



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

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 scheme has now been extended further till 31.03.2020 i.e. co-terminus with the fourteenth finance commission period. The programme aims at to support individual innovators having original ideas to convert them into working models, 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. PRISM Scheme is now a component scheme of Industrial Research and Development (IRD) scheme of DSIR. The department has supported around twenty-four (24) new projects during 2019-20 (up to January 11, 2020) (**Annexure - 9**). The department has also successfully completed thirteen (13) PRISM projects during the year. The details of the completed projects supported under PRISM are given in **Annexure - 10**.

2. HIGHLIGHTS OF SOME OF THE COMPLETED/ ON-GOING PRISM PROJECTS

2.1 Development of Pedal Boat Based Water Weed Cleansing Mechanism (Jalweedu)

The innovation developed by Dr. S. Selvarajan from Bangalore has been scouted and mentored by TOCIC at National Aerospace Laboratories (NAL), Bangalore and DSIR with financial support under PRISM-DSIR scheme.

The innovator has successfully developed and demonstrated Pedal Boat Based Water Weed Cleansing Mechanism fitted with a 5.5 HP petrol engine, hydraulic system based scoop and saw-toothed weed cutters. The developed system includes a rugged hydraulically operated water weed cutter, a scoop for removing the floating weeds and wastes present in a water body. The baseline vessel chosen is a common pedal boat. For effective water weed cutting innovator has adopted a Saw-toothed pair of 'V' shaped, one side fixed and other sliding, 4ft long cutter type installed at the front of the boat. The cutter can have rotary as well as a linear oscillatory motion. The weeding operation is enabled by hydraulic cylinder movement. Highlights of the product are: innovative development of hydraulic based propulsion system as the third channel of control that makes use of a hydraulic motor that runs the propeller like an OBM and capacity to additionally retrofit about 30 kgs of subsystems which may be populated at various locations of the boat without comprising on adverse c.g shift in all three x, y and z directions.



2.2 Making of trans-femoral and transbital mechanical prosthetic leg

The innovation developed by Shri Jayendra Diwan from Ahmedabad has been scouted and mentored by TOCIC at Gujarat State Bio-Technology Mission (GSBTM), Gandhinagar



and DSIR with financial support under PRISM-DSIR Scheme. The Prosthetic Leg consists of **Silicone Liner** – made from tissue computable silicone;

Prosthetic socket – the prosthetic socket support the patient’s body weight and hold the residual limb firmly and comfortably during all activities. The prosthetic socket is made of HDPE plastic that is lighter and takes to the shape of patient’s foot. It provides protection, cushioning , conform to volume change of residual limb and confidence; **Pilon** – Aircraft grade aluminium (6061-T6) has been used, which is structurally stronger and lighter than steel; Feet – Prosthetic feet is made up of carbon fiber that meet the functional needs for shock absorption and energy storing response, and are light weight as well, strong, as it take on huge force and torque as patient wants to walk and run.

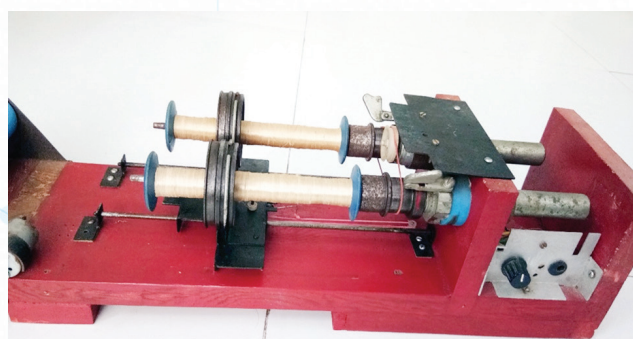


My limb Prosthetic Leg

2.3 Low power portable Muga and Eri spinning machine

The innovation developed by Shri Nripen Kalita from Guwahati has been scouted and mentored by TOCIC at CSIR- North East Institute of Science & technology (NEIST), Jorhat and DSIR with financial support under PRISM-DSIR Scheme.

There are different techniques already available in the market for spinning of eri and muga silk, like conventional type with pedal powered, motorized using external motor etc. In the current project, the innovator has developed a portable automatic electric powered and electronically controlled Muga & Eri Spinning Machine. It has been established that the developed spinning machine is easy to operate, minimum breakage of threads occurs and at the same time it is robust in long terms of use. Moreover the machine can smoothly and uniformly collects the Eri and Muga thread at both ends. The innovator claims that even worn out cocoons can be utilized for converting them into continuous thread. The project has successfully been demonstrated.



2.4 Development of a multipurpose & cost efficient instrument for study of magneto-electrochemical experiments with custom software for data display, recording & analysis;

The innovation developed by Shri Anuj Awasthi from Kanpur has been scouted and

mentored by TOCIC at SIDBI Innovation and Incubation Centre (SIIC), IIT Kanpur and DSIR with financial support under PRISM-DSIR Scheme.

Electrochemistry has been a revolutionary research area due to its key contribution to energy sector like battery, Super capacitor, fuel cell, hydrogen generation, pollution control like CO₂ reduction, Water purification, material synthesis like Aluminium, NaOH etc., coating & plating industry, corrosion industry and many more. All the above research areas need electrochemical workstation which includes potentiostatic & galvanostatic methods along with few more advanced methods like EIS. This instrument helps us studying all kinds of electrochemical kinetics & mass transfer, reaction mechanism etc. related experiments.

Magneto-electrochemistry seems to be the next emerging field in electrochemistry. The effect of external magnetic field on electrochemical processes is studied. A big void exists worldwide in the domain of electrochemical experimentation. To fill the void, the innovator designed an indigenous cost efficient innovative magneto-electrochemical instrument which will serve both purposes, availability of cost efficient electrochemical workstation to academia & researchers, and providing innovative magneto-electrochemical instrument to relevant researchers worldwide. The working prototype of the innovation has successfully been demonstrated. However, third party validation is awaited.



2.5 A Mechanical Powered Transmission Device

The innovation developed by Shri Rabindra K. Debgupta from Guwahati has been scouted and mentored by TOCIC at IIT Guwahati and DSIR with financial support under PRISM-DSIR Scheme.

The transmission device consists of mainly two components- a **transmission plate** and a **lever disc**. The transmission plate has a uniform well for the size of the lever disc to be placed inside and a transmission bolt mechanism that connects them. The input torque is brought at the centre of the transmission disc whereas the output torque is derived at the centre of the lever disc, by an input and out shaft, respectively. In addition, a cover disc covers the connected lever disc inside the well of the transmission disc. This device has various applications like in automobiles, motorcycles, industry or other such areas where torque conversion is necessary. It is a purely mechanical device, which makes it simple as well as efficient. Trials were conducted on a truck Registration No. AS-25A-9470 fitted with the fuel saving device innovated by Shri Rabindra K. Deb Gupta. It was found that with the developed transmission device there was 25 % fuel saving per liter of diesel. The project has successfully been completed.



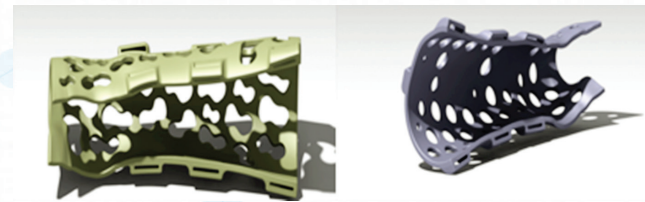


2.6 Design and Development of Novel 3D Printed Splints and Arm Supports for Arthritis and Arm Injured Patients

The innovation developed by Dr. M. G. Anantha Prasad from Bengaluru has been scouted and mentored by TOCIC at SPMVV, Tirupati and DSIR with financial support under PRISM-DSIR Scheme.

The development of additive manufacturing processes has improved production of prosthetic implants. The traditional fabrication process of custom made splints is skill dependent, time-consuming and splints themselves pose numerous problems with regard to patient compliance. The traditional fabrication process of custom-made splints has hardly undergone any progress with new manufacturing techniques and the new materials help to modernize this treatment method of fractures. For this reason, a splint model printed in 3D that replaces the deficiencies of the cast maintaining its virtues, has been developed. The methodology is based on three-dimensional digitalization techniques and 3D modeling with reverse engineering software. The splint is made of ABS (Acrylonitrile Butadiene Styrene) by technique of Additive Manufacturing with fused deposition modeling. The digital diagnostic imaging of the arm will be acquired by a 3D scanning device. Artec Eva 3D hand held scanner is used for obtaining digital data of the hand. After being digitized, the anatomical data will be used to provide the design of the splint through reverse engineering software. Geomagic Design X is used for this purpose. Geomagic Design X is purpose-built for converting 3D scan data into high-quality feature-based CAD models. Various versions of the splint are designed and several iterations are carried out. After filtering-off the unwanted data from 3D scanner, the refined data will be converted into CAD model. Catia V5 is

used for modeling the splint. NX Nastran in Solid edge ST10 is used for analyzing the splint for maximum displacement and other parameters for impact loading. Nastran is primarily a solver for finite element analysis. It does not have functionality that allows for graphically building a model or meshing. The objectives of the project involve the design of 3D printed novel hand splints as arm support for patients with arm injuries, analysis of the designed hand splints with the aid of reverse engineering software and fabrication of the designed splints by the process of Additive Manufacturing. The fused deposition modeling machine used in the process of fabrication is Stratasys F170 of series 123 which is renowned for 3D printing and prototyping.



2.7 Prototype Of Solar Connected New Hybrid MLI With Minimum Number Of Switches Using EAC Switching Technique

The innovation developed by Ms. A. Tejasree from Tirupati has been scouted and mentored by TOCIC at SPMVV, Tirupati and DSIR with financial support under PRISM-DSIR Scheme.

Among Renewable Energy Systems, Photovoltaic systems are widely used as they are clean and easily installable. These PV cells convert sunlight into electricity in the form of dc. A suitable converter is usually needed to convert the dc power into ac power. Recently the use of multilevel inverters (MLIs) in modern drives and for interfacing the renewable generation systems to the grid have given a wide scope for designing new topologies of MLIs. In this project focused

on the prototype of a single phase 31-level Hybrid Multi-level inverter by using eight switches and four separate DC sources from the solar panel with the Maximum Power Point Tracking. The main objective of this project is to increase the number of levels with a lower number of switches at the output without adding any complexity to the power circuit.

In this proposed system, the solar panels are used for power generation and batteries are used for standalone PV application. In the proposed method EAC switching Technique is used to find the switching angle for MLI. At the instant, MLI can be used to reduce the number of switches, LOH and THD. Here the THD decreases with increasing the number of levels and the efficiency of the scheme, losses and cost of inverter is less compared to conventional MLIs. With this simple method we can easily calculate the best switching angles, No need of solving complex non-linear equations. The Simulink model and prototype with different loads are designed.

A small prototype of solar connected 31-level inverter with eight switches and its rating nearly of 600VA and the switching losses are about 8W.

Specifications of proposed inverter:

S. No.	Parameter	Specifications
1	Nominal output voltage	230V AC
2	Output voltage tolerance	-5% to +6%
3	Frequency	50HZ
4	Power rating	600VA
5	Output wave form	True sine wave
6	Max THD	3%
7	Efficiency	>95%

2.8 Developing biodegradable and compostable sapling bags and trays using agricultural wastes

The innovation developed by Dr. Narendra Reddy from Bengaluru has been scouted and mentored by TOCIC at SPMVV, Tirupati and DSIR with financial support under PRISM-DSIR Scheme.

Seedling and sapling trays are extensively used for agriculture and horticultural applications. These trays are made using synthetic polymers such as polyethylene or polypropylene. Hence these trays are non-biodegradable. Farmers and general public purchase these sapling trays and after a few days, replant the saplings and dispose the trays as waste. This leads to considerable waste generation and more importantly land pollution. In addition, the plastic trays are not ideally suited for seedling generation and growth since they cannot hold moisture and cannot be used to treat with pesticides and insecticides by spraying in the outside. To overcome these limitations, we have developed 100% biodegradable sapling and seedling trays using agricultural residues such as coir, bagasse etc. our trays are not only biodegradable but can be functionalized with growth promoting hormones, insecticides and pesticides which will make them very attractive to farmers and general public. 100% biodegradable seedling and sapling trays developed using coconut coir. The project has successfully been completed

2.9 Development Of Solar Operated Micro Irrigation Applicator

The innovation developed by Shri M. L. Mehta from New Delhi has been scouted and mentored by TOCIC at College of Technology & Engineering (CTAE), Udaipur and DSIR with financial support under PRISM-DSIR Scheme.



It is well known that about 60% area in India comes under Rainfed Agriculture. Rain is the only source of water. Sowing is done, when rain comes. But when the crop is of 30-40 days & if rain does not come, the crop is under severe dry spell conditions and many a times the crop fails. The farmer has to incur heavy losses and sometimes it compels him to suicide. This is a matter of great concern for us to save the crop. The development of solar operated micro irrigation applicator will help the farmers on the rainfed area to deal with severe moisture stress conditions and saves the crop. Utilization of solar energy which is in abundance, economical and pollution free as compared to diesel engine and electric motor and supply of irrigation water through drip irrigation system already installed in the field, will fulfill our policy "PER DROP MORE CROP".

Solar operated micro irrigation applicator has been developed for the farmers of rainfed area to deal with the severe moisture stress conditions and save the crops. The source of power to pull the machine is one bullock or human power or tractor. It works as crop saving machine for crops under rainfed farming system. The machine can be installed anywhere in remote area and there is no need of electricity or diesel engine or genset etc. The machine coupled with technology is suitable to increase productivity and profitability in agriculture under rainfed farming system.

Solar operated micro irrigation applicator has been tested at CCSHAU Hisar vide Test Report No. HAU/FMPE/18-19/Misc. SOMIA-01 dated March, 2019 for the farmers of rainfed area to deal with the severe moisture stress conditions and save the crops. The design patent no 301280 vide 80328 dated 26th August, 2019 has been given by the controller general of patents, design and trade office (Govt of India) Kolkata.

The machine is suitable to save the crop

under dry spell conditions in dry land agriculture and has been recommended for its commercial production by CCSHAU Hisar.

The innovation will bring revolution in production and productivity in dry land agriculture. The profitability of farmers and GDP of country will increase appreciably. The innovative machine will encourage farmers to adopt high value crops to generate more income. The machine is capable to save crop, when it is under severe moisture stress conditions. The innovation will help those land holdings in remote area where there is no electricity or diesel engines or gensets etc. The solar operated micro irrigation applicator is useful for other purposes e.g lighting, music system, mobile charging, drinking and bathing of animals etc. The rain water harvesting mechanism is inbuilt system with the machine to store water in storage tank for irrigation. This will avoid dependency of water from other sources. The innovation helps towards *Per drop More Crop* through drip irrigation technology. The innovation will contribute towards doubling of income of the farmers as per the agenda of the government. The project has successfully been completed



Solar operated micro irrigation applicator with drip irrigation system

2.10 Smart Nest Management System for small scale business in Rural Areas

The project Smart Nest Management system for small scale business in rural areas is executed by the innovator - Shri Uddip Kashyap, Shillong. The innovator has been scouted and mentored by TOCIC at IIT Guwahati and DSIR with financial support under PRISM-DSIR Scheme.

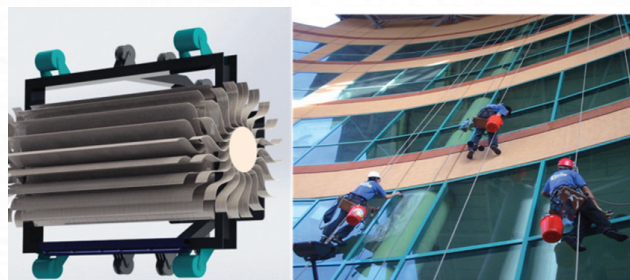
The innovator has designed and developed Smart Coop aiming at assisting in homestead rearing of chickens. The smart nest / nest management system aims especially monitoring and acquisition of vital information relating to the bird's health and egg count. The most significant component of the proposed system is the nest box. It has dimension of approx. 13x13x15 inches and is a rectangular

Parallel piped except for the top face which is sloped for the inner installation design. The innovation has direct impact at rural level. It is easy to use and implement. The project has successfully been completed.

2.11 Automatic window washer and dryer machine for high rise building

The project Automatic window washer & dryer machine for high rise building is executed by the innovator, Shri Rohan Kaundal, Mumbai through the TOCIC (TePP Outreach cum Cluster Innovation Centre) at CSIR-CSIO, Chandigarh. The innovator has developed proof of concept of an automatic window cleaning machine for high rise buildings which is a vertically moving cleaning machine especially applicable to the outer walls of high rise buildings and which contains a pair of rotary arms that can automatically rotate about the horizontal axis and a brush sets which forms the structure for automatic washing of the outer walls of high rise building. The proposed Automatic

Window Cleaning Machine offers an innovative solution for safe and automated cleaning of high rise building facades and windows. This proposed development offers a safe and effective way of cleaning multi-storied buildings and can be customized to fit specific site requirements. The real estate developers would benefit a lot from this machine. The project has been successfully completed.



"Automatic Window Washer & Dryer Machine for High Rise Building": Minimize danger of falling

2.12 Development of a Novel Animal Free Reagent based prototype Blood Test Kit for Early Heart Attack Diagnosis

The PRISM project Development of a Novel Animal Free Reagent based prototype Blood Test Kit for Early Heart Attack Diagnosis is executed by the innovator Dr. Susmita Ghosh, Kolkata through the TOCIC (TePP Outreach cum Cluster Innovation Centre) at CSIR-CGCRI, Kolkata. The innovator developed proof of concept of an animal-free prototype H-FABP from human blood / serum in clinical range of 10 mg./ml. In several incidences, genuine heart attack is ignored and valuable time is wasted. When heart attack is suspected, diagnosis in India mainly refers to cardiograms that require expensive instruments and trained technician. The output of this innovation i.e. H-FABP can be detected within 2 hours after onset of heart attack with higher accuracy and throughput than ECG The project has successfully been completed.



2.13 Artificial human-skin as an alternative to animal model for drug and cosmetic testing

The PRISM project Artificial human-skin as an alternative to animal model for drug and cosmetic testing is executed by the innovator, Dr. (Mrs.) Ranjana C. Dutta, Hyderabad through the TOCIC (TePP Outreach cum Cluster Innovation Centre) at Sri Padmavati Mahila Viswa Vidyalalayam (SPMVV), Tirupati. The innovator designed and developed Advance 3D cell culture technology and unique ECM mimicking biomaterials at per animal model for drug toxicity testing. The innovation would provide an advance in vitro skin model for testing permeability and toxicity of new chemical entities (NCEs) including cosmetics. The project has successfully been completed.



Artificial human skin as an alternative to animal

Artificial human skin as an alternative to animal model for in vitro Drug and Cosmetic testing

2.14 Solar Powered Farm level cold storage with battery-less refrigeration and thermal storage [Phase-II]

The PRISM project Solar Powered Farm level cold storage with battery-less refrigeration and thermal storage is executed by the innovator, Mr. Vivek Pandey, Kharagpur, West Bengal through through the TOCIC (TePP Outreach cum Cluster Innovation Centre) at IIT, Kharagpur. The innovator has developed a novel cost-effective pilot scale micro cold storage unit, which is a small scale cold storage facility powered by solar and hybridized with other sources

like biomass. The proposal envisages development & deployment of 8 pilots for testing product performance over different climatic conditions and geographies. This unit uses PV powered Vapor Compressor Cycle along with thermal storage system and hybridization, which produces required cooling effect and run 24x7 hrs. with an energy storage system. Micro Cold Storage is small-scale solar powered cold storage system. It is a pioneering product in the cold chain space that bundles various innovations together. The system contains both pre-cooling and storage arrangement. It comes with every feature of an ideal cold storage system and is complete standalone. It can be hybridized with any other source of energy as the need be. The end product has been endogenously developed cold storage system for Commodities like Fruits, Vegetables, Flowers, Seeds, Grains with approximately 3.5 metric ton of storage capacity with an in-built pre-cooling capacity of 0.5 metric tonnes. The product (Cold storages) near / at the farm location will minimize post-harvest losses by ensuring that the product quality and quantity doesn't deteriorate till it reaches the customer. The innovation has got many awards. The project has successfully been completed.



Solar Powered Farm level cold storage with battery-less refrigeration and thermal storage: A standalone rural Innovation for inclusive growth

2.15 Effective & Preventive prosthesis for treatment of multiple neck ailments

The PRISM project Effective & Preventive

prosthesis for treatment of multiple neck ailments is executed by the innovator Dr. Sandeep Chatterjee, Burdwan (West Bengal) through the TOCIC (TePP Outreach cum Cluster Innovation Centre) at CSIR-CMERI, Durgapur. The innovator has developed an user-friendly, light weight and low cost external neck device meant for proper treatment of various types of neck pathology like cervical spondylitis, cervical disk prolapse. The proposed improved orthosis is expected to facilitate effective treatment for neck related ailments through relaxation of neck muscle spasms by controlled traction effect, as also through the provision of effective point supports in bony prominences of the facial skeleton and improved ventilation of the neck area, thereby affording continued use. The proposed orthosis can also be used as a base support for providing support for different spinal pathology like cervical spine fracture and delivery of certain modes of pain alleviation like UST and IFT therapy. The proposed improved orthosis is expected to facilitate effective treatment for neck related ailments through relaxation of neck muscle spasms by controlled traction effect, as also through the provision of effective point supports in bony prominences of the facial skeleton and improved ventilation of the neck area, thereby affording continued use. The product can also be used as a base

support for providing support for different spinal pathology like cervical spine fracture and delivery of certain modes of pain alleviation like UST and IFT therapy. The project has been successfully completed.



Effective & Preventive prosthesis for treatment of multiple neck ailments

3. OTHER ACTIVITIES

A number of other activities were organised /participated by DSIR along with TOCIC during the year to sensitize academia, disseminate information on PRISM to the larger mass of the populace network partners and impact generation among common masses.

