



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

1. A2K+ Studies
2. A2K+ Events
3. Technology Development and Utilization Programme for Women (TDUPW).
4. Technology Development and Demonstration Programme (TDDP)





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

Access to Knowledge for Technology Development and Dissemination (A2K+) is a scheme targeted towards developing mechanisms to disseminate science, technology and innovation related information to industries, research and academic institutions, in-house R&D units of industry, Scientific & Industrial Research Organizations (SIROs), consultants, industry associations, techno-entrepreneurs, government departments and others.

Programmes supported are the following:

- 1 Supporting industrial technology related studies (A2K+ Studies)
- 2 Supporting the organization of national and international conferences, exhibitions etc. (A2K+ Events)
- 3 Support for Technology Development and Utilization Programme for Women, including projects spilling over from the 11th five year plan.
- 4 Continuing support to Technology Development and Demonstration Programme projects, spilling over from the 11th five year plan (TDDP)

1 A2K+ - Studies


The main objective of the programme is to undertake industrial technology related studies on frontier areas

of technology that impact the country. The study-reports are aimed at providing a useful information and knowledge base to industry, industry associations, academia, research institutions, consultants, entrepreneurs, research students and policy makers for initiating useful projects and carrying out further work in these areas.

Study areas of importance in different fields of technology were identified in collaboration with different government ministries and departments and proposals were invited in the identified subject areas. Around 50 proposals were received from various technical and industrial organisations across the country, out of which 10 studies were recommended. Two studies have been initiated during the year; a brief write-up on each follows.

Study - 1 “Framework of Industry-University Linkages in Research”

The study is aimed at understanding the dynamics of university-industry linkages and how this can facilitate significant research that would be beneficial to all stakeholders. The current status of university-industry linkages would be studied and case studies brought out with respect to capacity



building, research and development activities and innovation, covering aspects relating *inter alia* to the needs of the growing sectors of the Indian economy. The international scenario in China, Japan, Germany and USA would be studied before drawing conclusions and making recommendations for increasing the efficacy of university-industry linkages.

Study - 2 “Technology diffusion in the Millet processing industry specific to Karnataka, Andhra Pradesh and Maharashtra States.”

The study is aimed at defining modes of establishing a robust and sustainable millet processing industry with adaptable technologies in the country. Diffusion studies of millet processing with emphasis on Ragi processing technologies specific to Karnataka, Barnyard Millet and Foxtail in Andhra Pradesh and Sorghum in Maharashtra would be carried out resulting in suitable policy level interventions to enhance the impact of millet based products. The processing practices of industries in the identified regions and the extent of adoption of modern technologies by them will be studied, to evolve suitable technology transfer mechanisms.

2 A2K+ Events

The “Access to Knowledge for Technology Development and Dissemination – Events” programme of DSIR provides a platform for exchange of views leading to useful insights on issues relating to industrial research and technological innovation. The programme supports the organization of workshops, interactions, training programmes, exhibitions and other events to facilitate industry, consultancy organizations, academic and research institutions in identifying and developing tools and techniques to remain competitive in today’s business climate.

The main objective is to provide a platform for exchange of views and sharing of useful insights and learnings from industry, academia, consultancy

and research organizations. These events aim at increasing awareness and capacity building of stakeholders in various facets of industrial research and innovation, leading to strengthening of technological capabilities and competitiveness.

Achievements

Post TAC2, 107 proposals were received from different agencies to organize workshops, stakeholder meetings, interaction meets, training programmes, exhibitions and other events on topics related to promotion of industrial research and innovation. These proposals were scrutinized for completeness and relevance with respect to the Scheme Guidelines (formulated during the year) by the Departmental Internal Screening Committee. These proposals were further put up for discussion and recommendation in the TAC Meetings. Proposals recommended by TAC were processed for financial concurrence & approval and then sanctioned to the concerned agencies.

Some events that were supported by the department during the year are illustrated below:

- Clean Technology Exposition
- Industrial Waste Management in SME Sector
- Workshops on Biopharmaceuticals / Medical Devices at NE and Ahmedabad
- Innovation & Intellectual Property Management Strategies for Industrial Development
- Workshops on Innovations for enhancing Industrial and Entrepreneurship Development in the state of Bihar
- Management of Intellectual Property Rights in India
- Innovation of Technologies, Markets and Developments in Diagnostics, Biopharmaceuticals and Bio-Medical Sector



- Innovation Summit cum Excellence Awards
- Innovative Research and Entrepreneurial Opportunities In Biotechnology
- Accelerating Industrial Growth through Science, Technology Innovation
- Expo cum Workshop on Food technologies
- Six Sigma for MSMEs Tool for Process Improvement
- National Conference on Role of Biopharmaceuticals in achieving Health by 2020
- Indo-European Conference on Fostering Co-operation in Research, Innovation and IPR
- 4th Bio-Nano Agri Summit 2015: Technologies to Transform Agriculture in India
- Advanced Manufacturing Technologies for Engineering Sector
- Conference and Exhibition on Food Innovation 2015: Science, Innovation and technology for Sustainable Food Production
- National Conference on Physics Industry Interface
- MSME Design Conclave for New Product Development
- Industrial Hazardous Waste Management in SME Sector
- 1 Day International Conference on Information Technology- Value Claiming or Value Creating
- Technology Summit & Knowledge Expo-2015


- IESS 2015 Exhibition and International Seminar
- Conference on “Integrated Approaches for Promotion and Development of Herbal Medicine”.
- International Symposium on Next Generation Approaches for Sustainable Development of Hill and Upland Horticulture

3: Technology Development and Utilization Programme for Women (TDUPW)

The program 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 Technology up gradation (through technologies developed by scientific establishments) of micro, small and medium enterprises run by women Self Help Groups(SHGs)/entrepreneurs .
- Showcasing of appropriate technologies developed by scientific establishments and organizing demonstration programmes for the benefit of women.
- Design and development of products, processes (by utilizing waste) beneficial to women.
- Diffusion of technologies developed by scientific establishments for reduction of drudgery and empowerment of women.

The following two proposals, recommended by the Technical Advisory Committee (TAC) were at various stages of approval as on 31st December 2015.



(i) ***Capacity Building of Economically Backward Rural Women Through Participatory Training on Integrated Fish Farming with Improved Backyard Poultry Breeds in Homestead Ponds***

The main objectives of the proposal received from Bidhan Chandra Krishi Viswavidyalaya, Directorate of Research, P.O: Kalyani, Pin- 741 235, District Nadia, West Bengal are capacity building of rural women on integrated poultry-fish farming in their homestead ponds through participatory training and demonstration programmes for their income generation and nutritional support as well and dissemination of the technology in the adjoining villages through organizing training and demonstration programmes in association with different panchayats of adjoining Block of the village.

The integrated poultry-fish farming offers great efficiency in resource utilization, as waste or by-products from one system is effectively recycled. It also enables effective utilization of available farming space for maximizing production. Fish culture in combination with agriculture or livestock is a unique and lucrative venture and provides a higher farm income, makes available a cheap source of protein for the rural population, increases productivity on small land-holdings and increases the supply of feeds for the farm livestock. Thus, it provides more employment, and improves socio-economic status of farmers and betterment of rural economy. The project will be implemented in Nadia district of West Bengal. The project has been recommended by the Technical Advisory Committee and was being processed for approval and support.

(ii) ***Enhancing the Livelihoods of Tribal Women through Technological Intervention of Trainings on Non-Wood Forest Products (Identification, collection, storage, processing and marketing of Non-Wood forest products)***

The main objectives of the proposal received from Department of Agricultural Extension and Rural Sociology, Tamil Nadu Agricultural University, Coimbatore are to train the tribal women on collection, storage, processing, value addition and marketing of Non-wood Forest Products (NWFPs) and assess the impact of the trainings on the livelihood status of tribal women. The project deals with strengthening the Non-Wood Forest Products (NWFPs) sector by means of training the tribal people regularly on aspects related to proper collection methods, storage, processing, value addition techniques and marketing of NWFPs to improve socio-economic status of the beneficiaries of the project areas. The project has been recommended by the Technical Advisory Committee and was being processed for approval and support.

A brief write up on the projects completed during the year is as follows:

(i) ***Economic empowerment of SC & ST women on processing of moringa leaves and its products as an income generating activity***

The main objectives of the proposal received from Deptt of Home Science Extension, Home Science College and Research Institute, Tamilnadu Agricultural University, Tamilnadu were to develop and standardize new innovative traditional value added products using Moringa leaves by applying new technologies, encourage cultivation of moringa and to train rural women on processing of moringa leaves and development of value added products as an income generating activity. During the project period 485 women were trained. 58 women entrepreneurs have been successful in setting up their business after getting trained under the project. Most of the entrepreneurs are able to sustain their enterprises for more than one year. One entrepreneur is exporting the products to Malaysia through export agency and also selling in local market. Another entrepreneur is selling the products in 40 departmental stores. Women trained under the project are exporting the products to Singapore and

Dubai and also selling in local market. All the entrepreneurs have obtained FSSAI license for marketing their products. A booklet on Establishment of Moringa processing unit has been prepared. One paper has been published in refereed journal, five articles published, three papers presented in national seminars, one CD produced and one portal “Technology on processing and value addition of Moringa leaves” has been developed and hosted in TNAU Agri portal.

(ii) *Generating Secured Income for farm Women through dissemination of Hybrid Castor production technology*


The main objectives of the proposal received from Tapioca and Castor Research Station, Tamilnadu Agricultural University, Salem Distt, Tamilnadu were to create awareness on Hybrid castor production technology and disseminate production technology and disseminate the technologies among farm women, impart trainings for farm women for up gradation of knowledge and skill on hybrid castor production and to generate secured farm income for farm women through adoption of hybrid castor production and to enhance their socio- economic status. The project was implemented in Salem & Namakkal districts of Tamil Nadu. During the first year, Vazhapady and Sankari blocks in Salem district and Elachipalayam block in Namakkal district were selected for project implementation. In the Second year, Magudanchavadi in Salem district and Rasipuram and Mallasamuthiram blocks in Namakkal district were selected for project implementation. In total six blocks i.e three blocks from Salem district and three blocks from Namakkal district were selected for the study. Under the project, 18 villages were selected, three awareness programmes, six training programmes and six field day (demonstration) programmes were completed. 180 women beneficiaries benefited under the project. The training programmes covered various aspects on hybrid castor production like details of planting season, varieties, hybrids, spacing and plant population maintenance, seed treatment method,

fertilizer management, irrigation, weed management, inter cropping and plant protection.

(iii) *Technological empowerment and sustainable livelihood security of tribal women through agricultural farm productivity and employment generation activities in Kalrayan hills of Tamil Nadu*

The project “Technological empowerment and sustainable livelihood security of tribal women through agricultural farm productivity and employment generation activities in Kalrayan hills of Tamil Nadu” was executed by Tapioca and Castor Research Station of Tamil Nadu Agricultural University, Salem District, Tamil Nadu. The objectives of the proposal were to empower the tribal women through beekeeping enterprises for generating personal income, local poverty and environmental protection, improve local health standards through the use of bee products and study the impact of the projected technologies on the status of selected villages. The project dealt with environmental protection through bee keeping enterprises. The scientific programme in the project was for increasing socio-economic status of tribal women in Kalrayan Hills of Tamilnadu. Under the project, the organization completed proposed activities like five awareness programme covering 500 beneficiaries and 25 groups (around 5 groups from each village and total 5 villages), hands on training programme on beekeeping enterprises for 25 groups vis-à-vis around 500 beneficiaries (around 20 members in each group) and training on value addition of honey for 400 beneficiaries from 500 beneficiaries etc. The organization completed 15 training programmes on beekeeping enterprises and 10 training programmes on honey value addition as proposed. All the training programmes were conducted at Kalrayan hills of Tamil Nadu. As an outcome of the project, 25 beehive enterprises were developed in the project area. The beneficiaries were also able to develop other value added honey products.





(iv) Socioeconomic empowerment of rural women by training them with agro based biotechnological intervention

The Project “Socioeconomic empowerment of rural women by training them with agro based biotechnological intervention” was executed by Department of Zoology, The Standard Fireworks Rajaratnam College for Women, Sivakasi, Tamil Nadu. The objectives of the proposal were to exploit the ecofriendly biotechnology processes/packages for self sustained employment and income generation among rural women, provide additional enterprise to rural women with agricultural background, recycle agro based wastes and to create awareness on environmental conservation, develop trained professionals in S & T, promote entrepreneurship by training the rural women for Mushroom cultivation, Vermi composting of mushroom spent substrate, Value addition of mushroom, evolve regional network to get into global market and to uplift the socioeconomic status of rural women. The organization completed all proposed activities viz., Exploitation of ecofriendly biotechnology processes/packages for self sustained employment and income generation among rural women; Guiding rural women with agricultural background towards creation of enterprises; Knowledge dissemination for recycling of agro based wastes and creating awareness on environmental conservation. Under the project awareness and hands on training programmes were conducted for 200 beneficiaries at Sivakasi block. Under the project, 200 women beneficiaries were trained on mushroom cultivation, vermi composting of mushroom spent substrate and promotion of entrepreneurship.

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:

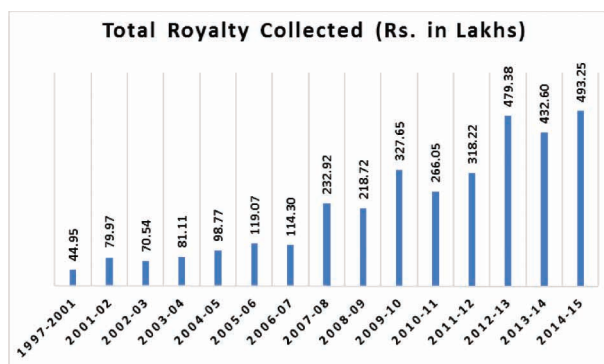
- (a) Development of a new or improved product resulting in prototype development and ending with demonstration in commercial environment.
- (b) Development of a new or improved process resulting in establishment of process know-how, development of process equipment and demonstration of yield, efficacy 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.

Under Technology Development and Demonstration Programme (TDDP) in operation since 1992, the department has supported 254 R&D projects of Industrial units with a total project cost of Rs. 750.60 crores in which DSIR support is Rs. 280.40 crores.

The projects cover a number of industry sectors and the share of these industry sectors in the project supported is: 32% engineering; 27% electronics; 21% Chemical; 7% energy and waste utilization and 13% Health & Pharma. The projects supported have been spread over 22 states of the country and the share of top five states in the number of project supported is: Andhra Pradesh 18%, Karnataka 15%, Maharashtra 13%, Delhi 10% and Tamil Nadu 10%.

76 technologies developed under the scheme have been commercialized (**Annexure 1**) and the department has received a cumulative royalty of around Rs.33.77 Crore during 1997-2015. During the current financial year, progress of 31 projects was monitored and 17 projects were successfully completed.



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

Status of TDDP Projects on-going from Eleventh Plan and monitored during the financial year 2015-16

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

The objective of this project is to design, develop and demonstrate Indigenous Radiotherapy Simulator by refurbishing an existing imported simulator. Radiation therapy is one of the established modes of cancer treatment that helps to diagnose physical


extent of tumor and its relation to surrounding tissues for proper selection of size & orientation of radiotherapy beams. It is useful to verify a treatment plan and is an essential tool for improving the quality of radiotherapy for treatment of cancer patients. Diagnostic x-ray is used as source of radiation. The new design has software facilities in imaging, image processing and communication system, electronic circuitry with image guided motor controls, wireless remote controls etc. The existing refurbished Radiotherapy Simulator shall be installed in a cancer hospital for regular clinical work after it is certified by Atomic Energy Regulatory Board (AERB). The project is nearing completion.

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

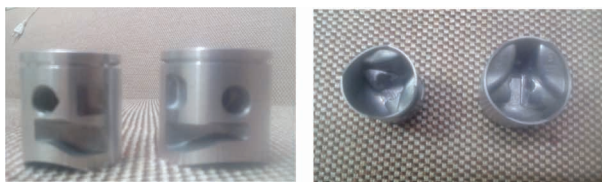
Indian Agricultural Research Institute (IARI) had developed a hydrogel at laboratory scale for use in agriculture. The technology for the same was licensed to Earth International Private Ltd. (EIPL), who sought financial assistance from the Department to transfer the technology to pilot scale. The hydrogel absorbs a minimum of 350 times its weight of pure water at 50°C and is ideally suited to Indian agro-climatic conditions. The company was able to achieve the production of desired quality of hydrogel in the pilot plant after receiving laboratory scale technology from IARI. The technology was scaled from laboratory scale (100g) to pilot scale initially in batch sizes of 10Kg and 25kg and has now been scaled up to 50 Kg batch size using larger reactors and increased mechanization. The plant has a capacity to make 100 Kg/day at present. The company has submitted the project completion report including field trial report from AICRP (All India Co-ordinated Research Project). The project has been successfully completed.

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





M/s Abilities India Pistons & Rings Ltd., Delhi had taken up a project for development of small size pistons for IC engines used in specialized applications like Chain saws, Brush cutters, Hedge trimmers' etc. very popular world over. The development of light weight and thin walled pistons with intricate shapes with High Pressure Die Cast (HPDC) process was taken up to achieve the desired high degree of fuel efficiency. The components produced with HPDC process are "Near Final Shape" without any additional machining and render the engine more efficient in terms of improved fuel economy and reduced emissions. The company for the first time in India has successfully developed & demonstrated the HPDC process for piston making and has made 390 pistons with Al-Si alloy for 33cc and 50 cc two stroke engines catering to speeds of 14000 rpm as against 6000 rpm normally used in automotive industry. The company has bagged ACT (ACMA Centre for Technology) Summit award 2015 under the Innovation category for this development.



33cc and 50cc Pistons developed by HPDC process

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

M/s Ardee Hi-Tech Pvt Ltd, Vishakhapatnam had taken up the project 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 yields similar results as compared to the existing technologies without using water. The system electronics, removal technology, logic of separation etc. developed are novel. The company has

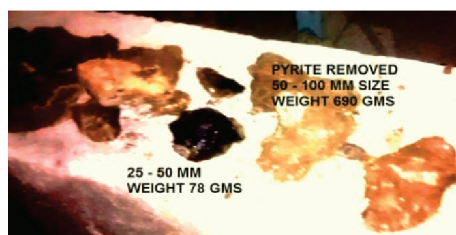
successfully completed the project. The field trials of X-Ray based Sorting system were conducted at a commercial scale Lignite Processing plant designed erected, installed and commissioned by Ardee at GMDC, Bhavanagar for beneficiation of lignite by elimination of clay and other pyrites with input feed of 480 Mt/hour.



Overview of Lignite Beneficiation plant designed, erected, installed and commissioned by Ardee



50 - 13 mm modules at GMDC Lignite Beneficiation Plant



Pyrites in sizes from 25 mm to 100 mm removed at GMDC Lignite Beneficiation Plant

5. E-waste Recycling & Precious Metal Recovery by M/s Eco Recycling Ltd., Mumbai

Electronic waste (E-waste) is continuously increasing with the socio-economic and technological developments. Presently, the electronic goods are disintegrated mechanically and plastics, chassis and circuit boards are separated

using manual methods, which is not only slow and time consuming process but also hazardous for the workers engaged in disintegration of e-waste. The e-waste is a rich resource containing several precious metals like gold, platinum, silver, copper, etc. Under this project, a complete e-waste recovery cycle has been developed to address all the relevant concerns and will help in recovering the precious metals such as platinum, gold, silver, copper, aluminium, iron, etc. from e-waste. The process developed for separation of metal is based on air convection heating, where atmospheric air is heated by Infra-Red lamps to the requisite temperature of up to 220 degree centigrade. The process is automatic. The purity of metal recovered under this process was tested by CSIR-NML, Jamsedpur. The project has been successfully completed.



Precious metal recovery system

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

The project for development of indigenous FTIR Spectrophotometer was taken up in view of the growing demand for low cost indigenous FTIR spectrophotometer in the educational and research institutions as well as SMEs in the pharmaceutical and chemical sector. The company was able to complete the process of component fabrication & manufacture Pilot batch instruments. FTIR product



FTIR spectrophotometers


specifications have also been achieved. The project has been successfully completed.

7. 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 was to develop a delayed release and scaleable Endoxifen formulation safer than the parent Tamoxifen as a selective estrogen receptor modulator. Endoxifen (4-hydroxy N-desmethyl tamoxifen) is an active metabolite of the marketed drug Tamoxifen used for the treatment of breast cancer. The use of Endoxifen as a therapeutic agent e.g. for cancer and psychiatric & neurodegenerative diseases has the following significant advantages compared to the mother compound Tamoxifen:

- The active component can be directly administered instead through a pro-drug.
- Offering consistent results for the efficacy by abolishing person to person variable outcomes of the existing therapy, resulting from Tamoxifen that showed variable results due to genetic polymorphism of CYP2D6 enzyme, which converts Tamoxifen to Endoxifen.
- Substantially dose reduction, resulting in reduced cost of therapy.
- Reducing potential side effects of the parent compound, Tamoxifen.





The project has been successfully completed with the development of process for synthesis of new chemical entity 'Endoxifen' and its formulation which is to be used for the treatment of breast cancer.

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

The main objectives of the project were to scale-up the non-infringing processes developed at lab scale in respect of 17 Active Pharmaceutical Ingredients (API's) viz. Telmisartan, Montelukast, Zolmitriptan, Levetiracetam, Irbesartan, Lacidipine, Valsartan, Olmisartan Medoxomil, Linazolode, Candesartan, Tamsulosin HCl, Fosamprenavir, Manidipine HCl, Nifedipine, Felodipine Bifanozole and Florfenicol from gms. level to Kgs. Level on a pilot plant scale. These API's are mainly used for the treatment of diseases like asthma, seasonal allergies, hypertension, migraine, epilepsy, congestive heart failure, enlarged prostate etc. The company has filed three patents for the processes developed for Telmisartan, Irbesertan and Olmisartan Medoxomil. The project has been successfully completed with the development of processes for 17 Active Pharmaceuticals Ingredients at Semi Pilot Scale batches (1-5 Kg. level), Exhibit batches (5-10 Kg. level) & Validation batches (5-10 Kg. level).

9. 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 project aims at producing a class of B-amino acid based DPP IV inhibitors using novel heterocyclic, structurally unrelated to any DPP-IV inhibitors known so far. It is a new DPP-IV inhibitor that has better half-life, advantageous potency, stability and selectivity, less toxicity and/or better pharmacodynamics properties. Phase I clinical studies have been successfully completed on tablet formulation and Phase II toxicity studies are progressing well. For this New Chemical Entity, the

company has filed patents world-wide and has been granted in countries such as USA, Europe, Japan and China. The project is under progress.

10. 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 cost effective liquid and stable rabies vaccine superior to the existing freeze-dried one. The Vaccine formulation will be liquid stable and storable at 4°C with a shelf life of 2-3 years. The process is highly reproducible with complete removal of host cell DNA contamination. The Project is under progress.

11. 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 Colocynthin – an anti-arthritis product, at several scale-up levels and also to identify quality raw materials sources from different parts of India. The company has developed 50% and 95% Colocynthin grades that may be useful in the development of anti-psoriatic and anti-cancer formulations. The project has been completed.

12. 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. Components identified for conversion are 'Suspension Links', 'Steering Knuckles' from cast / forged steel / iron components

for production with LPDC Aluminum equivalents. The suspension links and steering knuckles have been developed successfully in the facilities developed under the project. Automation of the developed process and defect recognition and correction automatically has also been completed. The developed products will reduce the weight and improved the mileage of the vehicle which results lesser running cost and reduced emissions. The Project is nearing completion.



Steering knuckle

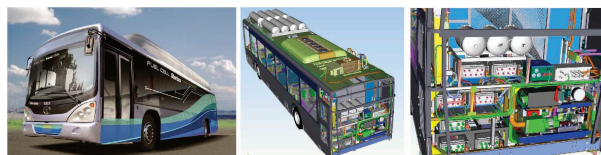


Suspension links

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

M/s Tata Motors Ltd, Mumbai has taken up a project on development and demonstration of Fuel Cell Bus.

Hydrogen is emerging as a leading contender for the energy carrier options of future. The project is aimed at design, development and demonstration of Fuel Cell Bus which will be fueled by Hydrogen. Approval for Hydrogen storage and for Hydrogen filling at the Hydrogen refuelling infrastructure has been obtained from Petroleum and Explosives Safety Organisation (PESO) and approval for testing of fuel cell bus at TML, Sanand (Gujarat) has been obtained from Ministry of Road Transport and Highways (MORTH) / Central Institute of Road Transport (CIRT) and regular field trials on the prototype were under progress at TML facility at Sanand. Vehicle prototyping with further improvements and technology additions were also in progress. The Project is under progress.




Fuel Cell bus and layout of its sub systems

14. Purification of Gas Gangrene Clostridium Toxins & Development of Monovalent and Polyvalent Antitoxins by M/s. 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 method, 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 has been completed.

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





Water Jet Germany Pvt. Ltd, Tamil Nadu has undertaken the project for design and development of a pump which can build up pressures beyond 6000 bar for increased cutting speeds, thereby improving productivity of the water jet cutting machine. A prototype with 50 HP hydraulic power pack is under development. The Project is under progress.

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

M/s Aron Universal Ltd., Bangalore has taken up a project to develop and commercialize novel UV-reflective security inks and pigments in five colours with improved performance characteristics in terms of glow intensity under UV exposure, solvent resistance, reduced particle size and acid/alkali resistance. The process for four colours viz. Blue, Lemon Yellow, Golden Yellow & Red in respect of both pigments & Inks with desired properties has been developed except that little more improvement in acid/alkali resistance & solvent solubility in Acetone and Toluene was being attempted. The project is under progress.

17. Development and Commercialization on Low Temperature Polymer Exchange Membrane Fuel Cell and Stack by M/s 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 fuel cells developed at proof of concept level at IIT Mumbai delivered the power of 0.2 watts per cm² with air as an oxidant. The development and fitting of all the required supporting equipment such as gas chamber, flow path, test bench, etc. has been completed. The project has achieved a maximum current density of 665 mA/cm² with O₂ and 347 mA/cm² with air for a single 300 cm² cell. The project is now integrating

multiple cells for developing 1kW and 3 kW fuel cell stack. The Project is under progress.

18. Project “Development & Commercialization of Seating Mechanism (Recliner, Track & Lifter)” – M/s Hema Engineering Industries Limited, Gurgaon

The objective of the proposal is to develop Seat Mechanisms for automobiles which will be import substitution. 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 as per the FMVSS/ECE/BIS/ standards for seating systems. Motor vehicle seat strength is assessed through both static testing in FMVSS 207, Seating Systems, and dynamic testing in FMVSS 208, Occupant Crash Protection. FMVSS 207 testing focuses on seat-to-back and seat-to-vehicle anchorage strength, while FMVSS 208 indirectly assesses seat performance through evaluation of occupant injury risk indicators.

The seat mechanism involves recliner, track and lifter. The main feature of the proposed recliner is its compact size. The available mechanism is of 90-100 mm in diameter. The proposed unit will be of 75mm diameter. This gives advantage of designing the full seat structure in compact form and ultimately cost savings in materials. It is designed to international specifications. The main feature of designing track mechanism is to develop the mechanism operated by cable. The passenger can adjust position by just pulling a plastic knob fitted to the front or side of the seat cushion frame. In the existing mechanism the release of the slider is done by toggle bar or a small knob. This mechanism has fine adjustment of 6 mm. In the proposed lifter mechanism, the seat cushion can be raised by 1.5 mm in each stroke. The design of the lifter is unique in terms of smooth operation. The project is under progress.

19. Three Dimensional Mixer by M/s. Hexagon Product Development Pvt. Ltd., Vadodara

The main objective of the project was to develop a prototype of 3-Dimensional Mixer which will be used for efficient mixing of powder and liquid materials. In addition to the traditional motions of rotation and transition, a third fundamental motion of inversion based on Schatz Inversion Geometry has been introduced in this mixer. The 3-Dimensional mixer has many benefits in comparison to the available two dimensional mixers such as:

- Removes segregation of materials and maintains homogeneity of the internal mass.
- Less consumption of power (around 40%) due to better surface contact.
- Since there is no single axis of rotation, no centrifugal force is generated, hence restriction of rotational speed is eliminated.

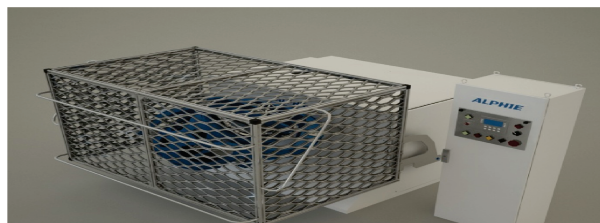
The project has been successfully completed with the development & demonstration of a 75 litre capacity 3-Dimensional mixer.



Three dimensional mixer


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

M/s. Hi-Tech Robotic Systemz Ltd., Gurgaon had taken up the project to develop an AGV Pallet Truck, which combines an autonomous navigation system with pallet handling system, a new generation of AGV controller, a new power pack and guidance system. The goals of this project are to develop an indigenous vehicle as a substitute for imported vehicles and develop a new generation controller. The company has successfully completed the project and developed and demonstrated an advanced pallet handling and stacker AGV, which combines different technologies of autonomous navigation, new generation controller, guidance system, etc. to meet the demand for advanced material handling system on factory floors and in warehouse applications.



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

The objective of the project was to develop prototypes of solid handling fluid transfer pumps of 3", 4" and 6" cross section with accessories for pumping slurry and highly viscous fluids. These are innovative pumping solutions for water, waste water, sludge etc. M/s. OEWPL self-priming diesel pumps are the latest innovation in mobile pumping solutions for construction, water, and utilities sectors, providing reliable and high performance liquid pumping whenever needed. In addition to solid-handling capabilities, these pumps also offer fuel efficiency, with fuel consumption rates up to six times lower than the equivalent models from other manufacturers of portable diesel pumps. In view of their unique self-priming system, these pumps are cleaner, greener and more economical than the traditional diesel driven pumps. These pumps are



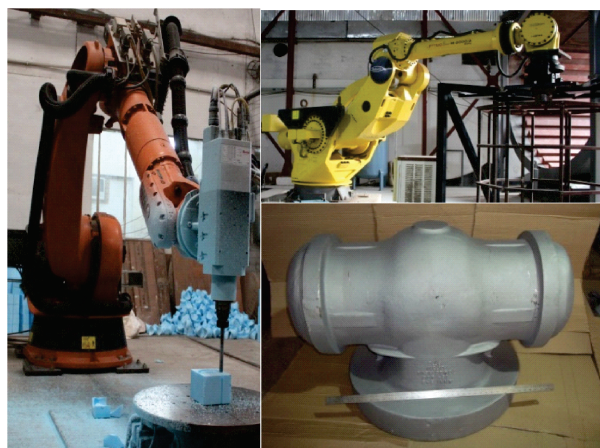
ideal for Viscous Liquids, Raw/Process Water, Storm/Flood Water, Sewage, Sludge, Slurry, Bentonite etc. and can be deployed for Site Drainage, Emergency Pumping, etc. The project has been successfully completed.

22. 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 radio-therapy. The proposed machine will be able to offer 3D conformal therapy using cobalt 60. The overall cost of treatment with such a configuration will be low, while offering 3D conformal treatment. This machine will be precise, accurate, rugged and reliable for conformal therapy at a fraction of the cost of similar machines in developing countries. It is operated by a built in battery with low power consumption, suitable for rural India. The project is under progress.

23. 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 objective is to set up a pilot plant facility of rapidcast technology for production of single piece castings upto 5000 Kg. The main objective of the project is to reduce the cumbersome process of making dies and mold of the product which requires lot of time and investment. The proposed technology "Rapidcast" will be used to cast a single piece 5000 Kg casting of with better quality, consistency and much faster speeds. The existing processes like sand moulding, shell moulding, investment castings etc. can not yield these features. The high point of the project is that the parts to be developed do not need any Tooling and are poured in partial vacuum. All state of the art equipments have been secured for Project. The project is under progress.



5000 kg single piece stainless steel rapid cast technology

24. 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 for some Drug Targets viz. anticancer. The project is nearing completion.

25. 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 was to synthesize Corey's Lactone, a key intermediate required for the synthesis of several prostanoids and to synthesize Iloprost, Lubirprostone and Travoprost from Corey's Lactone. Iloprost is used to treat pulmonary arterial hypertension and diseases in which the blood vessels are constricted & blood can't flow to the tissues. Travoprost is used in the treatment of glaucoma and ocular hypertension. Lubiprostone is used for the treatment of chronic constipation of unknown cause in adults as well as irritable bowel syndrome associated with constipation in women. The company has successfully developed the process of

synthesis of all the proposed products. The project is nearing completion.

26. 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 switched reluctance motor and control system for a hybrid car that can be mounted on the transmission shaft. The hybrid electric Vehicle (HEV) has been developed. The developed HEV has been sent to ARAI, Pune for testing and approval. The Project is under progress.

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

This project aims to automate the production process in fireworks Industry in order to achieve elimination of human touch of toxic chemicals, improving the occupational hazards, improving the productivity, reduction of cost and elimination of environmental pollution. The innovative technologies, viz. an automated drying chamber (solar powered) for indoor drying of fireworks, automatic weighing and mixing plant, mixing chamber with vibro screen and pneumatic motor in double story arrangement, automatic fire works powder filling machinery with PLC control and fireworks packing system which works on both electrical and pneumatic operations have been developed under this project. The automation process will bring a revolutionary change in the 800 fireworks industries in and around Sivakasi which is the only major Fireworks hub in India. The introduction of automation in fireworks manufacturing process will lead to achieve Improvement in 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. The project has been successfully completed.



Automated filling system

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

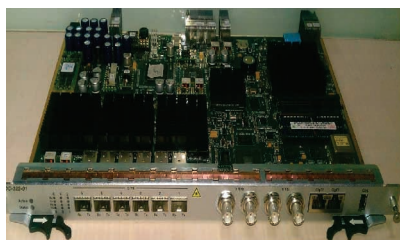
The basic objectives of the project were i) Developing the recipe and processing of a compound based on reprocessed polycarbonate and elastomer, which will have properties closer to the virgin polycarbonate and ii) Developing a compound based on reprocessed polyamide-6 and elastomer which will have properties close to polyamide- 12. The final compounds were targeted towards hard luggage industry and optical fiber cable industry respectively. The project has been successfully completed.

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

M/s Tejas Networks Ltd., Bangalore had taken up a project to design, develop and manufacture indigenous eNodeB Base stations based on Long Term Evolution (LTE) emerging as the single most dominant wireless standard for fourth generation (4G) wireless access. eNodeB (Enhanced Node-B) is the Radio Base station for the 4G Telecom



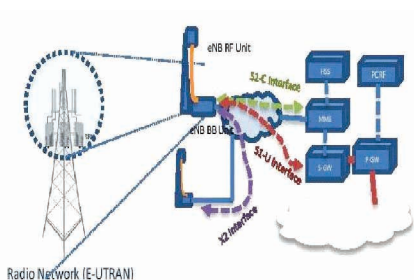
Technology [4th Generation Long Term Evolution (4G-LTE) network] which provides the wireless access to subscriber terminals. It enables high speed data access of 120 Mbps or more per base station and very low latencies of the order of a few milliseconds, providing a DSL-like user experience over a wireless network. The company has successfully completed the project.



eNodeB Baseband (eDC card)



TJ-1600C platform on which the eDC card is hosted to provide eNodeB functionality



TJ1600-11 Combined optical transport and wireless access platform

30. Upscaling and commercial production of the lactic acid bacteria starter culture for yogurt curd production by M/s. Tropilite Foods Pvt Ltd, Gwalior

The company has developed freeze dried *Streptococcus thermophilus* NCIM 5539, an isolate from curd, after extensive characterization including whole genome sequencing. *S. thermophilus* NCIM 5539 was observed to be suitable for dairy industry especially curd/yogurt, based on market trials. Cell mass yield of 6-10.6% with 2.5×10^{10} / ml has been achieved on 300 L fermenters. The desired counts of NCIM 5539 have been observed to be more than 18 months at -20°C , which is desirable for industrial applications. Gel firmness was high and post acidification pH drop was 0.2 to 0.8 only along with shelf life of final product up to 15 days under refrigeration. The company has set up a pilot plant facility for the project. The project has been successfully completed.

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

The project involves development of a machine for manufacturing “oral thin film” containing Medicines. The process of manufacture of such product comprises of formulation of drug solution/ dispersion/ emulsion required for solvent casting and its characterization. The project has been successfully completed.

List of projects completed during 2015-16

1. Development of Small size pistons for Two Stroke Engines by high pressure die casting process by M/s Abilities India Pistons & Rings Ltd., Delhi
2. Development and Demonstration of process for manufacture of Hydrogel at Pilot Plant Scale by M/s Earth International Pvt. Ltd., New Delhi
3. Development of Coal dry beneficiation system -X-Ray based Sorting system for Indian Coals of size range 13-50mm (ArdeeSort) by M/s Ardee Hi-Tech Pvt Ltd, Vishakhapatnam

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| 4. E-waste Recycling & Precious Metal Recovery by M/s Eco Recycling Ltd., Mumbai | Oriental Engineering Works Pvt. Ltd., Yamuna Nagar |
| 5. Indigenous Development of FTIR Spectrophotometer by M/s ELICO Limited, Hyderabad | 12. Development and Demonstration of Innovative Technology for the automation of Firework Manufacturing by M/s Sri Kaliswari Fireworks Private Ltd., Sivakasi, Tamil Nadu |
| 6. Development of Endoxifen as a new efficacious and safe therapeutic agent for the treatment of breast cancer by M/s. Intas Pharmaceuticals Ltd, Ahmedabad | 13. Development of LTE Macro eNodeB Base stations by M/s TEJAS Networks LTD., Bangalore |
| 7. Development of Non-infringing processes for API's in pilot scale by M/s. Ogene Systems (I) Pvt. Ltd., Hyderabad | 14. Upscaling and commercial production of the lactic acid bacteria starter culture for yogurd curd production by M/s. Tropilite Foods Pvt Ltd, Gwalior |
| 8. Optimization and Pilot Plant trials towards commercialization of Standardized Colocynthin extract from the medicinal plant "Citrullus Colocynthis by M/s. SAMI Labs Ltd., Bangalore | 15. Development & demonstration of technology to manufacture a new dosage form namely Oral Thin Films by M/s. ZIM Laboratories Ltd., Nagpur |
| 9. Three Dimensional Mixer by M/s. Hexagon Product Development Pvt. Ltd., Vadodara | 16. Purification of Gas Gangrene Clostridium Toxins & Development of Monovalent and Polyvalent Antitoxins by M/s. VINS Bioproducts Ltd., Hyderabad |
| 10. Smarter Material Handling Automated Guided Vehicles (AGVs) by M/s. Hi-Tech Robotic Systemz Ltd., Gurgaon | 17. New Process Development for Special Elastomer Compound by M/s. Som Shiva (Impex) Limited, Ahmedabad |
| 11. Solid Handling Fluid Transfer Pumps by M/s. | |



