

## II-B. TECHNOLOGY DEVELOPMENT AND DEMONSTRATION PROGRAMME

### 1. PREAMBLE

Technology Development and Demonstration Programme (TDDP) is a component programme of Technology Promotion Development and Utilization (TPDU) Programmes. The genesis of TDDP is PATSER Scheme, which commenced in VIII Five Year Plan in 1992. The PATSER Scheme continued in the VIII and IX Plan and was re-designated as TDDP in the X Plan. TDDP aims to support technology development efforts of industry R&D system.

### 2. OBJECTIVES

The programme aims at strengthening the interface between industry, R&D establishments and academic institutions and provides catalytic support for development 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 industrially useful applications. The objectives of the programme are:

- (a) Development and demonstration of innovative need-based technologies for making industry competitive, and
- (b) Strengthening the interface between industry, R&D establishments and academic institutions

### 3. ACTIVITIES

The Department provides, on a selective basis, 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 in 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 cluster.
- (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 purpose industry's resources.

The Department, under this programme has so far supported about 260 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. Around 54 technologies developed under the scheme have been commercialized or are under commercialization.

During the period under report, more than 75 new proposals received against open advertisements in leading daily newspapers. Total 30 proposals were recommended through four Technical Advisory Committee meetings (TAC) in the field of engineering, manufacturing, electronics, drugs, chemicals & fertilizers, etc. were awarded to different companies with the total project cost of 198.00 Crores

#### 4. STATUS OF THE PROJECTS SUPPORTED DURING THE ELEVENTH PLAN

##### **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.**

The Radiator Fan is used in Diesel Electric Locomotives to bring down the temperature of the Diesel Engine cooling water to the desired level. Drive between the Engine and Radiator Fan consists of an Eddy Current Clutch (ECC) which is capable of providing variable speed and a suitable Gear Box which provides mechanical coupling between the Clutch and the Fan. Eddy Current Clutch Gear units presently being used by Diesel Locomotive Works (DLW), Varanasi for Indian Railways, are brush type couplings with

rotating winding and copper coated drums and are inherently prone to frequent breakdowns. Brushless Eddy Current Clutch Gear Units for Radiator Cooling Fans, due to non-contact type technology, have relatively lower maintenance costs and longer life.

In the present project, M/s Eddy Current Controls (I) Ltd. have undertaken the design and development of 90 KW Brushless Eddy Current Clutch Gear Unit for Radiator Cooling Fans with the additional constraints imposed by the limited space available and high ambient temperature environment prevailing in the engine space where presently ECC is housed. The company, improving upon the initial prototype could overcome the problem of excessive heating of drum, clutch voltage saturation etc. and has developed 90 KW Brushless Eddy Current Clutch Gear Unit. The testing of the prototype as per the specifications and field requirements is under trial.

The project activities completed.

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

Hydrogels also known as Super Absorbent Polymers (SAP), are substances that have a unique 40,000 to 50,000 per cent 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. Hydrogel 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 year. 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.

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

Radiotherapy (Radiation treatment) plays a major role in multidisciplinary cancer treatment. Delivering accurate radiation dose conforming to the tumour is one of the most important needs in Radiotherapy. To achieve this radiation conformal treatment for all types of cancer, Radiotherapy Simulator (RTS) is the basic hardware equipment. RTS is basically a Radiological Imaging System, mimicking all the mechanical functions of a Teletherapy treatment machine (telecobalt Machine or Linear Accelerator), which is used for radiation treatment of cancer. With Radiotherapy Simulator it is possible to create all types of image reconstruction, storage, networking and result output.

The project of M/s Elim Meditech Pvt. Ltd. made progress in assembling all the hard ware mechanical sub-system of the old RTS system and developed new electronics sub systems and software controls for the design, development and demonstration of Indigenous Radiotherapy Simulator for Radiation cancer treatment.

The project is under progress.

**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.**

PBL1427 has exhibited potent, reversible competitive inhibition in human DPP IV enzyme activity with an IC<sub>50</sub> 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 as suggested by a better K<sub>off</sub>. 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. Further it results in an increase in active GLP-1 which leads to glucose dependent secretion of Insulin. PBL 1427 also improves the oral glucose tolerance in various animal models of diabetes like db/db and ob/ob mice. In addition it exhibits a body weight reduction in leptin receptor deficient db/db mice. PBL 1427 appears to be metabolically stable in in-vitro metabolism studies performed in pooled liver microsomes from various species such as mice, rats and humans. It exhibits a favorable pharmacokinetic profile in mice and rats with an oral bio-availability of 50-70 %. PBL 1427 did not show any accumulation of drug in any of the organs studied. PBL 1427 did not show any mutagenicity or cytotoxicity in AMES assay even upto a concentration of 3000 g/plate. 14 days repeat dose probe toxicity in SD rats with oral formulation did not show any adverse event suggesting a NOAEL of >100 mpk. In summary, 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 present project is to develop a commercially viable process for up scaling PBL 1427 and to build a capability of a cGMP compliant API manufacturing facility in five years duration.

The project is under progress.

**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 and these not being built by Indian industries. Uday Computer Aided Manufacturing Ltd is a leading manufacturer and exporter of small size CNC Rotary Tables and diversified products for various

industry sectors and Machine Tool Builder. They have established capability for CNC Rotary Tables of sizes, viz. of 100 mm - 1600 mm dia. Under this proposal, development of a Large Size CNC Rotary Table of size 2500 x 2500 with Translation Movement will be demonstrated for application in the domestic as well as global market. The project has been supported by DSIR for duration of 18 months.

The project is under progress.

**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 has been supported by DSIR for duration of 30 months.

The project is under progress.

**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 has been supported by DSIR for duration of 3 year.

The project is under progress.

**Liquid Coolant Recovery System by Pure Tech India, Trichy**

The objective of the proposal is to enhance the Research and Development activities of the product Liquid Coolant Recovery System and customize it to suit all types of working environments with an aim to make the equipment economical & tradition. The project has been supported by DSIR for duration of three year.

The project is under progress.

**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<sub>6</sub> 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 has been supported by DSIR for duration of three year.

The project is under progress.

**Design & Development of Capacitance Type Fuel Level Sensor for Flexi Fuels by M/s. Pricol Ltd., Coimbatore**

The objective of the project is to design and develop a reliable automotive fuel level sensor with capacitance principle compatible for all types of fuels (Flexi fuels) such as RME (Rapeseed Methyl Ester), PME (Palm Methyl Ester), FAME (Fatty Acid Methyl Ester), Ethanol blended fuels -Grade E10, E15, E20 & E85 at optimum cost. The project has been supported by DSIR for duration of two year.

The project is under progress.

**New Product Development (Nitroscanate) by P.I. Drugs & Pharmaceuticals Ltd., Thane**

Synthesis of nitroscanate (1-isothiocyanato-4-(4-nitrophenoxy) benzene ( $C_{11}H_8N_2O_3S$ )). Nitroscanate is an anthelmintic of the diphenyloxy group. Nitroscanate is known to interfere with and inhibit the synthesis of ATP in *Fasciola hepatica* while A.M.P. levels are increased. The alterations in A.T.P. 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 A.T.P. 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 process involves novel way for isolation of pure 4-(4-nitrophenoxy) aniline HCl salt by using methanolic HCl. The process involves methyl ethyl ketone purification to get the required quality. The project has been supported by DSIR for duration of eighteen months.

The project is under progress.

**Optimization of an innovative process and its cost effective manufacturing of a fast acting anti diabetic recombinant drug product insulin Lispro, a rapid acting insulin analogue, and testing its clinical comparability (safety and efficacy) with the innovator's product by Biocon Limited, Bangalore**

The objective of the project is development of Biosimilar Insulin Lispro process, a fast acting Insulin analogue and its commercialization in Indian market. Eli Lilly had the first insulin analogue with "lispro" as a rapid acting insulin analogue. It is marketed under the trade name Humalog. The cost of 3ml Humalog cartridge is 450, which is almost 10times higher than the cost of regular Insulin. Biocon's vision is to provide the affordable as well as good quality drug product

to the Indian and world Diabetic patient population. Biocon is confident about achieving the target and meeting the deliverables with the cost effective proposed process plan. The project has been supported by DSIR for duration of three year.

The project is under progress.

**Development of Long acting hormonal intra-uterine contraceptive device by M/s Famy Care Ltd., Mumbai**

The project is to make a substitution of MIRENA. The innovative product is very expensive (About 8000/- per piece) and cannot be afforded by the masses of our country. LNG-IUS is imported in India from the innovator by Cadilla healthcare. There is no manufacturer in India or for that matter anywhere in the world other than the innovator who can provide the product at an affordable cost. An import substitution is the need of the hour. The objective in this endeavour is to manufacture LNG containing long acting intrauterine contraceptive devices which is generically equivalent to Mirena®. Due to the cost of the existing IUS product, most of the NGO's use a copper based device for contraception as opposed to safer and more effective LNG-IUS. The copper containing device has many problems during its insertion regimen like excessive bleeding, pain during insertion, irregular menses, etc. LNG-IUS overcomes all the problems of copper based IUD's and provides a safe and highly effective means of contraception. The project has been supported by DSIR for duration of three year.

The project is under progress.

**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; the present generation of 500,000 tons per annum will shortly reach to a million ton. This 'waste' is resource rich and also very hazardous too and therefore can't be ignored. Presently 'Kabadies' are dismantling end of life electrical & electronic

equipments in their own style and leaving behind polluted air, water and soil for us to inhale, drink and eat toxic mixed eatables. 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 has been supported by DSIR for duration of two year.

The project is under progress.

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

The objective of the project is to manufacture of Magnesium and Calcium Metal Powder through Pidgeon process for use in steel industries. The project is aimed at manufacturing a total quantity of 10 MT of Magnesium and Calcium Metal Powder through various batches with varied operating conditions and the test the product in laboratory as well as industrial trial for their purity, performance and steel industry acceptability. For De-sulphurisation the use of Magnesium powder when indigenously developed will result in cost savings to the extent of around Rupees 3 to 4 thousand per Tonne of hot metal. So also Calcium metal will result in saving of around Rupees 2 to 3 thousand per Tonne of Steel. Traditional methods generates a huge amount of carbon di-oxide by burning Coal for heating the retorts. The present proposal will reduce energy requirement substantially. The project has been supported by DSIR for duration of eighteen months.

The project is under progress.

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

The project will produce the following 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 products have a world market. Importantly, there is also a large requirement in India. Primarily since these products are linked with development (FM, Bollywood performances, corporate presentations, product launches, entertainment venues, airport, railway stations). These are mushrooming all over a developing India. The project has been supported by DSIR for duration of two year.

The project is under progress.

**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 as a beneficiating media but with lower water consumption, thus, leading to lesser effluent generation. The system electronics, removal technology, logic of separation is totally different than its competitors and there is no conflict on technology issues. The project has been supported by DSIR for duration of one year.

The project is under progress.

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

The objective of this project is to develop a process for Commercial Manufacturing 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. Now the company will develop Commercial Manufacturing of Standardized Extract NLT 40 % L- Dopa from *Mucuna pruriens* (Kaunch) seeds at 500 Kg, batch size pilot plants. The project has been supported by DSIR for duration of two year.

The project is under progress.

**Development of Indigenous Technology of Materials for Nano Photofunctional Applications by ICT, 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 ICT, 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 most successful dyes to date belong to the family of ruthenium complexes. Other alternatives are still being pursued due to the scarcity of ruthenium. There are no manufacturers of DSC or the dyes for DSC in India. The project is supported by DSIR for duration of 24 months.

The project is under progress.

**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 of F (ab')<sub>2</sub> purification from equine plasma and testing the efficacy of the purified antitoxin by animal assays and user trials. The project has been supported by DSIR for duration of forty two months.

The project is under progress.

**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, which is being attempted for the first time in India. The project has been supported by DSIR for duration of 24 months.

The project is under progress.

## 5. NEW PROJECT PROPOSALS

During the period under report, against open advertisements in leading daily newspapers, more than 75 new proposals were received. Total 30 proposals, in the field of engineering, manufacturing, electronics, drugs, chemicals & fertilizers, etc., were recommended through four Technical Advisory Committee meetings. The short brief of some of these projects are given below:

### **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. However the challenge is processing the Elastomer and granulating it. It is essential to incorporate Low melting temperatures of Elastomer and High melting temperatures of Polymers while compounding in the Polymer Matrix and in order to do so, metered feeding is necessary to make it a commercially viable proposition.

The project has been supported by DSIR with a grant of 270.00 lakhs out of the total project cost of ₹ 774.25 lakhs for duration of 24 months.

### **Development of Biofertilizers (Emulsifiable Concentrate) for Nutrient 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 year.

The project has been supported by DSIR with a grant of ₹ 260.00 lakhs out of the total project cost of ₹ 654.00 lakhs for duration of 12 months.

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

The objective 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: (a) Develop an indigenous vehicle as a substitute for vehicles that currently must be imported into India & (b) Gather essential know how on the processes required to create the specifications for and to install a system comprising the above type of AGV.

The project has been supported by DSIR with a grant of 40.00 lakhs out of the total project cost of ₹ 150.70 lakhs for duration of 24 months.

### **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 has been supported by DSIR with a grant of ₹ 70.00 lakhs out of the total project cost of 352.50 lakhs for duration of 36 months.

**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, integrate and standardize energy efficient automation system for the development of 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 factor.

The aim is to develop innovative solution for greenhouse technology coupled with effective product development whilst ensuring safety, manufacturability and cost effectiveness. The technology developed in this project will make it possible to control the system in such a way that the temperature can be drastically reduced upto 8-10°C which in itself is a revolutionary innovation. This project will be a highly energy efficient in turn to reduce the cost of various operations in the greenhouse thereby increase the acceptability of the greenhouse technology in the areas where energy supply is either very insufficient or even not available and will help in horizontal spread of the technology with justified economical and ecological concerns.

In this project the integration of the different abiotic factors like temperature, humidity, light, CO<sub>2</sub> will be done which is a very novel concept as no such technology has been developed till date which integrates the abiotic factors in the greenhouse. With the technology developed in this project the factors can be integrated in such a way so that they will complement each other for providing optimized conditions for the crop production in the greenhouse.

The project has been supported by DSIR with a grant of 200.00 lakhs out of the total project cost of ₹ 447.50 lakhs for duration of 24 months.

**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 method. The objectives of this new product development are:

- ◆ Rapid proto development using incremental forming process and layered manufacturing.
- ◆ Experimental trials with new variety of Medium Carbon Steel for achieving weight reduction (Target at least 15%).
- ◆ Process qualification for heat treatment and tempering process for the new material proposed to be used.
- ◆ Optimize the fits and tolerance of mating parts to improve Delayed fracture test.
- ◆ Develop new test procedures to evaluate the vibrations and noise from the new chains

The company proposes to design and develop a light weight chain with 15% reduction in weight compared to our existing chain for two wheeler. The innovation involves selection of new raw material for Pin, Bush and plates with respect to existing chain model. *SAE 1050* for plate being used for the existing chain will be replaced by *SAE 1045* in the new chain. For Pin the existing model is in *15B25* where as in new model, it is proposed to use *SCM420*. For Bush, the existing model is in *16MnCr5* where as new one will be in *SAE8620*. This will increase the endurance and fatigue strength of the drive chain.

The other major change is proposed to be made in the Heat treatment process. The new process will be designed and qualified as per the requirement of the chemical and mechanical properties of the proposed raw materials. This is expected to increase the endurance and fatigue strength.

Rapid development of parts for the new chain as a prototype is proposed by using the principles of layered manufacturing, sculptured surface

machining called incremental sheet metal forming. These processes enable three-dimensional generation of freeform surfaces without using a component specific tooling and therefore have the potential to significantly reduce the cost of rapid manufacturing. One of the important requirements for commercializing is the capability to form components with desired accuracy and surface finish. The major steps in this process are

- Creating the geometry/ solid model of the component,
- Saving it in .STL or .STEP format,
- Developing the code to detect the coordinates and triangulation/tessellation using the .STL or .STEP file,
- Selection of incremental depth,
- Finding the sectional points along the profile at the constant depth and doing the same moving incrementally.

It is also proposed to introduce Shot Peening of plates which will be a first time for a chain in India. They are not using this method in our existing chain models. This process is expected to help improve the fatigue strength.

In the design of parts and assembly of chain, it is proposed to change the fits and tolerance of mating parts up to the optimum level to enhance the duration of Delayed fracture test.

The project has been supported by DSIR with a grant of 295.00 lakhs out of the total project cost of 696.70 lakhs for duration of 36 months.

**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 the Brushless DC motor (BLDC) and control for hybrid car.

Company has found an innovative concept in their design for HEV application. It is essential to operate motor at high torque in low speed range while it should be able to sustain high speed. The unique innovative design handles this issue by

rotating two bodies of motor and thus reduces Back EMF at high speed. Company has also filed the patent application.

The project has been supported by DSIR with a grant of ₹ 360.00 lakhs out of the total project cost of ₹ 1093.00 lakhs for duration of 24 months.

**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 of weighing, mixing, filling, drying and packing of cracker manufacture. The introduction of automation in fireworks manufacturing process will lead to achieve:

- Upgradation of technology in fireworks industry which is at present carried on manually
- Finding out a solution for the acute shortage of labour
- Reducing the cost of manufacturing so that the Indian firework manufacturers can compete with the foreign competitors-earning of foreign exchange
- Reduction of energy consumption by introducing solar energy in some of the production process like drying
- Controlling the wastage of raw materials by the introduction of automatic weighing system, electronically controlled manufacturing process like mixing and filling through machineries.
- Improving the working conditions of workers and reducing the occupational hazards
- Production of quality fireworks free from manufacturing defects and malfunction by improved process control and strengthening the testing and evaluation facilities
- Application of computer hardware and customized software packages for the improved and safe process control, inventory management and integration of

different processes of the fireworks manufacturing through online monitoring.

This proposed project aims to automate most of the production process in order to achieve elimination of human touch of toxic chemicals, improving the occupational hazards, improving the productivity and elimination of environmental pollution. The increased productivity after incorporating the above innovations will achieve the cost reduction particularly after completion of the pilot test and starting the regular scaled up commercial production.

The project has been supported by DSIR with a grant of ₹ 83.00 lakhs out of the total project cost of ₹ 225.84 lakhs for duration of 36 months.

#### **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 dash because 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 challenge to pre-commercialization would entail injecting fibre in moulding process with the mould being able to take the contours and shape of the final product. The designing of the shape would inter alia depend on the shrinkage of the fibres during the moulding stage. Detailed study would need to be taken to establish the shrinkage of the fibre so that the tolerance can be given to the cage where fibre will be injected for moulding.

The project has been supported by DSIR with a grant of ₹ 150.00 lakhs out of the total project cost of ₹ 328.04 lakhs for duration of 15 months.

#### **Innovative Product Development and manufacturing Process for three important oncology therapeutic recombinant proteins- GCSF, IFN alpha 2b and L-asparaginase by M/s. A.R.A. Healthcare Pvt. Ltd., Gurgaon**

To develop the process for the commercial scale production of pharmacopoeial grade of three biosimilar molecules namely Granulocyte Colony Stimulating Factor (GCSF), Interferon alpha-2b (IFN $\alpha$ 2b), and L- Asparaginase.

The company has constructed over expressed clone with strong promoter optimized codon bias for protein expression in *E. coli* system. Optimized high cell density fed batch fermentation condition at lab level to produce 4-5 gm per liter protein. Develop simplified process for the folding and refolding of over expressed solubilised protein. Two steps simplified and scalable protein purification process has been optimized at lab scale level for these proteins.

The project has been supported by DSIR with a grant of 305.00 lakhs out of the total project cost of ₹ 864.75 lakhs for duration of 24 months.

#### **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*. It has a huge potential in India and abroad with great social impact.

The project has been supported by DSIR with a grant of ₹ 118.00 lakhs out of the total project cost of ₹ 397.30 lakhs for duration of 36 months.

**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.**

Main objective of the project is to reduce the cumbersome process of making dies and mould of the product which requires lot of time and investment and not only makes the product/ part costly but also increase the production lead time. The rapid cast would be the most innovative and revolutionary Casting Technology. With Rapid Cast "Near Net Shape" castings of highly complex geometrics, in a variety of difficult metallurgies, can be produced weighing up to 5,000 Kgs single piece. Further, all this can be done while keeping the environment in mind and keeping the emissions to the minimum. The casting of 5000 kgs single piece is new in India. M/s. PTC is the first company who will develop rapid cast technology for manufacturing of stainless/steel castings in India.

The project has been supported by DSIR with a grant of 500.00 lakhs out of the total project cost of 1800.00 lakhs for duration of 24 months.

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

The objective of this project proposal is to design and development of 3-Dimensional mixer of 500 litres capacity and bringing in Indian market for pharmaceuticals, paints, construction and finishing industry.

The project envisages the design and development of 3 Dimensional Mixer which will be used for efficient mixing of powder and liquid materials. As proof of concept, the company has already developed a prototype of 20 litre capacity which the company wants to scale up to 500 litres capacity.

The project has been supported by DSIR with a grant of ₹ 60.00 lakhs out of the total project cost of ₹ 182.00 lakhs for duration of 36 months.

**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 objective of the project is to develop novel ,eco-friendly dextrose base Biopesticides, Reactor Design and process optimization, to develop economic control method for formulation, its bioassay, field trials, product validation etc. and implementation and publicity of classical biological control strategy.

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 want to scale up these bio-pesticides. *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 has been supported by DSIR with a grant of ₹ 46.00 lakhs out of the total project cost of ₹ 127.59 lakhs for duration of 24 months.

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

The objective of the project is to eliminate open defecation fully and to prevent human wastes from being dumped on the ground this is a major cause of disease in the country, to convert human waste and other bio degradable substances into water and gas 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.

Stone India Ltd has been working on the Biological Toilet Project development for the last three year. The concept of bio digester tank has been jointly developed by Stone India Limited along with its technical collaborators both in India and overseas. Stone India Limited has designed and installed Bio Toilet Modules which have been running successfully in the Indian Railways for over a year now. Regular monitoring of the Bio Toilets is done so that the effluents discharged can be collected and tested to be within the specified limits laid

down by the railways and to collect passenger feedback for improvements in the system. Now, the main challenge is to incorporate these bio digesters in the stationary toilets so that they can function efficiently and the effluent discharged lie within the accepted environmental standards.

The project has been supported by DSIR with a grant of ₹ 288.00 lakhs out of the total project cost of ₹ 611.80 lakhs for duration of 12 months.

**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 in the temperature ranges in room temperature.

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 stationary 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<sup>2</sup> 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 has been supported by DSIR with a grant of ₹ 326.90 lakhs out of the total project cost of ₹ 957.62 lakhs for duration of 30 months.

The details of TDDP projects commercialised are given in Annexure 9.