and business plan projection, business operations for production, distribution, marketing and sales support services are always aligned with the programmes being implemented by the Federal and State Governments in India. Company has proposed ambitious objective of diversification of products and new ventures. The different future objectives and strategies are:

- Increase market share of Solar Photovoltaic's (SPV) and Railways Safety & Signaling systems with more channel partners tie up
- Switch over to 156 x 156 mm cell manufacturing process to increase output
- Up-gradation of approx 25 MW/year module manufacturing capacity
- Develop new technology based solar cells/ module through collaboration with different University and National labs such as Dye Sensitized Solar Cells (DSSCs) to reduce the production cost & increase efficiency
- Enhance the production capacity of PCM to 60,000 nos. per annum and interacting with National Labs for reduction of PCM rejection rate
- Development of new projects for Tellurium purification, Germanium Crystal Growth and CIGS Flexible module project for defence requirement

- Exploring Export options for CZT crystal and other products
- Adoption of new technology/products and Modernization and Up-gradation of Plant & equipments for new technology/products
- Diversification, technology tie ups with international majors
- Implementation of Key Research Area (KRA), Quality circles, Employees suggestion scheme Regular Training Programs, Open house discussion, Multi disciplinary team and Workers Participation in Management by Shop Floor/ Plant Level meetings
- Development and Up-gradation of Train Protection and Warning System (TPWS)
- Development of Scanning, Security and Surveillance equipment and exploring tie ups for Security Systems
- Common user R&D and Training center to cater to the needs for design, development, testing and validation of all product portfolio and development of new products
- Enter in the emerging Business in the Area of Power Electronics (Cleantech), Sensor and communication technology
- Development of new products such as Micro-Inverter, Solar Powered RO systems for village and Magnetron Production

4. FOREIGN EXCHANGE RECEIPTS AND OUTGO

During the year under review, company has spent 18.71 Crores in foreign exchange as against 29.28 Crores in the previous year towards purchase of raw material, components and spares, capital goods, travel etc. Company earned foreign exchange of 5.09 Crores as against 6.73 Crores in the previous year from export of its products.

5. ENERGY CONSERVATION

The company being an electronic industry, its operations are not energy intensive. However, the company frequently evaluates its processes and plant and machinery to economize on its energy consumption. To reduce power consumption, conventional tube lights and bulbs have been replaced with CFLs. It has done redistribution of the leads in the solar photovoltaic plant so as to make optimum use of its captive DG sets. The company has recently installed a 100 KWp PV power plant & same under consideration to reduce over reliance on the conventional grid parity. More than 1,000 poplar plants have been planted. A nursery of poplar plants has been set up to provide saplings for further plantation next year. Thus, the company is putting in efforts towards improvement of the environment.

6. PARTICULARS OF EMPLOYEES

In accordance with the Companies (particulars of employees) Rules 1975 read with Sub-section 2-A of Section 217 of Companies Act 1956 as amended in 1988, none of the employees of the Company either employed throughout the year or for a part of the year under report, was in receipt of remuneration more than the maximum prescribed in the Rules.

7. IMPLEMENTATION OF HINDI, INDUSTRIAL RELATIONS AND HUMAN RELATIONS

The company had very cordial industrial relations during the year. The management also initiated programmes for upgrading the skills of the employees. In order to ensure the use of Hindi, the employees continued to be trained in Prabodh, Praveen, Pragya Hindi Courses, Hindi typewriting and use of Hindi Computers. Hindi week was organized from 14th to 21st September, 2013. Various short-time training programmes and workshops were conducted for workers and officers during the year. Special workshops and various competitions in Hindi were organized and awards distributed to the winners. Half-yearly Hindi Newsletter 'HAMARA CEL' was also published.

8. WELFARE OF RESERVED CATEGORIES

All Government Directives relating to the reserved categories such as SC, ST, Physically Handicapped, and Ex-servicemen etc. continue to be implemented during the year. Total number of employees in these categories was 138 which represent about 23.55% of the total strength of the Company as on 31.3.2013.

DSIR ANNUAL REPORT

Administration & Finance

1. Administration

2. Finance

3. Audit Observations by CAG

IX

सत्यमेव जयते

IX. ADMINISTRATION AND FINANCE

1. ADMINISTRATION

The Department of Scientific & Industrial Research (DSIR) was created in January 1985. The Administrative Division of the Department, comprising Establishment Section, General Section and Vigilance Unit, looks after activities related to personnel, implementation of the Flexible Complementary Scheme (FCS) promotion mechanism meant for the Scientists (Group 'A'), foreign deputations of officers, vigilance matters, administrative reforms mechanism, work relating to CGHS facilities, staff welfare, coordination etc.

Since both DST & DSIR are situated in same premises, all the celebrations such as S & T Foundation Day, Technology Day, Retirement Meetings, Sadbhavana Divas, Sports, Staff Welfare get-togethers, Hindi Pakhwada, Vigilance Week, etc are celebrated as a common event with active cooperation of both Departments.

1.1 Staff Strength

The staff in position in different groups in the Department (other than that of autonomous bodies viz. Council of Scientific and Industrial Research (CSIR) and Public Sector Undertakings viz. National Research Development Corporation (NRDC) / Central Electronics Limited (CEL) as on 1st January 2014 is given below:

	General	SC	ST	OBC	Total
Group 'A' (Gazetted)	31	5	4	1	41
Group 'B' (Gazetted)	7	,,1	0	1	9
Group 'B' (Non-Gazetted)	18	4	2	1	25
Group 'C' (Non-Gazetted)	3	8	-	2	13
Total	59	18	6	5	88

1.2 Promotion of Rajbhasha

The Official Language Section of the Department, manned by an officer of the level of Deputy Director (OL), has made relentless efforts towards implementation of the instructions issued by the Department of Official Language for implementation of the Official Language Policy in the Department and the Autonomous Bodies and Public Sector Undertakings under its administrative purview. Hindi Section of the Department carries out translation work under Section 3(3) of Official Language Act. The Department has taken the following steps for progressive use of Rajbhasha in the official work, as also implementation of Official Language Policy of the Government:

- Quarterly meetings of Official Language Implementation Committee held under the chairmanship of the Joint Secretary (Admin) of the Department, who is the Nodal Officer for implementation of the Official Language Policy in the Department. During the year, three meetings were organized and timely follow up action taken;

- The progress reports regarding use of Rajbhasha in the Department sent to the Department of Official Language (Headquarter) every quarter;

- During the year, Rajbhasha inspections carried out in the Attached Offices of the Department, i.e. Council of Scientific & Industrial Research (CSIR) and Consultancy Development Centre (CDC) and the Public Sector Enterprises of the Department, i.e. Central Electronics Limited (CEL) and National Research Development Corporation (NRDC). Inspection of *CSIR – National Institute for Interdisciplinary Science and Technology* (CSIR-NIIST), Thiruvananthapuram, was also carried out during the year.

- Officers requested to make use of the services of Stenographers, Personal Assistants (PAs), Private Secretaries (PSs) trained in Hindi Stenography for doing their official work in Hindi. The Stenographers not knowing Hindi Stenography are being nominated for such training as per training program prescribed by the Department of Official Language from time to time.

- General Administration advised to do their work in Hindi as per Rule 8 (4) of Official Language.

- For compliance of the implementation of the Official Language Policy, effective Check Points have been prescribed.

- *Hindi Pakhwara* observed from 13th-27th September, 2013 in collaboration with the Department of Science and Technology. On the occasion, the message of Hon'ble Home Minister of India was read out. Various competitions with active participation of officers and employees were organized, *viz*. Hindi Poetry, Essay writing, Hindi typing and shorthand, noting and drafting, Translation, Quiz and Hindi dictation (for class IV employees). Winners in the competitions were given cash prizes of Rs.2000/-, Rs.1500/- and Rs.1000/- for first, second and third positions respectively. Consolation prizes at the rate of Rs.500/- were also given away.

- In an effort to fulfill the provisions of the Official Language Policy in the electronic mode, the Department has hosted its official website in English and Hindi. Unicode has been installed in all computers to enable officers/staff to use Rajbhasha in the electronic mode of e-mail. Employees are being imparted Hindi/ computer training.

- During the year, two workshops were organised in the Department to create conducive environment for promotion of Hindi in official work with special emphasis on Section 3(3) of Official Language Act. Officers and staff participated wholeheartedly in the deliberations.

- Workshop on Hindi was organized at *CSIR – National Institute for Interdisciplinary Science and Technology* (CSIR-NIIST), Thiruvananthapuram also.

- 30 English-Hindi Dictionaries were purchased and distributed among officers and staff of the Department with a view to helping encourage increased use of Hindi in official work.

2. FINANCE

The financial summary giving the AE 2012-13, BE 2013-14, RE-2013-14 and BE 2014-15 of various Plan and Non-Plan schemes of DSIR is given in **Table 1**.

3. EXTRACTS FROM CAG'S REPORT

The extracts from CAG's report are given at **Annexure-13.**

Financial Summary

DSIR ANNUAL REPORT

X

सत्यमेव जयते

Table 1: FINANCIAL SUMMARY(Rs. in Crores)
AE-2012-13, BE-2013-14, RE-2013-14, AE-2013-14, BE-2014-15(PROPOSED)

SCHEME	ACTUAL EXPENDITURE 2012-13			BUDGET ESTIMATES 2013-14			REVISED ESTIMATES 2013-14			ACTUAL EXPENDITURE 2013-14			BUDGET ESTIMATES 2014-15 (PROPOSED)		
	Plan	Non- Plan	Total	Plan	Non- Plan	Total	Plan	Non- Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
1. DSIR															
Secretariat Economic Services – DSIR	0.00	7.62	7.62	0.00	10.50	10.50	0.00	10.00	10.00	0.00	8.71	8.71	0.00	10.32	10.32
PRISM	3.73	0	3.73	18.00	0	18.00	4.83		4.83	1.83	0	1.83	18.00	0	18.00
PACE	0.19	0	0.19	17.50	0	17.50	5.84		5.84	0.19	0	0.19	20.00	0	20.00
BIRD	2.07	0	2.07	14.50	0	14.50	5.72	0	5.72	2.61	0	2.61	20.00	0	20.00
A2K+	18.76	0	18.76	34.00	0	34.00	25.19	0	25.19	22.18	0	22.18	21.50	0	21.50
CEL	0.20	0	0.20	18.00	0	18.00	18.00	0	18.0	16.00	0	16.00	29.00	0	29.00
NRDC	0	0	0	8.00	0	8.00	5.72	0	5.72	5.71	0	5.71	9.00	0	9.00
CDC	3.16	0	3.16	4.00	0	4.00	4.00	0	4.00	3.60	0	3.60	2.00	0	2.00
DSIR Bldg. & infrastructure	0	0	0	1.00	0	1.00	0	0	0	0.00	0	0.00	0.50	0	0.50
TOTAL : DSIR	**28.11**	**7.62**	**35.73**	**115.00**	**10.50**	**125.50**	**69.30**	**10.00**	**79.30**	**52.12**	**8.71**	**60.83**	**120.00**	**10.32**	**130.32**
2.CSIR & ONGOING SCHEMES															
Administration	25.00	500.00	525.00	45.00	560.00	605.00	34.00	560.50	594.50	34.00	560.50	594.50	45.00	600.83	645.83
National Laboratories	1211.73	790.20	2001.93	1372.00	875.00	2247.00	1236.70	875.00	2111.70	1236.70	875.00	2111.70	1605.50	880.00	2485.50
Scientists Pool	0.00	7.00	7.00	0.00	7.50	7.50	0.00	7.50	7.50	0.00	7.50	7.50	0.00	8.00	8.00
National S&T HRD (res sch	180.00	96.00	276.00	180.00	105.00	285.00	175.00	105.00	280.00	175.00	105.00	280.00	180.00	108.00	288.00
Intellectual Property & Tech. Dev.	40.00	0	40.00	40.00	0	40.00	35.00	0	35.00	35.00	0	35.00	40.00	0	40.00
New Millennium Indian Tech. Leadership Initiative	40.00	0	40.00	45.00	0	45.00	30.00	0	30.00	30.00	0	30.00	30.00	0	30.00
Innovation Complexes	20.00	0	20.00	76.00	0	76.00	38.00	0	38.00	38.00	0	38.00	63.00	0	63.00
CSIR : NEW SCHEMES															
CSIR-800 Scheme	0	0	0	50.00	0	50.00	1.00	0	1.00	1.00	0	1.00	5.00	0	5.00
CSIR scheme for open innovation	0	0	0	70.00	0	70.00	1.00	0	1.00	1.00	0	1.00	10.00	0	10.00
CSIR initiative for inclusive, participative and collaborative research & Dev.	0	0	0	10.00	0	10.00	0	0	0	0	0	0	0.50	0	0.50
National Civil . Aircraft Dev	0	0	0	10.00	0	10.00	0	0	0	0	0	0	1.00	0	1.00
TOTAL: CSIR	**1516.73**	**1393.20**	**2909.93**	**1898.00**	**1547.50**	**3445.50**	**1550.70**	**1548.00**	**3098.70**	**1550.70**	**1548.00**	**3098.70**	**1980.00**	**1596.83**	**3576.83**
GRAND TOTAL(CSIR+DSIR)	**1544.84**	**1400.82**	**2945.66**	**2013.00**	**1558.00**	**3571.00**	**1620.00**	**1558.00**	**3178.00**	**1602.82**	**1556.71**	**3159.53**	**2100.00**	**1607.15**	**3707.15**

ANNEXURES

ANNEXURE - 1

STATEMENT ON RECOGNITION OF IN–HOUSE R&D UNITS

Month	Year	Receipts	Cumulative Receipts	Disposal	Cumulative Disposal
January	2013	44	99	14	14
Frbruary	2013	18	117	38	52
March	2013	38	155	20	72
April	2013	25	180	11	83
May	2013	16	196	29	112
June	2013	12	208	18	130
July	2013	22	230	24	154
August	2013	20	250	33	187
September	2013	22	272	22	209
October	2013	30	302	26	235
November	2013	30	332	22	257
December	2013	14	346	18	275
January	2014			22	
February	2014			13	
March	2014			7	

ANNEXURE - 2

STATEMENT ON RENEWAL OF RECOGNITION OF IN-HOUSE R&D UNITS WHOSE RECOGNITION WAS VALID UPTO 31.03.2013

Month	Year	Receipts	Cumulative Receipts	Disposal	Cumulative Disposal
January	2013	32	32		
February	2013	20	52	0	0
March	2013	130	182	0	0
April	2013	42	224	102	102
May	2013	10	234	43	145
June	2013	19	253	24	169
July	2013	18	271	27	196
August	2013	15	286	19	215
September	2013	20	306	41	256
October	2013	18	324	18	274
November	2013	18	342	21	295
December	2013	3	345	15	310
January	2014	0	345	8	318
February	2014	0	345	9	327
March	2014	0	345	3	330

ANNEXURE - 3

LIST OF IN-HOUSE R&D UNITS IN INDUSTRY REPORTING ANNUAL EXPENDITURE MORE THAN Rs. 5000 LAKHS

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
1.	Agila Specialties Private Limited	15258
2.	Alembic Ltd.	15170
3.	Apollo Tyres Ltd.	32058
4.	Ashok Leyland Ltd.	58800
5.	Bajaj Auto Ltd.	12460
6.	Bharat Electronics Ltd.	37108
7.	Bharat Heavy Electric Limited	98186
8.	Bharat Petroleum Corporation Limited	17210
9.	Biocon India Ltd.	12450
10.	Cadila Healthcare Ltd.	30170
11.	Cipla Ltd.	37805
12.	Crompton Greaves Ltd.	6100
13.	Cummins India Ltd.	6200
14.	Daimler India Commercial Vehicles Pvt. Ltd.	21922
15.	Delphi Automotive Systems Pvt. Ltd.	11136
16.	Dr. Reddy's Laboratories Ltd.	65092
17.	E-I DuPont India Pvt. Ltd.	21000
18.	Engineers India Ltd.	8542
19.	Fresenius Kabi Oncology Ltd.	8326
20.	Glenmark Pharmaceutical Ltd.	10500
21.	Hindustan Aeronautics Ltd.	12063

Annexure-3 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
22.	Hindustan Lever Ltd.	9936
23.	Indian Oil Crop. Ltd	20773
24.	Indian Petrochemicals Corporation Ltd.	7127
25.	Indian Telephone Industries Ltd.	7154
26.	Ind-Swift Laboratories Ltd.	8000
27.	Intas Pharmaceuticals Ltd.	21186
28.	Intellisys Technology & Research Ltd.	5329
29.	IPCA Lab. Ltd.	10073
30.	Ispat Industries Ltd.	10000
31.	ITC Ltd.	16870
32.	Johnson & Johnson Ltd.	6071
33.	JSW Steel Limited	7378
34.	Jubilant Organosys Ltd.	6091
35.	Kavveri Telecom Products Ltd.	6105
36.	Kudos Chemie Limited	5225
37.	Larsen & Toubro Ltd.	18235
38.	LG Electronics India Pvt. Ltd.	6005
39.	Lupin Ltd.	63500
40.	Macleods Pharmaceuticals Ltd.	8356
41.	Maharashtra Hybrid Seeds Company Ltd.	6649
42.	Mahindra & Mahindra Ltd.	79063
43.	Maruti Suziki India Ltd	51742
44.	Matrix Laboratories Ltd.	29369
45.	Medha Servo Drives Pvt. Ltd.	17570
46.	Micro Labs Ltd.	7715
47.	MindariKa Pvt. Ltd.	5718
48.	Monsanto Holdings Pvt. Ltd.	6856
49.	Mylan Laboratories Ltd	75073
50.	National Aluminium Company Ltd.	5302
51.	Nicholas Piramal Pvt. India Ltd.	9115

Annexure-3 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
52.	Nissan Ashok Leyland Technologies Pvt. Ltd.	7110
53.	Oil and Natural Gas Corporation Ltd.	34015
54.	Orchid Chemicals & Pharmaceuticals Ltd.	7090
55.	Panacea Biotech Ltd.	8734
56.	Piramal Healthcare Limited	18993
57.	Ranbaxy Laboratories Ltd.	49015
58.	Reliance Industries Ltd.	59550
59.	Rolta India Ltd.	17500
60.	Serum Institute of India. Ltd.	5240
61.	Steel Authority of India Ltd.	11692
62.	Sun Pharmaceuticals Industries Ltd.	15919
63.	Syngne International Ltd.	5751
64.	TATA Chemicals Ltd.	43810
65.	Tata Consultancy Services (TCS) Ltd.	13400
66.	Tata Motors Ltd.	154869
67.	Tata Power Co. Ltd.	22950
68.	Tata Steel Ltd.,	5149
69.	Tejas Networks Limited	6476
70.	The United Phosphorous Ltd.	6072
71.	TVS Motor Co. Ltd.	9804
72.	Unichem Laboratories Ltd.	6250
73.	United Phosphorus Ltd.	6072
74.	Upper India Steel Mfg. & Engg. Co. Ltd.	6440
75.	USV Ltd.	5168
76.	VE Commercial Vehicles Limited	22209
77.	Watson Pharma Private Limited	13987
78.	Wipro Ltd.	20940
79.	Wockhardt Ltd.	11500

* R&D Expenditures Reported are as claimed by the firms in their available Annual reports in DSIR/renewal applications.

ANNEXURE - 4

LIST OF IN-HOUSE R&D UNITS IN INDUSTRY REPORTING ANNUAL EXPENDITURE IN THE RANGE OF Rs. 500 LAKHS TO Rs. 5000 LAKHS

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. In lakhs) *
1.	Abbott Healthcare Private Limited	1491
2.	Ace Designers Ltd.	610
3.	Ajanta Pharma Ltd.	2196
4.	Albert David Limited	580
5.	Alkali Metals Ltd.	542
6.	Amara Raja Batteries Ltd.	2301
7.	Arch Pharma Labs Ltd.	2576
8.	Asian Paints (India) Ltd.	4373
9.	Associated Cement Companies Ltd.	682
10.	Astra Microwave Products Ltd.	625
11.	Atul Limited	690
12.	Audco India Ltd.,	538
13.	Aurobindo Pharma Ltd.	1732
14.	Automotive Infortronics. Pvt. Ltd.	1309
15.	Avesthagen Ltd.	2485
16.	AVL Technical Centre Private Limited	4500
17.	Bajaj Tempo Ltd.	1974
18.	Balkrishna Industries Limited (BKT)	2395
19.	BASF India Ltd.,	1050
20.	Battelle Science & Technology India Pvt. Ltd.	858
21.	Bharat Dynamics Ltd.	807

Annexure-4 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs in lakhs) *
22.	Bharat Earth Movers Ltd.	1793
23.	Bharat Forge Ltd.	852
24.	Bharat Serums & Vaccines Ltd.	2838
25.	Bilcare Ltd.	2628
26.	Biological E. Ltd.	820
27.	Bioseed Research India a Division of DCM Shriram Consolidated Ltd.	3564
28.	Brakes India Ltd.	3961
29.	Britannia Industries Ltd.	1180
30.	BST Ltd.	928
31.	Cadila Pharmaceuticals Ltd.	3424
32.	Camson Bio Technologies Limited	1918
33.	Carborundum Universal Ltd.	800
34.	Cavinkare Private Ltd.	826
35.	Ceat Limited	1000
36.	Celestial Labs Ltd.	564
37.	Celon Laboratories Ltd.,	1200
38.	Centaur Pharmaceuticals Pvt. Ltd.	1350
39.	Central Electronics Ltd.	3363
40.	Central Mine Planning & Design Inst. Ltd.	1601
41.	Clariant Chemical (India) Ltd.	1500
42.	Claris Life Sciences Ltd.	2233
43.	Clinigene	3810
44.	Clonz Biotech Pvt.Ltd.	2890
45.	CMC Ltd.	891
46.	Connexios Life Sciences Pvt. Ltd.	4493
47.	Cooper Corporation Pvt. Ltd.	3031
48.	Coromandel International Limited	508
49.	CTR Mfg Industries Ltd	1138
50.	Deepak Nitrite Ltd.	646
51.	Defence Land Systems India Pvt Ltd	1200
52.	Delphi-TVS Diesel Systems Ltd.	1878

Annexure-4 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
53.	Dhanuka Laboratories Limited	722
54.	Dishman Pharmaceutical & Chemical Ltd.	1150
55.	Divi's Laboratory	1753
56.	East West Seeds India Pvt. Ltd.	954
57.	Economic Explosives Limited	500
58.	Eicher Motors Ltd.	1526
59.	EID Parry (India) Ltd.	792
60.	Eimco Elecon (India) Ltd.	870
61.	Elantas Beck India Ltd.(formerly Beck India Ltd.)	600
62.	Elecon Engineering Company Limited	600
63.	Electronics Corporation of India Ltd.	4328
64.	Electropneumatics & Hydraulics (India) Pvt Ltd.	759
65.	Elgi Equipments Ltd.	2652
66.	EMCO Ltd.	659
67.	Emcure Pharmaceuticals Ltd.	3969
68.	Emerson Network Power (India) Pvt. Ltd.	565
69.	Endurance Technologies Ltd.	1199
70.	Enem Nostrum Remedies Pvt. Ltd.	500
71.	Escorts Ltd.(Tractor Division)	3450
72.	Essar Steel Ltd.	2750
73.	Excel Crop Care Ltd.	1206
74.	Exicom Tele-Systems Ltd.	1300
75.	Exide Industries Ltd.	938
76.	FDC Ltd.	2080
77.	Fenner (India) Ltd.	886
78.	Fermenta Biotech Ltd.	537
79.	Flowmore Limited	2023
80.	Forbes Marshal Pvt. Ltd.	612
81.	G.SURGIWEAR LIMITED	1092
82.	G7 Synergon Pvt. Ltd.	3300
83.	Gabriel India Ltd.	1200

Annexure-4 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
84.	Gennova Biopharmaceuticals Ltd.	772
85.	Genus Power Infrastructures Ltd.	895
86.	Gharda Chemicals Ltd.	3370
87.	Gland Pharma Ltd.	2951
88.	Glaxo Smithkline Pharmaceutical Ltd.	579
89.	GMM Pfaudler Ltd.	2085
90.	Godavari Biorefineries Ltd	950
91.	Godfrey Phillips India Ltd.	1611
92.	Godrej Consumer Products Ltd.	890
93.	Granules India Ltd.,	808
94.	Grauer & Weil (India) Ltd.	878
95.	Greeves Cotton Ltd.	1251
96.	Gujarat Alkalies & Chemicals Ltd.	601
97.	Gujarat Olio Chem Ltd.	571
98.	Gujarat State Fertilizers & Chemicals Ltd.	1231
99.	Havells India Limited	520
100.	HBL Nife Power System Ltd	600
101.	HCL Infosystems Ltd.	3842
102.	Hemz India Pvt Ltd.	610
103.	Hema Engineering Industries Ltd.	615
104.	Hetero Drugs Ltd.	2910
105.	Himachal Futuristics Communication Ltd.	4283
106.	Himalaya Drug Company	804
107.	Hindustan Motors Ltd.	1244
108.	Hindustan Petroleum Corporation Ltd.	880
109.	Hindustan Polymides & Fibres Ltd.	2523
110.	Hindustan Zinc Ltd.	1350
111.	Hi-Tech Gears Ltd.	1050
112.	HLL Lifecare Ltd.(Formerly Hindustan Latex Ltd.)	650
113.	Hospira Healthcare India Private Ltd.,	3871
114.	HPL Electric & Power Pvt. Ltd.	700

Annexure-4 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
115.	Hytech Seed India Pvt. Ltd.	950
116.	ILS Bioscience Pvt. Ltd.	550
117.	Inbiopro Solutions Pvt. Ltd.	836
118.	Indian Aluminium Company Ltd.	628
119.	Indoco Remides Ltd.,	1390
120.	Indofil Industries Ltd	2640
121.	Indus Biotech Ltd.	1432
122.	International Tractors Ltd.,	2019
123.	Inventia Healthcare Pvt. Ltd.	1162
124.	Ion Exchange (India) Ltd.	600
125.	ITI Ltd.	1100
126.	J Mitra & Co. Pvt. Ltd.	675
127.	J.B. Chemicals & Pharmaceuticals Ltd.,	1824
128.	Jain Irrigation Systems Ltd.	3060
129.	Jay Ushin Ltd	575
130.	Jindal Steel & Power Limited	3729
131.	JK Agri Genetics Ltd.	1304
132.	JK Tyre & Industries Limited	3229
133.	JNS Instruments Limited	1158
134.	Jyoti CNC Automation Pvt. Ltd.	1291
135.	Jyoti Limited, Vadodara	529
136.	Kancor Ingredients Ltd.,	540
137.	Kansai Nerolac Paints Limited	1310
138.	Kaveri Seed Company (P) Limited	1450
139.	KEC International Limited	1156
140.	Kemin Industries South Asia Pvt. Ltd. (formerly Kemin Nutritional Technologies (India) Pvt. Ltd.)	941
141.	Kemwell Biopharma Pvt. Ltd.	1075
142.	Kennametal India Ltd.	1470
143.	Kimplas Piping Systems Limited	1140
144.	Kiran Global Chems Limited	1151

Annexure-4 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
145.	Kirloskar Brothers Ltd.	2600
146.	Kirloskar Oil Engines Limited	1792
147.	Krishidhan Seeds Private Ltd.	1352
148.	Lakshmi Machine Works Ltd.	1376
149.	Landis+Gyr Ltd.	3200
150.	Lauras Labs Pvt Ltd.	2188
151.	LifeCell International Pvt. Ltd.	553
152.	Lincoln Pharmaceuticals Ltd	600
153.	Link well Tele System (P) Ltd.	605
154.	LML Ltd.	925
155.	Lohia Starlinger Ltd.	750
156.	Lucas-TVS Ltd.	2324
157.	Lumax DK Auto Industries Ltd.	1000
158.	Lumax Industries Limited	1274
159.	Luminous Power Technologies (P) Ltd.	2588
160.	Lyka Labs Limited	768
161.	Madras Engineering Industries Pvt. Ltd.	1025
162.	Mahindra Reva Electric Vehicles Pvt. Ltd.	3286
163.	Mahindra Navistar Automotives Ltd.	4783
164.	Mahle Filter Systems (India) Ltd.	500
165.	Makhteshim -Agan India Pvt Ltd.	1920
166.	Makino Auto Industries	800
167.	Malladi Drug and Pharmaceuticals Ltd.	555
168.	Mankind Pharma Ltd.	1866
169.	Mann And Hummel Filter Pvt Ltd.	1341
170.	Marico Ltd.	678
171.	Marshall Breeders (P) Ltd.	732
172.	Matrix Comsec Pvt. Ltd.	700
173.	McNally Bharat Engineering Company Ltd.	2500
174.	Mehta API Pvt. Ltd.	500
175.	Meritor HVS (India) Ltd.	1936

Annexure-4 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
176.	Metahelix Life Sciences Ltd	835
177.	Minda Industries Ltd.	1495
178.	Minda Stoneridge Instruments Ltd.	768
179.	Mirc Electronics Ltd.	1155
180.	Mishra Dhatu Nigam Ltd.	2060
181.	Mitra Biotech Pvt. Ltd.,	500
182.	Moser Baer India Ltd.	1298
183.	Motor Industries Co. Ltd.	2973
184.	MRF Ltd.	1215
185.	MSN Laboratories Ltd.	3229
186.	Nagarjuna Agrichem Ltd.	625
187.	Nagarjuna Fertilisers and Chemicals Ltd.	2738
188.	Natco Fine Pharmaceuticals Pvt. Ltd.	506
189.	NATCO Pharma Limited	2286
190.	Nath Biogene (I) Ltd.	700
191.	National Engineering Industries Ltd.	2434
192.	National Mineral Development Corporation Ltd.	695
193.	National Thermal Power Corporation Ltd.	561
194.	Navin Fluorine International Ltd.	581
195.	Nector Lifesciences Ltd.	1388
196.	Neyveli Lignite Corporation Ltd.	1127
197.	Nirmal Seeds Pvt. Ltd.	1064
198.	NMDC Ltd.	2200
199.	Novartis Healthcare Pvt. Ltd.	1113
200.	NRB Bearings Ltd.	2120
201.	Nucleus Software Exports Limited	3040
202.	Nunhems India Pvt. Ltd.	1703
203.	Nuziveedu Seeds Pvt. Limited	2657
204.	OCL India Ltd.	600
205.	Oil India Ltd.	1400
206.	Omax Autos Limited	2250

Annexure-4 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
207.	OmniActive Health Technologies Ltd.	507
208.	Organica Aromatics Ltd.	4819
209.	Orient Paper Mills	508
210.	P. I. Industries Ltd.	915
211.	Parabolic Drugs Ltd.	4877
212.	Paramount Conductors Ltd.	2428
213.	Perrigo Laboratories India Pvt. Ltd.	1288
214.	Pest Control (I) Ltd.	863
215.	Philips Electronics India Limited	699
216.	Phillips Carbon Black Ltd.	1550
217.	Piaggo Vehicles Pvt. Ltd., Pune	1174
218.	Pidilite Industries Ltd.	1305
219.	Poly Medicure Ltd.	500
220.	Praj Industries Ltd.	2714
221.	Pricol Ltd.	3172
222.	Proagro Seed Company Ltd.	724
223.	Projects & Development India Ltd., The	675
224.	Promed Exports Ltd	1804
225.	Radient Cables Pvt. Ltd.	801
226.	Rallis India Ltd.	2039
227.	Ramco Systems Ltd.	3284
228.	Rane (Madras) Ltd.	660
229.	Rasi Seeds (P) Limited	2380
230.	Ravindranath G.E. Medical Associates Pvt. Ltd.	671
231.	Regent Drug Ltd	2067
232.	Reliance Life Sciences	2652
233.	RPG Life Sciences Limited	1720
234.	RRB Energy Ltd.	1993
235.	Rusan Pharma Ltd.	2098
236.	Sahajananad Medical Technologies Pvt. Ltd.	689
237.	Sami Lab Ltd.	730

Annexure-4 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
238.	San Engg & Locomotive Co. Ltd.	850
239.	Sanden Vikas (India) Pvt. Ltd.	947
240.	Sandhar Technologies Ltd.	628
241.	Sankhya InfoTech Pvt Ltd., (Hyderabad)	1213
242.	Sanofi-Synthelabo (India) Ltd.	2964
243.	Sanzyme Ltd.,	1000
244.	Savannah Seeds Pvt. Ltd.	594
245.	Secto Automotive Ltd.	1175
246.	Secure Meters Ltd.	4191
247.	Semco Electric Pvt. Ltd.,	578
248.	Semi Conductor Complex Ltd.	502
249.	Sentiss Pharma Pvt Ltd.	1649
250.	Sequent Scientific Ltd.	2000
251.	SH Kelkar & Company Pvt. Ltd.	550
252.	Shantha Biotechnics Pvt. Ltd.	2630
253.	Sharda Motor Industries Ltd.	900
254.	Shasun Chemical and Drugs Ltd.	2850
255.	Shasun Pharmaceuticals Ltd.	3126
256.	Shilpa Medicare Limited	1975
257.	Shree Cement Ltd.	1607
258.	Shriram Piston & Rings Ltd.	583
259.	Siechem Technologies Pvt. Ltd.,	876
260.	Simpson & Co. Ltd.	2600
261.	SLK Software Services(P) LTD	929
262.	SMR Automotive Systems India Limited	585
263.	Snam Alloys Pvt. Ltd	1200
264.	Solar Industries India Limited	900
265.	Sphaera Pharma Pvt. Ltd.	874
266.	SRF Ltd.	3150
267.	Stempeutics Research Pvt. Ltd.	2595
268.	Strides Arcolab Ltd.	3050

Annexure-4 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
269.	Structwel Designers & Consultants Pvt. Ltd.	710
270.	Sudarshan Chemical Industries Ltd.	1798
271.	Suguna Poultry Farm Ltd.	834
272.	Sundaram Clayton Ltd.	572
273.	Sundaram Fastners Ltd.	984
274.	Super Agri Seeds Pvt. Ltd.	550
275.	Super Religare Laboratories Ltd	1010
276.	Survival Technologies Pvt.Ltd.	500
277.	Suven Life Sciences Ltd.	3368
278.	Symed Labs Ltd.,	919
279.	Syngenta India Ltd.	905
280.	Tally Solutions Pvt. Ltd.	1083
281.	Tata Tea Ltd.	508
282.	Tecmuseh Products India Ltd.	500
283.	TEVA API India Ltd.	3500
284.	Thermax Limited	2205
285.	TML Drivelines Ltd	2529
286.	Torrent Pharmaceuticals Ltd.	3191
287.	Tractors & Farm Equipment Ltd.	3943
288.	Transasia Bio-Medicals Ltd.	1078
289.	TRF Limited	570
290.	Triveni Turbine Ltd.	506
291.	TTK Prestige Limited	1469
292.	Tube Investment of India Ltd	1446
293.	Tube Investments of India Ltd.	1065
294.	Turbo Energy Ltd.	3700
295.	Ucal Fuel Systems Ltd.	717
296.	Ultratech Cement Limited	1300
297.	Unijules Life Science Ltd.	900
298.	Unimark Laboratories Ltd.	2328
299.	Unitech Machines Ltd.	3680

Annexure-4 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
300.	United Spirits Ltd.	939
301.	Vardhman Chemtech Limited	600
302.	Varroc Engineering Pvt. Ltd.	2643
303.	Varroc Polymers Pvt. Ltd.	1528
304.	Veeda Clinical Research Pvt. Ltd.	4327
305.	Venco Research & Breeding Farm Ltd.	4295
306.	Venkateshwara Hatcheries Pvt.Ltd.	1450
307.	Venkateshwara Research & Breeding Farm (P) Ltd.	2838
308.	Venus Remedies Ltd.	2200
309.	Vibha Agrotech Ltd.	1880
310.	Videocon International Ltd.	2341
311.	Vivimed Labs Ltd.	1179
312.	VMC Systems Ltd.	3912
313.	Voltas Limited	610
314.	Vyome Bioscience Pvt Ltd.	585
315.	WABCO-TVS (India) Ltd.	1400
316.	Wanbury Ltd.,	504
317.	Wheels India Ltd.	1263
318.	Zen Technologies Ltd.	825
319.	ZIM Laboratories Ltd.	1720
320.	Zuventus Healthcare Ltd.	800

ANNEXURE - 5

LIST OF IN-HOUSE R&D UNITS IN INDUSTRY REPORTING ANNUAL EXPENDITURE IN THE RANGE OF Rs. 200 LAKHS TO Rs. 500 LAKHS

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
1	A S L Advanced System Ltd.,	375
2	Aarti Drugs Ltd.	374
3	Aarti Industries Ltd.	464
4	Ador Welding Ltd.	240
5	Advanced Enzymes	475
6	Advanced Neuro-Science Allies Pvt. Ltd.	404
7	Ajit Seeds Ltd.	346
8	Alkam Laboratories Ltd.	364
9	Alkyl Amines Chemicals Ltd.	256
10	ALP Nishikawa Company Limited	221
11	Alphamed Formulations Private Limited	219
12	Amalgam Leather Pvt. Ltd.	283
13	Amrutanjan Ltd.	373
14	Anabond Ltd.	322
15	Analogic Controls India Ltd	207
16	Ankur Seeds Pvt. Ltd.	313
17	Anuh Pharma Ltd.	281
18	Applied Electro-Magnetics Pvt. Ltd.	240
19	Avestha Genguine Technologies Pvt. Ltd.	495
20	Bafna Pharmaceuticals Limited	200
21	BalaJi Amines Ltd.	372

Annexure-5 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
22	Balmer Lawrie & Company Ltd.	253
23	Bangalore Integrated System Solution Pvt. Ltd.	215
24	Bata India Ltd.	392
25	Bejo Sheetal Seeds Pvt. Ltd	390
26	Berger Paints India Ltd.	279
27	Bharat Biotech International Ltd.	448
28	Bharat Heavy Plate & Vessels Ltd.	338
29	Bilag Industries Pvt. Ltd.	315
30	Biostadt MH Seeds Ltd.	264
31	Bliss GVS Pharma Ltd	304
32	Botil Oil Tools India Pvt. Ltd.	493
33	BPL Ltd.	370
34	Buhler (India) Pvt. Ltd.	496
35	Calyx Chemical & Pharmaceuticals Pvt. Ltd.	244
36	Cantaur Chemical Ltd.,	373
37	Cantaur Pharmaceuticals Ltd.,	350
38	Castrol India Ltd.	487
39	Catterpillar India Ltd.	232
40	Chennai Petroleum Corporation Ltd.	334
41	Clause (India) Private Limited	366
42	Colour-Chem Ltd.	482
43	Concept Pharmaceuticals Ltd.	250
44	Connectwell Industries Pvt. Ltd.	334
45	Cosmo Films India Ltd.	290
46	Crystal Crop Protection Private Limited	231
47	Dai-ichi Karkaria Ltd.	355
48	Delta Finochem Pvt Ltd	200
49	DE-NOCIL Crop Protection Ltd.	216
50	Dhampur Sugar Mills Ltd.	300
51	Dr. Vithalrao Vikha Patil Sahakari Sakhar Karkhana Ltd.	384
52	Duroshox Pvt. Ltd.	275

Annexure-5 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
53	Dynamatic Technologies Ltd.	232
54	Efftronics System Pvt. Ltd.	212
55	Elcom International Pvt Ltd	359
56	Elder Pharmaceutical Ltd.	400
57	Elgi Tread (India) Ltd.	208
58	Elin Electronics Ltd.	332
59	Emcure Biotech Ltd.	450
60	Emergent Genetics India Pvt. Ltd.	323
61	Encore Software Ltd.	428
62	Eureka Forbes Ltd.	424
63	Evolute Systems Pvt. Ltd.	400
64	Evonik Energy Services (India) Pvt. Ltd.	275
65	Excel Industries Ltd.	208
66	Fibcom India Ltd.	273
67	forus health pvt ltd	244
68	Foseco India Ltd.	242
69	Gandhar Oil Refinery India Ltd.	215
70	Ganga Kaveri Seeds Pvt. Ltd.	381
71	Garware Polyester Ltd.	261
72	Genus Overseas Eletronics Ltd.	302
73	Goodlass Nerolac Paints Ltd.	412
74	Grasim Industries Ltd.	283
75	Gupta H.C. Oversease (I) Pvt. Ltd.	300
76	Hargovind Bajaj Research & Development Centre	258
77	Hikal Ltd.	351
78	Hindustan Cables Ltd.	207
79	Hindustan Construction Company Ltd.	362
80	HMT Machine Tools Ltd.	281
81	IBP Company Ltd.	229
82	Ind Swift Laboratories Ltd.	458
83	India Pistons Ltd.	233

Annexure-5 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
84	Indian Acrylics Ltd.	295
85	Indian Rare Earth Ltd.	236
86	Indofill Chemicals Ltd. (Division of Modipon Ltd.)	220
87	Innova Childern's Heart Hospital.	461
88	Innova Rubbers Private Limited	385
89	Intervet India Pvt. Ltd.	368
90	J.K. Agri-Genetics Ltd.	493
91	Jayem Automotives Ltd.,	200
92	Jindal Vijaynagar Steel Ltd.	240
93	JK Lakshmi Cement Limited	243
94	JK Paper Limited	395
95	Kabra Extrusiontechnik limited	472
96	Kannametal Widia India Ltd.	295
97	KCP Sugar Industries Corporation Ltd.	421
98	Kinetic Engineering Ltd.	251
99	Kirloskar Copeland Ltd.	262
100	Kopran Research Laboratories Ltd.	307
101	Krishidan Seeds Ltd.	415
102	Labindia Analytical Instruments Pvt. Ltd.	246
103	Lamco Industries Pvt. Ltd.	360
104	LG Balakrishnan & Brothers Ltd.	300
105	Mafatlal Industries Ltd.	268
106	Mahabal Metals Pvt. Ltd,	200
107	Mahagujarat Seeds Pvt. Ltd.	280
108	Maini Precision Products (P) Ltd.,	400
109	Mane India Private Limited	285
110	Mangalam Cement Ltd.	280
111	Manugraph India Ltd.	310
112	Marico Industries Ltd.	240
113	Marson Ltd.	216
114	Matrix Telecom Pvt. Ltd.	337

Annexure-5 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
115	Mayur Uniquoters Limited	447
116	Mc Nally Sayaji Engineering Ltd.	250
117	Mc-Dowell & Co. Ltd.	355
118	Mecon Ltd.	353
119	Medley Pharmaceuticals Ltd.	486
120	Megafine Pharma (P) Ltd.	329
121	Meghmani Organics Ltd.	370
122	Merck Ltd.	483
123	Messung Systems	364
124	MIC Electronics Ltd.	237
125	Micromatic Grinding Technologies Ltd.	429
126	Midas Communication Technologies Pvt. Ltd.	427
127	Minda Huf Ltd.	227
128	Modern Insulators Ltd.,	350
129	Modipon Ltd.	221
130	Mother Diary Fruit & Vegetabls Pvt. Ltd.	373
131	MRO-Tek Ltd.	282
132	Mukand Limited	200
133	Multi Arc India Ltd.	239
134	Namdhari Seeds Pvt. Ltd.	244
135	Nandan Biomatrix Limited	400
136	Naprod Life Sciences Pvt. Ltd.	238
137	Natesan Synchrocones Pvt Ltd	425
138	National Aluminium Company Ltd.	435
139	National Organic Chemical Industries Ltd.	206
140	Natural Remedies Pvt. Ltd.,	443
141	Navya Biologicals Pvt. Ltd.	220
142	Newland Laboratories Ltd.	439
143	NICCO Corporation Ltd.	225
144	Nitta Gelatin India Ltd.	300
145	NutraHelix Biotech Pvt. Ltd.	265

Annexure-5 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
146	Ocimum Bio Solutions (India) Ltd.,	250
147	Orbicular Pharmaceutical Technologies Pvt. Ltd.	350
148	Oriental Engineering Works Pvt.Ltd.	200
149	Panama Petrochem Ltd.	385
150	Paracoat Products Ltd.	215
151	Park Controls & Communications Ltd.	300
152	Parthys Reverse Informatics Analytic Solutions Private Limited	256
153	Pinnacle Industries Ltd.	375
154	Poddar Pigments Ltd.	250
155	Polyplex Corporation Ltd.	252
156	Powerdeal Energy Sysytems (I) Pvt. Ltd Nashik	283
157	Pratista Industries Ltd.	379
158	Precision Automation and Robotics India Ltd.	425
159	Premas Biotech Pvt.Ltd.	462
160	Premier Evolvics Pvt. Ltd.	290
161	Premium Energy Transmission Ltd.	456
162	Prima Telecom Ltd.	250
163	Privi Organics Ltd.	350
164	Provimi Animal Nutrition India Pvt. Ltd.	300
165	Radhe Renewable Energy Development Pvt. Ltd.	375
166	Radiant Corporation Pvt. Ltd.	350
167	Rajasthan Antibiotics Limited	280
168	Rajshree Sugars & Chemicals Ltd.	232
169	Rane Brake Linings Ltd.	462
170	Rane TRW Steering Systems Ltd.	458
171	Raptakos, Brett & Co. Ltd.	386
172	Rashtriya Chemicals & Fertilizers Ltd.	456
173	Reliance Cellulose Products Ltd.	225
174	Reva Electric Car Co. Pvt. Ltd.	355
175	Richcore Lifesciences Pvt. Ltd.	200
176	Rico Auto Industries Ltd.	350

Annexure-5 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
177	Rishabh Instruments Private Ltd.	400
178	Rockman Industries Ltd.	497
179	Rossari Biotech Limited	255
180	Rotofilt Engineers Ltd.,	300
181	Sakthi Sugar Ltd.	364
182	Samcor Glass Ltd.	244
183	Samtel Colours Ltd.	245
184	Sandvik Asia Ltd.	400
185	SeedWorks International Pvt. Ltd.	494
186	Sekhsaria Chemicals Ltd.	347
187	Seminis Vegetables Seeds India Ltd.	294
188	Shalimar Paints Ltd.	315
189	Sharon Bio- Medicine Ltd.	350
190	Siegwerk India Pvt. Ltd.	390
191	Sika India Private Ltd.	263
192	Skanray Healthcare Pvt Ltd	485
193	Smilax Laboratories Ltd.	268
194	SMS Pharmaceuticals Ltd.	250
195	SOF Blue Pvt. Ltd.	333
196	Sona Koyo Steering Systems Ltd.	280
197	Sona Okegawa Precision Forgings Ltd.,	310
198	Southern Petrochemical Industries Corpn. Ltd.	332
199	SPC Biotech Pvt. Ltd.	200
200	Speck Systems Ltd.(Formerly Speck Systems Pvt. Ltd.)	280
201	Sri Biotech Laboratories India Ltd.	212
202	Srini Pharmaceuticals Ltd.	200
203	SSP Pvt. Ltd.	230
204	Stanadyne Amalgamations Private Limited	278
205	Steel Strips Ltd.	201
206	Steel Strips Wheels Limited	325
207	Steer Engineering Pvt. Ltd.	324

Annexure-5 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
208	Sterlite Industries (India) Ltd.	228
209	Stesalit Limited	450
210	Stumpp, Schedle and Somappa Spring Pvt. Ltd	247
211	Sundaram Brake Lining Ltd.	301
212	Sungro Seeds Limited	426
213	Sushen Medicamentos Private Limited	224
214	Symphony Pharma Life Sciences Private Limited	350
215	System Controls Technology Solutions Pvt Ltd.	280
216	Tablets (India) Ltd.	250
217	Tagros Chemicals India Ltd.	350
218	Tamil Nadu Newsprint and Papers Ltd.	475
219	Tamilnadu Petroproducts Ltd.	280
220	Tata International Ltd.	384
221	Tata Refractories Ltd.	206
222	Telco Construction Equipment Company Ltd.	343
223	Texmaco Limited	200
224	The Andhra Sugars Ltd.	341
225	The Indian Hume Pipe Company Ltd.	261
226	Themis Laboratory Limited	475
227	THINQ Pharma-CRO Ltd.	491
228	Thirumalai Chemicals Ltd.,	348
229	Tide Water Oil Co. (India) Ltd.	292
230	Tirth Agro Technology Pvt KLtd.	206
231	Titanium Tantalum Products. Ltd.	250
232	Tonira Pharma Ltd.	234
233	Transpek Industry Ltd.	300
234	Trimex Sands Private Limited	380
235	TRL Krosaki Refractories Ltd	380
236	Troikaa Pharmaceuticals Ltd.	245
237	Tulasi Seeds Pvt. Ltd.	300
238	Turbo Engineering Ltd.	228

Annexure-5 Contd.

Sl. No.	Name of the firm	R&D Expenditure Reported (Rs. in lakhs) *
239	TVS Electronics Ltd.	442
240	Uflex Ltd.	375
241	Ultra International Ltd.	225
242	Umedica Laboratories Pvt. Ltd.,	230
243	Unicorn Seeds Pvt. Ltd.	266
244	United Telecoms Ltd.	311
245	Uurmi Systems Pvt Ltd.	350
246	Vaishnavi Biotech Ltd.	350
247	Varuna Biocell Pvt. Ltd.	200
248	Vector Bioscience Pvt. Ltd.	275
249	VEM Technologies Pvt.Ltd.	376
250	V-Guard Industries Limited	250
251	Vidya Herbs Pvt. Ltd.	220
252	VIP Industries Ltd.	425
253	Vishnu Chemicals Ltd.	269
254	Vivo Bio Tech Ltd.	236
255	VNR Seeds Pvt. Ltd.	224
256	Warkem Biotech Pvt Ltd.	250
257	Wendt india Limited	260
258	Wires and Fabriks (SA) Ltd.	339
259	Yaaganti Seeds Pvt. Ltd.	285
260	Yashraj Biotechnology Ltd.	450
261	ZCL Chemicals Ltd.	307
262	Zenotech Laboratories Ltd.	250

* **R&D expenditures reported are as claimed by the firms in their available Annual reports in DSIR/renewal applications.**

ANNEXURE - 6

LIST OF SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATIONS (SIROS) RECOGNIZED BY DSIR DURING THE PERIOD JANUARY 2013 TO MARCH 2014.

S.No.	Name of Organisation	DSIR Validity
1.	St. Joseph's Institute of Science and Technology Trust, Chennai	31.03.2015
2.	Durga Charitable Society, Mohan Nagar, Ghaziabad	31.03.2015
3.	Foundation for Agricultural Resources Management and Environment Remediation (FARMER) New Delhi.	31.03.2015
4.	L.J. College of Pharmacy of Lok Jagruti Kendra, Ahmedabad	31.03.2015
5.	R.V.S. Educational Trust, Dindigul, Tamil Nadu	31.03.2015
6.	Centre for People's Forestry (CPF), Secunderabad, Andhra Pradesh.	31.03.2016
7.	The Cashew Export Promotion Council of India (CEPCI), Cochin	31.03.2016
8.	Hyderabad Science Society, Hyderabad	31.03.2016
9.	Society for Education Welfare & Action Rural (SEWA-Rural), Jhagdia, Bharuch, Gujarat	31.03.2016
10.	PRAGYA, Gurgaon	31.03.2016
11.	Healis – Sekhsaria Institute for Public Health, Navi Mumbai	31.03.2016
12.	FICCI Research and Analysis Centre (FRAC), New Delhi	31.03.2016
13.	Loyola Centre for Research and Development of Xavier Research Foundation, Ahmedabad	31.03.2016
14.	Institute of Neurosciences, Kolkata [for its Research Unit 'Ram Gopal Chamaria Medical Research Centre')	31.03.2016
15.	Oriental College of Pharmacy of Oriental Education Society, Mumbai	31.03.2016
16.	Global Medical Education and Research Foundation, Hyderabad	31.03.2016
17.	Nature Conservation Foundation, Mysore	31.03.2016
18.	NAWAD TECH [National Waterways Development Technology], Tamil Nadu.	31.03.2016

Annexure-6 Contd.

S.No.	Name of Organisation	DSIR Validity
19.	KIIT University (Kalinga Institute of Industrial Technology University), Bhubaneswar.	31.03.2016
20.	Garhwal Community Development & Welfare Society, Chamba, District Tehri Garhwal, Uttarakhand	31.03.2016
21.	Devki Devi Foundation, New Delhi(Max Super Specialty Hospital, a unit of Devki Devi Foundation),	31.03.2016
22.	Saveetha Engineering College (Saveetha Medical and Educational Trust, Erode), Thandalam, Chennai.	31.03.2016
23.	Karpaga Vinayaga College of Engineering and Technology, Chennai, Tamil Nadu.	31.03.2016
24.	Shrimati Kashibai Navale Medical College and General Hospital, Pune	31.03.2016
25.	Sri Shyam Sundar 'Shyam' Institute of Public Cooperation and Community Developments, Bhopal	31.03.2016
26.	Tata Institute of Fundamental Research (TIFR), Mumbai	31.03.2016
27.	Agri Biotech Foundation, Hyderabad (Formerly A.P. Netherlands Biotechnology Programme), Hyderabad	31.03.2016
28.	Chandradeep Solar Research Institute, Kolkata	31.03.2015
29.	Islamic Academy of Education, Mangalore	31.03.2016
30.	Centre for Environment and Development (CED), Kerala	31.03.2016
31.	G.H.R Education Foundation Society, Nagpur	31.03.2016
32.	Vels Institute of Science, Technology and Advanced Studies (VISTAS), Pallavaram, Chennai	31.03.2016
33.	Vel Shree R. Rangarajan Dr. Sagunthala Rangarajan Educational Academy, Chennai	31.03.2016
34.	Foundation for Environment and Economic Development Services (FEEDS), Manipur	31.03.2016
35.	APT Research Foundation, Pune, Maharashtra	31.03.2016
36.	Kalasalingam and Anandam Ammal Charities, Chennai	31.03.2016
37.	Periyar Maniammai Institute of Science and Technology (PMIST) Vallam, Thanjavur	31.03.2016
38.	Foundation for MSME Clusters, New Delhi	31.03.2016
39.	Rajeev Gandhi Memorial College of Engineering & Technology (RGMCET) of Parameswara Educational Academy, Nandyal, Andhra Pradesh	31.03.2016
40.	International Institute of Waste Management (IIWM), Bhopal	31.03.2016
41.	Narayana Nethralaya Foundation (a Charitable Institution) Bangalore	31.03.2016

ANNEXURE -7

CERTIFICATE FOR CLAIMING CENTRAL EXCISE DUTY EXEMPTION FOR THREE YEARS AS PER NOTIFICATION NO. 13/99-CE DATED 28TH FEBRUARY, 1999

Sl.No.	Name of the Company	Product for exemption	Patented Technology
1.	Rishabh Instrument Pvt. Ltd., Nashik	Clamp Meter	i. Clamp metr with rotary mechanism for clamp Jaws ii. Clamp Meter with safe trigger mechanism
2.	Bharat Petroleum Corporation Ltd, Mumbai	Bharat Metal Cutting Gas (BMCG)	i. Hydrocarbon based Fuel Compositions

ANNEXURE - 8

LIST OF COMMERCIAL R&D COMPANIES APPROVED BY DSIR U/S 80IB(8A) OF IT ACT 1961

1. M/s TCG Lifesciences Limited, Kolkata
2. M/s Jubilant Chemsys Ltd., Noida
3. M/s Shipra Labs Ltd., Hyderabad
4. M/s GVK Bioscience Pvt. Ltd., Hyderabad
5. M/s Synchron Research Services Pvt. Ltd., Ahmedabad
6. M/s Evotec (India) Pvt. Ltd., Thane (W)
7. M/s Clintha Research Limited (Formerly M/s BA Research India Ltd., Ahmedabad)
8. M/s Advinus Therapeutics Pvt. Ltd., Bangalore
9. M/s Fine Research & Development Centre Pvt. Ltd., Mumbai
10. M/s Actavis Pharma Development Centre, Bangalore
11. M/s Clinsys India Ltd., Nodia
12. M/s Orchid Research Laboratories Ltd., Chennai
13. M/s P I Life Science Research Ltd., Udaipur
14. M/s Aditya Birla Science & Technology Company Ltd., Navi Mumbai
15. M/s Sun Pharma Advance Research Company Ltd., Baroda
16. M/s Global Transgenes Limited, Aurangabad
17. M/s Fortis Clinical Research Ltd., Faridabad

ANNEXURE - 9

LIST OF COMPANIES APPROVED U/S 35(2AB) OF INCOME TAX ACT, 1961

Sl. No.	Firm
1.	Ramtech Software Solutions Pvt. Ltd.
2.	Aquatech Systems (Asia) Pvt. Ltd.
3.	Rex-Tone Industries Ltd.
4.	Unijules Life Sciences Ltd.
5.	Infosys Ltd.
6.	Electrophenumatics & Hyddrulic (India) Pvt. Ltd.
7.	Godavari Biorefineries Ltd.
8.	Resonance Labratories Pvt. Ltd.
9.	Sparsha Pharma International Pvt. Ltd.
10.	Ciron Drugs & Pharmaceuticals Pvt. Ltd.
11.	Natural Capsules Ltd.
12.	Enaltac Labs Pvt. Ltd.
13.	Mahle Filter Systesm (India) Ltd.
14.	Pranav Vikas (India) Ltd.
15.	Deki Electronics Ltd.
16.	Khosla Machines Pvt. Ltd.
17.	Aurangabad Electricals Ltd.
18.	Reliance Industries Ltd.
19.	VST Tillers Tractors Ltd.
20.	Sharda Motor Ltd.
21.	Tata Power Companay Ltd.
22.	Gabriel India Ltd.
23.	3M India Ltd.
24.	Hoganas India Pvt. Ltd.
25.	Gennova Biopharmaceuticals Ltd.
26.	Hy-Gro Chemicals Pharmtek Pvt. Ltd.
27.	Akums Drugs & Pharmaceuticals Ltd.
28.	Applied Electro Magnetics Pvt. Ltd.
29.	Proline Seeds Company (India) Pvt. Ltd.
30.	IC Electricals Companay (P) Ltd.
31.	Setco Automotive Ltd.
32.	Triveni Turbine Ltd.
33.	Associated Soapstone Distributing Company Pvt. Ltd.
34.	Stedman Pharmaceuticals Pvt. Ltd.
35.	Nu Genes Pvt. Ltd.
36.	Nath Biogene (I) Ltd.
37.	Visteon Climate Systems India Ltd.
38.	Avra Laboratories Pvt. Ltd.
39.	Bangalore Biotech Labs Pvt. Ltd.
40.	Sud Chemie India Ltd.
41.	O/E/N India Ltd.
42.	Audco India Ltd.
43.	Kesoram Industries Ltd.
44.	Amara Raja Batteries Ltd.
45.	VNR Seeds Pvt. Ltd.
46.	Gujarat Metal Cast Industries Ltd.

Annexure-9 Contd.

Sl. No.	Firm
47.	E C Blades & Tools Pvt. Ltd.
48.	The Kerala Minerals and Metals Ltd.
49.	Prescient Color Ltd.
50.	International Panacea Ltd.
51.	Deepak Novochem Technologies Ltd.
52.	Parry Agro Industries Ltd.
53.	Richcore Lifesciences Pvt. Ltd.
54.	Anuh Pharma Ltd.
55.	Ramsons Scientific & Surgical Industries Pvt. Ltd.
56.	Kimplas Piping Systems Ltd.
57.	Nirmal Industrial Controls Pvt. Ltd.
58.	JK Lakshmi Cement Ltd.
59.	L.G. Balakrishnan & Bros. Ltd.
60.	Symphony Ltd.
61.	J.K. Paper Ltd.
62.	Sandhar Technologies Ltd.
63.	Mayur Uniguoters Ltd.
64.	Gamesa Wind Turbines Pvt. Ltd.
65.	Claas India Pvt. Ltd.
66.	Merchem Ltd.
67.	Ashida Electronics Pvt. Ltd.
68.	Parason Machinery (India) Pvt. Ltd.
69.	Kabra Extrusiontechnik Ltd.
70.	Anthea Aromatics Pvt. Ltd.
71.	Cavinkare Pvt. Ltd.
72.	D.K. Pharmachema Pvt. Ltd.
73.	Economic Explosives Ltd.
74.	Micromatic Grinding Technologies Ltd
75.	Rabonik (India) Pvt. Ltd.
76.	Photokina Chemicals Pvt. Ltd.
77.	Varuna Biocell Pvt. Ltd.

Sl. No.	Firm
78.	Suguna Foods Ltd.
79.	Chemspec Chemicals Pvt. Ltd.
80.	Monsanto Holdings Pvt. Ltd.
81.	Encube Ethicals Ltd.
82.	Solar Industries Ltd.
83.	Bharat Dynamics Ltd.
84.	East West Seeds India Pvt. Ltd.
85.	Eagle Seeds & Biotech Ltd.
86.	S.K. Dynamics Pvt. Ltd.
87.	Forace Polmers Pvt. Ltd.
88.	Sri Rama Agri Genetics (India) Pvt. Ltd.
89.	Excel Industries Ltd.
90.	Sasken Communication Technolgoies Ltd.
91.	Tata Toyo Radiator Ltd.
92.	Survival Technologies Pvt. Ltd.
93.	Ingersoll-Rand (India) Ltd.
94.	Grand Polycoats Company Pvt. Ltd.
95.	Genotypic Technology Pvt. Ltd.
96.	Arvind Ltd.
97.	MIL Controls Ltd.
98.	Privi Organics Ltd.
99.	Ambuja Intermediates Ltd.
100.	Resonance Specialties Ltd.
101.	SEE Linkages Pvt. Ltd.
102.	Mather and Platt Pumps Ltd.
103.	Agriland Biotech Ltd.
104.	Everest Blowers Pvt. Ltd.
105.	TML Drivelines Ltd.
106.	Kemwell Biopharma Pvt. Ltd.
107.	Hetero Labs Ltd.
108.	Senthil Seeds Pvt. Ltd.
109.	Aadhaar Seeds Pvt. Ltd.

Annexure-9 Contd.

Sl. No.	Firm
110.	Erol Exports Pvt. Ltd.
111.	Ador Welding Ltd.
112.	Agappe Diagnostics Ltd.
113.	Insecticides (India) Ltd.
114.	Hindustan Petroleum Corporation Ltd.
115.	ICPA Health Products Ltd.
116.	Innova Rubbers Pvt. Ltd.
117.	Penn Bio Chemicals (India) Pvt. Ltd.
118.	Trimex Pvt. Ltd.
119.	Metallizing Equipments Co. Pvt. Ltd.
121.	Stovec Industries Ltd.
122.	V-Guard Industries Ltd.
123.	UCAM Pvt. Ltd.
124.	Elecon Instruments Pvt. Ltd.
125.	Natesan Synchrocones Pvt. Ltd.
126.	Nucleus Software Exports Ltd.
127.	Kirshidhan Research Foundation Pvt. Ltd.
128.	CTR Mfg Industries Ltd.
129.	Ashapura Minechem Ltd.
130.	Autoprint Machinery Manufactures Pvt. Ltd.
131.	Microgenix specialities Pvt. Ltd.
132.	C&S Electric. Ltd.
133.	HIL Ltd.
134.	The Andhra Pradesh Paper Mills Ltd.
135.	Camlin Fine Sciences Ltd.
136.	Chetas Control Systems Pvt. Ltd.
137.	Virchow Biotech Pvt. Ltd.
138.	Eagle Burgmann India Pvt. Ltd.
139.	Sai Life Sciences Ltd.
140.	Global Pharma Healthcare Pvt. Ltd.
141.	Vibha Agrotech Ltd.
142.	Rhydburg Pharmaceuticals Ltd.
143.	Stanadyne Amalgamations Pvt. Ltd.
144.	Duroshox Pvt. Ltd.
145.	GMM Pfaudler Ltd.
146.	Ardee Technologies Pvt. Ltd.
147.	Laxmi Hydraulics Pvt. Ltd.
148.	Elcom International Pvt. Ltd.
149.	Hawkins Cookers Ltd.
150.	Asian PPG Indusrties Ltd.
151.	Flowmore Ltd.
152.	Anil Ltd.
153.	Zuventus Healthcare Ltd.
154.	RJ Biotech Ltd.
155.	Albert David Ltd.
156.	Clean Science & Technology Pvt. Ltd.
157.	Skanray Healtcare Pvt. Ltd.
158.	Kamani Oil Industries Pvt. Ltd.
159.	Paramount Conductors Ltd.
160.	Navin Fluorine International Ltd.
161.	Gandhar Oil Refinery India Ltd.
162.	SH Kelkar & Company Pvt. Ltd
163.	Continental Carbon India Ltd.
164.	TTK Prestige Ltd.
165.	Supriya Lifescience Ltd.
166.	Dabur India Ltd.
167.	Mindarika Pvt. Ltd.
168.	Fresenius Kabi Oncology Ltd.
169.	BACFO Pharmaceuticals (India) Ltd.
170.	Monarch Catalyst Pvt. Ltd.
171.	SLN Technologies Pvt. Ltd.
172.	ALP Nishikawa Company Ltd.
173.	Hester Biosciences Ltd.

Annexure-9 Contd.

Sl. No.	Firm
174.	Rudraksha Allied Chemical Pvt. Ltd.
175.	Labindia Analytical Instruments Pvt. Ltd.
176.	Wendt (India) Ltd.
177.	Mahabal Metals Pvt. Ltd.
178.	Virdis BioPharma Pvt. Ltd.
179.	BG LI-IN Electricals Ltd.
180.	Intelux Electronics Pvt. Ltd.
181.	Jay Ushin Ltd.
182.	Megafine Pharma Pvt. Ltd.
183.	Super Agri Seeds Pvt. Ltd.
184.	Minda Industries Ltd.
185.	Muez Hest India Pvt. Ltd.
186.	JNS Instruments Ltd.
187.	Connectwell Industries Pvt. Ltd.
188.	Elecon Engineering Company Ltd.
189.	Kandui Industries Pvt. Ltd.
190.	Asian Paints Industrial Coatings Ltd.

Sl. No.	Firm
191.	Kairav Chemofarbe Industries Ltd.
192.	G. Surgiwear Ltd.
193.	Delta Finochem Pvt. Ltd.
194.	Hi Tech BioSciences India Ltd.
195.	Goma Engineering Pvt. Ltd.
196.	Prakruti Products Pvt. Ltd.
197.	Fine Finish Organics Pvt. Ltd.
198.	ALP Overseas Pvt. Ltd.
199.	Tata Chemicals Ltd.
200.	Vardhman Chemtech Ltd.
201.	Bambino Agro Industries Ltd.
202.	Aron Universal Ltd.
203.	Electrolab (India) Pvt Ltd.
204.	Voltas Ltd.
205.	Garware Bestretch Ltd.
206.	Sri Biotech Laboratories India Ltd
207.	Daimler Commercial Vehicles Pvt. Ltd.

ANNEXURE - 10

LIST OF TDDP/PATSER PROJECTS COMMERCIALIZED

S. No.	Agency	Project Title
1	ACE Designers Pvt. Ltd., Bengaluru	Development of PC Based CNC System
2	Aesthetic Technologies Pvt. Ltd., Kolkata	Dev. of an Interactive Multimedia Package for Intellectual Property Rights Training
3	Aishwaraya Telecom Pvt. Ltd., Hyderabad	Hand Held Optical Test Equipments
4	Andrew Yule & Co. Ltd., Kolkata	Development of Rough Top Conveyor Belting
5	Anu's Lab Ltd., Hyderabad	Development of process for manufacture of 1-Bromo-3-chloropropane (B.C.P.) and 1-3-dibromo Propane (D.B.P.) in pilot plant
6	Arch Pharmalabs Ltd., Mumbai	Development of Polymorphic Form-I of Clopidogrel Bisulphate Process
7	Ardee Business Services Pvt. Ltd., Vishakhapattanam	Dev. of a Mobile, Four Channel Modular, RAMDARS Sys tem for Dry Beneficiation of Coal.
8	Ardee Business Services Pvt. Ltd., Vishakhapattanam	Development of Higher Dimension Aluminum Granules Coded Wire along with Complete High speed Wire Feeder
9	ATCOM Technologies Ltd., Mumbai	Development of Microbalance of 200 gm. Capacity with 1 mg. Accuracy
10	Bharat Earth Movers Ltd. (BEML), Bengaluru	Upgradation of 50 T Dumper 200 HP Front end loader
11	Bharat Earth Movers Ltd. (BEML), Bengaluru	Dev. of Technology for Design and Manufacture of 460 HP Wheel Dozer
12	Delta Agro Chemicals Ltd., Krishna	Dev.of process for manufacture of Furfural Alcohol by Hydrogenation of Furfural
13	Dolphin Industrial Co-operative Society Ltd., Vizianajaram	Glazing of terra-cotta Clay Products
14	Elkay Chemicals Limited, Pune	Development of Next Generation Amino Silicone based on Hydrosilation Technology
15	Encon Thermal Engineers (P) Ltd., Faridabad	Dev. of Technology for Design and Manufacture of Im proved Industrial Natural Gas Burners

Annexure-10-Contd.

Sl. No.	Agency	Project Title
16	Enercon Systems Pvt. Ltd., Bengaluru	Development of Centralised Electrical Energy Management System
17	Gujarat Narmada Valley Fertilizers Co.Ltd., Bharuch	Dev.and Demo. of Liquid Phase Oxidation Process for Hydrogen Sulfide Removal
18	Haryana Leather Chemicals Ltd., Haryana	Technology Development and Demonstration for application of Cross Linkables Aqueous Aliphatic Polyurethane Dispersions for Leather and Shoe Finishing
19	HERO Cycles Ltd., Ludhiana	Design,Development,Installation and Commissioning of 6-Hi Cold Rolling Mill
20	Hindustan Zinc Ltd., Udaipur	Extraction of Cobalt to Extract Copper Sulphate
21	Hindustan Zinc Ltd., Udaipur	Installation of Nickel Extraction Technology
22	Innovation Communications Systems Ltd., Hyderabad	Development of Voice Enabled Web
23	Innovation Communications Systems Ltd., Hyderabad	Development of Interactive Voice Response System With Multilingual Capability
24	Insecticides (India) Limited, Bhiwadi	A new approach to sythesis of an import substitute 3-methyl-N-nitroimino perhydro-1,3,5-oxadiazine (MNIO), an intermediate for the manufacture of Thiamethozam.
25	JSL Industries Ltd., Anand	Dev. of Air Circuit Breaker
26	Klas Technology Ventures Ltd., Bengaluru	Research & Development of Aluminium Cylinders for Liquified Gases for Domestic, Automotive Applications
27	Lifecare Innovations Pvt. Ltd., New Delhi	Liposomal Amphotericin-B
28	Litex Electricals Ltd., Pune	Laser Pumping Lamps
29	Maini Materials Movement Pvt. Ltd., Bengaluru	Development of In-plant Material Handling Equipments
30	MECPRO Heavy Engineering Ltd., New Delhi	Development and Demonstration of Eco-friendly and Effi cient Edible Oil Refining technology of Twin Bleaching system and Deacidification-cum-Deodorization System
31	MECPRO Heavy Engineering Ltd., New Delhi	Demonstration of on Efficient Solvent Extraction Plant & Technology with the Vent Air Cracking system
32	MIC Electronics Ltd., Hyderabad	Development of Fraud Management and Control Centre (FMCC)
33	Minda Industries Ltd., Delhi	Development of Auto Electrical Switches using Rapid Prototyping Facility of I.I.Sc.
34	Mishra Dhatu Nigam Ltd., Hyderabad	Development of Technology for producing Wires With Superior Surface Finish employing Wet Drawing Technique
35	Mishra Dhatu Nigam Ltd., Hyderabad	Development of Technology for Welding Molybdenum Coils to make coils in single coil weight of 20 kgs.
36	NALCO, Bhuvneshwar	Dev. of Technology at Pilot Scale Production of Special Grade Alumina

Annexure-10-Contd.

Sl. No.	Agency	Project Title
37	NED Energy Ltd., Bangaluru	Development of High Energy Density Valve Regulated Lead Acid Batteries
38	Ogene system India P. Ltd., Hyderabad	Nano Labelled DNA/RNA compounds
39	Organic Coatings Ltd., Mumbai	Development of (I) Water-based flexo inks used for alsorgent stock (craft paper) and Coated Stock (aat paper) (ii) U.V. radiation cuving inks used for coated stock and non-alsarlent sufistrates such as PVC Polyster etc.
40	Pan India Electromech Pvt. Ltd., Gurgaon	Development and Demonstration of Complete Automated Solution for Hydrography
41	Pennwalt Ltd., Mumbai	Dev. of Tech. for coating of Chemical process equmt. with fluoropolymers and other high performance polymeric products.
42	Poona Health Services Ltd., Pune	Development of Implants for Knee Joints
43	Priya Klay Pvt. Ltd., New Delhi	Development of Technology, Equipment and related "Product(s)" for Production of Stone Ware/ Vitrified Clay Pipes and other Pipes of other materials, made/produced as a result of this Project having large Diameters of 600 mm to 1000 mm and above and lenght
44	Pure Tech India, Trichy	Liquid Coolant Recovery System
45	Radiant Cables Pvt. Ltd., Hyderabad	Development of (a) Low loss RF cables for higher frequency above 10GHZ,(b) Data Bus cable with fire survival, low capacitance dielectric properties and © Laser marked loom assemblies.
46	Rishabh Instruments Pvt. Ltd., Mumbai	Design, development & manufacture of (i.) 5 3/4 digit multimeter & (ii) 6 3/4 digit multimeters
47	Rishang Keishing Foundation for Management of Tribal Areas, New Delhi	Ginger Oil
48	Sami Labs Limited, Bengaluru	Development and Pilot Plant Trials Towards Commercilisation of two Products, namely (I) A pentapeptide with a Natural Triterpenoid Conjugate (ii) Extraction of Pterostilbebe from Pterocarpus Marsupium & Conversion to Resveratrol
49	Select Packaging Machines Ltd., Thane	Special Blister Packaging Machines/Form Fill-seal Machine
50	Sequent Scientific Ltd., Thane	Development of Nitroscanate
51	Sequent Scientific Ltd., Thane	Development of Dorzolamide HCl
52	SM Telesys Ltd (SMTL), Noida	Development of CT(Computer Telephony Integration) based Call Centre Software
53	SM Telesys Ltd (SMTL), Noida	Dev. of Two Line Indian Language Multilingual Pager (ILP)
54	Solaris Chemtech Ltd. (formerly BILT Chemicals), Mumbai	Dev.and demo. of Technology for the manu. of Tetra Bromo Bisphenol-A (TBBA) on a pilot plant level
55	Steel Strips Wheel Ltd., Chandigarh	Technology Development and Demonstration of Improved Manufacturing Process for Automotive Wheel Discs

Annexure-10-Contd.

Sl. No.	Agency	Project Title
56	T. Stanes & Company Ltd., Coimbatore	Establishing and Producing bio Control Agents on Pilot Plant Scale
57	T. Stanes and Company Limited, Coimbatore	Development of Biofertilizers (Emulsifiable concentrate) for Nutrient Management of Agricultural Crops
58	T. Stanes and Company Ltd., Coimbatore	Dev. of technology for manufacture of Digested Organic Supplement (DOrS)
59	The Maharashtra State Seeds Corporation Ltd., Mumbai	Design, Development and Fabrication of Mini Dry Gas Cotton Seed Delinting Plant (0.5 TPH Capacity)
60	Transasia Bio-Medicals Ltd., Mumbai	Fully automated high speed blood chemistry analyser for through put of around 1000 tests/hour
61	United Telecom Ltd., Bengaluru	Asymetric Digital Subscriber Line (ADSL) System
62	United Telecom Ltd., Bengaluru	Development of AAM (ATM Access Multiplexer)
63	Zen Technologies Ltd., Hyderabad	Design and Development of 6 DoF Electrical Motion Platform
64	Zen Technologies Ltd., Hyderabad	Interactive Small Arms Training Simulator (ISAT)

ANNEXURE -11

DETAILS OF COMPLETED PROJECTS SUPPORTED UNDER ERSTWHILE TECHNOPRENEUR PROMOTION PROGRAMME

Completed Projects During the Year 2013-2014

Sl. No.	Name of the project
TePP Phase - I	
1.	Development of portable, non-invasive Oral Cancer Detection System
2.	An innovative technology for Recharging Alluvial Aquifers
3.	Innovation of ultra-thin elctro-stag refined technology/cost-effective substitute for critical application
4.	Fitment removal cum lifting/lowering arrangement for draft gear of wagons of railways
5.	Low cost multimedia projector
6.	Nutraceutical composition containing Egg Yolk derived anti-diarrheal agent
7.	Development of prototype of flat bed 3-axis PC controlled vertical NC milling m/c for sculptured surface machining for ornamental wood carving
8.	Multiple-crop portable circular oil expeller
9.	Digitally controlled three dimensional billboard
10.	Development of low-cost diagnostic tool to identify cardiac patients at risk of restenosis
11.	Portable microscopic slide projector(Teaching Aid)
12.	Banana cotton separator
13.	Development of process for the development of probiotic juices fro general public
14.	Digital Assistant- Low cost hand held device for rural banking using SMS Compatible Biometrics(fingerprint)
15.	Supportive limb for physically challenged
16.	Integrated security management system
17.	Innovation of high performance cricket leg gear
18.	Project Y-Cook – Convenient to Eat, Multi Dish Just Eat Food in thermoformed inter-lockable rigid containers

Annexure-11-Contd.

Sl. No.	Name of the project
19.	Mrityunjay – an advanced electronic distant patient monitoring system
20.	CNG Magnetorheological finishing machine
21.	A damper controlled above knee prosthesis
22.	"2 in 1", Self-secured orthodontic spring separator for predictable separation of teeth in orthodontic patients
23.	Natural potassium extract from agricultural organic source
24.	Solar powered DC/BLDC motor operated kerosene dispensing unit with biometric/bar code access control for PDS
25.	Vehicle driver monitoring system
26.	Solar heat treatment of sugarcane nodes and sugarcane node cutting machine
27.	Design and development of a dynamic stretch comfort measurement device for sports and health care applications
28.	Smart solar irrigation unit
29.	Laser scan head : design and development
30.	Low specific cost solar parabolic dish concentrator system
31.	Ozone system for enriching oxygen in diesel engine
32.	Automated multi-level modular system for parking vehicles
33.	Low cost laparoscopic surgical tool interface to a virtual realty : Laparoscopic Surgical Simulator
34.	Design of eco-friendly leisure boat
35.	Development of friction stir welding process
36.	Tarang Pariwartak- Generating electricity from ocean waves
37.	An innovative technology for recharging alluvial aquifers
38.	Multi-stage bamboo slivering machine
39.	Sollector Dish : A New Approach tp Solar Tracking for Concentrating Solar Power(CSP)
40.	Multiple Well Completion Technology
41.	Digital controlled precise dispensing valve
Micro-Technopreneurship	
1.	Visbreaker for crude petroleum oil
2.	Double tank flush cistern
3.	3rd Invincible EYE-A home automation system using voice and face recognition
4.	HEPCO Beverage (A herbal and fruit beverage with medicinal & nutritional properties)
5.	Multi-layer, scan able voice output communication aid and special access switches

Annexure-11-Contd.

Sl. No.	Name of the project
6.	Design and development of Switched Reluctance (SR) submersible motor
7.	Motion control of wheel chair by head rotation using MEMS alerometer
8.	Customized vermin-compost production
9.	Solar tea maker
10.	Development of bio-battery
11.	Data accumulation of a player in live sports
12.	Wireless voice assistant for the dumb
13.	Continuously controlled electronic servo mains voltage stabilizer
14.	3rd Invincible Eye- A home automation system using voice and face recognition
15.	Audio sensing assistance for deaf people
16.	Mobile phone detector in aircraft
17.	Intuitive tele-controlled machine arm
18.	Coconut fibre as suture material
19.	Mechanical Porter (Foot Pedaling Model)
TePP Phase-II	
1.	Split-type forming cutter, inserts & cutter heads
2.	Tractor mounted pulverizer
3.	Heating and cooling apparel
4.	A rotary apparatus adopted to perform as a variable compression ratio internal combustion engine
5.	Mobile crime and accident reporting platform(MCARP)
6.	Testing, trials & validation of prefabrication technology(PFT) developed products
7.	P-2 STATCOM
18.	Modular & reversible 2-in-1 school shoes
19.	Prototype development of Rahman's Yender
20.	Sports car with hybrid engine

ANNEXURE -12

REPRESENTATION OF SCs, STs AND OBCs

Groups	Number of Employees				Number of appointments made during the previous Calendar year									
	(As on 01-01-2014)				By Direct Recruitment				By Promotion			By other Methods		
	Total	SCs	STs	OBCs	Total	SCs	STs	OBCs	Total	SCs	STs	Total	SCs	STs
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Group A	41	5	4	1	-	-	-	-	-	-	-	-	-	-
Group B	34	5	2	2	-	-	-	-	-	-	-	-	-	-
Group C	13	8	-	2	-	-	-	-	-	-	-	-	-	-
Total	88	18	6	5	-	-	-	-	-	-	-	-	-	-

Note: DSIR recruits only Scientific and Technical posts.

* Under FCS

REPRESENTATION OF THE PERSONS WITH DISABILITIES AS ON 1st JANUARY 2014

Group	Number of Employees				Direct Recruitment							Promotion						
					No. of vacancies reserved				No of Appointments Made			No. of vacancies reserved			No of Appointments Made			
	Total	VH	HH	OH	VH	HH	OH	Total	VH	HH	OH	VH	HH	OH	Total	VH	HH	OH
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Group A	41	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-
Group B	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Group C	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	88	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-

ANNEXURE -13

EXTRACTS OF AUDIT OBSERVATIONS BY CAG

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

4.1 Public Private Partnership for setting up 'The Centre for Genomic Application' by Institute of Genomics and Integrative Biology

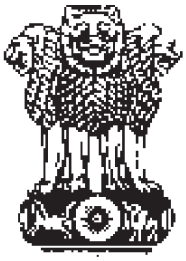
Institute of Genomics and Integrative Biology (IGIB) signed an agreement with the Institute of Molecular Medicine (IMM), a private partner for setting up 'The Centre for Genomic Application' (TCGA). IGIB did not follow due diligence before selecting the private partner. The agreement with IMM did not have adequate provisions for safeguarding interests of Government. TCGA could not achieve self-sufficiency, as envisaged. The pricing policy for its services was uneconomical. The financial practices of TCGA leaned in favour of the private partner, as apparent from undercharging of services rendered, booking of expenditure unrelated to TCGA in its accounts and not charging the partner for use of equipment belonging to IGIB. The monitoring mechanism established for TCGA was lax. Advisory Council of TCGA did not issue the policy framework and guidelines for operation of TCGA by the private partner. The objective of TCGA becoming a national research facility and a shared resource for use by universities, industries and laboratory groups remained largely unachieved. The activities of TCGA were suspended in August 2011.

4.2 Unfruitful expenditure

Central Institute of Mining and Fuel Research, a constituent unit of Council of Scientific and Industrial Research, failed to utilise technology of energy efficient coke oven in development of a demonstration/ commercial plant. As a result, expenditure of Rs 2.14 crore incurred on the project was rendered unfruitful.

Union Audit Report Scientific Departments (Report No 22 of 2013)

Annexure-14



R F D

(Results-Framework Document)

for

Department of Scientific and Industrial Research
(2012-2013)

Annexure-14-Contd.

Section 1:
Vision, Mission, Objectives and Functions

Vision

Enabling India to emerge as global industrial research and innovation hub

Mission

Attracting industrial research in the country through industry and institution centric motivational measures and incentives; Creating an enabling environment for development and utilization of new innovations.Enhance innovations through its resources and channelize benefits thereof to the people.

Objective

1 To promote and nurture research and development in industry with a view to enhance industry's share in national R&D; expenditure;

2 To promote innovations through its resources and channelize benefits for public good;

3 To promote and support industry including start-ups for development of new products, processes and technologies leading to industrial competitiveness;

4 To encourage the spirit of creativity and innovativeness in individuals and scientist entrepreneurs;

5 To promote and support Cluster Innovation Centres in MSME Cluster initiated by National Innovation Council;

6 To provide technology based support for programmes aimed at benefitting women;

7 To prepare a roadmap for Sectoral Innovation Council on Industrial R&D;

8 To track scientific innovations in the country;

9 To assess the outcome of major technologies of national importance, developed by CSIR on a continuous basis;

10 Capacity building of Asia Pacific region through Asian & Pacific Centre for Transfer of Technology (UN ESCAP-APCTT);

11 To implement e-Governance and ERP initiatives;

Functions

1 All matters concerning the Council of Scientific & Industrial Research

2 All matters relating to National Research Development Corporation

3 All matters relating to Central Electronics Limited

4 Registration and Recognition of R&D; Units

5 Technical matters relating to UNCTAD & WIPO

6 National register for foreign collaborations

7 Matters relating to creation of a pool for temporary placement of Indian Scientists & Technologists

Section 2:
Inter se Priorities among Key Objectives, Success indicators and Targets

Annexure-14-Contd.

Objective	Weight	Action	Success Indicator	Unit	Weight	Target / Criteria Value				
						Excellent	Very Good	Good	Fair	Poor
						100%	90%	80%	70%	60%
[1] To promote and nurture research and development in industry with a view to enhance industry's share in national R&D expenditure;	28.00	[1.1] Recognition and renewal of R&D Centres	[1.1.1] Recognition & registration to new in-house R&D units; Scientific & Industrial Research Organisations (SIROs); and Public Funded Research Institutions (PFRIs)	Nos.	5.88	250	240	230	225	220
			[1.1.2] Renewal of recognition & registration to in-house R&D units; SIROs; PFRIs	Nos.	3.08	780	775	725	700	675
		[1.2] Fiscal incentives for Scientific Research	[1.2.1] Approving new companies for availing fiscal benefits	Nos.	8.96	70	67	64	60	58
		[1.3] Assessment of R&D and Innovation output of industry	[1.3.1] New patents filed	Nos.	1.96	28	25	22	20	18
			[1.3.2] New products commercialized	Nos.	1.96	12	10	8	7	6
		[1.4] Online access to scientific journals by In-house R&D units and SIROs	[1.4.1] No. of scientific journals accessed online	Nos.	3.08	5	4	3	2	1
			[1.4.2] No. of In-house R&D units and SIROs having online access to scientific journals	Nos.	3.08	30	25	22	20	18
[2] To promote innovations through its resources and channelize benefits for public good;	28.00	[2.1] To launch new scheme on "Promoting Innovations in Individuals, Start-ups and MSMEs" (PRISM)	[2.1.1] Launching of the Scheme	Date	4.20	30/09/2012	07/10/2012	15/10/2012	22/10/2012	30/10/2012

Section 2:
Inter se Priorities among Key Objectives, Success indicators and Targets

Objective	Weight	Action	Success Indicator	Unit	Weight	Target / Criteria Value				
						Excellent	Very Good	Good	Fair	Poor
						100%	90%	80%	70%	60%
		and finalize its guidelines								
			[2.1.2] Issuance of scheme guidelines	Date	2.80	30/10/2012	07/11/2012	14/11/2012	21/11/2012	28/11/2012
		[2.2] To launch new scheme on "Patent Acquisition and Collaborative Research and Technology Development" (PACE) and finalize its guidelines	[2.2.1] Launching of the Scheme	Date	4.20	30/09/2012	07/10/2012	15/10/2012	22/10/2012	30/10/2012
			[2.2.2] Issuance of scheme guidelines	Date	2.80	30/10/2012	07/11/2012	14/11/2012	21/11/2012	28/11/2012
		[2.3] To launch new scheme on "Building Industrial R&D and Common Research Facilities" (BIRD) and finalize its guidelines	[2.3.1] Launching of the Scheme	Date	4.20	30/09/2012	07/10/2012	15/10/2012	22/10/2012	30/10/2012
			[2.3.2] Issuance of scheme guidelines	Date	2.80	30/10/2012	07/11/2012	14/11/2012	21/11/2012	28/11/2012
		[2.4] To launch new scheme on "Access to Knowledge for Technology Development and Dissemination" (A2K+) and finalize its guidelines	[2.4.1] Launching of the Scheme	Date	4.20	30/09/2012	07/10/2012	15/10/2012	22/10/2012	29/10/2012
			[2.4.2] Issuance of scheme guidelines	Date	2.80	30/10/2012	07/11/2012	14/11/2012	21/11/2012	28/11/2012
[3] To promote and support industry including start-ups for development of new products, processes and technologies leading to industrial competitiveness;	5.00	[3.1] Completion of on-going Technology Development and Demonstration Programme (TDDP)	[3.1.1] Product Prototype / Process developed and demonstrated	Nos.	4.00	9	8	7	6	5

Annexure-14-Contd.

Section 2:
Inter se Priorities among Key Objectives, Success indicators and Targets

Objective	Weight	Action	Success Indicator	Unit	Weight	Target / Criteria Value				
						Excellent	Very Good	Good	Fair	Poor
						100%	90%	80%	70%	60%
		projects								
		[3.2] Independent evaluation of Technology Development and Demonstration Programme (TDDP)	[3.2.1] Submission of evaluation report to the department	Date	1.00	10/03/2013	14/03/2013	18/03/2013	22/03/2013	25/03/2013
[4] To encourage the spirit of creativity and innovativeness in individuals and scientist entrepreneurs;	5.00	[4.1] Completion of on-going Technopreneur Promotion Programme (TePP) projects	[4.1.1] Product Prototype / Process demonstrated	Nos.	4.00	42	40	38	35	32
		[4.2] Independent evaluation of Technopreneur Promotion Programme (TePP)	[4.2.1] Submission of evaluation report to the department	Date	1.00	10/03/2013	14/03/2013	18/03/2013	22/03/2013	25/03/2013
[5] To promote and support Cluster Innovation Centres in MSME Cluster initiated by National Innovation Council;	7.00	[5.1] To support proposals for establishment of new Cluster Innovation Centres in MSME Clusters in association with National Innovation Council (NInC)	[5.1.1] Support to Training Programmes in the clusters	Nos.	3.50	18	16	14	12	10
			[5.1.2] Support to Innovative proposals of MSMEs from the clusters	Nos.	3.50	25	22	20	18	15
[6] To provide technology based support for programmes aimed at benefitting women;	2.00	[6.1] Support proposals from a Non-Governmental Organisations (NGOs), Women Self-Help Groups (SHGs) and other concerned agencies	[6.1.1] Number of agencies supported	Nos.	2.00	9	8	6	4	3
[7] To prepare a roadmap for Sectoral Innovation Council on Industrial R&D;	2.00	[7.1] To organize stakeholder meetings for seeking inputs	[7.1.1] Compilation of stakeholder inputs into a roadmap	Date	2.00	07/03/2013	10/03/2013	14/03/2013	17/03/2013	20/03/2013

Annexure-14-Contd.

Section 2:
Inter se Priorities among Key Objectives, Success indicators and Targets

Objective	Weight	Action	Success Indicator	Unit	Weight	Target / Criteria Value				
						Excellent	Very Good	Good	Fair	Poor
						100%	90%	80%	70%	60%
[8] To track scientific innovations in the country;	2.00	[8.1] Creation of a Scientific Innovations Database	[8.1.1] Finalization of database structure and sources of information	Date	1.00	15/09/2012	18/09/2012	21/09/2012	24/09/2012	27/09/2012
			[8.1.2] Scientific innovations added in the database	Nos.	1.00	120	115	110	105	100
[9] To assess the outcome of major technologies of national importance, developed by CSIR on a continuous basis;	2.00	[9.1] To carry out an economic impact assessment of major technologies of national importance, developed by CSIR	[9.1.1] Identification of technologies of national importance, developed by CSIR	Nos.	1.00	6	5	4	3	2
			[9.1.2] Preparation of technology impact assessment reports	Nos.	1.00	6	5	4	3	2
[10] Capacity building of Asia Pacific region through Asian & Pacific Centre for Transfer of Technology (UN ESCAP-APCTT);	2.00	[10.1] To provide infrastructural and programme support	[10.1.1] Provision of Institutional support	Date	1.00	31/12/2012	15/01/2013	31/01/2013	07/02/2013	14/02/2013
			[10.1.2] Programme activities supported	Nos.	1.00	2	1	1	1	1
[11] To implement e-Governance and ERP initiatives;	2.00	[11.1] Design, Development, Validation and Certification of Enterprise Resource Planning (ERP) solution for e-Office as well as for department's external interface	[11.1.1] User Acceptance of the e-Office and ERP package	Date	2.00	15/12/2012	31/12/2012	15/01/2013	31/01/2013	28/02/2013
* Efficient Functioning of the RFD System	3.00	Timely submission of Draft for Approval	On-time submission	Date	2.0	05/03/2012	06/03/2012	07/03/2012	08/03/2012	09/03/2012

* Mandatory Objective(s)

Annexure-14-Contd.

Section 2:
Inter se Priorities among Key Objectives, Success indicators and Targets

Objective	Weight	Action	Success Indicator	Unit	Weight	Target / Criteria Value				
						Excellent	Very Good	Good	Fair	Poor
						100%	90%	80%	70%	60%
		Timely submission of Results	On- time submission	Date	1.0	01/05/2012	03/05/2012	04/05/2012	05/05/2012	06/05/2012
* Administrative Reforms	6.00	Implement mitigating strategies for reducing potential risk of corruption	% of implementation	%	2.0	100	95	90	85	80
		Implement ISO 9001 as per the approved action plan	Area of operations covered	%	2.0	100	95	90	85	80
		Identify, design and implement major innovations	Implementation of identified innovations	Date	2.0	05/03/2013	06/03/2013	07/03/2013	08/03/2013	09/03/2013
* Improving Internal Efficiency / responsiveness / service delivery of Ministry / Department	4.00	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	%	2.0	100	95	90	85	80
			Independent Audit of implementation of public grievance redressal system	%	2.0	100	95	90	85	80
* Ensuring compliance to the Financial Accountability Framework	2.00	Timely submission of ATNs on Audit paras of C&AG	Percentage of ATNs submitted within due date (4 months) from date of presentation of Report to Parliament by CAG during the year.	%	0.5	100	90	80	70	60
		Timely submission of ATRs to the PAC Sectt. on PAC Reports.	Percentage of ATRS submitted within due date (6 months) from date of presentation of Report to Parliament by PAC during the year.	%	0.5	100	90	80	70	60
		Early disposal of pending ATNs on Audit Paras of C&AG Reports presented to Parliament before 31.3.2012.	Percentage of outstanding ATNs disposed off during the year.	%	0.5	100	90	80	70	60
		Early disposal of pending ATRs on PAC Reports presented to Parliament before 31.3.2012	Percentage of outstanding ATRS disposed off during the year.	%	0.5	100	90	80	70	60

* Mandatory Objective(s)

Section 3:
Trend Values of the Success Indicators

Objective	Action	Success Indicator	Unit	Actual Value FY 10/11	Actual Value FY 11/12	Target Value FY 12/13	Projected Value for FY 13/14	Projected Value for FY 14/15
[1] To promote and nurture research and development in industry with a view to enhance industry's share in national R&D expenditure;	[1.1] Recognition and renewal of R&D Centres	[1.1.1] Recognition & registration to new in-house R&D units; Scientific & Industrial Research Organisations (SIROs); and Public Funded Research Institutions (PFRIs)	Nos.	200	220	240	245	250
		[1.1.2] Renewal of recognition & registration to in-house R&D units; SIROs; PFRIs	Nos.	625	720	775	785	800
	[1.2] Fiscal incentives for Scientific Research	[1.2.1] Approving new companies for availing fiscal benefits	Nos.	63	72	67	70	80
	[1.3] Assessment of R&D and Innovation output of industry	[1.3.1] New patents filed	Nos.	--	--	25	30	35
		[1.3.2] New products commercialized	Nos.	--	--	10	12	14
	[1.4] Online access to scientific journals by In-house R&D units and SIROs	[1.4.1] No. of scientific journals accessed online	Nos.	--	--	4	5	6
		[1.4.2] No. of In-house R&D units and SIROs having online access to scientific journals	Nos.	--	--	25	40	60
[2] To promote innovations through its resources and channelize benefits for public good;	[2.1] To launch new scheme on "Promoting Innovations in Individuals, Start-ups and MSMEs" (PRISM) and finalize its	[2.1.1] Launching of the Scheme	Date	--	--	07/10/2012	--	--

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Section 3:
Trend Values of the Success Indicators

Objective	Action	Success Indicator	Unit	Actual Value FY 10/11	Actual Value FY 11/12	Target Value FY 12/13	Projected Value for FY 13/14	Projected Value for FY 14/15
	guidelines							
		[2.1.2] Issuance of scheme guidelines	Date	--	--	07/11/2012	--	--
	[2.2] To launch new scheme on "Patent Acquisition and Collaborative Research and Technology Development" (PACE) and finalize its guidelines	[2.2.1] Launching of the Scheme	Date	--	--	07/10/2012	--	--
		[2.2.2] Issuance of scheme guidelines	Date	--	--	07/11/2012	--	--
	[2.3] To launch new scheme on "Building Industrial R&D and Common Research Facilities" (BIRD) and finalize its guidelines	[2.3.1] Launching of the Scheme	Date	--	--	07/10/2012	--	--
		[2.3.2] Issuance of scheme guidelines	Date	--	--	07/11/2012	--	--
	[2.4] To launch new scheme on "Access to Knowledge for Technology Development and Dissemination" (A2K+) and finalize its guidelines	[2.4.1] Launching of the Scheme	Date	--	--	07/10/2012	--	--
		[2.4.2] Issuance of scheme guidelines	Date	--	--	07/11/2012	--	--
[3] To promote and support industry including start-ups for development of new products, processes and technologies leading to industrial competitiveness;	[3.1] Completion of on-going Technology Development and Demonstration Programme (TDDP) projects	[3.1.1] Product Prototype / Process developed and demonstrated	Nos.	6	3	8	10	12

Section 3:
Trend Values of the Success Indicators

Objective	Action	Success Indicator	Unit	Actual Value FY 10/11	Actual Value FY 11/12	Target Value FY 12/13	Projected Value for FY 13/14	Projected Value for FY 14/15
	[3.2] Independent evaluation of Technology Development and Demonstration Programme (TDDP)	[3.2.1] Submission of evaluation report to the department	Date	--	--	14/03/2013	--	--
[4] To encourage the spirit of creativity and innovativeness in individuals and scientist entrepreneurs;	[4.1] Completion of on-going Technopreneur Promotion Programme (TePP) projects	[4.1.1] Product Prototype / Process demonstrated	Nos.	32	37	40	42	45
	[4.2] Independent evaluation of Technopreneur Promotion Programme (TePP)	[4.2.1] Submission of evaluation report to the department	Date	--	--	14/03/2013	--	--
[5] To promote and support Cluster Innovation Centres in MSME Cluster initiated by National Innovation Council;	[5.1] To support proposals for establishment of new Cluster Innovation Centres in MSME Clusters in association with National Innovation Council (NInC)	[5.1.1] Support to Training Programmes in the clusters	Nos.	--	--	16	20	25
		[5.1.2] Support to Innovative proposals of MSMEs from the clusters	Nos.	--	--	22	35	50
[6] To provide technology based support for programmes aimed at benefitting women;	[6.1] Support proposals from a Non-Governmental Organisations (NGOs), Women Self-Help Groups (SHGs) and other concerned agencies	[6.1.1] Number of agencies supported	Nos.	8	8	8	8	9

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Section 3:
Trend Values of the Success Indicators

Objective	Action	Success Indicator	Unit	Actual Value FY 10/11	Actual Value FY 11/12	Target Value FY 12/13	Projected Value for FY 13/14	Projected Value for FY 14/15
[7] To prepare a roadmap for Sectoral Innovation Council on Industrial R&D;	[7.1] To organize stakeholder meetings for seeking inputs	[7.1.1] Compilation of stakeholder inputs into a roadmap	Date	--	--	10/03/2013	--	--
[8] To track scientific innovations in the country;	[8.1] Creation of a Scientific Innovations Database	[8.1.1] Finalization of database structure and sources of information	Date	--	--	18/09/2012	--	--
		[8.1.2] Scientific innovations added in the database	Nos.	--	--	115	--	--
[9] To assess the outcome of major technologies of national importance, developed by CSIR on a continuous basis;	[9.1] To carry out an economic impact assessment of major technologies of national importance, developed by CSIR	[9.1.1] Identification of technologies of national importance, developed by CSIR	Nos.	--	--	5	5	5
		[9.1.2] Preparation of technology impact assessment reports	Nos.	--	--	5	5	5
[10] Capacity building of Asia Pacific region through Asian & Pacific Centre for Transfer of Technology (UN ESCAP-APCTT);	[10.1]To provide infrastructural and programme support	[10.1.1] Provision of Institutional support	Date	3	--	15/01/2013	15/01/2014	15/01/2015
		[10.1.2] Programme activities supported	Nos.	--	--	1	1	1
[11] To implement e-Governance and ERP initiatives;	[11.1]Design, Development, Validation and Certification of Enterprise Resource Planning (ERP) solution for e-Office as well as for department's external interface	[11.1.1] User Acceptance of the e-Office and ERP package	Date	--	--	31/12/2012	--	--

* Mandatory Objective(s)

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Section 3:
Trend Values of the Success Indicators

Objective	Action	Success Indicator	Unit	Actual Value FY 10/11	Actual Value FY 11/12	Target Value FY 12/13	Projected Value for FY 13/14	Projected Value for FY 14/15
* Efficient Functioning of the RFD System	Timely submission of Draft for Approval	On-time submission	Date	05/03/2010	07/03/2011	06/03/2012	--	--
	Timely submission of Results	On- time submission	Date	29/04/2011	30/04/2012	03/05/2012	--	--
* Administrative Reforms	Implement mitigating strategies for reducing potential risk of corruption	% of implementation	%	--	--	95	--	--
	Implement ISO 9001 as per the approved action plan	Area of operations covered	%	--	--	95	--	--
	Identify, design and implement major innovations	Implementation of identified innovations	Date	--	--	06/03/2013	--	--
* Improving Internal Efficiency / responsiveness / service delivery of Ministry / Department	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	%	--	--	95	--	--
		Independent Audit of implementation of public grievance redressal system	%	--	--	95	--	--
* Ensuring compliance to the Financial Accountability Framework	Timely submission of ATNs on Audit paras of C&AG	Percentage of ATNs submitted within due date (4 months) from date of presentation of Report to Parliament by CAG during the year.	%	--	--	90	--	--
	Timely submission of ATRs to the PAC Sectt. on PAC Reports.	Percentage of ATRS submitted within due date (6 months) from date of presentation of Report to Parliament by PAC during the year.	%	--	--	90	--	--
	Early disposal of pending ATNs on Audit Paras of C&AG Reports presented to Parliament before	Percentage of outstanding ATNs disposed off during the year.	%	--	--	90	--	--

* Mandatory Objective(s)

Section 3:
Trend Values of the Success Indicators

Objective	Action	Success Indicator	Unit	Actual Value FY 10/11	Actual Value FY 11/12	Target Value FY 12/13	Projected Value for FY 13/14	Projected Value for FY 14/15
	31.3.2012.							
	Early disposal of pending ATRs on PAC Reports presented to Parliament before 31.3.2012	Percentage of outstanding ATRS disposed off during the year.	%	--	--	90	--	--

* Mandatory Objective(s)

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Section 4:
Description and Definition of Success Indicators and Proposed Measurement Methodology

Success Indicators	Actions	Description and Definition	Measurement Methodology
Objective 1			
To promote and nurture research and development in industry with a view to enhance industry's share in national R&D expenditure	Recognition and renewal of R&D Centres	Applications for Inhouse R&D are scrutinized in the department and those recommended by the Screening Committee are approved by the Competent authority for recognition / registration. Similarly applications for renewal of recognition are scrutinized in the department and approved by the competent authority.	The number of new in-house R&D centres, SIROs and PFRIs recognized / registered or the recognition renewed
	Fiscal incentives for Scientific Research	As per Income Tax Act, Secretary, DSIR is the prescribed authority for approval of companies for claiming weighted deduction on R&D expenditure. The department reports the expenditure eligible for weighted tax deduction to DGIT (E).	The number of companies eligible for weighted tax deduction notified to DGIT (E).

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	Assessment of R&D and Innovation output of industry	Evaluation and assessment of R&D being carried out in industrial units.	Number of new patents filed and value of new products commercialized by industrial units during the year.
	Online Access to scientific journals by In-house R&D units and SIROs	The scientific journals shall be made available to the In-house R&D units and SIROs online at subsidized cost so that the concerned institutions can enhance their knowledge and research activities	No. of In-house R&D units and SIROs accessing scientific journals shall be tracked at the time of granting / renewing recognition. Quality of research of the institutions shall be assessed by papers published, patents granted and technologies commercialized.
Objective 2			
To promote innovations through its resources and channelize benefits for public good.	To launch new scheme on "Promoting Innovations in Individuals, Start-ups and MSMEs" (PRISM) and finalize its guidelines	Under the scheme, innovative proposals of MSMEs shall be supported; CSIR –Cluster Innovation Centres (CICs) promoted by National Innovation Council shall be supported for providing innovative solutions; existing network of TePP Outreach Centres shall be expanded; proposals from individual innovators / incubates shall be supported; and support shall be extended to approved Technopreneur Promotion Programme (TePP) projects, spilling over from the 11th five year plan.	Periodic monitoring of various stages of approval and internal discussions on draft guidelines.

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	To launch new scheme on "Patent Acquisition and Collaborative Research and Technology Development" (PACE) and finalize its guidelines	Under the scheme, support shall be provided to Indian industries to acquire Intellectual Property at early stage from overseas or within the country and add value to the acquired IP; and focus shall be on Public-Private-Partnerships (PPP) to create enabling environment for collaborative research between Industry and Universities/Public Funded Research Institutions.	Periodic monitoring of various stages of approval and internal discussions on draft guidelines.
	To launch new scheme on "Building Industrial R&D and Common Research Facilities" (BIRD) and finalize its guidelines	Under the scheme, R&D in Industry shall be encouraged and supported; and support shall be provided for creation of Common Research Facilities for Small and Micro Industries.	Periodic monitoring of various stages of approval and internal discussions on draft guidelines.

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	To launch new scheme on "Access to Knowledge for Technology Development and Dissemination" (A2K+) and finalize its guidelines	Under the scheme, Science, technology and innovation related international journals from major publishers shall be made accessible to 1500 inhouse R&D units of industry and 600 Scientific &Industrial Research Organisations (SIROs) and techno-entrepreneurs, besides conducting studies/conferences on Industrial Status in the country; support shall be provided for Technological Empowerment of Women projects, including projects spilling over from the 11th five year plan; and support shall be extended to Technology Development and Demonstration Programme (TDDP) projects, spilling over from the 11th five year plan.	Periodic monitoring of various stages of approval and internal discussions on draft guidelines.

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Objective 3			
To promote and support industry including startups for development of new products, processes and technologies leading to industrial competitiveness;	Completion of on-going Technology Development and Demonstration Programme (TDDP) projects	Projects only with innovative technological content are supported from the proof of concept / laboratory stage upto the pilot plant stage, Demonstrating the commercialization potential of the product / process developed.	Out of the total number of projects supported, projects that result into commercialization are measured which indicates the outcome.
	Independent evaluation of Technology Development and Demonstration Programme (TDDP)	Technology Development and Demonstration Programme (TDDP) was continued in the 11th five year plan with an objective to assist industries in upscaling of the lab scale technologies upto pilot plant level before commercialization. Industries were required to pay back the grant received by them upon successful commercialization of the products / processes developed. The programme is being discontinued in the 12th Five Year Plan its present form. Experiences of the department in running the programme and its outcome shall be evaluated by an external agency.	Periodic meetings with the agency engaged for carrying out the independent evaluation shall be held to identify the evaluation criteria and accept the report.

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Objective 4			
To encourage the spirit of creativity and innovativeness in individuals and scientist entrepreneurs;	Completion of on-going Technopreneur Promotion Programme (TePP) projects	Creative individuals are supported to convert their innovative ideas into prototypes / models.	Out of the total number of projects supported, products / prototypes and models developed indicate the outcome.
	Independent evaluation of Technopreneur Promotion Programme (TePP)	Technopreneur Promotion Programme (TePP) was continued in the 11th five year Plan with an objective to assist individual innovators in conversion of their innovative ideas into workable prototypes / models. The programme is being discontinued in the 12th Five Year Plan its present form. Experiences of the department in running the programme and its outcome shall be evaluated by an external agency.	Periodic meetings with the agency engaged for carrying out the independent evaluation shall be held to identify the evaluation criteria and accept the report.

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Objective 5			
To promote and support Cluster Innovation Centres in MSME Cluster initiated by National Innovation Council;	To support proposals for establishment of new Cluster Innovation Centres in MSME Clusters in association with National Innovation Council (NInC)	NInC and CSIR have entered into an MoU wherein innovations in about 150 clusters shall be supported. DSIR is already supporting 7 pilot clusters initiated by the National Innovation Council (NInC) viz. Bamboo Cluster at Agarthala, Pharma Cluster at Ahmedabad, Food Processing Cluster at Krishnagiri, Brassware Cluster at Moradabad, Auto-component clusters at Faridabad, Ayurveda Cluster at Thrissur and Delhi University Cluster at New Delhi. DSIR shall provide the partial support for: Establishment of the other Cluster Innovation Centres (CICs); organization of training programmes in clusters; and innovative proposals of MSMEs in clusters.	In collaboration with NInC, no. of new Cluster Innovation Centres shall be identified, training programmes shall be organized in association with agencies such as CII, IL&FS, TCS etc. and innovative proposals shall be solicited by engaging CSIR scientists with MSMEs in the clusters.
Objective 6			
To provide technology based support for programmes aimed at benefitting women;	Support proposals from a Non-Governmental Organisations (NGOs), Women Self-Help Groups (SHGs) and other concerned agencies	Inviting projects from NGOs and other organizations aimed at evolving technological solutions for the benefit of women.	The numbers of projects approved are the ones recommended by Technical Advisory Committee (TAC) and concurred by IFD.

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Objective 7			
To prepare a roadmap for Sectoral Innovation Council on Industrial R&D	To organize Stakeholder meetings for seeking inputs		Sectoral Innovation Council will hold periodic meetings with various stakeholders to obtain inputs and suggestions for formulation of an effective roadmap that will clearly identify the roles of each stakeholder.
Objective 8			
To track scientific innovations in the country	Creation of a Scientific Innovations Database	Scientific Innovations Database shall include parameters such as title, source, description, utility, commercialization details and impact of innovations. The sources for compilation of innovations shall include the patent database, National Innovation Foundations' Grass-root Innovations, Technology Business Incubators, Science &Technology Entrepreneurship Parks, Innovation awards given by various agencies and the various programmes of the Govt. of India leading to innovative products / services.	The innovations compiled from various sources shall be assessed by an expert committee before uploading the same on the database. The committee shall also study and benchmark the proposed database with similar innovation databases existing elsewhere.

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Objective 9			
To assess the outcome of major technologies of national importance, developed by CSIR on a continuous basis	To carry out an economic impact assessment of major technologies of national importance, developed by CSIR	CSIR is engaged in development of several technologies having useful industrial applications. Some of these technologies are of national importance, having direct benefit to the laboratories and industries who commercialize these technologies as well as indirect benefits to the economy and society by way of access to affordable health, pollution free environment and fulfillment of their basic needs.	The direct benefits of major CSIR technologies shall be assessed in terms of royalty to the laboratories and commercial profits of the industry. Indirect benefits to economy and society shall be assessed by evaluating the costs of accessing alternate products / services by the people, in absence of products / processes based on CSIR technologies.
Objective 10			
Capacity Building of Asia Pacific region through Asian and the Pacific Centre for Transfer of Technology (UN ESCAP-APCTT).	To provide infrastructural and programme support	DSIR is the country's focal point for United Nations Economic and Social Commission for Asian and the Pacific Centre for Transfer of Technology (UN ESCAP-APCTT). The department provides institutional grant and programme support. UN ESCAP decides the programmes to be carried out by APCTT.	Number of programmes / activities supported in a year are measured
Objective 11			
To implement e-Governance and ERP initiatives.	Design, Development, Validation and Certification of Enterprise Resource Planning (ERP) solution for e-Office as well as for department's external interface	System Study, Requirement specification, Process, Information Architectures, and Development of ERP, Graphical User Interface (GUI) Validation, User Acceptance Test (UAT) and Certification	Validation, Successful User Acceptance Test (UAT), Functional Testing, Alpha Testing and certification.

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Section 5:
Specific Performance Requirements from other Departments

Department	Relevant Success Indicator	What do you need?	Why do you need?	How much you need?	What happens if you do not get it?
Relevant scientific departments e.g. DST, DBT, Ministry of Environment and Forests, Ministry of New and Renewable Energy, Department of Information Technology, etc.	Approval of fresh projects for funding	Peer review of fresh proposals	To assist the Technical Advisory Committee (TAC) of the Department in recommendation of the projects	This is an essential requirement for recommendation of proposals by TAC	Approval of fresh projects will be affected if peer review comments not received. However, Department will have to follow up telephonically/ through SMS etc.
Relevant scientific departments e.g. DBT, Department of Information Technology, Department of Pharmaceuticals, Department of Chemicals &Petrochemicals, Department of Agriculture, ICMR, ICAR, etc.	Recognition of new In-house R&D units, SIROs and PFRIs	Comments and views on the applications received for recognition	The views of Administrative Ministry are taken into consideration before recognition	To take care of any untoward experience of other departments in respect of any In-house R&D unit, SIRO or PFRI	Absence of comments may hold up recognitions. However, Department will have to follow up telephonically/ through SMS etc.

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Department of Revenue, Ministry of Finance	Approval of new cases for Income tax Deduction / benefits on R&D investments	Long term policy on fiscal incentives for scientific research required	For efficient implementation of fiscal incentives by DSIR	Sufficiently long term policy of 10-15 years duration required	If the incentives are announced or withdrawn frequently, industry response to R&D diminishes. However, department encourages industry for R&D through other mechanisms.
National Innovation Council and Ministry of MSME	To promote and support Cluster Innovation Centres in MSME Cluster initiated by National Innovation Council;	Cluster Proposals as per departmental guidelines	To seek approval of competitive authority and extend support to the clusters	Adequate No. of cluster proposals so as assist in establishment of the targeted no. of clusters for the year.	Targeted number of clusters may not be supported in absence of proposals. However, the department shall maintain a close liaison with NInC to obtain proposals.

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Section 6:
Outcome/Impact of Department/Ministry

	Outcome/Impact of Department/Ministry	Jointly responsible for influencing this outcome / impact with the following department (s) / ministry(ies)	Success Indicator	Unit	FY 10/11	FY 11/12	FY 12/13	FY 13/14	FY 14/15
1	Increased R&D spend by industry	Director General of Income Tax (E)	R&D expenditure certified u/s. 35(2AB) of Income Tax	Rs. in Crore	3200	3500	3800	4000	4200
2	Enhanced innovative output of industry	Industry	No. of Innovative products / processes successfully demonstrated	Nos.	6	3	8	10	12
3	Nurturing innovative potential of individuals	TePP Outreach Centres	No. of innovations demonstrated by individuals	Nos.	32	37	40	42	45
4	Enhanced the competitiveness of MSME Clusters	National Innovation Council (NInC) and Ministry of MSME	No. of innovative proposals from MSME Clusters	Nos.			22	35	50

PERFORMANCE EVALUATION REPORT

Objective	Weight	Action	Success Indicator	Unit	Weight	Target / Criteria Value					Achiev-ement	Performance	
						Excellent	Very Good	Good	Fair	Poor		Raw Score	Weigh-ted Score
						100%	90%	80%	70%	60%			
1 To promote and nurture research and development in industry with a view to enhance industry's share in national R&D expenditure;	28.00	Recognition and renewal of R&D Centres	Recognition & registration to new in-house R&D units; Scientific & Industrial Research Organisations (SIROs); and Public Funded Research Institutions (PFRIs)	Nos.	5.88	250	240	230	225	220	322	100.0	5.88
			Renewal of recognition & registration to in-house R&D units; SIROs; PFRIs	Nos.	3.08	780	775	725	700	675	715	76.0	2.34
		Fiscal incentives for Scientific Research	Approving new companies for availing fiscal benefits	Nos.	8.96	70	67	64	60	58	110	100.0	8.96
		Assessment of R&D and Innovation output of industry	New patents filed	Nos.	1.96	28	25	22	20	18	28	100.0	1.96
			New products commercialized	Nos.	1.96	12	10	8	7	6	12	100.0	1.96
		Online access to scientific journals by In-house R&D units and SIROs	No. of scientific journals accessed online	Nos.	3.08	5	4	3	2	1	0	0.0	0.0
			No. of In-house R&D units and SIROs having online access to scientific journals	Nos.	3.08	30	25	22	20	18	0	0.0	0.0
2 To promote innovations through its resources and channelize benefits for public good;	28.00	To launch new scheme on "Promoting Innovations in Individuals, Start-ups and MSMEs" (PRISM) and finalize its guidelines	Launching of the Scheme	Date	4.20	30/09/2012	07/10/2012	15/10/2012	22/10/2012	30/10/2012	30/09/2012	100.0	4.2
			Issuance of scheme guidelines	Date	2.80	30/10/2012	07/11/2012	14/11/2012	21/11/2012	28/11/2012	30/10/2012	100.0	2.8

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PERFORMANCE EVALUATION REPORT

Objective	Weight	Action	Success Indicator	Unit	Weight	Target / Criteria Value					Achiev-ement	Performance	
						Excellent	Very Good	Good	Fair	Poor		Raw Score	Weigh-ted Score
						100%	90%	80%	70%	60%			
		To launch new scheme on "Patent Acquisition and Collaborative Research and Technology Development" (PACE) and finalize its guidelines	Launching of the Scheme	Date	4.20	30/09/2012	07/10/2012	15/10/2012	22/10/2012	30/10/2012	30/09/2012	100.0	4.2
			Issuance of scheme guidelines	Date	2.80	30/10/2012	07/11/2012	14/11/2012	21/11/2012	28/11/2012	30/10/2012	100.0	2.8
		To launch new scheme on "Building Industrial R&D and Common Research Facilities" (BIRD) and finalize its guidelines	Launching of the Scheme	Date	4.20	30/09/2012	07/10/2012	15/10/2012	22/10/2012	30/10/2012	30/09/2012	100.0	4.2
			Issuance of scheme guidelines	Date	2.80	30/10/2012	07/11/2012	14/11/2012	21/11/2012	28/11/2012	30/10/2012	100.0	2.8
		To launch new scheme on "Access to Knowledge for Technology Development and Dissemination" (A2K+) and finalize its guidelines	Launching of the Scheme	Date	4.20	30/09/2012	07/10/2012	15/10/2012	22/10/2012	29/10/2012	30/09/2012	100.0	4.2
			Issuance of scheme guidelines	Date	2.80	30/10/2012	07/11/2012	14/11/2012	21/11/2012	28/11/2012	30/10/2012	100.0	2.8
3 To promote and support industry including start-ups for development of new products, processes and technologies leading to industrial competitiveness;	5.00	Completion of on-going Technology Development and Demonstration Programme (TDDP) projects	Product Prototype / Process developed and demonstrated	Nos.	4.00	9	8	7	6	5	9	100.0	4.0
		Independent evaluation of Technology Development and Demonstration Programme (TDDP)	Submission of evaluation report to the department	Date	1.00	10/03/2013	14/03/2013	18/03/2013	22/03/2013	25/03/2013	30/06/2013	0.0	0.0

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PERFORMANCE EVALUATION REPORT

Objective	Weight	Action	Success Indicator	Unit	Weight	Target / Criteria Value					Achiev-ement	Performance	
						Excellent	Very Good	Good	Fair	Poor		Raw Score	Weighted Score
						100%	90%	80%	70%	60%			
4 To encourage the spirit of creativity and innovativeness in individuals and scientist entrepreneurs;	5.00	Completion of on-going Technopreneur Promotion Programme (TePP) projects	Product Prototype / Process demonstrated	Nos.	4.00	42	40	38	35	32	42	100.0	4.0
		Independent evaluation of Technopreneur Promotion Programme (TePP)	Submission of evaluation report to the department	Date	1.00	10/03/2013	14/03/2013	18/03/2013	22/03/2013	25/03/2013	30/06/2013	0.0	0.0
5 To promote and support Cluster Innovation Centres in MSME Cluster initiated by National Innovation Council;	7.00	To support proposals for establishment of new Cluster Innovation Centres in MSME Clusters in association with National Innovation Council (NInC)	Support to Training Programmes in the clusters	Nos.	3.50	18	16	14	12	10	0	0.0	0.0
			Support to Innovative proposals of MSMEs from the clusters	Nos.	3.50	25	22	20	18	15	0	0.0	0.0
6 To provide technology based support for programmes aimed at benefitting women;	2.00	Support proposals from a Non-Governmental Organisations (NGOs), Women Self-Help Groups (SHGs) and other concerned agencies	Number of agencies supported	Nos.	2.00	9	8	6	4	3	9	100.0	2.0
7 To prepare a roadmap for Sectoral Innovation Council on Industrial R&D;	2.00	To organize stakeholder meetings for seeking inputs	Compilation of stakeholder inputs into a roadmap	Date	2.00	07/03/2013	10/03/2013	14/03/2013	17/03/2013	20/03/2013	07/03/2013	100.0	2.0
8 To track scientific innovations in the country;	2.00	Creation of a Scientific Innovations Database	Finalization of database structure and sources of information	Date	1.00	15/09/2012	18/09/2012	21/09/2012	24/09/2012	27/09/2012	15/09/2012	100.0	1.0
			Scientific innovations added in the database	Nos.	1.00	120	115	110	105	100	120	100.0	1.0
9 To assess the outcome of major technologies of national importance,	2.00	To carry out an economic impact assessment of major technologies of	Identification of technologies of national importance, developed	Nos.	1.00	6	5	4	3	2	6	100.0	1.0

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PERFORMANCE EVALUATION REPORT

Objective	Weight	Action	Success Indicator	Unit	Weight	Target / Criteria Value					Achiev-ement	Performance	
						Excellent	Very Good	Good	Fair	Poor		Raw Score	Weigh-ted Score
						100%	90%	80%	70%	60%			
developed by CSIR on a continuous basis;		national importance, developed by CSIR	by CSIR										
			Preparation of technology impact assessment reports	Nos.	1.00	6	5	4	3	2	6	100.0	1.0
10 Capacity building of Asia Pacific region through Asian & Pacific Centre for Transfer of Technology (UN ESCAP-APCTT);	2.00	To provide infrastructural and programme support	Provision of Institutional support	Date	1.00	31/12/2012	15/01/2013	31/01/2013	07/02/2013	14/02/2013	08/02/2013	68.57	0.69
			Programme activities supported	Nos.	1.00	2	1				1	90.0	0.9
11 To implement e-Governance and ERP initiatives;	2.00	Design, Development, Validation and Certification of Enterprise Resource Planning (ERP) solution for e-Office as well as for department's external interface	User Acceptance of the e-Office and ERP package	Date	2.00	15/12/2012	31/12/2012	15/01/2013	31/01/2013	28/02/2013	15/12/2012	100.0	2.0
* Efficient Functioning of the RFD System	3.00	Timely submission of Draft for Approval	On-time submission	Date	2.0	05/03/2012	06/03/2012	07/03/2012	08/03/2012	09/03/2012	05/03/2012	100.0	2.0
		Timely submission of Results	On- time submission	Date	1.0	01/05/2012	03/05/2012	04/05/2012	05/05/2012	06/05/2012	30/04/2012	100.0	1.0
* Administrative Reforms	6.00	Implement mitigating strategies for reducing potential risk of corruption	% of implementation	%	2.0	100	95	90	85	80	100	100.0	2.0
		Implement ISO 9001 as per the approved action plan	Area of operations covered	%	2.0	100	95	90	85	80	100	100.0	2.0
		Timely preparation of departmental Innovation Action Plan (IAP)	On-time submission	Date	2.0	01/05/2013	02/05/2013	03/05/2013	06/05/2013	07/05/2013	01/05/2013	100.0	2.0

* Mandatory Objective(s)

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PERFORMANCE EVALUATION REPORT

Objective	Weight	Action	Success Indicator	Unit	Weight	Target / Criteria Value					Achiev-ement	Performance	
						Excellent	Very Good	Good	Fair	Poor		Raw Score	Weigh-ted Score
						100%	90%	80%	70%	60%			
* Improving Internal Efficiency / responsiveness / service delivery of Ministry / Department	4.00	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	%	2.0	100	90	80	70	60	91	91.0	1.82
			Independent Audit of implementation of public grievance redressal system	%	2.0	100	90	80	70	60	36.54	0.0	0.0
* Ensuring compliance to the Financial Accountability Framework	2.00	Timely submission of ATNs on Audit paras of C&AG	Percentage of ATNs submitted within due date (4 months) from date of presentation of Report to Parliament by CAG during the year.	%	0.5	100	90	80	70	60	100	100.0	0.5
		Timely submission of ATRs to the PAC Sectt. on PAC Reports.	Percentage of ATRS submitted within due date (6 months) from date of presentation of Report to Parliament by PAC during the year.	%	0.5	100	90	80	70	60	100	100.0	0.5
		Early disposal of pending ATNs on Audit Paras of C&AG Reports presented to Parliament before 31.3.2012.	Percentage of outstanding ATNs disposed off during the year.	%	0.5	100	90	80	70	60	100	100.0	0.5
		Early disposal of pending ATRs on PAC Reports presented to Parliament before 31.3.2012	Percentage of outstanding ATRS disposed off during the year.	%	0.5	100	90	80	70	60	100	100.0	0.5

* Mandatory Objective(s)

Total Composite Score : 81.51

Annexure-14-Contd.

ANNEXURE -15

CSIR INSTITUTES / LABORATORIES

BIOLOGICAL SCIENCES

CSIR-CCMB	Centre for Cellular and Molecular Biology, Hyderabad
CSIR-CDRI	Central Drug Research Institute, Lucknow
CSIR-CFTRI	Central Food Technological Research Institute, Mysore
CSIR-CIMAP	Central Institute of Medicinal & Aromatic Plants, Lucknow
CSIR-IGIB	Institute of Genomics & Integrative Biology, Delhi
CSIR-IHBT	Institute of Himalayan Bioresource Technology, Palampur
CSIR-IICB	Indian Institute of Chemical Biology, Kolkata
CSIR-IIIM	Indian Institute of Integrative Medicine, Jammu
CSIR-IMTECH	Institute of Microbial Technology, Chandigarh
CSIR-IITR	Indian Institute of Toxicology Research, Lucknow
CSIR-NBRI	National Botanical Research Institute, Lucknow

CHEMICAL SCIENCES

CSIR-CLRI	Central Leather Research Institute, Chennai
CSIR-CECRI	Central Electrochemical Research Institute, Karaikudi
CSIR-CSMCRI	Central Salt & Marine Chemicals Research Institute, Bhavnagar
CSIR-CIMFR	Central Institute of Mining & Fuel Research, Dhanbad
CSIR-IICT	Indian Institute of Chemical Technology, Hyderabad
CSIR-IIP	Indian Institute of Petroleum, Dehradun
CSIR-NCL	National Chemical Laboratory, Pune
CSIR-NEIST	North-East Institute of Science and Technology, Jorhat
CSIR-NIIST	National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram

ENGINEERING SCIENCES

CSIR-AMPRI	Advanced Materials and Processes Research Institute, Bhopal
CSIR-CBRI	Central Building Research Institute, Roorkee
CSIR-CGCRI	Central Glass and Ceramic Research Institute, Kolkata
CSIR-CMERI	Central Mechanical Engineering Research Institute, Durgapur
CSIR-CRRI	Central Road Research Institute, New Delhi
CSIR-IMMT	Institute of Minerals and Materials Technology, Bhubaneswar
CSIR-NAL	National Aerospace Laboratories, Bengaluru
CSIR-NEERI	National Environmental Engineering Research Institute, Nagpur
CSIR-NML	National Metallurgical Laboratory, Jamshedpur
CSIR-SERC	Structural Engineering Research Centre, Chennai

INFORMATION SCIENCES

CSIR-NISCAIR	National Institute of Science Communication and Information Resources , New Delhi
CSIR-NISTADS	National Institute of Science Technology and Development Studies, New Delhi
CSIR-4-PI	Fourth Paradigm Institute, Bengaluru

PHYSICAL SCIENCES

CSIR-CEERI	Central Electronics Engineering Research Institute, Pilani
CSIR-CSIO	Central Scientific Instruments Organisation, Chandigarh
CSIR-NGRI	National Geophysical Research Institute, Hyderabad
CSIR-NIO	National Institute of Oceanography, Goa
CSIR-NPL	National Physical Laboratory, New Delhi

UNITS

CSIR-HRDC	Human Resource Development Centre, Ghaziabad
CSIR-TKDL	Traditional Knowledge Digital Library, Ghaziabad
CSIR-URDIP	Unit for Research and Development of Information Products, Pune
CSIR-OSDD	Open Source Drug Delivery, New Delhi
CSIR-TRISUTRA	Translational Research and Innovative Science through Ayurgenomics, New Delhi

ABBREVIATIONS / ACRONYMS

AMPRI	Advanced Material and Processes Research Institute
APCTT	Asian and Pacific Centre for Transfer of Technology
CBDT	Central Board of Direct Taxes
CBRI	Central Building Research Institute
CCMB	Centre for Cellular and Molecular Biology
CDC	Consultancy Development Centre
CDRI	Central Drug Research Institute
CDS/ISIS	Computerized Data Services/Integrated Set of Information Systems
CECRI	Central Electrochemical Research Institute
CEERI	Central Electronics Engineering Research Institute
CFTRI	Central Food Technological Research Institute
CGCRI	Central Glass and Ceramic Research Institute
CII	Confederation of Indian Industry
CIMAP	Central Institute of Medicinal & Aromatic Plants
CIMFR	Central Institute of Mining and Fuel Research
CITT	Centre for International Trade in Technology
CLRI	Central Leather Research Institute
CMERI	Central Mechanical Engineering Research Institute
CRRI	Central Road Research Institute
CSIO	Central Scientific Instruments Organisation
CSIR	Council of Scientific & Industrial Research
CSMCRI	Central Salt & Marine Chemicals Research Institute
DBT	Department of Bio-Technology
DCPC	Department of Chemicals & Petrochemicals
DCSSI	Development Commissioner, Small Scale Industries
DRDO	Defence Research and Development Organization
DSIR	Department of Scientific & Industrial Research
ESCAP	Economic and Social Commission for Asia and the Pacific
EXIM	Export-Import
FC	Foreign Collaborations
FICCI	Federation of Indian Chambers of Commerce and Industry
ICAR	Indian Council of Agricultural Research
ICAS	Indian Council of Ayurveda & Siddha
ICMR	Indian Council of Medical Research
ICSSR	Indian Council of Social Sciences Research

ICSTI	International Centre for Science & Technology Information
IDAMS	Internationally Developed Data Management System
IGIB	Institute of Genomics & Integrative Biology
IGNOU	Indira Gandhi National Open University
IHBT	Institute of Himalayan Bioresource Technology
IICB	Indian Institute of Chemical Biology
IICT	Indian Institute of Chemical Technology
IIFT	Indian Institute of Foreign Trade
IIIM	Indian Institute of Integrative Medicine
IIP	Indian Institute of Petroleum
IISc	Indian Institute of Science
IIT	Indian Institute of Technology
IITR	Indian Institute of Toxicology Research
IMMT	Institute of Minerals and Materials Technology
IMT	Institute of Microbial Technology
INFLIBNET	Information Library Network
INSA	Indian National Science Academy
IPR	Intellectual Property Rights
ISRO	Indian Space Research Organization
ITPO	India Trade Promotion Organization
LAN	Local Area Network
LCA	Light Combat Aircraft
MDR	Multi Drug Resistance
MIT	Ministry of Information Technology
MoU	Memorandum of Understanding
NACIDS	National Access Centres to International Database Services
NAFEN	National Foundation of Indian Engineers
NAL	National Aerospace Laboratories
NBRI	National Botanical Research Institute
NCAER	National Council of Applied Economic Research
NCL	National Chemical Laboratory
NCSI	National Centre for Science Information
NEERI	National Environmental Engineering Research Institute
NEIST	North-East Institute of Science & Technology
NGRI	National Geophysical Research Institute
NICMAR	National Institute of Construction Management and Research
NID	National Institute of Design
NIDC	National Industrial Development Corporation
NIFT	National Institute of Fashion Technology
NIIST	National Institute for Inter-disciplinary Science and Technology
NIO	National Institute of Oceanography
NISCAIR	National Institute of Science Communication and Information Resources
NISTADS	National Institute of Science Technology and Development Studies
NMCC	National Manufacturing Competitiveness Council
NML	National Metallurgical Laboratory
NPL	National Physical Laboratory

NRDC	National Research Development Corporation
NRFC	National Register of Foreign Collaborations
NSTMIS	National Science and Technology Management Information System
PSU	Public Sector Undertaking
SERC	Structural Engineering Research Centre
SIRO	Scientific and Industrial Research Organization
SME	Small and Medium Enterprise.
TCO	Technical Consultancy Organization
TDB	Technology Development Board
TEDO	Technology Export Development Organization
TePP	Technopreneur Promotion Programme
TIFAC	Technology Information Forecasting and Assessment Council
TM	Technology Management
TQM	Total Quality Management
UGC	University Grants Commission
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
WIPO	World Intellectual Property Organization

Council of Scientific & Industrial Research (CSIR)
Anusandhan Bhawan, 2 Rafi Marg,
New Delhi 110001
http://csir.res.in

Consultancy Development Centre (CDC)
2nd Floor, Core IV-B, Indian Habitate Centre
Lodhi Road, New Delhi -110003
http://www.cdc.org.in

National Research Development Corporation (NRDC)
20-22, Zamroodpur Community Centre,
Kailash Colony Extension,
New Delhi 110 048
Website: http://www.nrdcindia.com

Central Electronics Limited (CEL)
4 Industrial Area, Sahibabad 201010
Uttar Pradesh
http://celindia.co.in