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**Government of India**
**Ministry of Chemicals & Fertilizers**
**Department of Chemicals & Petrochemicals**


# 3rd

## National Awards for

# TECHNOLOGY INNOVATION

## in

## Petrochemicals & Downstream Plastics Processing Industry 2012-13

**Tuesday, May 7, 2013** **Manekshaw Centre, New Delhi.**

**Shri Srikant Kumar Jena**
Hon'ble Minister of State (Independent Charge) for Chemicals and Fertilizers;
Statistics & Programme Implementation,
Government of India, New Delhi - 110 001.

It gives me immense pleasure to complement all the award winners at the 3rd National Awards for Technology Innovation (2012-2013) and the entrepreneurs for their immense contribution to the petrochemicals & downstream industry through innovation. The Ministry of Chemicals and Fertilizers, Government of India introduced the scheme of National Awards for Technology Innovation in Petrochemicals & Downstream Plastics Processing Industries in 2010-11 and I am happy that the awards are serving as tools to fulfill the quest for innovation, excellence and improvement of services in petrochemical and downstream plastic industries.

Petrochemicals & downstream plastics processing industries in India have been playing a predominant role in shaping our lives. I believe that innovation in emerging field of polymers shall foster new economic opportunities in a knowledge-based economy. I take this opportunity to admire the path breaking role being played by the Central Institute of Plastics Engineering & Technology (CIPET), an autonomous institute under the Department of Chemicals & Petrochemicals, which is devoted to academic, technological support and research activities for the growth of plastic and allied industries in the country

I look forward to continued and enhanced participation by the industry in the forthcoming editions of the National Awards for technology innovation in the field of Petrochemicals and Downstream Plastic Processing Industries.

***(Srikant Kumar Jena)***

**Shri Indrajit Pal**, I.A.S.
Secretary to the Govt. of india
Department of Chemicals & Petrochemicals
Ministry of Chemicals & Fertilizers
Shastri Bhavan
New Delhi - 110 001.

Congratulations to the winners of the 3rd National Award for Technology Innovation in Petrochemicals and Plastics Processing Downstream Industries 2012-13. The National Awards Scheme motivates inventors and researchers to carry out research and development in the areas of Petrochemicals, in turn improving performance and quality of products and technology.

Polymers and goods made of polymers are indispensable items in our lives and their importance cannot be undermined. With the advent of new and innovative materials and technologies, the industry has assumed great importance and induced radical changes in all aspects of human life.

I thank the members of the Expert Committee who have spared time to carry out the adjudication in fairness and impartiality. I would also like to commend CIPET for conducting the National Awards for Technology Innovation in Petrochemicals & Plastics Processing Downstream Industries for the third year in a row.

I take this opportunity to praise the participating organizations and individuals, and invite them to continue their efforts with renewed zeal.

***(Indrajit Pal)***

**Shri V. K. Subburaj**, I.A.S.
Additional Secretary & Financial Advisor
Department of Fertilizers
Ministry of Chemicals & Fertilizers
Government of India
New Delhi - 110 001.

The Department of Chemicals & Petrochemicals has taken initiative to promote a culture of technology innovation and excellence across petrochemicals & downstream plastics processing industries. I am pleased to note that CIPET is organizing this programme on behalf of DCPC to reward the innovators in a suitable way. These awards are intended to enhance our innovation capacities to a level of international recognition.

I am very happy to note that the function is being organised to felicitate the awardees of the 3rd National Awards 2012-13 on 7th May, 2013.

A whole lot of things have happened in plastics since the last half of the century. Advances into new areas of applications have been more and more frequent and consequential. Engineering and processing technology have advanced tremendously. A steady attention to new technology and very professionals allow us to reach a great qualitative level and to obtain great benefits in the sector.

I wish all the innovators great success in their endeavours to serve the society and make India more inclusive, imaginative and integrated.

29/4/2013

***(V.K. Subburaj)***

**Smt Neelkamal Darbari**, I.A.S.
Joint Secretary
Department of Chemicals & Petrochemicals
Ministry of Chemicals & Fertilizers
Government of India
New Delhi - 110 001.

During the last few years, several initiatives have been taken by the Department of Chemicals and Petrochemicals to promote the industry and facilitate its growth. One of the ways it has sought to do so is to incentivise innovation and promote R&D in the field of polymers. The initiative of the Government to institute The National Awards for Technology Innovation for rewarding outstanding professionals, institutions and individuals in the field of polymers and plastics processing industries, is a step in that direction.

In a short span of time, The National Awards have become very popular and achieved peer recognition among professionals, entrepreneurs and researchers from various industries and R & D Institutions. It has seen an encouraging response from researchers and entrepreneurs alike and I am certain that the 3rd National Awards for Technology Innovation will also work towards recognising the most outstanding usage of technology in multi-disciplinary applications of Polymers.

I commend the Central Institute of Plastics Engineering & Technology (CIPET) for taking up the challenge of executing the 2012-13 edition of the National Awards for Technology Innovation with recognisable success. I also wish to take this opportunity to felicitate the members of the Expert Committee who spared their time to scrutinise and evaluate the nominations received.

My heartiest congratulations to all the awardees. I wish them all the best in their pursuit of excellence and hope that their innovation, enthusiasm and dedication will inspire others to work for constant innovation with a view to remaining competitive.

***(Neelkamal Darbari)***

**Dr. A.J.V. Prasad**, I.A.S.
Joint Secretary
Department of Chemicals & Petrochemicals
Ministry of Chemicals & Fertilizers
Government of India
New Delhi - 110 001.

I am happy to note that the National Awards Scheme devised by the Department of Chemicals & Petrochemicals has successfully completed two consecutive editions and the presentation of National Awards to the Awardees in the third edition has been scheduled on May 07, 2013.

The R&D sectors contributing towards the development of newer technologies in the field of plastics are to be encouraged and I hope that the National Awards Scheme would inspire and motivate the young innovators, scientists and professionals to endeavour to excel continuously in this verdant and vibrant field.

I take this opportunity to compliment the awardees for their praiseworthy innovations and appreciate the team from the Department, CIPET and Expert Panel who played vital role in successfully organising the event.

I wish all the awardees best wishes.

***(Dr. A.J.V. Prasad)***


Say
Yes
to
Plastics

# Awardees

**Dr. Keki Gharda**
Chairman-cum-Managing Director

**M/s. Gharda Chemicals Limited**
B-27, 29, MIDC, Dombivili (East)
Thane - 421203 (Maharashtra).

Gharda Chemicals Limited is a USD 200 millions turnover company with 60% earning from Exports. It has many firsts in the field of polymers, pigments, dyestuffs, pesticides and veterinary drugs, Manufacturing units at Dombivili and Lote Parshuram (Maharashtra State), Ankleshwar and Panoli (Gujarat State). Strategic alliances and branch offices worldwide - Europe, USA, Latin America, Asia Pacific, Africa and Australia.

GHARDA in the past had manufactured and sold PEEK (polyether ether ketone), PES (Polyether sulfone), PSU (Polysulfone) and PPSU (Polyphenylene Sulfones). GHARDA has now commercialized the high performance engineering thermoplastic, Polyether Ketone (PEK) under the trade name G-PAEK, Polyether Ketone Ketone (PEKK) under the trade name GAPEKK. Also, has developed & commercialized thermosetting AB-PBI polymer which has very high operating temperature upto 400 deg C.

All these with in-house developed technology and GHARDA also have patented the process for manufacturing of these polymers. GHARDA plans to go down stream to manufacture AB-PBI fibers for heat resistant fabrics, a first in India.

GHARDA also has set up an advanced research facility at Dombivili called Gharda Institute of Science and Technology (GIST) which is a multi-disciplinary research center to carry out research on polymers, pigments and aromatics.

## "An economical process to manufacture ABPBI (2,5 Polybenzimidazole) parts"

*M/s. Gharda Chemicals Limited*

Gharda Chemicals Limited (GCL) has developed the technology for the manufacture of monomer and polymer of 2,5 Polybenzimidazole (ABPBI) since 2010/11 using indigenous in-house technology. AB-PBI is available as Neat Resin in powder form and also as blends with PEK (Polyether Ketone), with further compounded with Glass Fiber, Carbon Fiber, PTFE and Mineral Fillers and is sold worldwide under the trade name of **GAZOLETM.**

GCL has not only developed this technology independently to manufacture ABPBI polymer but also has developed processing technology for the processing of ABPBI powder by compression moulding and for making proprietary blends for which GCL has applied for the patents in India.

**GAZOLE 5000 (AB-PBI) Polymer - Advantages:**

1. Highest compressive strength of any unfilled resin
2. Excellent tensile and flexural strength
3. Lowest coefficient of friction and highest wear resistance properties
4. Excellent hardness
5. High Tg (460$^{0}$C) and heat deflection temperature (467$^{0}$C)
6. Very good chemical, gamma ray & plasma resistance
7. It offers the highest heat resistance and mechanical property retention up to 400$^{0}$C
8. Low out-gassing in vacuum (dry material).

**M/s. Gharda Chemicals Limited is the WINNER of National Awards 2012-13 under the Industry Category of "INNOVATION IN POLYMERIC MATERIALS"**

Shri Jandas P.J.

Dr. Smita Mohanty

Prof. (Dr.) S.K. Nayak

**Laboratory for Advanced Research in Polymeric Materials (LARPM) - CIPET**
B/25, CNI Complex, Patia
Bhubaneswar - 751024.

**Laboratory for Advanced Research in Polymeric Materials (LARPM),** R&D wing is the manifestation of qualitative research in the emerging areas of Polymeric Materials. The laboratory is equipped with State-of-the-art Infrastructure & Instrumentation Facilities to undertake various Developmental Activities in the focused areas viz.: Bio-polymers Composites and Nano-composites Fuel Cells Hydrogels Recycling etc.

**Shri Jandas P. J.** is a Senior Research Fellow (SRF) and has submitted his Ph.D. thesis in the area of Biopolymer. He has published 06 nos. of research papers in high impact International Journals. He was awarded the 'Merit Scholarship in Polymer Processing' by Polymer Processing Academy (PPA) in 2012 in recognition of his innovative research.

**Dr. Smita Mohanty** holds the post of Scientist & In-charge, LARPM-CIPET, Bhubaneswar. She has more than 90 publications in various high impact International Journals to her credit apart from 05 Indian Patents and 03 Books (co-authored). She has been a part of about 10 Sponsored Projects in capacity of PI / Co-PI. She is supervising around 10 research fellows for the Ph.D. program in the area of Polymer Science & Engineering.

**Prof. (Dr.) S. K. Nayak,** Ph.D, D.Sc., is the Professor & Chair, LARPM has been working in the advanced field of Polymer Science & Engineering for last 26 years with rich expertise in academics and research. As Principal Investigator, undertook 50 sponsored R&D Projects and guided over three dozen Ph.D Scholars. He has over 250 research publications in leading international journals, more than 200 international conference proceedings, 05 patents, 10 pending published patents and 30 Design registrations. He is author and editor of 15 Books/Books Chapters in the field of Advanced Materials and Polymer Engineering & Science.

## "Polyimide Based Piezoelectric-Induced Pressure Pulse (PIPP) Films for MEMS Applications"

*Prof. (Dr.) S. K. Nayak, Dr. Smita Mohanty & Shri Jandas P. J.*

Present work aims to develop a process to prepare Polyimide based piezoelectric-induced pressure pulse (PIPP) films for Micro Electro Mechanical Systems (MEMS) application. The films shall be used for sensing pressure in various electronic equipments.

Silicon rubbers and ceramics are the current frontrunners as base matrices for MEMS application. However, in case of these materials, the consistency of properties in terms of sensitivity, flexibility and thermal stability are still concerned areas for the researchers. Proposed PI/MWCNT nanocomposite PIPP films follow a unique mechanism of electron tunneling, deliver better sensitivity of applied pressure with consistency than the current materials.

Since the matrix, PI, acts like a medium for providing fixed gaps for the tunneled electrons, the resistivity varies exponentially with the gap width between neighboring nanotubes. The tunneling intensity can be controlled by varying nanotube loading, mechanical and thermal treatments during synthesis and pre-treatments of MWCNT. Use of integrated circuit technology for fabrication of electrets transducers using PI/MWCNT films makes it an attractive choice for application in miniature hearing aids and lightweight electronic handsets.

**Team - Prof. (Dr.) S. K. Nayak, Dr. Smita Mohanty & Shri Jandas P. J. of LARPM-CIPET is the WINNER of National Awards 2012-13 Under the Academics/R&D Institution Category of "INNOVATION IN POLYMERIC MATERIALS"**

Prof. (Dr.) Anindya Deb

**Indian Institute of Science (IISc.)**
Bangalore - 560 012
Karnataka.

**Indian Institute of Science (IISc.)** is a premier public institution for scientific and technological research and higher education located in Bangalore, India. It was established in 1909. It acquired the status of a Deemed University in 1958. Departments and Centres in the Institute are broadly assigned to two categories: Science and Engineering.

**Dr. Anindya Deb** is currently Professor at Centre for Product Design and Manufacturing (CPDM), Indian Institute of Science (IISc.), Bangalore and is also the Chairman of the department. He obtained his Ph.D from the State University of New York at Buffalo, USA and ME from the Memorial University of Newfoundland, St. John's, Canada.

He has supervised Ph.D, M.Sc.(Engg.) and M.Des students in their theses and projects, published more than 100 papers in international journals and conferences, and obtained five automotive-related patents including three US, one European and one Indian patent, and an Indian design registration on a lightweight aluminum-intensive spaceframe car. He has organized international symposia such as “Indo-US Symposium on Preventing Road Crash Injuries Through Vehicle Safety Design” and “Indo-UK Symposium on Biocomposites for Various Engineering Applications”, chaired/organized technical sessions in national and international conferences, and delivered invited talks in India and abroad.

## "Nanoclay-Polypropylene based enhanced automotive upper interior head impact safety protection"

*Prof. (Dr.) Anindya Deb*

Polypropylene (PP) has been extensively used as an aesthetic material for interior trim (i.e. covers) for vehicle body components such as A- and B-pillars as well as doors. However, what may not be apparent is that suitably designed plastic trims with concealed countermeasures can play an important role in protecting occupants against severe injuries during collisions and roll-overs.

A significant fraction of fatalities involving passengers in automobile accidents is due to severe head injury. In order to improve upper interior head impact safety in such situations, injection-molded plastic trims with internal fin-type ribs can be provided on vehicle body components such as A-pillars located on either side of the windshield of a vehicle. These ribs are to be optimally designed along with the trim panel such that in the event of an occupant's head striking the outer surface of the trim, the ribs will impinge on the inner steel panel of the pillar and collapse plastically absorbing a significant amount of impact energy.

The current innovation titled "Nanoclay-Polypropylene Based Enhanced Automotive Upper Interior Head Impact Safety Protection" employs a nano-composite in the form of indigenously-produced polypropylene reinforced with an Indian Nanoclay in a representative automotive A-pillar trim. The integrally molded ribs are designed to be unique to avoid any IP infringement. The countermeasure is suitable for mass production through injection molding and is recyclable. Being cost-effective, it can be an efficient solution for entry level cars which are being used by a majority of Indian population.

**Prof. (Dr.) Anindya Deb of Indian Institute of Science (IISc.) is the WINNER of National Awards 2012-13 under the Individual Category of "INNOVATION IN POLYMERIC PRODUCTS"**

Shri Anand Bangur

**M/s. Shriji Polymers (India) Pvt. Ltd.**
15-D, Industrial Area, Maksi Road
Ujjain - 456 010
Madhya Pradesh.

**M/s. Shriji Polymers (India) Pvt. Ltd.** is a leading manufacturer of high-quality packaging products such as HDPE bottles and PP caps Promoted by Mr. Anand Bangur. Shriji Polymers is an ISO 9001:2008 Certified, USFDA and Canadian DMF holding company located at Ujjain, Goa & a green field project at Pharma SEZ Pithampur near Indore. Their total capacities stand at 1 million bottles per day and 1 million caps per day, having a wide range of containers in different sizes from 10cc to 2000cc, PP closures (CR) available in the sizes from 18mm to 93 mm.

**Shri Anand Bangur** an Innovative, hardworking, and creative man who creates his own dreams and fulfill them. He is 48 years young and versatile business man. He is a Commerce graduate from the most prestigious institute of India, Shriram College of Commerce, New Delhi. He started his business at an early age of 22 years with the first step in the field of packaging industry. He started up a small corrugated board box manufacturing factory in 1983 as ANAND PACKAGING Industry. The target at that point was to cater to blooming textile industries of his city, Ujjain.

Further on the journey extended to client based expansion from developing industrial towns of Dewas and Pithampur. The group expanded capacities till 1997 in the field of corrugated board boxes making only. In the year of 1997, having good experience in packaging industry and with support of esteemed clients, he entered in the field of Plastic Industry as ARPIT PLASTICS PVT. LTD., manufacturing facility for HDPE bottles. Having foothold in the plastic packaging market, in the year 2006-07, they started a unit of Injection Molding/ Injection Blow Molding bottles, a USFDA approved unit in the name of M/s SHRIJI POLYMERS (I) LTD. They have started one more unit of Injection Molding/ Injection Blow Molding bottles and Caps which is also a USFDA approved unit.

## "Child Resistant Cap"

### *M/s. Shriji Polymers (India) Pvt. Ltd.*

The present invention provides a cap assembly comprising an outer cap having at least one hinge extending from a bottom surface of the outer cap and an inner cap having at least one undercut along an inside rim of the inner cap. It is an aspect of an embodiment of the present invention to provide inner cap teeth along an outer periphery of the inner cap and outer cap teeth along an inside of the outer cap. It is a further aspect of an embodiment of the present invention to provide that when a pressure exerted on the top of the outer cap, the hinges are compressed and the outer cap engages with the inner cap.

It is a further aspect of an embodiment of the present invention to provide a method of using a cap assembly comprising an inner cap and an outer cap. It is a further aspect of an embodiment of the present invention to provide fitting the inner cap inside the outer cap, where in a distance is provided between the bottom surface of the outer cap and the top surface of the inner cap.

It is a further aspect of an embodiment of the present invention to provide exerting a pressure on the outer cap such that the hinge is compressed and the distance between the bottom surface of the outer cap and the top surface of the inner cap is decreased.

**M/s Shriji Polymers (India) Pvt. Ltd. is the WINNER of National Awards 2012-13 under the Industry Category of "INNOVATION IN POLYMERIC PRODUCTS"**

Shri M.J.Giridharan

**M/s C. G. Enterprises**
175, P.B. Road
Chennai - 600 007
Tamilnadu.

**M/s C.G.Enterprises,** manufacturers of HDPE pipeline Fabrication machineries and HDPE Pipe fittings upto 1200mm Diameter. The constant redesigning and research on the machine as warranted and demanded by the market had made the company the unique in the industry in a short span of 5 years, since its starting in 2007.

Constant development and redesigning of the machines had enhanced the company to deal with the new challenges that are thrown during the execution of the Pipeline project. This had led to the making of several machines, which are a substitute for import of machines at a lower cost, with, in house technology and indigenous materials, thus saving a lot of foreign exchange and of course improving the profits.

**Shri M J Giridharan ,** BE (Mech.), MBA, M.Phil. (Marketing), the Proprietor of M/s C G Enterprises, has 20 years of experience in HDPE pipeline industry. After working in Multinational organizations, he had started his own company and had grown in humps & leaps within a period of 5 years purely by the constant development on HDPE Pipeline Fabrication Machineries.

# INNOVATION OF POLYMER PROCESSING MACHINERY & EQUIPMENT

## "Multiport HDPE Saddle Welding Machine"

*Shri M.J. Giridharan*

M/s. C G Enterprises had developed Multiport Saddle Welding machine using indigenous in house technology. The first of its kind to Fabricate Multiple welding of branch pipes on a single main HDPE header. These saddle machines is the most precise and economical way to tap through 2" to 4" branch saddles, which are currently widely used in the HDPE Pipeline in desalination plants for their Reverse Osmosis(RO) Membrane connections with a closer spacer distance. This type of machine can also be widely used for fabricating HDPE Reducing Tee in workshop. With an integrated portion of welding and tapping enables to complete the whole fabricating process. Removable PTFE coated heaters of ranging from 1 to 6 nos concave heating plate for each diameter of the branch /tapping pipe sizes, with separate two channel timer, records the time during the soaking and cooling phases of the welding parameter. Linear guided ways are equipped for the set of heating plate and dragging plate. The belt around the header pipe holds the main header pipe firmly during the welding process.

The welding method used is of Butt Fusion Technology as per the standard DVS 2207. This machine uses only 1/10 of the time that was used in the old and conventional method of PE welding methods and also the arrangement had increased productivity and in turn a better profitability based on the Quantity produced however without comprising the Quality of Joints being achieved in shorter time. Thus, improving the project completion time. This indigenously developed Multi port Saddle Welding Machine had surprised some of the Foreign Visitors when they visited their plants. In the international market such multi saddle welding has not been done. Their machine is not only an import substitute but also an unique one in the HDPE Industry, where giants are in the playing arena.

**Shri M. J. Giridharan is the WINNER of National Awards 2012-13 under the Individual Category of "INNOVATION OF POLYMER PROCESSING MACHINERY & EQUIPMENT"**

**Dr. M O Garg**
Director-CSIR-IIP, Dehradun

**CSIR-Indian Institute of Petroleum**
(Council for Scientific & Industrial Research)
Mohkampur, Dehradun - 248 005
Uttarakhand.

**CSIR-Indian Institute of Petroleum (CSIR-IIP)**, Dehradun, an ISO 9001:2008 certified national laboratory under Council for Scientific and Industrial Research (CSIR) was set up in 1960 with mandate of supporting the then nascent petroleum industry in the country and to pursue research and development in the downstream sector of the hydrocarbon industry. CSIR-IIP provides technical services to petroleum industry impart training, conducts techno-economic feasibility studies and market demand surveys of petroleum products and assists BIS in formulation of standards.

CSIR-IIP is engaged in developing cutting edge technologies in the areas of petroleum refining, natural gas, petrochemicals, specialty chemicals, value addition to petroleum products as well as alternative sources for petroleum products. It has transferred more than fifty technologies to various industries including PSU and private refineries in India.

# INNOVATION IN POLYMER WASTE MANAGEMENT & RECYCLING TECHNOLOGY

"Technology to convert waste plastics (Polyolefins) to automotive grade fuel and petrochemicals"

*CSIR - Indian Institute of Petroleum*

CSIR-Indian Institute of Petroleum (CSIR-IIP) and GAIL (India ) Ltd have jointly developed an environment friendly technology to convert waste polyolefins (polyethylenes and polypropylenes) into exclusively any one of the products, viz. gasoline, diesel or petrochemicals. The liquid fuel (gasoline/ diesel) meet most of the Euro III specifications and their performance is comparable to commercial automotive fuel. The petrochemicals consist mainly of toluene and xylenes which are important raw materials for polymer industry. Based on the process developed 1 Kg of polyolefinic waste, devoid of contaminants, can produce either 550-600 ml gasoline or 750-800 ml diesel or 450-500 ml petrochemicals, along with LPG in each case.

The process has the potential to solve the problem of plastics waste disposal in an economical and environment friendly way, augment the supply of fuel and also provide economic benefits to the weaker segment of the society.

**CSIR-Indian Institute of Petroleum (CSIR-IIP) is the WINNER of National Awards 2012-13 under the Academics/R&D Institution Category of "INNOVATION IN POLYMER WASTE MANAGEMENT & RECYCLING TECHNOLOGY"**

Dr. S. T. Mhaske

Dr. Vilas S Karande

Dr. N. R. Savadekar

**Institute of Chemical Technology**
Department of Polymer and Surface Engineering
Matunga, Mumbai - 400 019
Maharashtra.

**Institute of Chemical Technology (ICT),** formerly the University Department of Chemical Technology (UDCT), is a premier chemical engineering research institute located in Mumbai, Maharashtra, India. It is focused training and research in various branches of chemical engineering, chemical technology, and pharmacy. It was established in 1933 and was granted deemed university status in 2008.It is the only state funded deemed university in India.

**Dr. Shashank T. Mhaske** is an Assistant professor in Department of Polymer and Surface Engineering at Institute of Chemical Technology, Mumbai. He has received M. Tech and Ph. D. (Tech) degree in Chemical Technology with specialization in Polymer Engineering and Technology from Department of Polymer and Surface Engineering at Institute of Chemical Technology, Mumbai (formerly known as UDCT). Presently he is teaching Polymer Engineering Subjects and providing guidance to undergraduate, Postgraduate and Doctoral students.

**Dr. Vilas S. Karande** is a Polymer Technologist from Institute of Chemical Technology, Mumbai (formerly known as UDCT). He has done M. E. (Plastic Engineering) and Ph. D (Tech) in Polymer Engineering and Technology from the same Institute. Presently he is working as a Section Head in Industrial Resins (R & D department) at Pidilite Industries Limited, Mumbai.

**Dr. Niranjan R. Savadekar** is a Polymer Technologist from University Department of Chemical Technology, Jalgaon. He has done M. Tech. and Ph. D (Tech) in Polymer Engineering and Technology from Institute of Chemical Technology, Mumbai (formerly known as UDCT). Presently he is working as a Project Investigator at The Bombay Textile Research Association, Mumbai.

## "Synthesis of Nanocellulose (Nanowhiskers and Nanofibers) and its applications in biopolymers to enhance their performance properties"

*Dr. Shashank T. Mhaske, Dr. Vilas S Karande & Dr. Niranjan R. Savadekar*

Due to the recent environmental policies, increased attention has been paid to the development of biocomposite materials for several industrial applications, such as automotive, construction and packaging. Environmental concerns and depletion of fossil fuels are the main driving forces for the developments in new bio-based green products.

Though the potential availability of agricultural based biomass in India is around 280 million tonnes, the dominant use is for fodder and biofuel production. A value addition can be done by using it as a potential reinforcing material in polymer composites. The above work deals with the design and development of cellulose reinforced biocomposites based on Starch, K-Carrageenen, Chitosan, Guargum, Polyvinyl alcohol and their blends. Incorporation of nano-cellulose into the said materials had resulted in considerable improvement in their mechanical, barrier and degradation properties; whereas, changes in crystallinity and thermal properties were insignificant.

The composite films can be used in the agricultural mulching as well as food packaging applications.

**Team - Dr. Shashank T. Mhaske, Dr. Vilas S Karande & Dr. Niranjan R. Savadekar of Institute of Chemical Technology is the WINNER of National Awards 2012-13 under the Academics/R&D Institution Category of "INNOVATION IN GREEN POLYMERIC MATERIALS & PRODUCTS"**

**Dr. Raksh Vir Jasra**
Head, Research and Technology Group

**M/s Reliance Industries Ltd.**
P.O. - Petrochemical
District: Vadodara
Vadodara - 391 346

**Reliance Industries Limited (RIL)** is India's largest private sector company on all major financial parameters with a turnover of INR 339,792 crore (US$ 66.8 billion), cash profit of INR 31,994 crore (US$ 6.3 billion) and net profit of INR 20,040 crore (US$ 3.9 billion) as of March 31, 2012.

RIL is the first private sector company from India to feature in Fortune's Global 500 list of 'World's Largest Corporations' and 'World's Top 100 companies', ranking 99th in terms of revenues and 130th in terms of profits in 2012. RIL ranks 68th in the Financial Times' FT Global 500 list of the world's largest companies. RIL is ranked amongst the '50 Most Innovative Companies - 2010' in the World in a survey conducted by the US financial publication - Business Week in collaboration with the Boston Consulting Group (BCG). In 2010, BCG also ranked RIL as the second highest 'Sustainable Value Creators' for creating the most shareholder value over the decade in the world.

**Dr. Raksh Vir Jasra,** FNAE, Ph.D from IIT, Delhi has research experience of 32 years in area of chemicals and petrochemicals. He joined Reliance in 2008 as head of Research and Technology Group, Vadodara which is focused on Petrochemicals R&D.

# POLYMERS IN AGRICULTURE AND WATER CONSERVATION

## "Polymeric Packaging for Extending Shelf Life of Agriculture, Floriculture and Horticulture Produce"

***M/s Reliance Industries Ltd.***

India is known as fruit and vegetable basket of the world as it produces 75 MMT of fruits and 147 MMT of vegetables with wide variety having second rank after China as per National Horticulture Database 2011 published by National Horticulture Board. However, due to improper post harvest storage technology and facilities, India looses plant produce worth Rs 44,000 crore as per a study conducted by the Central Institute for Post Harvest Engineering and Technology in 2009, Ludhiana.

Indian scenario demands technological advances and consistent efforts to reduce post harvest losses significantly at all the stages of supply chain from agricultural farms to consumer at home. Prime reason for fruits and vegetables decay is ethylene release from plant produce and fungal decay due to improper storage.

RIL has developed innovative polymeric Nano material based packaging to extend shelf life of fruits and vegetables under ambient conditions. Shelf life is extended through selective adsorption of ethylene which is known to act as a ripening hormone. Indian and US patents are filed for the present innovation. This innovation will have important role in the transportation and marketing of horticulture products along with maintenance of their quality.

**M/s Reliance Industries Ltd. is the WINNER of National Award 2012-13 under the Industry Category of "POLYMERS IN AGRICULTURE AND WATER CONSERVATION"**

Shri G. Krishnan

**M/s Mohana Orthotics and Prosthetics Centre**
Old No. 154, New No. 313, M.T.H. Road
Villivakkam, Chennai - 600 049
Tamilnadu.

M/s Mohana orthotics and prosthetics centre has been established in the year 1975 by Shri G. Krishnan and since then manufacturing assistive aids and appliances. Lately the company has experimenting with plastic and its composite material to develop an indigenously made light weight, cost effective highly durable artificial limbs. The limb is fitted to Indian patients at a rate of Rs.6, 000/- (Rupees six thousand only) where as the imported one cost around Rs.55, 000/- (Rupees fifty five thousand only).

The Managing Director of this company – **Shri G. Krishnan** is a qualified leather and footwear technologist from Central footwear training centre Chennai. He had gained lot of experience in working as prosthetics at artificial limb centre of Government general hospital Chennai and also as instructor at artificial limb manufacturing corporation of India in Orissa, After gaining enough experience, he started Mohana Orthotics and Prosthetics Centre. Shri G. Krishnan has been helping hand for people with disability to walk independently without any body's help .

Proprietor **Shri G. Krishnan's** goal is to make endoskeleton type of limbs at a much cheaper rate with materials easily available in India. Since graphite is being abundantly used in the manufacture of imported types of artificial limbs, Shri G. Krishnan planned to substitute it with Nylon 66 natural glass filled 63%, a plastic polymer. Graphite availability being extremely rare and high cost in India.

This nylon which is in the form of granules can be heated and injected by injection molding machine at temperatures ranging from 200 to 240 degree centigrade to get the required shape of the product. The product thus produced is of light weight, highly durable, rust free and having sheer stress strength equal to that of metals.

**M/s Mohana Orthotics and Prosthetics Centre is the WINNER of National Awards 2012-13 under the Industry Category of "POLYMERS IN PUBLIC HEALTH CARE"**

Dr. Niranjan Karak

**Tezpur University**
Tezpur - 784 028
Assam.

Tezpur University was established by an Act of Parliament in 1994. The objects of this Central University as envisaged in the statutes are that it shall strive to offer employment oriented and interdisciplinary courses to meet the regional to national aspirations and the development of the state of Assam and also offer courses and promote research in areas which are of special and direct relevance to the region and in the emerging areas in Science and Technology.

**Dr. Niranjan Karak**, Professor and Head, Department of Chemical Sciences, Tezpur University is working on advanced polymers and Nanomaterials to meet the demands of today's material society. He is working in this University as one of the founding faculty members to teach polymer Science and Technology since March, 1997. He received his M.Sc., M. Tech. and Ph. D. degrees from Indian Institute of Technology, Kharagpur. He has published 81 research papers all in international Journals of high repute, three books (two are singled author) and two patents (filed) in just last five years.

## "Biodegradable Tough Transparent Novel Hyperbranched Polyurethanes from Vegetable Oils"

*Dr. Niranjan Karak*

A strong demand on high quality polymeric products inclines the polymer scientists to produce their polymers with novel and innovative ideas.

A few such hyperbranched polymers have been synthesized by a simple direct poly-condensation of A2 with Bx ($x \geq 2$) monomers where at least one of the reactants is a vegetable oil or an immediate derivative of a vegetable oil. These polymers possess low melt and solution viscosity, high reactivity, large number free expose functionality, high solubility, etc. A long chain segment based hyperbranched polyurethane resulted in very good toughness which is combined property of strength and flexibility, along with the other desired properties like, high adhesive strength, acceptable biodegradability, good transparency, high flexibility, etc. are also achieved. Furthermore, these thermoplastic elastomeric materials are melt processable as well as solution castable. They can also transformed to high performance thermosetting polymeric materials by modifying with epoxy, polyester resins, etc. These hyperbranched polyurethanes exhibited excellent shape fixity and shape recovery under the application of stimuli like heat, solvent, microwave, etc. Above all, they are cytocompatible, immunocompatible, hemocompatible as well as histocompatible and support the adherence and proliferation of the cells.

Thus the present invention relates to development of novel hyperbranched polyurethane from vegetable oils in accordance to the mandates of Green Chemistry keeping its research abreast of the Triple Bottom Line Approach. This development is a sustainable development. The polymers developed by the nominee have immense industrial prospects as biodegradable advanced binder for coatings and paints, adhesive, shape memory materials, biomaterials, etc.

**Dr. Niranjan Karak of Tezpur University is the WINNER of National Awards 2012-13 under the Individual Category of "RESEARCH IN THE FIELD OF POLYMER SCIENCE & TECHNOLOGY"**

Dr. Mangala Joshi

Dr. Amitava Bhattacharyya

**Indian Institute of Technology**
Hauz Khas, New Delhi- 110 016

**PSG Institute of Advanced Studies**
Coimbatore (Tamilnadu)

**Dr. Mangala Joshi** is a Professor in the Department of Textile Technology at IIT Delhi. She is an alumnus of IIT Delhi having obtained her M Tech and PhD degrees in Polymer Science and Technology. Her current research interests are - Nanotechnology Applications in Textiles, Polymer Nanocomposites: fibers and coatings, Nano-materials, Nanocoating and Nanofibers, Bioactive and Functional Textiles. Several sponsored research projects funded by DST (Nanomission), Govt. of India, Aerial Delivery Research and Development Establishment (ADRDE, Agra) DRDO, Department of Biotechnology (DBT- Govt. of India) and Industry both national and international are supervised by her. She is a member of Nano Research Group at IIT Delhi and also associated with interdisciplinary research team working in the area of 'Nanobiotechnology' and a focus on "Bioactive Nanocomposites" under a sponsored project by US multinational Lockheed Martin. She has guided many PhD, M Tech and B Tech projects at IIT Delhi related to these research areas. She has more than 60 refereed publications in international and national journals and about 90 papers in conferences and also authored several book chapters. She is an executive member of professional bodies such as Polymer Processing Academy (PPA) and Fiber Forum India (FFI).

**Dr. Amitava Bhattacharyya** is an Assistant Professor in PSG Institute of Advanced Studies. He did his PhD on 'Hybrid Nanographite based polymer Nanocomposite" under supervision of Prof. Mangala Joshi, Department of Textile Technology at IIT Delhi in the year 2011. He has worked in Textile industry for more than three years and has research interests in the area of polymer Nanocomposite and polymeric scaffolds. He has published eight refereed papers, one monograph and one book besides several conference publications. He received the Invention Award 2012 from Intellectual Ventures, USA on polymer scaffolds and is in the process of acquiring patent on that.

## "Polyurethane / Nanographite based Multifunctional Coatings for Defense Applications"

*Dr. Mangala Joshi & Dr. Amitava Bhattacharyya*

Microwave absorbing materials (RAM) serve a great role in electromagnetic pollution control, electromagnetic interference shielding and stealth technology. These are used to coat as powder or as dispersion in polymers on all defense establishments (stationary or mobile). Conventional RAM is effective against a specific frequency range and offer little stealth against the modern detection systems. An "ideal" RAM should have advantages such as high radar wave absorption at low thickness and density; wide bandwidth and flexibility.

In this work, novel hybrid nanographite particles have been synthesized via co-deposition of iron and nickel on nanographite particles using fluidized bed electrolysis, a simple and eco-friendly technique. These metal coated nanographite particles were dispersed in polyurethane matrix and showed a significant enhancement in microwave absorption as a thin coating and at relatively low loadings (<10 wt %).

The flexibility of such nanocomposite coatings is almost retained at 10 wt% loading and the durability is found to be excellent under accelerated weathering conditions. These excellent results have been reported for the first time using novel hybrid nanographite particles in polyurethane matrix and there are no similar literature reports for other RAM coatings. The developed Polyurethane/hybrid nanographite based nanocomposite in coating or film form have the potential defence applications as camouflage coatings, covering or envelop on army vehicles, naval ships, military establishments, etc. for an effective microwave shielding effect. These flexible polymer nanocomposites also offer the possibility of many other industrial applications in microsystem technologies, as microwave or radar absorbent material; in astronautics and for anticorrosive coatings.

**Team - Dr. Mangala Joshi of IIT-Delhi and Dr. Amitava Bhattacharyya of PSG Institute of Advanced Studies is the WINNER of National Awards 2012-13 under the Academics/R&D Institution Category of "RESEARCH IN THE FIELD OF POLYMER SCIENCE & TECHNOLOGY"**


Grow
with
Plastics

# Runner-up & Commendation

Dr. T. S. Natarajan

Dr. S. Anitha

**Indian Institute of Technology - Madras**
Chennai - 600 036
Tamilnadu.

**Indian Institute of Technology - Madras,** is one among the foremost institutes of national importance in higher technological education, basic and applied research. The Institute has fifteen academic departments and a few advanced research centre's in various disciplines of engineering and pure sciences, with nearly 100 laboratories organized in a unique pattern of functioning.

**Dr. T. S. Natarajan** is senior professor in the Department of Physics having more than three decades of teaching and research experience. Published more than seventy five research papers and publications in conferences and reputed journals. Visiting Professor at University of Alberta Canada and University Malaya Malaysia during 2011-2012. Has a passion for teaching and has recorded 40 video lectures on Basic Electronics under NPTEL (National Programme on Technology Enhanced Learning) which are now available on the YouTube freely world over. Has been ranked among the Top 10 Most Popular Professors on YouTube by some independent agency.

**Dr. S. Anitha** is presently doing her Post Doctoral work in Department of Physics at IIT-Madras. She has constantly endeavored to develop electrospun fibers for multifaceted applications. She has several International publications in peer-reviewed journals to her credit. She has also won "Best Poster and Oral Presentation Award" for her work. She was awarded "Swami Vivekananda Award" for Best Youth in 2006 by Bharahi Yuvakendra at Madurai. She have also participated several elocutions and group discussions for further concurrence.

## "Development of Electrospun Nanocomposite Smart Material"

*Dr. T. S. Natarajan & Dr. S. Anitha*

The development of smart materials with multi-functional properties can have significant impact in novel technological applications. We have prepared a flexible fibrous membrane using simple and low cost Electrospinning method. The prepared membrane exhibit exotic properties and excellent potential for several large scale industrial applications in the near future. Until now, a stumbling block towards the large-scale production and commercialization of polymer nanocomposites has been the need for a cost- effective and simple technique for ensuring uniform dispersion of the nanoparticles in the polymer matrix.

The scheme developed and reported here has overcome this to a great extent. The suitability of the prepared fibrous membranes was tested for three different and exciting applications. They are: i) Superhydrophobic; ii) UV Shielding; and iii) Antimicrobial properties. The Salient feature of the prepared Electrospun Nanocomposite smart material

- Enhanced stable superhydrophobicity
- Effective UV-A filter
- Long term, recyclable antimicrobial membrane
- Easy to scale up for commercial production of nanocomposites

**Team - Dr. T. S. Natarajan and Dr. S. Anitha of IIT- Madras is the RUNNER-UP of National Awards 2012-13 under the Academics/R&D Institution Category of "INNOVATION IN POLYMERIC MATERIALS"**

Smt. Sarojini Swain

Shri Mohit Mehta

Shri Sachin Joshi

**M/s Crompton Greaves Limited**
Global R & D Centre, Building-I
Bhaskara, Kanjur Marg (East)
Mumbai - 400 042
Maharashtra.

**Crompton Greaves (CG)** is an Indian multinational company engaged in design, manufacturing, and marketing of products related to power generation, transmission, and distribution based in Mumbai. It is part of Avantha Group. Col. R.E.B. Crompton founded R.E.B. Crompton & Company in 1878. Over the years, the company has evolved into one of India's largest private sector enterprises. CG is ranked amongst the world's top ten electrical transformer manufacturers.

**Smt. Sarojini Swain** is currently working as a scientist at the global R & D Centre of CG in specialty research team. She did her MTech in polymer technology from CIPET and MSc in chemistry (Gold Medalist) from Utkal University, Bhubaneswar, also MBA in operations from UBI, Belgium. She has around 5.5 years of experience in various industrial R & Ds. She has more than 20 national & international publications in the field of polymers & nanotechnology.

**Shri Mohit Mehta** is currently working as a design engineer in appliances division of CG. He did his B.Tech. in Mechanical from Kurukshetra University, Haryana. He is having more than 5 years of industrial experience in various companies. He is doing his MBA in Operations from Symbois. He has added more than 10 design patents to his credit.

**Shri Sachin Joshi** is currently heading the Industrial design centre of CG Global R & D. He is having more than 12 years of experience in CG. He did his B.E in production. He had several papers & patents in the field of materials & design.

## "Mild Steel Based Storage Water Heater Tank; inside coated with specially developed Nano based Liquid Polymer applied by 2 Axis Synchronized Robotic Painting System"

*Smt. Sarojini Swain, Shri Mohit Mehta and Shri Sachin Joshi*

This invention provides a coating system for steel, the coating system comprising a primary coat comprising Nanocomposites of epoxy resin and modified clay and solvent less epoxy based outer coat. A unique two coat liquid polymer system designed for storage water heater tank. The COATING SYSTEM is patented as under mentioned:

1) Pretreatment - Zinc Phosphating
2) Primer – Epoxy based Zinc Phosphate Nanocomposites with modified clay.
3) Top Coat - Solvent less epoxy

Two AXIS Syncronised Robotic painting machine is designed to perform the unique action of rotation and inside spraying of the 6L, 10L, 15L, 25 L. M.S tanks which is necessary for smooth and pinhole free coating of the mild steel tank inner lining for corrosion protection purpose. This machine has a servo driven reciprocating arm which has 3 airless spray nozzles, spraying in different desired directions. Each nozzle start & stop operation is controlled by PLC program while withdrawal of the reciprocator arm.

Advantages over known Alternatives are Improved corrosion resistance with reduced coating thickness, Flexibility at lower angle, Passes reverse impact, Improved solvent resistance, Improved adhesive strength, Reduced process cycle time due to elimination of intermediate coat, Better aesthetics (even coat throughout the inner side of MS tank) and Higher rate of production with 2 axis robotics painting against conventional system.

**Team - Smt. Sarojini Swain, Shri Mohit Mehta and Shri Sachin Joshi of Crompton Greaves is the RUNNER-UP of National Awards 2012-13 under the Industry Category of "INNOVATION IN POLYMERIC PRODUCTS"**

Shri Manoharmayum
Manihar Sharma

**Shri Manoharmayum Manihar Sharma**
Nongmeibung Wangkheirakpam Leikai,
Imphal East
Manipur.

During the early ages of **Shri Manihar Sharma,** he had many innovative concepts but due to his poor family condition there was no opportunity to set up his innovative works.

Automatic Pump Operator was the first project that came in his mind, it was started when he was 51 years old, and he had started his deep research works on this project since 1996, in the year 1997, it was promoted by Manipur science and Technology council (MASTEC) to Techno Entrepreneur promotion programme (TEPP), this was manipulated by DSIR, he had acquired a sum amount of grant from TIFAC through DSIR, so as per the instruction from DSIR, he had re-evaluated his deep research work and submitted final report which was handed over to National Innovation Foundation (NIF) and received National Award on 18th Nov,2009 for the project of Automatic Pump Operator (APO). During the year 2009 before he received his National Award, National Bank for Agriculture and Rural Development (NABARD) had granted him a workshed. After that he has been continuing his research work on several projects like; Incense (Dhoop) Stick Making Machine, Innovative Dryer, Anti-theft Magnetic Lock and Solar Multi Silk & Muga Reeling Machine which were all submitted and approved by NIF. Among these projects, Innovative Dryer got patented from NIF, except Innovative Dryer most of the basic parts of the devices are made by Polyester Resin called Fiber Re-enforced Plastic (FRP). Innovation is his fundamental passion for his entire life-span. He'll keep working on new projects as long as he lives under any circumstance.

## "Solar Multi Silk Muga Reeling-Cum-Spinning Machine"

*Shri Manoharmayum Manihar Sharma*

The significance of Solar Multi Silk Muga Reeling-cum-Spinning Machine is its performance and durability. It weighs around 15 kgs. only but can operate like any other conventional machine. It performs multiple functions such as reeling, threading, spinning, etc. giving a one-time-finished product of tiniest thread of high quality in a single effort. The machine can be used for mulberry/silk, tussar as well as edi-cocoons.

As the name suggests, the super significance of this machine is using of solar power thereby making the operation of the machine a low cost, clean energy source and eco-friendly one; its simple and effective operation that even a handicapped person can run without much effort. It saves money, time and labour and gives higher profit which is the main concept of invention of this machine.

Another advantage of this machine is that it cost very less as compared to other machine but can produce yield of fine yarn like any other similar conventional machine. It is so to say that the machine is low-input, high-yield one. Even a local artisan can afford to buy one easily.

The most significance and benefits of the Innovation is especially for the rural cocoon growers.

**Shri Manoharmayum Manihar Sharma is the RUNNER-UP of National Awards 2012-13 under the Individual Category of "INNOVATION OF POLYMER PROCESSING MACHINERY & EQUIPMENTS"**

**Dr. Chandra Shekhar**
Director, CSIR-CEERI

**CSIR-Central Electronics Engineering Research Institute (CSIR-CEERI)**
CSIR Madras Complex, P.O.- T.T.T.I.
Taramani, Chennai - 600 113
Tamilnadu.

**CSIR-Central Electronics Engineering Research Institute (CSIR-CEERI)** is a pioneering research laboratory of Council of Scientific and Industrial Research (CSIR), New Delhi. It was established in 1953 and made immense contribution for the growth of electronics in the country. CEERI is engaged in the areas of MEMS & Micro Sensors, Optoelectronics Devices, Microelectronic Fabrication, VLSI Design, Nano Structures, Microwave Tubes, Power Electronics, Agrielectronics, Machine Vision Systems, Visible & NIR Technologies and Embedded Systems. CEERI's research activities are grouped into three major areas namely Semiconductor Devices, Microwave Tubes and Electronic Systems. CEERI is currently associated with AcSIR for award of M.Tech. and PhD degrees in electronics science and engineering. CEERI Chennai Centre is engaged in development of indigenous technologies and developed many novel systems for automation of Indian process industries. Currently, the Centre is focusing on machine vision and NIR spectroscopy based instrumentation for horticultural, plastics and food industries.

The Director of CSIR-CEERI, Dr. Chandra Shekhar obtained his PhD from BITS, Pilani and joined CEERI as Scientist in 1977. He has been instrumental in promoting Post Graduate Education, Training and Industrial Consultancy in the field of Microelectronics in the country. He was awarded the Young Scientist Award by UNESCO/ROSTSCA in 1986. He has been a member of several R&D Policy Planning, Project Formulation, Funding and Monitoring Committees of DST, DIT, ISRO, DAE of Govt. of India. His research interests include Silicon Microchip Design, Design Methodologies, Computer Aided Chip Design and R&D Management. He has more than 50 research publications to his credit in scientific journals.

# INNOVATION IN POLYMER WASTE MANAGEMENT & RECYCLING TECHNOLOGY

## "Online Sorting of Consumer Plastic Groups through Near-Infrared Spectroscopy"

*CSIR-Central Electronics Engineering Research Institute (CSIR-CEERI)*

Plastics are widely used non-biodegradable materials which have to be recycled economically and efficiently. For efficient recycling of plastics, different types of polymer materials have to be identified and segregated. Present innovation uses Near InfraRed Spectroscopy (NIRS) for the instantaneous and on-line identification of consumer plastics.

The developed system inspects singulated plastic items moving on a conveyor and uses NIRS reflectance measurements to identify 5 groups of polymers, namely Poly Ethylene Terephthalate (PET), Poly Vinyl Chloride (PVC), Poly Ethylene (PE), Poly Styrene (PS) and Poly Propylene (PP). The system consists of a conveyor arrangement, NIR radiation source, spectrometer and analysis software. A low-cost embedded system with a wireless interface automates the inspection process and safeguards the operating personnel from unhygienic environments.

The salient features of the innovation are:

- Sorts singulated plastics moving on a conveyor using non-destructive NIRS technique.
- Automated and low-cost system to distinguish 5 groups of polymers namely PET, PVC, PE, PS and PP.
- System can sort up to 4 plastic items per second and 0.5 tonne of plastic per hour.
- Accurate identification of plastics, e.g. about 99% for PET, 96-98% for PE, PP, PVC and PS.
- Special provision to separate PET from other plastics, since PET constitutes 47% of total disposed consumer plastics.
- Wireless communication capability safeguards the operating personnel from unhygienic environments.
- Robust and indigenously integrated system to withstand the Indian environmental conditions.
- Suitable for recycling of waste consumer plastics (wealth to waste).

**CSIR - Central Electronics Engineering Research Institute (CSIR-CEERI) is the RUNNER-UP of National Awards 2012-13 under the Academics/R&D Institution Category of "INNOVATION IN POLYMER WASTE MANAGEMENT & RECYCLING TECHNOLOGY"**

Smt.Sridevi Avancha

Shri Ajaya Kumar Behera

Dr. Ramkrishna Sen

Prof. Basudam Adhikari

**Indian Institute of Technology-Kharagpur**
Kharagpur -721 302
West Bengal.

The Indian **Institute of Technology Kharagpur (IIT Kharagpur)** is an engineering, management and law institution established by the government of India in 1951. The first of the IITs to be established, it is recognised as an Institute of National Importance by the Government of India.

**Smt. Sridevi Avancha** is a research scholar from Materials Science Centre at Indian Institute of Technology, Kharagpur. She did her M. Sc. from Bangalore University. She is presently working on biodegradable jute reinforced composites.

**Shri Ajaya Kumar Behera** is presently working as Lecturer in the Department of Chemistry at Rajendra (Jr.) College, Balangir, Odisha. He is pursuing his Ph.D. in the field of "Nano-biocomposites developed from Natural resources" at Materials Science Centre, IIT Kharagpur.

**Dr. Ramkrishna Sen** is an Associate Professor (Bioprocess Engineering) in the Department of Biotechnology, Indian Institute of Technology (IIT) Kharagpur, India. He is currently involved in developing, optimizing, modeling and scaling up bioprocesses for the production and applications of marine biosurfactants, probiotics based nutraceuticals, water-repellant durable jute geotextiles, jute composites and biofuels.

**Prof. Basudam Adhikari** is a Professor (Polymer division) in Materials Science Centre, Indian Institute of Technology (IIT) Kharagpur. He is currently involved in developing natural fiber based composites, jute based cement concrete, conducting polymers in gas sensing, taste sensors, and polymers in drug delivery. He has more than 100 research publications and is associated with a number of societies in India and abroad. He has guided more than fifteen PhD students.

# INNOVATION IN GREEN POLYMERIC MATERIALS & PRODUCTS

## "Biodegradable and Eco-friendly Jute Soy Composite and Sapling pot"

*Smt. Sridevi Avancha, Shri Ajaya Kumar Behera, Dr. Ramkrishna Sen & Prof. Basudam Adhikari*

The growing environmental concern and increase in global warming have made plastics and plastic based composites a target of criticism due to their deficiency in degradability in general compost medium. Plastic waste disposal management is now a great challenge due to non availability of free land for solid waste disposal in regions of high population density. To overcome the above stated problems, sustainable green composites were developed using natural soy resin and jute fibers without any hazardous solvents. These biodegradable eco-friendly composites are fabricated in a hydraulic press and mechanical and biodegradable properties of these green composites were evaluated.

These green composites are non flammable and reasonably flame resistant. Low cost, light weight, non flammable, comparative mechanical strength and complete biodegradability of these composites are the technical advantages over non biodegradable fiber reinforced plastic composites. These green composites can avoid petroleum based raw materials, and can be used as a replacement for conventional plastic products by finding applications in automotive and railway couch interiors, furniture, sapling pots etc and will one day become obvious alternatives to everyday plastics.

**Team - Smt. Sridevi Avancha, Shri Ajaya Kumar Behera, Dr. Ramkrishna Sen & Prof. Basudam Adhikari of IIT-Kharagpur is the RUNNER-UP of National Awards 2012-13 under the Academics/R&D Institution Category of "INNOVATION IN GREEN POLYMERIC MATERIALS & PRODUCTS"**

Shri Venkateshwar Rao

Dr. C. Rajendra Kumar

**M/s Godavari Polymers Pvt. Ltd.**
153, B&E, C&F, Phase II, IDA
Cheralapally, Hyderabad
Andhra Pradesh.

**Godavari Polymers Pvt. Ltd.** was incorporated, in August 1990, with an objective to manufacture, sell and service HDPE pipes and fittings. We started commercial production in July 1991, with initial annual capacity of 240 tons, with pipe sizes range from 20mm to 110mm OD, and today we have increased our production capacity with advanced manufacturing facility to 11000 metric tons and pipe sizes up to 500mm with the facilities for fabricating and injection mounding HDPE pipe fittings and sprinkler irrigation systems.

Known for its highest levels of quality & customer satisfaction in the field of PE Pipes & Micro Irrigation Segment [Sprinkler Irrigation System], Godavari decided to serve the farmer needs in the field of water management system and added drip irrigation system.

**Shri Venkateshwar Rao,** Managing Director, a commerce graduate had an inherent interest on plastic extrusions. Being self-motivated and energetic on managerial activities, he leads & directs the total functions of Finance, Accounts, Administration, Projects & Operations.

**Dr. C. Rajendra Kumar,** Director, a commerce graduate had supplemented his qualifications with MMM, MBA, M. Phil and PhD in management. He started his career as a Front Line Sales Man in Murugappa Group, and in three year's span he rose to the position of Regional Head. Being a co-promoter of Godavari Polymers Pvt. Ltd - Hyderabad, he was one of the stalwarts who pioneered in making Godavari brand synonymous for HDPE Pipes & Micro irrigation Systems.

## "Breakthrough Techniques in Drip Inline Lateral Design"

*M/s Godavari Polymers Pvt. Ltd.*

The inline drip laterals were being produced in India with two perforations [emitting holes] and were causing frequent clogging in the fields. Providing enhanced performance was the need of the hour during the period for gaining the confidence levels of the first time user of drip irrigation system. This required highest levels of operational skills in processing & additional investments in processing equipment.

Godavari, in the process of addressing the problem of clogging and to further enhance the life of the drip irrigation systems, the inline lateral is designed and produced with four perforations (emitting holes for discharge of water, which will enhance the use of drip irrigation systems wherein increasing the life of the system to an extent of 200 %).

The irrigation laterals with four perforations were well received by the farmers and instances of frequent clogging have been reduced by a great extent enhancing the life of the lateral as well as confidence levels of farmers.

Godavari drip laterals with 4 holes are serving the needs of thousands of farmers across the nation.

**M/s Godavari Polymers Pvt. Ltd. is the RUNNER-UP of National Awards 2012-13 under the Industry Category of "POLYMERS IN AGRICULTURE AND WATER CONSERVATION".**

Dr. K. P. Chellamani

Shri Veerasubramanian

Shri. R.S.V. Balaji

**The South India Textile Research Association (SITRA)**
13/37, Avanashi Road, P.B.No. 3205,
Aerodrome Post, Coimbatore - 641 014
Tamilnadu.

**SITRA** is one amongst the chain of textile laboratories in the country sponsored by the Textile industry and supported by the Ministry of Textiles, Government of India. It is an autonomous scientific research organisation registered in May 1951 under the Societies Registration. SITRA has been recently designated as **Centre of Excellence for Medical Textiles by Ministry of Textiles, Government of India.**

**Dr. K.P. Chellamani** has to his credit over 275 research and review papers in Indian and International textile journals and he is also a co-author of 15 monographs published by SITRA. He has been awarded the F.T.A. by The Textile Association, (India), Mumbai in the year 1991 and F.I.E. by the Institution of Engineers (India), Kolkata in the year 2003. He is a recipient of 23 National Awards in recognition of his research work in different areas of spinning & Technical textiles. He has 8 patents to his credit.

**Shri D. Veerasubramanian** is an M.Tech. (Textile Technology) from Anna University, Chennai. He has 2 years of experience in spinning mills as Quality Assurance Officer and joined The South India Textile Research Association (SITRA) in the year 2009 as Scientific Officer.

**Shri R. S. Vignesh Balaji** is an M.Tech. (Textile Technology) from Anna University, Chennai. He joined SITRA in the year 2010 as Scientific Officer and he is currently involved in research projects dealing with advanced wound care dressings. He has published 10 research papers in leading Textile Journals.

## "Barbed Bi-directional Surgical Sutures"

*Dr. K. P. Chellamani, Shri D. Veerasubramanian & Shri R. S. V. Balaji*

A self–anchoring suture which can alleviate complications associated with conventional suture knots and obviate the need to tie a knot has been developed by SITRA. The design of this suture involves the introduction of bi–directional barbs into a monofilament. This provides improved tissue repair as compared to the conventional sutures. SITRA has designed and fabricated an equipment to introduce bi–directional barbs into a monofilament suture. The optimum combination of barb dimensions in the barbed suture developed by SITRA includes

i) barb angle 165˚,

ii) helical angle 15˚ and

iii) barb depth 0.15 mm.The barbed sutures were subjected to implantation trials in wister rats. The tissue holding capacity of the barbed sutures is higher than that of the conventional sutures by about 35% after 14 days of implantation and 15% after 21 days of implantation.

**Team - Dr. K. P. Chellamani, Shri D. Veerasubramanian & Shri R. S. V. Balaji is the Runner-up of National Awards 2012-13 under the Industry Category of "POLYMERS IN PUBLIC HEALTH CARE"**

Prof. (Dr.) Pralay Maiti

Prof. Nira Misra

Shri Govinda Kapusetti

**Indian Institute of Technology (BHU)**
**(IIT (BHU)) - Varanasi**
Varanasi - 221 005
Uttar Pradesh.

**Indian Institute of Technology (BHU) (IIT (BHU)), Varanasi** is a public Engineering institution located in the holy city of Varanasi, Uttar Pradesh. Founded in 1919 as part of the Banaras Hindu University (BHU), it was designated an Indian Institute of Technology in 2012. IIT(BHU) has 13 departments and three inter-disciplinary schools and offers B. Tech, M. Tech., Integrated dual degree (IDD) and Ph.D. degrees.

**Prof. (Dr.) Pralay Maiti** did his M.Sc. from IIT-Kharagpur in Chemistry and Ph. D from Indian Association for the Cultivation of Science, Kolkata in 1996 on polymer crystallization. Currently, he is Professor and Coordinator of the School of Material Science and Technology, IIT (BHU), Varanasi. He has published a number of papers and book chapters in international journals/publications of repute. He has been conferred with Prof. M. Santappa Silver Jubilee award and APA Young scientist award.

**Prof. Nira Misra** Graduated, Post-graduated and Doctoral Degree from Calcutta University through working as JRF and SRF at Indian Association for the cultivation of Science Jadavapur Kolkata. She has worked on Synthesis and Characterization of polymers with functional end group for Ph.D. Degree. She Joined IIT-BHU in March 1985 as Lecturer, presently working in same Institute IIT (BHU) as Professor at School of Biomedical Engineering and currently teaching Biomaterials, Biomechanics and Composites.

**Shri Govinda Kapusetti** received the degree of M. Tech in Biomedical Engineering from IIT (BHU), Varanasi, in 2009 and presently pursuing Ph. D in Biomedical Engineering at IIT (BHU), Varanasi, India. He was awarded by CSIR- SRF in 2011.

## "Polymer Based Nanobiocomposites for Faster Bone Healing"

*Prof. (Dr. ) Pralay Maiti, Prof. Nira Misra & Shri Govinda Kapusetti*

Bone cements are being used as grouting material in between the implant and human bone for better compatibility but suffer from low fatigue and poor biocompatibility. Nanohybrids of poly(methyl methacrylate) based bone cement and nanometer dimension layered double hydroxide have been developed as a superior grouting material for total joint arthroplasty. Mechanical strength including fatigue resistance of the nanohybrid is found to be improved significantly than that of pure bone cement. Biocompatibility of the nanohybrid has been testified through the cell viability of human osteoblast cells on the above material. Thus, the nanohybrid is found to be better material than bone cement as grouting material. The developed nanohybrid has been used as grouting material and significant improvement has been achieved in terms of bone healing rate.

For the first time, poly(methyl methacrylate) based bone cement and layered double hydroxide bionanohtbrids have been developed as a grouting material for total joint arthroplasty with significantly faster healing. One can control the bone healing as fast as within 25 days using the developed nanobiohybrid while 60 days and 80 days are required for similar healing for pure bone cement and control, respectively. Bone cement nanohybrid is proven to be highly stimulating towards calcium deposition at the wound site and it greatly favours the bone growth and cell attachment.

**Team - Prof. (Dr. ) Pralay Maiti, Prof. Nira Misra & Shri Govinda Kapusetti of IIT(BHU)-Varanasi is the RUNNER-UP of National Awards 2012-13 under the Academics/R&D Institution Category of "RESEARCH IN THE FIELD OF POLYMER SCIENCE & TECHNOLOGY"**

Dr. Niranjan Karak

**Tezpur University**
Tezpur - 784 028
Assam.

Tezpur University was established by an Act of Parliament in 1994. The objects of this Central University as envisaged in the statutes are that it shall strive to offer employment oriented and interdisciplinary courses to meet the regional to national aspirations and the development of the state of Assam and also offer courses and promote research in areas which are of special and direct relevance to the region and in the emerging areas in Science and Technology.

**Dr. Niranjan Karak**, Professor and Head, Department of Chemical Sciences, Tezpur University is working on advanced polymers and Nanomaterials to meet the demands of today's material society. He is working in this University as one of the founding faculty members to teach polymer Science and Technology since March, 1997. He received his M.Sc., M. Tech. and Ph. D. degrees from Indian Institute of Technology, Kharagpur. He has published 81 research papers all in international Journals of high repute, three books (two are singled author) and two patents (filled) in just last five years.

## "Novel High Performance Tough Hyper branched Epoxy Thermosets"

*Dr. Niranjan Karak*

The introduction of branching in polymers modifies their properties and processing characteristics. Hence the innovative designing of an epoxy resin with unique architectural features such as hyperbranched structure with combination of aliphatic-aromatic moieties may result in toughened epoxy without any processing difficulty. Hyperbranched epoxy resins are of special interest because of their easy synthetic accessibility, low viscosity, high solubility and large number of end functional groups for their industrial scale productions and applications. The poly (amido amine) cured these hyperbranched epoxy thermosets exhibited many unusual properties compared to the conventional linear analogs, and consequently emerging interest to academic and industrial fraternities. High solubility, low viscosity, ultra low dielectric constant, high thermostability, high tensile strength, elongation at break, strain energy or toughness, exceptional high adhesive strength, impact resistance and high scratch hardness are a few desirable properties to be mentioned.

The study further confirmed the significant effect of highly branched structures on solubility and other properties. Thus these hyperbranched epoxy thermosets possess both high tensile strength, as well as high elongation at break so these are tough materials. Thus high performance hyperbranched tough epoxy thermosets with excellent adhesive strength and good thermo stability was obtained in this innovation. The overall results indicate that thermoset can be used as a high performance tough epoxy thermoset, the most desired epoxy thermoset for advanced engineering applications. Thus the studied hyperbranched epoxy thermoset could be produced commercially in industrial scale, particularly in view point of its cost performance ratio.

**Dr. Niranjan Karak of Tezpur University is recognised with COMMENDATION of National Awards 2012-13 under the Individual Category of "INNOVATION IN POLYMERIC MATERIALS"**


Shri Ramchandra Shejwal


Shri Shantesh Chaudhari


Shri Ajay Siddannavar


Shri Yogesh Kotkar


Shri Vidyadhar Ingale


Shri Nilesh Gujar

**M/s Varroc Polymers Pvt. Ltd. - R&D Center**
L.6/2 B, MIDC Industrial Area
Waluj, Aurangabad
Maharashtra.

**M/s Varroc** started with much humble beginning about two decades back. Today the group is generating the sales revenue of Rs 6,000crores from its 31 (27 in India + 4 in Europe) manufacturing plants worldwide. Varroc Group includes two distinct companies Varroc Polymers Pvt Ltd. and Varroc Engineering Pvt Ltd are part of the three distinct verticals from these two companies; Polymers (part of Varroc Polymers), Metallic and Auto Electrical & Electronics (part of Varroc Engg.) are well equipped with the respective DSIR approved R&D center. The dedicated 5000+ employees are instill with Five Core Values of the group; **S**incerity, **H**umility, **I**ntegrity, **P**assion & **S**elf Discipline.

**Shri Ramchandra Shejwal** is Mechanical Engineer having 26 yrs experience in all aspects of Technical development including Design, Tooling, R&D & Program Management.

**Shri Shantesh Chaudhari** is a Mechanical Engineer having rich 20 yrs. experience in design & development. He is working as Program manager in Polymer R&D. He played a vital role in conversion of metal to plastic Innovation.

**Shri Ajay Siddannavar** is NTTF from Dharwad & having 17 yrs. of experience in Plastic Injection mould manufacturing. Presently working as a tooling head in Varroc Polymers.

**Shri Yogesh Kotkar** is ITI having 14 yrs. rich experience in Product Design. Presently working as Designer in R&D.

**Shri Vidyadhar Ingale** is Mechanical Engineer having 16 yrs. of experience in Development Quality & QMS. Presently working as Development Quality Head in R&D.

**Shri Nilesh Gujar** is Mechanical Engineer having 07 yrs experience in QMS. Presently working as QMS engineer in R&D department.

## "Conversion of CAC tank from Aluminum Die Casting to plastic component"

*Shri Shantesh Chaudhari, Shri Ajay Siddannavar, Shri Ramchandra Shejwal, Shri Vidyadhar Ingale, Shri Yogesh Kotkar & Shri Nilesh Gujar*

A plastic product has multiple advantages like flexibility in product design, cost reduction, weight reduction and elimination of assembly processes etc. over metal products. This advantage of flexibility in Plastic product design and Varroc Team's experience in plastic product Research and Development has led to innovations in many automotive products. Charged Air Cooler (CAC) Tanks are traditionally manufactured with Aluminum Die casting process. The need from customer for weight reduction arose to make the vehicles fuel efficient & cost effective.

The challenge of manufacturable redesigning of Aluminium CAC tank to Plastic Moulded tank was overcome during the design stage itself by generating several ideas through brain storming sessions & eliminating tooling problems. Customer requirement of mounting of temperature sensor on complex angled pipe shape was the most critical feature of the design. These features were redesigned with our reach experience & unique designs in mold and achieved by providing 5 complex sliders in the mould. Other challenges in Plastic molding process like differential shrinkage, flatness, Warpage & Pipe Ovality were taken care with our knowledge & experience through plastic flow simulation software – Moldflow. With our successful re-designing, Development & Commercialization of CAC tank customer could get weight saving of almost 50% (212 Gm) over the traditional Aluminum tank.

**Team - Shri Shantesh Chaudhari, Shri Ajay Siddannavar, Shri Ramchandra Shejwal, Shri Vidyadhar Ingale, Shri Yogesh Kotkar & Shri Nilesh Gujar of M/s Varroc Polymers Pvt. Ltd. - R&D Center is recognised with COMMENDATION of National Awards 2012-13 under the Academics/R&D Institution Category of "INNOVATION IN POLYMERIC PRODUCTS"**

Shri J. P. Aghera

**M/s ELPIE Engineers Pvt. Ltd.**
Plot No. 2749,
GIDC-Metoda, Rajkot
Gujarat.

**M/s Elpie Engineers Pvt Ltd** is very young plastic extrusion machinery Manufacturer Company with PP non woven fabric making machine, PP/PS/PET sheet extruder machine, thermoforming machine and thermoforming mould in its product portfolio. Under the flagship of Shri Jayantilal P. Aghera, Technical Director of ELPIE, the company has got the momentum and witnessed steep growth with innovative and first of its kind product. ELPIE is focused on the development of High performance extruder lines for several diverse applications for flexible packaging industry.

The vision of Shri J. P. Aghera, his zeal and passion for innovation contributed several first times in India technology in sheet/film extrusion lines to the Plastic Industry. With over 27 years of experience in tailoring plastic extrusion machinery, his passion, motivation, commitment and ethical business practices have poised the company to achieve higher success.

## "PP Non-Woven Fabric Making Machine"

### *M/s ELPIE Engineers Pvt. Ltd.*

One of the fastest growing application and tremendous demand of PP non woven fabric created vacuum for indigenous PP non woven fabric making machine. ELPIE's PP Non woven Spunbond lines offer various customized sizes ranging from 1.6 to 3.2 m fabric width with 12 -150 GSM. India's first indigenous, high-tech and high output PP non woven spunbond line with 3.2 m fabric width and 450 kg/hr capacity has been commissioned successfully in India by ELPIE.

Non – woven technology in plastic industry is showing hope for the biodegradable and environment friendly packaging. It caters to diversified industry – Agriculture, Geotextile, Automotive, Sanitary & hygiene, home furnishing & households. Machine produces zero wastage as whatever wastages produced is fed to the recycle extruder to make new fabric with allowable variation of ± 5 % only. Energy efficiency with 0.65 to 0.7 unit/kg, no noise pollution, environment friendly, easy to operate with help of single touch console etc. These are a few features of the PP non woven fabric making machine produced by ELPIE.

Enhanced spinning system which includes optimized air process supply optimized stretching and optimized lay-down would lead to the superior quality of PP non woven fabric. Availability of superior quality of the machine locally would act as the growth of the Plastic industry.

**M/s ELPIE Engineers Pvt. Ltd. is recognised with COMMENDATION of National Awards 2012-13 under the Industry Category of "INNOVATION OF POLYMER PROCESSING MACHINERY & EQUIPMENTS"**

Dr. T S Natarajan

Ms. Ramani Dhandapani

PHYSICS EQUIPMENTS CO

**Indian Institute of Technology - Madras**
Chennai - 600 036, Tamilnadu

**Physics Equipments Co.**
1, Lalitha Garden, Sannidhi Street
Thiruvanmiyur, Chennai – 600 041
Tamilnadu.

**Indian Institute of Technology - Madras** is one among the foremost institutes of national importance in higher technological education, basic and applied research. The Institute was formally inaugurated in 1959 by Prof. Humayun Kabir, Union Minister for Scientific Research and Cultural Affairs. The Institute has fifteen academic departments and a few advanced research centre's in various disciplines of engineering and pure sciences, with nearly 100 laboratories organized in a unique pattern of functioning.

**Dr. T S Natarajan** is a senior professor of Physics at the Indian Institute of Technology Madras, Chennai. He has served this institute with distinction for the past 37 years. He got his PhD also in the year 1984 from the same institute. He has developed many teaching aids and demonstration aids in Physics and Electronics and has more than 75 publications to his credit. He has won several awards for his teaching and research over the years. The technology related to the Electrospining equipment was developed in IIT Madras, Chennai. It was transferred in the year 2007 to Physics Instruments Co, founded in the year 1959 by Prof. T. Krishnamurti. Later Physics Equipment Co. was formed in 2009 to exclusively cater to the needs of nanotechnology and research based instrumentation.

**Ms. Ramani Dhandapani** is the Proprietor of the Physics Equipments Co., and Mr. C. Dhandapani is a Partner in Physics Instruments Co. The Electro Spinning Apparatus, ESPIN-NANO, was jointly developed with support from Prof .T.S. Natarajan of Physics Department of IIT-M.

## "Design and Development of an Indigenous Electrospinning Apparatus for Preparing Nano Fibers of Polymers"

*Dr. T. S. Natarajan & Ms. Ramani Dhandapani*

Electrospinning is a simple and versatile method to produce polymer nanofibers by accelerating a charged polymer jet in a very high electric field. The diameter of the fibers are in the range of 10µm to 10 nm, which is typically 1-3 orders less than that obtained by the conventional spinning process. The main components of the electrospinning process can be classified as (i) syringe (or pipette), (ii) high voltage power supply and (iii) counter electrode or substrate. Polymer in solution (or melt) form is loaded in the syringe and is connected to the positive terminal (it also can be negative terminal) of the high voltage power supply. For continuous production of nanofibers, the solution should be pushed at a constant flow rate. Generally, a syringe pump serves this purpose.

In the electrospinning process a high voltage is used to create an electrically charged jet of polymer solution or melt. One electrode is connected to the spinning solution/melt and the other attached to the collector. In most cases, the collector is simply grounded. The electric field is concentrated at the tip of the needle that contains a pendant droplet of the solution held by its surface tension. Accordingly, charges are induced on the surface of the drop. Mutual charge repulsion and the tendency of the surface charges to move towards the counter electrode, result in an electrostatic force against surface tension. As the intensity of the electric field is increased, the hemispherical surface of the fluid at the tip of the capillary tube elongates to form an inverted cone known as the Taylor cone. On increasing the electric field further, a critical value is reached when the repulsive electrostatic forces overcome the surface tension forces and a fine jet of charged polymer solution is ejected from the tip of the cone. This jet is further subjected to elongation process and instabilities, which results in the jet becoming very long and thin as they move towards the counter electrode. The polymer strands now start moving away from each other due to mutual repulsion and ultimately collect on the counter electrode as a random coil of nanofibers. Once the jet comes into the atmosphere, the low boiling point solvent evaporates, leaving behind only the charged polymer strands.

**Team - Dr. T. S. Natarajan of IIT-Madras and Ms. Ramani Dhandapani of Physics Equipments Co., Chennai is recognised with COMMENDATION of National Awards 2012-13 under the Academics/R&D Institution Category of "INNOVATION OF POLYMER PROCESSING MACHINERY & EQUIPMENTS"**

Dr. P. Nalayini

Dr. K. Sankaranarayanan

**Central Institute for Cotton Research**
Maruthamalai Road
Coimbtore - 641 003
Tamilnadu.

The Indian Council of Agricultural Research (ICAR) is an autonomous organization under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture, Government of India, Formerly known as Imperial Council of Agricultural Research and **established in 1929** Headquarted at New Delhi. the Council (ICAR) is the apex body for co-ordinating, guiding and managing research and education in agriculture including horticulture, fisheries and animal sciences in the entire country. With **99 ICAR Institutes** and **53 agricultural universities** spread across the country this is one of the largest national agricultural systems in the world. The ICAR has played a pioneering role in ushering Green Revolution and subsequent developments in agriculture in India through its research and technology development, making a visible impact on the national food and nutritional security. It has played a major role in promoting excellence in higher education in agriculture. It is engaged in cutting edge areas of science and technology development and its scientists are internationally acknowledged in their fields. With a view to develop a Centre of excellence for carrying out long term research on fundamental problems limiting cotton production and also to provide basic support to location specific applied research, the Indian Council of Agricultural Research has established the **Central Institute for Cotton Research (CICR)** at Nagpur in 1976.

**Dr. (Mrs.) P. Nalayini,** Principal Scientist joined ICAR as Scientist in 1993 and was elevated to Principal Scientist from 2009. She has been awarded the best thesis award by TNAU and subsequently received four awards by various National and International conferences for her research work. She has more than 100 publications in nationally and internally renowned journals, International and national conferences, book chapters and bulletin. She has specialized in weed science and water management. She was the Principal investigator of many projects including Technology Mission on Cotton Project with ten centers spread across the cotton growing regions of India. Her decade of classical work on use of poly ethylene mulching for doubling the yield of cotton based system besides weed control and moisture conservation is a worthy and notable contribution among others.

**Dr. K. Sankaranarayanan,** currently working as Principal Scientist (Agronomy) at Central Institute for Cotton Research holds a brilliant academic records, devoted primarily to research on cotton for nearly a decade. He obtained his Ph.D. from Tamil Nadu Agricultural University in 2001. He is a Practical agronomist and handled many projects as Principal Investigator including a NAIP project on Cotton value chain. His work on multi-tier cropping system deserved special mention. He has published his work in leading journals, conferences and symposia. He has received the best research article award for 2010 in Indian Journal of Agronomy by Indian Society of Agronomy.

## "Polyethylene Mulch Technology for Moisture Conservation, Weed Control and Enhancing the Productivity of Cotton-Maize Cropping System"

*Dr. (Mrs.) P. Nalayini & Dr. K. Sankaranarayanan*

Cotton crop is normally grown under ridges and furrow method and we have introduced broad bed furrow method under polyethylene mulching. The inter space between the broad beds were used to grow pulse crop (green gram) which could fetch additional income besides smothering weeds and enriching the soil with atmospheric nitrogen (legume effect).Due to enhancement in soil temperature, the plant growth promoting rhizobacterial population like Azospirillum, Phosphorus solubilizing Bacteria, Facultative Methylotrophs and total Diazotrophs were enhanced by 2-3 fold under polyethylene mulching. Cotton is a perennial crop and cutting the stem causes re growth. However after cotton harvest, when the cotton stem was cut below the cotyledon leaves, re-growth was prevented and succeeding rotation crop of maize was grown successfully in the old polyethylene sheet without removing the sheet. Combining drip system with poly ethylene mulching has been proved to be the best for easier application of fertilizers as fertigation. Irrigation water saving due to polyethylene mulching with conventional irrigation was 40- 50 % and polyethylene with drip irrigation was up to 85 %. No need for separate weed control because the opaque mulches will not allow weeds to grow and compete with crops. Doubling the yield (1.9 fold in cotton and 2.1 fold enhancement in succeeding maize) crop has been achieved. Water use efficiency was the highest (142.7 kg seed cotton/ha cm of water) under poly mulch + drip as against the lowest (42.7 kg seed cotton/ha cm of water) under conventional irrigation. The water saved by adopting polyethylene mulching could be used to bring additional area under irrigated crop.

**Team - Dr. (Mrs.) P. Nalayini & Dr. K. Sankaranarayanan of Central Institute for Cotton Research is recognised with COMMENDATION of National Awards 2012-13 under the Academics/R&D Institution Category of "POLYMERS IN AGRICULTURE AND WATER CONSERVATION"**


Prof. (Dr.) S. K. Nayak


Shri S. Ilangovan


Shri R. Joseph Bensingh


Shri B Nandagopal


Dr. K. Gireesan


Dr. T. S. Radhakrishnan

**Advanced Research School for Technology & Product Simulation (ARSTPS) – CIPET,** Guindy, Chennai

**&**

**Indira Gandhi Centre for Atomic Research (IGCAR),** Kalpakkam

**Advanced Research School for Technology & Product Simulation (ARSTPS)**, R&D wing of CIPET is the manifestation of qualitative research in the emerging areas of Plastics Product Development and life cycle analysis. The R&D centre is equipped with state-of-the-art infrastructure facilities to undertake various developmental activities in the focused areas viz. • Product Design • Product Development • Analysis & Simulation etc. ARSTPS team work on various projects related to different domain areas such as Automotive, consumer products, health care, telecom and aerospace to solve most challenging technical issues.

**Indira Gandhi Centre for Atomic Research (IGCAR)** under the Department of Atomic Energy is engaged in broad based multidisciplinary programme of scientific research and advanced engineering directed towards the development of Fast Breeder Reactor technology.

**Prof. (Dr.) S. K. Nayak,** Ph.D, D.Sc., has been working in the advanced field of Polymer Science & Engineering for last 26 years with rich expertise in academics and research. As Principal Investigator, undertook 50 sponsored R&D Projects and guided over three dozen Ph.D Scholars. He has over 250 research publications in leading international journals, more than 200 international conference proceedings, 05 patents, 10 pending published patents and 30 Design registrations. He is author and editor of 15 Books/Books Chapters in the field of Advanced Materials and Polymer Engineering & Science.

**Shri S. Ilangovan** is Chief Manager (T) at the CIPET Head Office. He has over 23 years of experience in the design and development of products and tools using CAD/CAM/CAE.

**Shri R. Joseph Bensingh** is working as Scientist at ARSTPS-CIPET. He has over 17 years of experience in the field of design and development of products and tools using CAD/CAM/CAE and CNC.

**Shri B Nandagopal** is Technical Officer at ARSTPS-CIPET. He has over 12 years of experience in the field of design and development of products using CAD/CAE, Tooling and testing.

**Dr. K. Gireesan** is currently a Scientific Officer (G) at the Indira Gandhi Centre for Atomic Research.

**Dr. T. S. Radhakrishnan** is superannuated from IGCAR as Head, Materials Science Division and is currently a DST supported Scientist with the MEG program at IGCAR.

## "Design and Development of Non Magnetic and Non Metallic Gantry for Magnetocardiography"

*Shri B. Nandagopal, Shri R. Joseph Bensingh, Shri S. Ilangovan & Prof. (Dr.) S. K. Nayak & Dr. K. Gireesan & Dr. T. S. Radhakrishnan*

Polymeric products, accessories and subsystems form integral and often visible front end parts of most modern health care diagnostic equipments, providing both aesthetic appeal and functionality. The development of the Gantry in this work represents an important indigenous capability in this sphere of medical equipment building. This has been developed as a functionally important accessory to the Magnetocardiography (MCG) System for routine cardiac investigations of patients in clinical settings in hospitals.

MCG is a technique that measures the tiny magnetic fields generated by the electrophysiology of the functioning of the heart and is complimentary to the well known ECG technique. The technique requires shielding of ambient electric and magnetic noise and also demands non magnetic materials for all its components including for the gantry that holds the system. The Gantry essentially is a hoist for the cryostat containing the SQUID sensors which is the heart of the system. The cryostat is a 1100 mm tall, 400 mm diameter, cylindrical double walled vacuum vessel made of FRP and is 50 kgs in weight, held in the Gantry by a cast FRP cantilever arm. This arm traverses on a polymeric lead screw and can be raised or lowered by a gear arrangement and a hand rotated wheel, to enable positioning of the human subject below the cryostat. The gantry is constructed using completely non magnetic and non metallic materials including fasteners. The materials used are Cast Nylon, E-glass Fiber and Epoxy resin. The design was subjected to safety analysis prior to fabrication and is successfully tested and is in routine operation at the Indira Gandhi Centre for Atomic Research.

**Team - Shri B. Nandagopal, Shri R. Joseph Bensingh, Shri S. Ilangovan & Prof. (Dr.) S. K. Nayak of ARSTPS - CIPET & Dr. K. Gireesan & Dr. T. S. Radhakrishnan of IGCAR is recognised with COMMENDATION of National Awards 2012-13 under the Academics/R&D Institution Category of "POLYMERS IN PUBLIC HEALTH CARE"**

Prof. (Dr.) S. K. Nayak

## 3rd National Awards for Technology Innovation in Petrochemicals and Downstream Plastic Processing Industry (2012-13)

*by*

**Prof. (Dr.) S.K. Nayak**
Director General - CIPET &
Chairman - 3rd National Awards Committee

India is significantly mounting in the industrial world with economic growth and is expected to be one of the largest by the turn of this decade. Virtually, in all key sectors of economy Agriculture, Infrastructure, Healthcare, Textiles and Consumer durables, polymers occupy a very important role. Polymers provide critical inputs which enable other sectors to grow.

The properties of commodity plastics are being enhanced by adding fibres, additives, etc. & these cost effective engineered plastics are replacing the application of engineering plastics. As a result, the overall product cost is reduced with increased performance. Rapid development of the macromolecular chemistry demands the development of the specialty polymers & products to adopt modern technology. Although most of the mass-produced polymers consist in plastic materials, fibers, synthetic rubber, thermal, chemical or electrical resistant lacquer or enamel coatings, the production of new polymers with special properties is becoming more and more important. During the last decade, the various uses of these materials have reached high levels of complexity.

In India, polymers demand increased from 5 million tons to 9 million tons (approx.) and capacity increased from 6 million tons to 10 million tons (approx.) in last six years. During the 12th five year plan there is potential to grow up to 14 million tons (2016-17). The focus will be on value additions to remain competitive, innovative designing for sustainable development and penetrating into high technology segments. Currently the expenditure on R&D in the Petrochemical sector is less than 1% of industry turnover. This needs to be increased in phases to 2 to 3%. The research in science and technology is essentially to achieve progress in economic growth, social development and environmental protection. The investment will allow India to continue to enjoy the many societal benefits that will flow from research and development in polymer science and engineering.

In order to promote & encourage the development of environmental friendly cost effectively polymeric material, products & process / technologies in line with the guidelines of National Policy on petrochemicals, Department of Chemical & Petrochemicals (DCPC), Govt. of India has announced a scheme –National Awards for Technology Innovation in Petrochemicals and downstream Plastics Processing Industry, with the core philosophy of "Reward the innovation suitably with an Award".



*contd...*

Central Institute of Plastics Engineering and Technology (CIPET), an extended arm of Dept. of Chemical & Petrochemicals, Govt. of India has been entrusted with the task of processing of the applications/nominations, scrutiny and evaluation of nominations through field experts tills the completion of organizing successfully the award function.

During 2010-11, 09 nominations were declared as winners and during 2011-12, 15 nominations were declared as winners and 10 nominations as runner up. The winners of National Awards were awarded with Shield, Citation & Cash award and runners-up were awarded with Shield & Citation.

The categories were classified as given below:

***1. Innovation in Polymeric Materials:***

New Polymers, Blends & Alloys, filled materials, fibers, Polymer, Composites and Nano composites, Smart Materials etc.,

***2. Innovation in Polymeric Products:***

New / creative product design, Non conventional application / Replacement of conventional materials (eg. Metals, ceramics etc.), Modification of product design for performance improvements

***3. Innovation of Polymer Processing Machinery & Equipments:***

Development of new processing techniques, Modification of machinery for higher efficiency/productivity / Automation, Energy conservation, product quality improvement, Improvement in moulds, dies and auxiliary equipments

***4. Innovation in Polymer Waste Management & Recycling Technology:***

Newer technology in plastic waste utilization into products/energy recovery, Recycling Technology, Plastic waste collection, segregation techniques, Product design for improved recyclability

***5. Innovation in Green Polymeric Materials & Products:***

Biopolymers, Biodegradable / compostable Polymers, Time controlled degradation, Green material filled polymers, Biodegradability evaluation techniques

contd...

***6. Polymers in Agriculture and Water Conservation:***

Water transportation, mulching, canal lining, Drip irrigation, Sprinkler system, Low Tunnels, Poly house etc., Controlled release system for fertilizer, pesticides, micro nutrients, etc., Innovative packaging for agriculture, floriculture and horticultural produce, Controlled permeability films & packaging for improved shelf life Novel Usage of plastics for food security.

***7. Polymers in Public Health care:***

Affordable / cost effective implants, implements and devises, New innovative products for medical application, Polymer based new drugs delivery system, Polymer body implants, Drinking water storage& transportation, Polymer membrane for water purification /Desalination, Devices for waste water, drainage, sewage treatment system

***8. Research in the field of Polymer Science & Technology***

Individual / Team of researchers in R & D Institutions & laboratories, original research work in polymeric materials processing etc. leading to proto type development & future industrial applications.

**IMPLEMENTATION FRAMEWORK & OPERATIONAL MODALITIES :**

306 numbers of application/nominations received for awards were scrutinized and valuated by the nominated field experts headed by the Director General, CIPET & Chairman of 3rd National Awards with the representatives from administrative Ministry / Government institution / Research laboratories / Academics Institution, National Level Industry Associations associated with petrochemical products and other representatives from Government of India. The recommendation of the Expert Committee was deliberated at the Prize Award Committee headed by the Joint Secretary of the Department of Chemicals & Petrochemicals. 11 nominations were finally selected and rewarded as WINNER, 08 nominations were rewarded as RUNNER-UP and 06 nominations were rewarded as COMMENDATION.

The Third National Award Function - to encourage and to promote Technology Innovation in Petrochemicals and Downstream Plastics Processing Industry (2012-13) is being organized on 7th May, 2013 at Manekshaw Centre, New Delhi.

**Central Institute of Plastics Engineering & Technology (CIPET)** is a premier National Institution devoted to Academic, Technology Support & Research (ATR) for the Plastics & allied industries in the India. Today CIPET operates a Hubs & Spokes model with 23 locations spread across the length & breadth of the country, which includes 5-High Learning Centres, 11-Other Learning Centres, 2-R&D wings, 3-Specialized Centres, 2-Vocational Training Centres. All the CIPET centres have uniform infrastructural facilities in the areas of Design, CAD/CAM/CAE, Tooling, Plastics Processing, Testing & Quality Control to cater to the needs of plastics and allied industries in the country.

CIPET offers blend of various specialized Academic Programmes in the field of Plastics Engineering & Technology (Doctoral, Post Graduate, Undergraduate, Post Diploma or Diploma) in order to provide qualified human recourses to plastics & allied industries. The Technology Support Service (TSS) to the industries and ingenious Research are the important product portfolios of CIPET.

CIPET renders Technology Support Services in Design, Tooling, Plastics processing, and Testing & Quality Assurance in India and abroad. CIPET's expertise as a third party inspection agency for plastics products as recognized by various Central & State Govt. organization for pre-dispatch/ delivery inspection of plastics & allied products.

CIPET has a R&D vision to be recognized as global R&D hub, in the area of Polymer Composites, Nanocomposite, Biopolymers, Functional Plastics, Carbon Nanotubes, Polymer Membranes, Conducting Polymers, Fuel Cells, E-Waste recycling etc., & Innovative product concept development & commercialization by aid of CAD/CAM/CAE expertise. Accordingly, CIPET has established two exclusive R&D centres viz. Advanced Research School for Technology & Product Simulation (ARSTPS) at Chennai and Laboratory for Advanced Research in Polymeric Materials (LARPM) at Bhubaneswar.

CIPET has signed various memorandum of Understanding (MoUs) for joint collaboration in faculty & staff exchange, student exchange, cooperative research exchange of academic materials etc., with leading international universities/ organizations at USA, Canada, Australia, Germany, France, Korea, Poland Mexico, China & Brazil.

With strong Alumni base of about 45,000 professionals, CIPET has emerged as an apex plastics technology institution, not only in India but a unique institution of its kid in Asia.

# NATIONAL AWARDS FOR TECHNOLOGY INNOVATION

## in Petrochemicals & Downstream Plastics Processing Industry

**Government of India**
**Ministry of Chemicals & Fertilizers**
**Department of Chemicals & Petrochemicals**

## INVITES

Nomination from Individual / Team,
Small / Medium / Large scale Industry, Academic / R&D Institution for


**Close of Nomination : 31st October 2013**

***Organised by:***

सेन्ट्रल इंस्टिट्यूट ऑफ प्लास्टिक्स इंजीनियरिंग एण्ड टेक्नोलॉजी (सिपेट)
**CENTRAL INSTITUTE OF PLASTICS ENGINEERING & TECHNOLOGY (CIPET)**
*(Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Government of India)*

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