

tdb news



Technology Development Board

Technology Development Board, Department of Science & Technology, Government of India



Commercializing Innovations

April-June | 2018

From Secretary's Desk



Dr. Bindu Dey
Secretary
Technology Development Board

Funding technology-oriented commercial projects is taking a great risk for any organization. Be it soft loan, equity or returnable grant, there is a valley of death, either technological or commercial that has to be crossed over by such enterprises. The anxiety is at both ends, investor's and investees.....

Technology Development Board (TDB) has been taking such risks for the last 21 years and lived up to anxiety-prone decisions with about 64% success rate. That means, the soft loan taken by a company is returned with interest and royalty. Last three years have been transformative not only for the quantum of funds received by TDB from the Government sources but also out of repayments, recoveries, high-premium exits in equity investments and international partnership. During 2017-18, sixteen Agreements were signed with the companies spanning all sectors. There was a committed investment of ~Rs. 350 cr. towards grant & loans while companies raised ~Rs. 940 cr. from alternate sources continuing the trend of ~three times co-investment against TDB's loans. Signing MoUs for Global Textiles Technology and a CSIR-led Road Technology were special events that Board has been very excited about. The journey towards indigenization of Medical Devices continued with drug-eluting stents to soon go global after USFDA approval. In this issue of TDB News, we bring to you the briefs about these companies with defined objectives of TDB-supported projects. A snapshot of the Technology Day 2018 celebrated in the presence of Hon'ble President of India with new ideas, aspirations and philosophy would take you closer to individuals and organisations that have been recognized through the National, MSME and Startup Awards 2018, and would surely update your vision on science commercializing scene!

I am sure you would enjoy reading.....

MoUs Signed by TDB in year 2017-18

Commercializing Innovations

Technology Development Board's primary mandate is centered around providing financial assistance to industrial concerns and other agencies attempting development and commercial application of indigenous technology or adapting imported technology to wider domestic applications.

TDB has always been sector agnostic in promoting commercialization of research leads, innovations and prototype technologies relevant to national economy. Continuing with the same philosophy, in its 21st year of inception, TDB signed 16 Memoranda of Understanding (MoUs) for innovative technology-driven projects.

With focus on soft loan @ 5 % simple interest and/or equity, TDB has evolved as a unique promoter of first generation entrepreneurs for development of socially relevant and profitable technologies, even at the risk of failure. Complimenting the Prime Minister's vision of "Make in India" initiative, TDB has been instrumental in enabling Indian Industry to stand-up to the competitive pressure and become a global player.

The projects supported this year provide innovative solutions / address the inherent challenges and bottlenecks across various sectors viz. medical devices, sustainable agriculture, green technology,



engineering, pharma & biotech, textiles, etc. This issue of TDB Newsletter showcases the main objectives and strengths of the projects supported during FY 2017-18. In this issue, we also bring to you a glimpse of the Technology Day 2018, celebrated on 11th May with the theme, "Commercializing Indigenous Technologies: Journey from Benchside to Business".

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Agreements Signed in Year 2017-18

S. No.	Project	Company Name	Date of Signing Agreement	Total Project Cost (Rs. Crore)	TDB's Assistance (Rs. Crore)
1	Development and Commercialization of Ubimedique Acute Care System (UMACS)	M/s Mobilexion Technologies Pvt. Ltd., Trivandrum	4 th May 2017 (Grant) 2 nd November 2017 (Loan)	2.60	0.15 (Grant) + 0.85 (Loan)
2	Integrate Manufacturing and USFDA Approval of Percutaneous Transluminal Coronary Angioplasty (PTCA) Balloon Catheter	M/s S3V Vascular Technologies, Bangalore	9 th May 2017	36.43	13.03
3	Defibrinated Sheep Blood	M/s Akshaya Agribiomed Pvt. Ltd., Hyderabad	6 th September 2017	4.40	1.90
4	Late stage development including Phase II & III of the attenuated dengue vaccine	M/s Panacea Biotech Pvt Ltd, New Delhi	14 th November 2017	57.99	28.99
5	Development and Commercialization of Sintered Carbide Alloys Technology	M/s IMCO Alloys Pvt. Ltd., Mumbai	17 th November 2017	3.67	1.84
6	Catheter Reprocessing System (C.R.S)	M/s Incredible Devices Private Limited, Chandigarh	21 st November 2017	1.05	0.47
7	Commercialization of cow dung compost as a means of strain delivery by applying electromagnetic radiation emitted from radionuclide's- ⁶⁰ Co : Alternative of synthetic NPK	M/s MSV Laboratories Pvt. Ltd, Medinapur, W.B.	27 th December 2017	15.81	6.31
8	Commercialization & Development of IMRT/IGRT based Treatment Planning System (TPS) for 6MV Medical LINAC	M/s Panacea Medical Technologies Pvt. Ltd., Bangalore	12 th March 2018	5.00	2.50
9	Scaling-up A Proprietary Room-Temperature Lead-Acid Battery Recycling Technology from a Pilot-Proof-of-Concept to A Pilot-Commercial Scale	M/s VerdeEn Chemicals Pvt. Ltd., Ghaziabad	15 th March 2018	12.42	1.50 (Grant) + 3.00 (Loan)
10	Establishing Commercial Plant using Congealing Technology to produce Lutein and other Carotenoids	M/s OmniActive Health Technologies Limited, Mumbai	21 st March 2018	33.00	14.00
11	Cold Mix Technology in Road Construction & Maintenance	M/s BitChem Asphalt Technologies Limited, Guwahati	23 rd March 2018	18.31	8.20
12	Manufacturing of 50 IRS units (critical component of Cochlear Implant system) for supplying to DEBEL, DRDO for clinical trials	M/s Shree Coratomic Limited, Pithampur (M.P)	24 th March 2018	1.69	0.70
13	Technology Adaption and Manufacturing of BS VI Quality Standard Piston	M/s Abilities India Pistons & Rings Ltd., Ghaziabad	24 th March 2018	16.83	8.41
14	Development and commercialization of Biogas and Bio-Enriched Organic Manure Plant utilizing only paddy straw	M/s Sampurn Agri Ventures Pvt. Ltd., Chandigarh	24 th March 2018	38.54	7.05
15	Development and commercialization of straw utilization technology: In-situ Accelerated and Sustainable Rice Straw Decomposition (ASRSD)	M/s Kan Biosys Pvt. Ltd., Pune	27 th March 2018	3.48	1.74
16	Birla Excel Solvent Spun Cellulosic Fibre Plant	M/s Grasim Industries Ltd., Nagda, MP	27 th March 2018	689.00	250.00
TOTAL				940.22	350.64

Development and Commercialization of Ubimedique Acute Care System (UMACS)

Mobilexion Technologies

TRIVANDRUM

Affordable and accessible basic health care is a major concern for India having ~60-70% rural population. Advancement in Information Technology and telemedicine is instrumental in providing healthcare to remote areas. Recognizing its potential, many hospitals established telemedicine networks interconnecting the main hospital with peripheral centres using satellite communication. However, a major lacuna has been the failure in scaling-up the architecture of special rooms/equipment required for video conferencing as well as the need for senior consultants to physically move to the special room.

Mobilexion Technologies, an incubatee of Sree Chitra Tirunal Institute of Medical Sciences, took up the challenge of developing and marketing home health care, telemedicine and automation systems for hospitals. Their products and services are bundled under the brand name Ubimedique.

UMACS (Ubimedique Acute Care System) is a full-fledged ICU and ward automation system consisting of: (a) Telemedicine Cart (UTM) that acts as central node (b) Trolley with an attached tablet (UTT) kept in each ward (c) Video Conferencing System (VCS) in tertiary hospitals (d) Native mobile applications for support groups. UMACS needs only a Wi-Fi router with internet bandwidth that may be provided using a 3G data card, a small amount of storage in a computing cloud and a trolley tablet to automate the operations of a running ICU/ ward. The trolley tablet captures clinical information from case sheets, sections of which are captured to the cloud computer from where it is digitized and converted to data amenable to automated analysis. The consulting clinician accesses the cloud ubiquitously through a mobile application. The system can also communicate with medical devices in the ICU to collect vital parameters and reduce manual entry.

TDB's financial assistance was pivotal in manufacturing a prototype version of the product. The first system was set up in Early Cancer Detection Centre, Palakkad and is linked to Regional Cancer



Center, Trivandrum. The second unit was set up in Community Health Centre, Sualkuchi, Assam and is linked to Modan Mohan Chowdary Hospital, Guwahati. Mobilexion is now working towards commercialization of three versions of the product - high end, middle, and low end.

This system makes telemedicine operations ubiquitous for clinicians at both ends. Due to advances in mobile/cloud computing and prevalence of smart phones, this is possible at a fraction of the cost of earlier systems. This system caters to the needs of rural health and primary health centers in cases of emergency and cases requiring specialized consultation. The company is also planning to enter the underdeveloped African countries.

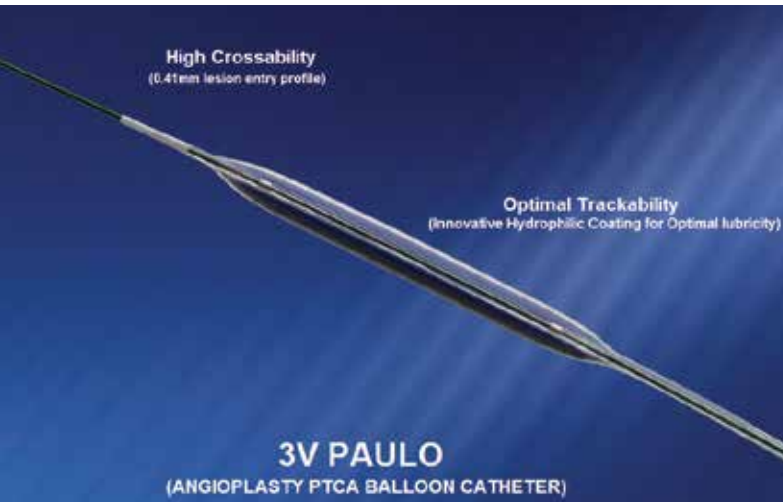


Dr. George Varkey
Chief Executive Officer

Integrated Manufacturing and USFDA Approval of Percutaneous Transluminal Coronary Angioplasty (PTCA) Balloon Catheter

S3V Vascular Technologies

BANGALORE



Angioplasty procedures in India and other Asia Pacific countries are growing at a rapid pace due to the emerging medical tourism industry, cardiovascular disease burden and aging population. India accounts for ~20% of the global population but imports about 90% of medical devices. There is an urgent need to develop critical medical devices indigenously and reduce India's dependence on imports. There is a significant increase in the usage of percutaneous transluminal coronary angioplasty (PTCA) balloon catheters due to the increase in number of stentings. The procedures now adopted use two types of balloon catheters viz. semi-compliant (SC) and non-compliant (NC) for

pre-dilatation and post-implantation, respectively. This has also increased the usage of PTCA balloon catheters in volume thereby increasing the financial burden for patients.

By innovating on minimally invasive cutting-edge technology and collaborating with physicians, S3V Vascular Technologies develops and manufactures Class III medical implants and Class II devices for use in cardiac, intracranial, nephrology, peripheral, urology and critical care interventions. They have designed and developed a PTCA balloon dilatation catheter system in their in-house R&D unit using a propriety process that will help reduce price with on par quality. The catheter is aimed at reducing the pre-dilatation process time and providing enhanced trackability and pushability across tortuous lesions. It has been developed under stringent manufacturing processes to build a product in compliance with the USFDA. S3V strongly believes that there are two major challenges to "Make in India" for class III medical devices. The first is manufacturing high quality medical devices at affordable prices so as to attract outsourcing of manufacturing to India. The only solution to achieve this is setting-up integrated manufacturing plants. The second challenge is from the regulatory brand perspective as Make in India products need to compete with globally manufactured USFDA approved products. TDB has provided financial assistance to achieve these solutions and commercialize a "Made in India" PTCA balloon catheter of highest quality in the global market. This will also help in reducing India's dependence on imported PTCA catheters thereby improving their accessibility and affordability.

S3V is promoted by technocrats who have more than 25 years of experience in the Medical Device Industry and have successfully developed 316LVM stents (1999), Cobalt Chromium Stents (2004), Paclitaxol DES (2005), Sirolimus DES (2006) and angiographic catheters. Thus, they have the right expertise to commercialize a "Made in india" PTCA balloon catheter of highest quality with a regulatory status to enter every market of the globe by bringing affordability.



Mr. B. Narayan
M.D.



Mrs. K. Narayan
Director



Dr. Vijay Gopal
Director

Deffibrinated Sheep Blood

Akshaya Agribiomed

HYDERABAD

In developed countries, sheep/horse blood is routinely used for preparing blood agar plates for microbiological cultures used for identification and antibiotic susceptibility testing of many pathogens. However, in developing countries like India, microbiologists have to depend on human blood agar plates mainly due to non-availability of sheep/horse blood in an organised way. This has several disadvantages as many pathogens either fail to grow entirely on human blood agar plates or exhibit morphological and haemolytic patterns that confound colony recognition. Furthermore, human blood can be hazardous to use due to the possibility of spreading Hepatitis & HIV. Hence, it is not practical to use human blood for making blood agar plates and there is a growing need to phase out use of human blood as a culture medium supplement. Whole blood/de-fibrinated blood from sheep has emerged as an acceptable alternative in diagnostic industry for commercial preparation of blood agar plates. However, it is neither practical nor acceptable to kill animals for collecting their blood in sterile form. Thus, there is a need to set up an organized sector for supplying authentic sheep/horse blood on commercial scale.

Akshaya Agribiomed was set-up with an objective to generate, develop and trade all kinds of biomedical and agricultural value-added products for human & veterinary use. The company has developed indigenous methods for collecting and processing sheep blood and de-fibrinated sheep blood with better stability and less hemolysis. They are able to provide a large-scale supply of authentic, safe, cost effective and quality sheep blood to top hospitals, diagnostic centers, food, feed and pharma industries in an organized manner, without sacrificing the sheep. The availability of good quality animals (Rams) in nearby livestock markets and the availability of large grazing lands, green/dry fodder and veterinary aid, medicines and marketing facility are some of their added advantages. They are the first legally registered company for supplying de-fibrinated sheep blood in India.



With a view to promote such indigenous ventures, TDB has provided financial support to Akshaya Agribiomed for scaling-up their facility. The new facility, once operational at full capacity, will aid in replacing the current un-ethical practices involved in this industry and bring India at par with the developed countries. It may also replace some of the imported products supplied/manufactured by foreign companies thereby saving a lot of foreign exchange and will help in generating employment in rural India.



Dr. G. Upender Reddy
Managing Director



Smt. G. Kavita Reddy
Director

Late stage development including Phase II & III of the attenuated dengue vaccine

Panacea Biotech

NEW DELHI



Dengue has emerged as one of the world's most painful mosquito-borne viral infection. It is a rapidly increasing public health problem in tropical and subtropical regions. Dengue disease is caused by dengue virus (DENV) serotypes (1-4) and is transmitted mainly by Aedes aegypti mosquitoes. The ideal Dengue vaccine should protect against disease caused by all 4 serotypes. Prevention is currently restricted to limited vector control measures and no effective dengue therapy /vaccine is available.

Thus, development of dengue vaccine is of national importance. It is estimated that about 2.4 to 3.5 billion doses of dengue vaccine will be required in the first five years of its introduction.



Dr. Rajesh Jain
Managing Director

Panacea Biotech's strong scientific and technical team is working on development and commercialization of a Dengue Tetravalent Vaccine (live attenuated, recombinant, lyophilized). The vaccine is based on a technology developed by National institutes of Health (NIH), USA and perfected indigenously through Panacea Biotech's in-house R&D. Scientists at NIH developed the attenuated strains of dengue viruses which have been tested in non-human primates for their safety and immunogenicity properties. The attenuated viruses were able to replicate and trigger generation of antibody response against each serotype, a primary requirement of a successful Dengue Vaccine. The vaccine strains did not have any adverse reactions and a challenge with respective wild type virus led to neutralization of the wild type viruses in immunized non-human primates. As part of technology transfer, NIH supplied fully characterized virus seeds of four Dengue Vaccine candidate viruses to Panacea Biotech. Working further on this, the company developed an in-house process to produce the vaccine virus Drug Substance (DS), analytical methods to qualify the vaccine and lyophilized formulation for longer stability. The clinical trials for the vaccine are expected to be completed by 2019.

Vaccine development requires huge investment as specialized facilities are required and trials need to be conducted all over the country. TDB is known to anchor & support projects of national importance and thus Panacea approached TDB for financial assistance for further development of the vaccine. Panacea's Dengue vaccine confers balanced immune response against all serotypes and all the vaccine viruses are irreversibly attenuated, consisting of complete backbone of all respective serotypes which is a very unique feature available only in Panacea's Vaccine. The vaccine is expected to be single dose and will provide protection from 2-60 yrs. old individuals.

Development and Commercialization of Sintered Carbide Alloys Technology

IMCO Alloys

MUMBAI



Crushing industries such as sugar factories, power plants, cement industries, mineral industries and steel making plants are in constant need of improved methods of crushing material to a ground finished material. Crushing industries conventionally use grinding rollers and hammers that continuously wear out and there is always a need for wear resistance materials having an improved wear life. These industries majorly use welding on their rollers and hammers for rebuilding purposes. However, this is not a very efficient solution as efficiency is dependent on the skill of the welder. Welding also happens to be quite expensive for rebuilding.

IMCO Alloys is a manufacturer of replaceable carbide tips for various types of applications related to wear & tear issues faced in industries like sugar, cement, aerospace, mining & construction, automobile, railways, fertilizers, petrochemicals, etc. They are the first authorized distributor of Ewac Alloys (L&T), Eutectic welding alloys and EDP chrome carbide wear plates.

IMCO has developed a patented process for manufacturing wear-resistant functionally gradient composite blocks that can be used as replaceable tips in crushing industries. The composite materials are exposed to vacuum brazing and controlled cooling to achieve composite block comprising steel back, copper alloy intermediate layer and sintered carbide alloy top layer. The composite product, after brazing, is used for hammer tips that have better wearability, corrosion resistance and extended life as compared to the ones made from conventional casting process. Sintered carbide is well known to sustain excellent properties when compared to metals, in terms of corrosion wear resistance and thermal stability. Due to their complex manufacturing process, the initial cost of the sintered carbide alloys is higher than conventional materials, however their significantly longer service life generates considerable cost saving. Though sintered carbide is widely used as an engineering material for excellent thermal,

chemical, mechanical and electrical properties, its applications are limited due to low fracture toughness. The composite block of IMCO ensures that sintered carbide takes care of the wear while load transmission is handled by the mild steel.

IMCO has a skilled team comprising metallurgical and material engineering experts, application engineers and production staff. They have successfully established the proof of concept with trials runs at the site of a vacuum furnace manufacturer based in Poland. With TDB's support, IMCO is setting up the manufacturing plant and importing the furnace for their operations. IMCO has also setup its first overseas marketing office with a vision to enter the global market.



Mr. Joydeep Duttgupta
Managing Director

Catheter Reprocessing System (C.R.S)

Incredible Devices

CHANDIGARH



Cardiovascular diseases (CVD's) are a leading cause of death accounting for nearly 31% mortalities globally. Of these, ~80% of the deaths happen due to high cost and inaccessibility to medical care. In India and other low resource settings, cardiovascular products such as catheters and guide wires, pacemakers and defibrillators are often reused with the sole consideration of reducing the cost. Apart from cost savings, reuse also leads to reduction in the toxic-biodegradable waste generated

by unsafe dumping of medical waste which is a leading cause of diseases & viral outbreaks affecting millions. However, reuse of disposable medical articles is saddled by concerns related to efficiency of cleaning and sterilization, effects of cleaning, disinfection and sterilization on the integrity of the articles and the safety of healthcare professionals who recycle these articles.



Mr. Vikram Goel
Founder and Director

With an aim to reduce the cost of treatment for CVD's, Incredible Devices has

developed a Catheter Reprocessing System (CRS). CRS is an innovative computer aided fully automated catheter cleaning machine. This product is aimed at replacing the conventional manual catheter reprocessing technique which neither ensures quality control nor standardization of cleaning process. Moreover, the conventional cleaning method is an expensive process. The main advantages of the system are:

- **Fully Automatic:** Automatically takes water, chemical cartridge, compressed air and prepares solution as per the requirements; cleans catheters using 24 different cycles
- **Inbuilt Self-test & Calibration:** Self-tests keep monitoring all CRS subunits for any defect & calibration ensures optimum performance of sensors; ensures 100% cleaning of catheters
- **Process Standardization:** Adopts a stringent cleaning process which cleans all microbes & antigen; follows same stringent process for every catheter and effectively cleans catheters with precision and accuracy.
- **Quality Assurance:** Possible only with such a system as it guarantees standardization of process; random QC sampling of each batch possible
- **Ease of Use:** Eliminates human error as system is computer controlled with almost no human interference
- **Increased Reuse:** Catheters can be reused 10 times; saves time and money by reducing reprocessing cost to less than Rs. 20/- per catheter

In addition, CRS reduces biomedical waste generation by 90% and clinical test results proves that they also make catheters safe to dispose only at cost of Re 1/- per catheter.

With TDB's investment, the company has started a small pilot production facility. The prototype has been successfully tested in two hospitals: Fortis, Chandigarh and Fortis, Ludhiana. CRS has benefitted more than 1 lakh patients till date and the company intends to benefit 36 lakh patients by 2020.

Commercialization & Development of IMRT/IGRT based Treatment Planning System (TPS) for 6MV Medical LINAC

Panacea Medical Technologies

BENGALURU



The requirement of Radiotherapy machines in India is about 30 to 40 machines annually and the demand is increasing every year due to early detection and increase in cancer incidence. A linear accelerator (LINAC) is used for external beam radiation treatments for cancer patients. Being technology and capital intensive, medical LINACs are manufactured by a few global players only. Panacea Medical is the only radiotherapy equipment manufacturer in Asia and one among the 5 key players in the world.

In collaboration with Bhabha Atomic Research Centre (BARC) and Society for Applied Microwave Electronic Engineering and Research (SAMEER), Panacea has already developed indigenous 6MV Medical LINAC (Siddharth II) with Stereotactic Body Radiation Therapy (SBRT) capability. The company is setting up a manufacturing line for commercialization of this machine under a previously funded TDB project.

Under a second TDB project, the company envisages supporting the 6MV LINAC with Intensity Modulated Radiation Therapy (IMRT) and Image Guided Radiation Therapy (IGRT) capabilities that will require new Treatment Planning System (TPS) algorithms and feature development.

The TPS System is being developed by a French company DOSIsoft SA and will be equipped to 6MV Medical LINAC for validation & testing in India. DOSIsoft has developed imaging, dose calculation and TPS System for the last 15 years for various treatment machines. The software will work as a assisting device for beam delivery with unique contouring solution to improve the productivity and streamline the process of planning and treatment. Once developed, the TPS System will be equipped to 6MV Medical LINAC for validation, system testing and trials in India.

The fully loaded system will analyse and plan radiation treatments in Three/Four dimensions. The system will input the machine parameters from the LINAC machine, input the patient data, calculate the

optimum dose and output required parameters to the LINAC machine for applying the dose. The treatment plans to provide estimation on dose distribution expected during the proposed treatment, and may be used to administer treatments after review and approval by qualified medical personnel. This will assist medical physicist and radiotherapists in beam manipulation and optimizing dosage calculations in treating cancer caused patients.

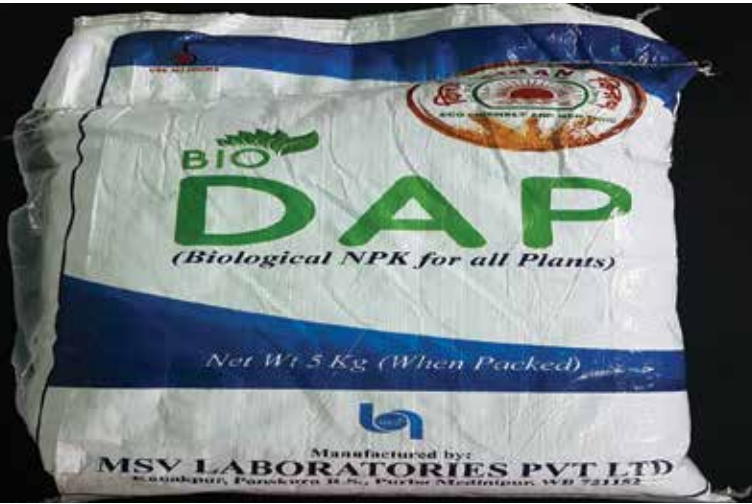
Currently, there are no such systems available in India and Asian countries and this system aims to be one of a few in the global market. The combined LINAC and TPS will serve the growing needs of the Indian market, at an effective price point, and is proposed to be deployed across Asian, Europe, Africa and Middle east countries.



Mr. G.V. Subrahmanyam
Co-founder, MD and CTO

Commercialization of cow dung compost as a means of strain delivery by applying electromagnetic radiation emitted from radionuclide's-60Co: Alternative of synthetic NPK

**MSV
Laboratories**
MEDINAPUR



India's agricultural policy reforms adopted in 1960s focussed on use of chemical NPKs to improve agriculture productivity and subsequently development and application of biological and organic inputs sourced from livestock were put on a backseat. Increased application of chemical fertilizer is adversely harming crop productivity and soil fertility. Further, NPK bio-fertilizers are currently being produced with carriers viz. charcoal/lignite/peat and sterilizing with high electricity and heat moisture method. These methods are expensive, time consuming and environmentally unfriendly.

MSV Laboratories is operating in the field of organic fertilizers, soil and plant pathology, bio-fertilizers



Promoters of MSV (in first row) **Mr. Asok Maiti, Ms. Alpana Maiti** and **Mr. Dibyendu Bikash Maiti** with the team

with specific focus on Biotechnology & Atomic technology to add value to agriculture practices. In their pursuit to make available large volume of biological NPK & micronutrients having the capacity for soil correction, MSV Laboratories started to identify low cost and effective solid carriers for biological NPK and their sterilization process for large scale production.

Cow Dung Compost (CDC) has emerged as an alternative carrier of NPK Bio-fertilizer and especially attractive in India due to the large number of livestock. Building upon this resource has many benefits namely (a) CDC has a texture comparable to soil; (b) strains of bio fertilizers embedded in CDC take lesser time to migrate to soil as compared to strains embedded in lignite/peat/ charcoal; (c) organic composites in CDC have higher heat resistance capacity and farmers can store bio-fertilizers in room temperatures Further, the company identified gamma sterilization of CDC by applying electromagnetic radiation emitted from radionuclides- 60Co as a low cost, less time consuming and pollution free method. With this vision, the company undertook research to achieve the following:

- Application of a large quantity of CDC as effective solid carrier of bio-fertilizer. CDC is also a source of organic materials effective for correction of soil condition e.g. OC, pH, EC, water holding capacity and aeration etc.
- Application of effective dose of gamma radiation for CDC sterilization to reduce cost of production in large volume with 'zero' carbon emission
- Addition of desired strains of bacteria viz. N/P/K/ PGPR with sterilized CDC for final production of their products viz. 'BIO-DAP' - Biological NP, 'CARBO' - Biological NPK & 'HUMAUR' - PGPR bio-fertilizers.

With TDB's support, MSV laboratories envisages commercialization of these products. Going forward, the company aspires to establish its projects in different parts of India where bovine are densely populated like Anand, Bhagalpur, Karnal, Benaras and Siliguri.

Scaling-up A Proprietary Room-Temperature Lead-Acid Battery Recycling Technology from a Pilot-Proof-of-Concept to A Pilot-Commercial Scale

**VerdeEn
Chemicals**
GHAZIABAD

The Indian Lead-Acid Batteries (LAB) market is currently worth about INR 32,000 Cr and is expected to grow at a 16% CAGR till 2020. About 3-4% of the battery production is exported out of India. These batteries consume about 1 million ton (1,000,000 ton) of Lead annually and 700,000 ton is being produced from battery recycling. This amounts to about INR 11,400 Cr worth of Lead being produced from battery recycling. Majority of LAB recycling occurs in the un-organized market where market players have no required permits and pay zero heed to health and safety norms.

VerdeEn was founded in April 2013 with an objective to develop a non-polluting technology to recycle LABs - one of the most polluting industries worldwide. VerdeEn solved the problem by developing a room temperature electrochemical process which is able to extract all the Lead out of used LABs and does not generate toxic emissions or solid waste. VerdeEn's proprietary recycling technology is fundamentally different than Smelting. The process utilizes a solid-state electro reduction of lead compounds obtained from the scrap batteries (battery paste containing lead sulfate (PbSO4) and lead oxides (PbO and PbO2)) as compared to the typical electrode position processes which involve dissolution of the metal compounds in the electrolyte. The metallics (recovered battery plate's grid metallic at the battery breaking and separation stage) are treated separately and melted to recover the grid alloy(s). The lead compounds along with proprietary solid fillers on contact with cathode in an alkaline medium get converted to metallic lead. Since the process does not involve the dissolution of lead, there is no formation of lead dioxide (PbO2) at the anode which is a major drawback of the various conventional processes. The low solubility of lead compounds is another major hindrance in scalability and industrial viability of the typical electrode position processes. Presently, at the anode, OH- ions are consumed to produce oxygen, and at the cathode equivalent number of OH- ions are formed. The major achievement of this technology is standardization of an electro-chemical process



which is able to handle the significant variability in chemical composition of used LABs.

The problem being solved by VerdeEn is extremely complex and multi-disciplinary in terms of chemistry, process engineering, machine design and controls but provides the satisfaction of solving a real-life problem impacting people's health thus providing a positive social impact.



Mr. Vipin Tyagi
CEO

Mr. Sanjeev Tyagi
CTO

Establishing Commercial Plant using Congealing Technology to produce Lutein and other Carotenoids

OmniActive Health Technologies

MUMBAI



largest producers of Lutein in the world.

OmniActive has built-up a novel platform called Omnibead, which are stable beadlets of lipophilic nutrients comprising carotenoids such as lutein. This platform is a robust, scalable, environmentally-friendly, economical, stable and bio-available formulation platform for improving the shelf life of products that get affected by light, heat and oxygen. These beadlets are well accepted across all geographies and are incorporated into a large variety of applications and finished products. However, certain limitations were identified in this technology and the company has further improved and refined the platform by using congealing encapsulation technology. Lutein is embedded in a polymer matrix to produce dispersible, stable and uniform particles of lutein suitable for tablet compression, capsule filling, water based beverages, stick packs and for preparing sprinkles or suspensions for oral administration. This is especially useful in size controlled manufacturing of various drug dosage forms.

The process is more eco-friendly as all the solvents used in the process are recovered and has higher throughput due to lower cycle times. Further, this approach yields 5% and 10% concentration of lutein which is cost effective as compared with the existing products available in market. This technology will help to improve stability in different dosage forms and provide a low cost product by virtue of modifications in equipment design and excipient composition compared to existing major selling products in the market. This technology can be adapted to other compounds of natural origin. Low cost, stable and bio-available formulations for high value products using this advanced technology will establish India in the Nutrition and dietary supplements space.

Natural carotenoids such as beta-carotene, lutein, lycopene, astaxanthin, zeaxanthin, canthaxanthin, etc. have gained popularity in the dietary supplements and nutraceuticals segments and their market is projected to reach USD 1.4 billion by 2019, at a CAGR of around 3.5 from 2014. Though few Indian companies are involved in the nutraceutical market, this scenario is set to change due to consumers' increasing preference for natural goods and health awareness.

OmniActive offers a range of quality active health ingredients for dietary supplementation, nutritional fortification and functional food applications. They have a strong and well equipped R&D set-up including state-of-the-art manufacturing facilities, in various parts of India. The sales and marketing presence is across the US, Europe and Asia. They have a stronghold in Lutein dietary supplements segment and are amongst the



Mr. Sanjay Mariwala
Managing Director

Cold Mix Technology in Road Construction & Maintenance

BitChem Asphalt Technologies

GUWAHATI



In India, the traditional hot mix technology involving use of asphalt with bitumen aggregate is widely used for pavement construction. This technology is both energy and emissions intensive as it involves on-site heating to make the bitumen workable. Also, there are enormous challenges in maintaining the temperature requirement during rainy season, in high altitude/snow-bound areas, etc. Cold Mix, on the other hand, eliminates heating by using custom designed cationic bitumen emulsions and aggregates. Normally, aggregates are wetted with water and then coating of bitumen emulsion is done. Low viscosity of cationic bitumen emulsion ensures better penetration and spreading capacity when compared with the hot mix. It is electrically charged with built-in anti-stripping properties for better bondage with hydrophilic aggregates. It can be used with wet aggregates thus enabling work during the monsoons. It does not need any pre-heating thereby saving costs, reducing carbon emissions and eradicating occupational hazards to workers. The usage of cold mix bitumen emulsion is thus a sustainable technology and is ideal for India.

BitChem is a new-generation road science & technology enterprise. It promotes Green Roads® philosophy and encourages the usage of cold paving technology. It has earned the distinct reputation of becoming the "Exclusive Licensee for Cold Mix Technology from CSIR-CRRI", the country's premier road research institute.

The tailor-made Cold Mix Technology is the result of the company's dedicated R&D wing in association with the CSIR-CRRI. The company started developing tailor made cold mix binders, through the process of laboratory-based mix design, to overcome the field challenges found at site application. Certain features developed by BitChem include: i) avoidance of pre-wetting of aggregates using non-standard mixing equipment; ii) mixing with the aggregates found in different regions of India; iii) meeting customized lead time of the cold mix work sites; iv) customization with climatic conditions apart from different terrain;

and v) increasing durability of roads due to high dose of anti-stripping agents compared to standard emulsion. The cold mix binders are manufactured using special additives; and customized using specific aggregates available from any source in India without pre-wetting. Being rich in anti-stripping properties, they provide higher life to roads than hot-mix technology.

With TDB's support, the company envisages establishing a manufacturing unit for commercial production of Cold Mix Bitumen Emulsion at Plasto Steel Park, Phase II, Barjora, Bankura, West Bengal. The proposed plant shall have an installed capacity of 48000 MTPA.



Mr. Rajeev Agarwal
Chief Executive Officer

Manufacturing of 50 IRS units (critical component of Cochlear Implant system) for supplying to DEBEL, DRDO for clinical trials

Shree Coratomic
PITHAMPUR



Shree Coratomic Limited (SCL) was formed as a subsidiary of Shree Pacetronix Limited (SPL) in the year 1995 for the manufacturing of indigenous Cochlear Implants. SPL is the only manufacturer of cardiac pacemakers, along with their accessories in India and thus have the capability to manufacture a high-precision biomedical implantable device like cochlear implant. Through its parent company, SCL has been associated with DRDO in the development of Cochlear Implant since inception of the project. DRDO has recognized SCL as the only Indian company that possesses the capability to manufacture and supply the indigenous device.

The technology is completely indigenous and has been developed by DRDO with their technical arm NSTL, Visakhapatnam along with their Biomedical Research Lab DEBEL, Bangalore. Bangalore. SCL has garnered support from Defence Research and Development Establishment (Gwalior), Indian Institute of Toxicology, Defence Institute of Physiology and Allied Sciences (Delhi), ANURAG-Defence Research and Development Organization. The device has been successfully tested on animals and cadavers. Human testing, in collaboration with DRDO-NSTL and DEBEL is ready to be initiated.

With TDB's support, SCL will manufacture 50 Implantable receiver stimulator (IRS) units and provide them to DEBEL for conducting human clinical trials of the indigenous cochlear implant. SCL intends to commence commercial scale production post success of human clinical trials for cochlear implants and be the first company in India to manufacture Cochlear Implants. In addition to India, the company plans to enter overseas markets, beginning from Indian sub-continent and Africa.

A Cochlear Implant is an electronic medical device that replaces the function of the damaged inner ear (cochlea). Unlike hearing aids, which make sounds louder, cochlear implants bypass the damaged hair cells of the cochlea to provide sound signals to the brain. Cochlear implant is the only way of rehabilitating persons with profound sensory neural hearing loss due to damaged inner hair cells. This device is capable of bringing back a profound deaf person to normal hearing. If this

implant is done at an early stage (1 year to two years of age), it would be possible to integrate a totally deaf child into the mainstream. Majority of people who belong to the lower economic strata are currently deprived of this facility due to the unaffordable cost of the currently available products and the higher cost is mainly due to non-availability of indigenous implants.



Mr. Atul Kumar Sethi
Managing Director

Technology Adaption and Manufacturing of BS VI Quality Standard Piston

Abilities India
Pistons & Rings
GHAZIABAD



In April 2017, India banned use of BS III certified vehicles in favor of the higher BS IV emission standards. By April 2020, India aims to leapfrog to the BS VI standards. To achieve higher performance standards, engine design has continued to evolve and engineering innovations from specialized surface engineering technologies and coating technology has helped significantly. To improve engine efficiency by reducing the losses; piston assembly accounts for approximately 45-50% of the total losses.

Abilities India Piston and Rings was founded over 40 years ago and today is a leader in the production of pistons and rings for automobiles (two and three wheelers), chainsaws, brush cutters, agriculture sprayers and compressors. It is a major supplier to OEMs for many reputed vehicles and engine manufacturers in India and abroad, including Japan, USA, China and Europe. Currently 60% of the total turnover of the company is from exports.

The company has developed a new technology for Electroless plating of Nickel-Phosphorous-Boron (Ni-P-B) coating on intricate shaped light weight pistons to enable conformance to BS IV standards at a globally competitive price. The coating has unique features and is also suitable for Indian conditions. This innovative coating will improve the various physical, mechanical, tribological and thermal properties of pistons that will lead to improvement in engine performance and reduction in emissions. The process has no generation of fumes/smokes, has lower energy consumption and requires lesser amount of water. It has good tribological properties due to dendritic/amorphous structure that retains oil by capillary action (self-lubricating property/anti galling). This technology will support OEMs to meet new emission norms since these pistons will be 10-15% lesser in weight. Also, the thermal barrier Nickel based coating will provide enhanced thermal and tribological properties like low coefficient of friction, high wear resistance and high corrosion resistance. The new technology pistons are presently being successfully used globally in auto and high

segment applications such as high-speed garden and lawn mower engines and high-end bikes.

The process developed by the company is a cost-effective technology compared to other global competitors and is a green and energy saving technology. This can be seen as a better solution considering the increased use of non-fossil alternate fuels. Once the products are commercialized, the customers would be benefitted with hi-tech proven and tested product at a lower price. As per the company's estimates, 20% of 2-wheeler industry will use Ni-P-B coating in the next 2-3 years.



Mr. Sunil Arora
Managing Director

Development and commercialization of Biogas and Bio-Enriched Organic Manure Plant utilizing only paddy straw

Sampurn Agri Ventures
CHANDIGARH



The company indigenously developed the technology for fermenting paddy straw on a commercial scale. This technology was derived from the basic anaerobic digestion process along with its pre-treatment. It has been further upgraded & fine-tuned in collaboration with the Indian Institute of Technology, Delhi. SAVPL's plant at Fazilka is the first of its kind in the world to be able to process paddy straw on a commercial scale for gainful management of paddy straw. The design of the pre-treatment & process is unique as it breaks the lignin layer of paddy straw to expose cellulose & hemicellulose for extracting value in the form of biogas. Additionally, the remnant compost is processed further to produce bio-enriched manure which has a good potential for sustainable agriculture. The bio-enriched manure can be customized as per the soil condition such as acidic, alkaline or neutral. This technology also helps in saving water as this compost has water retention property.

The manure that has been developed by the company has been tested and field trials conducted by PAU, based upon which PAU has recommended this manure for agriculture use and have included in the Package of Practises published by PAU. SAVPL has also tied up with PAU for value addition to produce bio-enriched paddy straw compost.

Use of Paddy straw to produce compost will not only improve crop productivity, it will also prevent paddy straw burning by converting it into bio-fertilizer thereby preventing environment pollution. It will also save upto 40% water. By improving soil health and reducing cost of cultivation, this project will help in creating much needed employment in rural areas of Punjab.

In the year 2008, Punjab Agriculture University (PAU) published a report on soil health condition stating that Nitrogen, Phosphorous and Potassium (NPK) efficiency in the soil has reduced to 20%. In the year 1966-67, every kg of NPK produced 80 Kg grains. This had declined to 16 kg grains by the year 2003. Also, as per the latest report published in the year 2017, one third of India's agriculture land is under stress. These reports also state that the solution to this problem is to introduce use of manure

in the agriculture practices. Sampurn Agri Ventures Pvt Ltd (SAVPL) realized this and ventured into development of a novel technology to process paddy straw for producing biogas and manure.



Mr. Sanjeev Nagpal
Founder and Director

Development and commercialization of straw utilization technology: In-situ Accelerated and Sustainable Rice Straw Decomposition (ASRSD)

Kan Biosys
PUNE

Rice is the most important crop and staple food of more than 70% population of India and India is the second largest producer of rice after China. Roughly around 2 tons of rice stubble is produced every acre which, due a narrow window of just 10 to 15 days before sowing wheat, is burnt on the fields by the farmers in the regions of Punjab & Haryana, causing severe respiratory diseases across this belt of North India and deterioration of soil conditions.

M/s Kan Biosys Pvt. Ltd., Pune is an Agri-biotech company engaged in the production of microbial inputs for agriculture. The company has been manufacturing innovative certified Agri-inputs like bio-fertilizers, bio-pesticides and services for soil health management for the past 10 years.

Kan Biosys developed a new technology that enables farmers to incorporate rice stubble on field and sow the wheat within 15 days. This novel but simple technology encompasses 5 easy steps: (1) Cutting rice straw by rotavator on field; (2) Mixing Speed Kompost® which is produced by Kan Biosys at their own in-house DSIR R&D laboratory with 50 kg of urea and broadcasting on field; (3) Irrigating field on 1st and 7th days to maintain moisture in stubble; (4) Turning field with tractor to incorporate partially decomposed rice stubble after a week; and (5) Sowing wheat as usual within 15 days.

Rice stubble is not easily decomposed due to high C:N (ratio) and presence of silica, oxalic acid and lignin. This project focuses on in-situ degradation approach of rice straw utilizing microbial cultures on farmer's field in 15-20 days. The proposed product "Speed Kompost" is an organic manure based microbial consortia containing ligno-cellulose degrading fungi and bacteria and having shelf life of one year. The fungi are produced by solid state fermentation while bacterial cultures are grown under submerged fermentation conditions and the dormant forms of these microbes are mixed with organic manure as carrier. The company has also developed microbe food which boosts the initial growth of microbes to



ensures early colonization on rice straw.

One of the major benefits of this technology is that the microbial culture is directly added to soil where the microbes aid in cellulose, starch and silica conversion. This technology involves minimal use of machinery and water. This is an economically viable option for farmers for rice straw management, especially in the rice growing states of Punjab and Haryana, and at the same time maintaining soil health for higher yield and pollution abatement measures.



Ms. Sandeepa Kanitkar
Chairperson & M.D.

Commercializing Indigenous Technologies: Journey from Benchside to Business



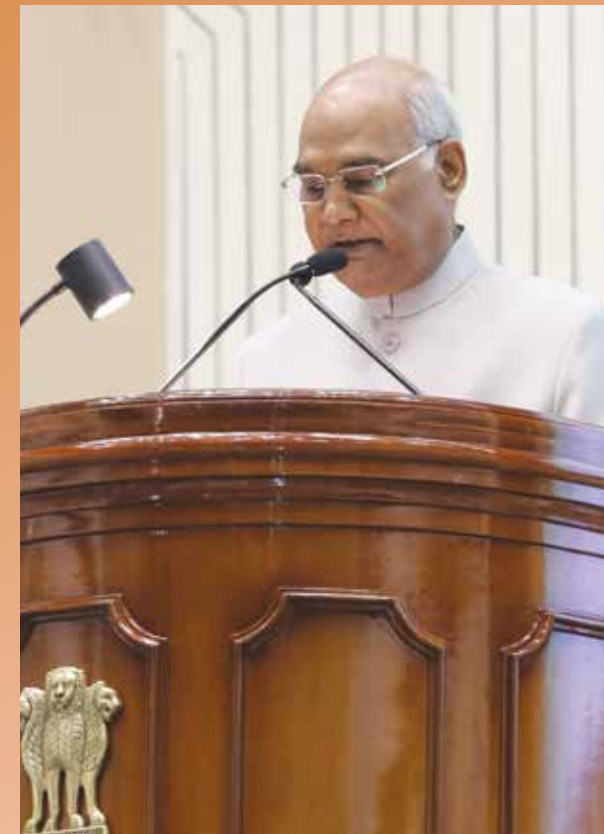
Innovation Commercialization

With a variety of major technological breakthroughs associated with the date 11th May (nuclear tests at Pokharan, maiden flight of indigenous passenger aircraft "Hansa-3" and test firing of Trishul missile system), the day is celebrated as **Technology Day** to extol the quest for scientific excellence and technological creativity.

Technology Day is now an annual occasion to celebrate innovations, honour innovators and recognise successful commercialization of innovations to benefit the society.

20th Technology Day was celebrated on 11th May 2018 at Vigyan Bhawan, New Delhi with the theme, "**Commercializing Indigenous Technologies : Journey from Benchside to Business**". Hon'ble President of India, Shri Ram Nath Kovind, graced the occasion as the Chief Guest and Dr. Harsh Vardhan, Hon'ble Union Minister of Science & Technology and Earth Sciences presided over the function. Prof. Ashutosh Sharma, Secretary, DST; Dr. Renu Swarup, Secretary, DBT; Lt. Gen. Girish Kumar, DG Survey General of India and Dr. Bindu Dey, Secretary, TDB shared the dais.

The function was also an occasion to present the Technology Awards constituted by various S&T agencies of Govt. of India to encourage and recognise efforts towards development and commercialisation of technology by Indian scientists and agencies. Technology Day Awards were presented to selected individuals and institutions for their outstanding contributions to India's S&T landscape in terms of novel products and processes that have the potential to make a notable contribution to national development and societal welfare.



Shri Ram Nath Kovind
Hon'ble President of India,
speaking on the occasion of Technology Day 2018

Hon'ble President of India, Shri Ram Nath Kovind, in his address, mentioned the genesis of celebrating Technology Day and commended the efforts of Dr. A.P.J. Abdul Kalam and Shri Atal Bihari Vajpayee by saying, "It was on this day two decades ago that the Pokhran nuclear tests took place and demonstrated India's capacity as a nuclear weapons state as well as a mature and responsible technology power, capable of harnessing sensitive knowledge". He congratulated all the Award winners, applauded their achievements and the innovative technologies awarded by stating "These new technologies have three attributes in common. First, they offer solutions that are necessary in the Indian context, and contribute to the social and economic needs of our people. Second, they achieve all this at competitive price points. Third, and this to my mind is the most critical, they don't compromise on quality". He acknowledged the 21st century challenges in the areas of robotics, artificial intelligence, Big Data Analytics, IoT, Quantum computing and highlighted government's schemes like Make in India, Start-up India, Digital India, Ayushman Bharat among others, towards its preparedness. Last but not the least, he emphasized the need of gender equality in science & technology and said that, "Gender equity must be integrated with technology production and technology sharing. We need more of our daughters and more of our country's young women to enter the technology and innovation space. Those who are already working here are doing a remarkable job, but their numbers need to improve. And improve urgently".



Awardees with Hon'ble President of India



Dr. Harsh Vardhan
Hon'ble Minister for Science & Technology and Earth Sciences, Govt. of India, speaking on the occasion of Technology Day 2018

Hon'ble Minister of S&T and ES, Dr. Harsh Vardhan, congratulated the award winners and applauded their achievements. By emphasizing the role of Ministry of Science & Technology, he said, "The Ministry of Science & Technology covers the entire value chain of science from foundational research to technology development and demonstration, intellectual property generation, innovations and start-ups to empowering our industry. We are fully aligned to the national missions and priorities in healthcare, agriculture, water, environment, clean energy, manufacturing, waste processing, digital India etc. Our support allows flourishing and strengthening of discoveries in sciences and development of several hundred disruptive technologies every year". He highlighted the vision of Prime Minister, Shri Narendra Modi in Science & Technology by saying that, "Scientific community must redefine R&D from Research and Development to Research leading to Development". By acknowledging India's potential, he said, "Today, India has institutional strength, strategic vision, technological tools and human resource in most critical sectors of economy. We can now build on these strengths to let innovation become the engine and technology the driver for our national growth".



Prof. Ashutosh Sharma
Secretary, Department of Science & Technology, speaking on the occasion of Technology Day 2018



Dr. Renu Swarup
Secretary, Department of Biotechnology, speaking on the occasion of Technology Day 2018



Commercial Product Launch, 2018 Charger for the Lithium-Ion Battery

by M/s Ampere Vehicles Pvt. Ltd., Coimbatore: Financed by TDB

Prof. Ashutosh Sharma, Secretary, Department of Science & Technology, welcomed the Chief Guest and other dignitaries. In his address, he highlighted this year's theme about "Commercializing indigenous technologies". He applauded the efforts and achievements of young entrepreneurs by stating, "There is a surge of optimism in our young entrepreneurs. My hats off to their spirit and energy. Here are some of the brightest minds converting their knowledge to country's development, wealth and societal good". By emphasizing the role of Science & Technology in every sector, he said, "Several National missions such as 'Start-up-India' and 'Make in India' offer unprecedented opportunities for translating our Science & Technology into entrepreneurship. There are extraordinary technology challenges and opportunities in rural, micro-industrial manufacturing, agriculture, water, healthcare, energy, environment, education, digital empowerment, affordable housing, Infrastructure for all and artificial intelligence. A seamless innovation ecosystem from basic R&D to technology translation to start-ups to entrepreneurship is taking very deep roots. The awards today present some of the compelling stories of indigenous technology and technology products for empowering the society, the citizens and the country".

Dr. Renu Swarup, Secretary, Department of Biotechnology thanked all dignitaries for their participation by saying that "How fortunate we are as a nation to have such a high level of engagement and commitment to promoting science technology and innovation in the country. The 'Start-up India', 'Stand-up India', 'Skill in India', 'Make in India' missions launched by Hon'ble Prime Minister have brought about revolutionary change, the impact of which is clearly visible today. India today is recognized as a vibrant Start-up Nation and a preferred partner for active International Cooperation." She applauded this journey of nurturing and creating the innovation ecosystem by saying that "The Ministry of Science & Technology DST, DBT, DSIR and CSIR through its organisations TDB, BIRAC and NRDC have created the enablers and drivers of the start-ups innovation ecosystems. Today we have the large pool of start-up Entrepreneurs, Incubators, Students and importantly an enhanced industry academia collaboration." She congratulated the award winners "This journey has just started, we have the strength, ability and competence to be global leaders. We hope that the enthusiasm and passion of our innovators being the fuel, the well-developed growing ecosystem being the engine and the enabling policies of government being the driver, we are well poised today to be the global technology innovation hub".

TECHNOLOGY DAY AWARDS

National Award

for the successful commercialization of indigenous technology



BHARAT BIOTECH INTERNATIONAL LTD.
Hyderabad

for ROTOVAC®, Rotavirus Vaccine (Live Attenuated, Oral) developed and manufactured indigenously. The vaccine is developed for children and is licensed in India and WHO prequalified.



AGAPPE DIAGNOSTICS LTD.
Kerala

for Mispa-i3, an automated cartridge based specific protein analyser having a combination of photometry and nephelometry techniques and "Unique Channel Shifting" based on requirement of the sample and investigations.

Technology Start-up Award

for the development of technology having commercial potential



ASTROME PVT. LTD.
SID, IISc, Bangalore

for GigaMesh, a generation ahead in millimetre wave product and is the first Point-to-Multipoint (P2MP) millimetre wave wireless communication solution in the world, offering capacity that can scale from 2+Gbps to 80+ Gbps as per network requirements.



CYCA ONCOSOLUTIONS PVT. LTD.
KIIT, TBI, Bhubaneswar

for CyPlatin and CyGlo drug delivery devices. CyPlatin is a novel formulation having the molecular drilling machine and anticancer drug Cisplatin. CyGlo is a unique formulation of molecular drilling machine and fluorescent dyes.

XCELLENCE IN BIO INNOVATION AND TECHNOLOGIES (XBITS) PVT. LTD.

Hyderabad



for RightBiotic, a point-of-care device for testing antibiotic sensitivity of pathogens found in human urine causing urinary tract infections. The device offers rapid detection, high sensitivity, specificity, affordability and accessibility.

TECHNOLOGY DAY AWARDS

MSME Award

for the successful commercialization of a technology based product



SYNKROMAX BIOTECH PVT. LTD.
Chennai

for Synkroscaff, a tissue engineered bovine (buffalo) pericardium, developed by IIT, Madras, as biological implant device for salvaging critical cardiovascular patients and other surgical agonising defects repair.



ANTS CERAMICS PVT. LTD.
Maharashtra

for Zirconia ceramic products, which unlike traditional ceramics that tend to be hard and brittle, Zirconia has high strength, wear resistance and flexibility far beyond those of most other technical ceramics.



M/S HIND VACUUM COMPANY PVT. LTD.
Bangalore

for 3-layer metallization on alumina substrate better known as Thin Film Metallized Alumina circuits. The product finds extensive applications in RF/Microwave integrated circuits, Hybrid microcircuits, SAW devices, RADAR and thin film resistors.



BLACKBIO BIOTECH INDIA LTD.
Bhopal

for TRUPCR, which is a real-time based qPCR test kit for quantitative detection of BCR-ABL1 fusion transcripts in bone marrow or peripheral blood samples.



ENVISION SCIENTIFIC PVT. LTD.
Surat

for ALBUMINUS DES+, a drug eluting stent for diabetic patients. This product delivers drug from stent and balloon both to overcome existing problem of focal, edge and diffused restenosis as with other approved devices.



TDB Facilitating Techno-social Ecosystem



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