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PLASTINDIA FOUNDATION®

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Member

Rajeev Chitalia
Member

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Member

New Office Bearers for 2015-2018

K K Seksaria elected as President of Plastindia Foundation for 2015-18

Rajiv Raval takes over as Vice President and Raju Desai as Treasurer

In the elections held on September 22, 2015 for the new Managing Committee of Plastindia Foundation, K K Seksaria was elected as the President, Rajiv Raval as Vice-President and Raju Desai as Treasurer of the Plastindia Foundation. All were selected unanimously. The new Managing Committee comprising of senior entrepreneurs of the Plastics industry assumed office with immediate effect. K K Seksaria took over from Subhash Kadakia.

Plastindia Foundation is the apex body of seven key all-India plastics industry associations. Indian Plastics industry contributes to more than Rs 90,000 crores to the exchequer and is one of the top five industries contributing to Indian GDP. It is growing at 15% per year and is expected to even grow at a faster pace once "Make in India", Skill India, Digital India, infrastructure, smart cities and smart villages come into force.

K K Seksaria is a veteran in the plastics industry and is the Managing Director of Uma Plastics Limited. He has served as the President of Indian Plastics Federation, Kolkata and also as Treasurer for Plastindia Foundation (2009 – 2012). Rajiv Raval has been President of Gujarat State Plastics Manufacturers Association and has served as Treasurer for Plastindia Foundation (2012 – 2015). He is the Executive Director of Vishakha irrigation Pvt Ltd. Raju Desai is the past Chairman of Plastivision 2013 and past-President of The All India Plastics Manufacturers' Association (AIPMA). Raju Desai is the Senior Executive Director – Marketing and HR of Jyoti Group.

Commenting on his election as President, K K Seksaria said, "I am grateful to the industry for the confidence reposed in me. Plastics Industry is one of the fastest growing industries in India which aims at serving the nation & its citizens by way of making their life easier & affordable as well as contributing to the national growth. Though there are various challenges before the industry, we are confident that with wider participation of all segments & stakeholders, we will be able to meet all challenges and to take plastics industry forward qualitatively and quantitatively".

Rajiv Raval is another industry veteran and a champion for "Go Green", "Live Green" concept. Engaged deeply in drip irrigation projects, Raval said, "I take this appointment as an opportunity to dispel the negative notions associated with plastics. As an industry, we must work together to ensure that the future generations have a better and greener planet to live."

Raju Desai mentioned, "The onus is on organisations like Plastindia Foundation to fulfil our Prime Ministers vision of 'Make in India'. The plastics industry in India has the capability of making India as the global hub of plastics and plastic-products. At Plastindia Foundation, we shall make all efforts in this direction".

Others elected to the Managing Committee are Jayesh K. Rambhia, Dr. S. K. Nayak, M. K. Mandal, Nitin Shah, Pradip Nayyar, Dr. E. Sundaresan, Atul H. Kanuga, Paresh V. Parekh, Gautam H. Gandhi, Rajeev Chitalia and Pradip Thakkar.

President: Mr K K Seksaria

A Chartered Accountant by Qualification, he has over 33 years of experience in Plastics & Engineering Industry. He is the Managing Director of Uma Plastics Ltd., apart from being director in various Companies. He is the past President of Indian Plastics Federation, Kolkata and has served as Hon. Treasurer for Plastindia Foundation for the term 2009-12. He is associated with various other Federations & NGO's

Vice President : Mr Rajiv Raval

He is a Executive Director, Vishakha irrigation Pvt Ltd. A second generation entrepreneur, engaged in drip irrigation activities, committed to Go Green, Live Green. He is the past President of Gujarat State Plastics Manufacturers Association and has served as Hon. Treasurer for Plastindia Foundation for the term 2012-15. He has been Gujarat State Plastic Manufacturers' Association nominee in Managing Committee of Plastindia Foundation

Treasurer : Mr Raju Desai

A Senior Executive Director – Marketing and HR at Jyoti Group , a leading Plastics Design and Processing firm in India since 1959 and Director of Intercontinental Polymer Pvt. Ltd. an Indo American joint venture focusing on plastics compounding and distribution. He has been the nominee from The All India Plastics Manufacturers Association (AIPMA) in the Managing Committee of Plastindia Foundation, also nominated to Plastindia International University (PIU) Committee. He is the past Chairman of Plastivision 2013 and past President of The All India Plastics Manufacturers Association (AIPMA).

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From the President's Desk

K K Seksaria

Dear Friends,

I feel honoured to communicate with you through this In-House Journal as President of Plastindia Foundation, for the first time. I am grateful to the Managing Committee of the Foundation, the Founder Members and the Industry for giving me this opportunity to serve the Plastics Industry. It was with great honour that I served as Treasurer of PIF for the term 2009-2012, and look forward to another productive and exciting term for the Foundation..

India is a land of opportunities. Much has been spoken about the growing Indian Plastics Industry and the potential it has to offer. We should focus on pushing this growth to envelope, challenging ourselves to think and go beyond target that we have set for ourselves. Over a span of many decades, the Indian Plastic industry has moved from simple processing to manufacturing speciality and high performance products. While the domestic market is the primary focus, the industry has the requisite characteristics and is fast becoming a Global Sourcing Hub for Plastics.

The Foundation is engaged in various activities which will help not only the Plastics Industry but also in turn , contributing to the overall growth of the country. One of the major initiatives that Plastindia Foundation has undertaken is in the field of education, specifically dedicated to the Plastic Industry. The Foundation is in the process of setting up of the Plastindia International University at GIDC, Dungra, Vapi, Gujarat, for providing trained manpower of International Standards to the Plastic industry and developing skilled entrepreneurs.

Today, the Plastics Industry faces major challenges on Environmental issues. Plastindia Foundation has taken several initiatives through its Environment and Plastics Image Committee in tackling the same. It is currently focusing on educating public at large regarding promoting Plastics waste recycling, avoiding littering of Plastics, proper waste disposal etc., by disseminating awareness amongst the cross section of the society with specific emphasis on young minds and the policy makers.

With this social objective in mind, Plastindia Foundation is also pursuing its goal of helping the farmers through use of drip irrigation systems to effectively increase the yield of the crops substantially by conservative use of scarce water. This is creating a definite positive image for Plastics on the environmental front.

The theme of current Plastindia Foundation In-House Journal is Plastics in Health & Hygiene. The modern medicine/medical equipment, over the years has increasingly become dependent on Plastics which has proved to be a boon for tremendous development achieved in the field of Medical Applications. This is due to the fact that Plastic have replaced several energy - consuming and scarce natural resource materials, thus resulting in lower packaging and other processing costs as well as delivering high quality medical products. I am sure that the various articles published in this issue will prove to be immensely informative to the reader.

I cordially solicit your suggestions and opinions for taking the activities further with greater efficiency and effectiveness.

Best Regards,
K K Seksaria
President Plastindia Foundation.

From the Desk of ...

Rajiv Raval

Dear Friends,

It gives me immense pleasure and pride to address you for the first time from the desk of Vice President, Plastindia Foundation. I am grateful to the new managing committee for having reposed faith in me and electing me as Vice President of this illustrious institution for the term 2015-2018. It was indeed an honour for me to have served the Foundation as Hon. Treasurer for the term 2012-2015 and I look forward to an eventful term as Vice President for the current term.

The theme for current issue of the In-House Journal is "Plastics in Health & Hygiene". In the past few decades, plastics have made latest medical science less painful and more affordable by all. Today, medical industry is using some of the most advanced Plastics products. There are several devices that could not have been possible without plastics. Plastics have actually saved, increased and enhanced lives of hundreds of thousands of people across the world.

Plastics remain at the forefront of Medical Innovations. In the early 1970s, manufacturers were using materials like glass, rubber, and metal to assemble syringes, surgical instruments, and other devices. With the advances in technology, the need for plastics became indispensable for use in intricate, high-performance device designs. Novel creations in polymer chemistry are expanding the variety of applications. Global market for Medical Polymers is expected to reach US $ 17 billion by 2020.

Indian Healthcare sector is estimated at US$38 billion expected to reach US$80 billion by the end of 2015. In the next 15 years it will grow at 15% CAGR. Use of plastics in healthcare industry in India will grow by 15% p.a. for next 5-6 years. Global market of plastics is 175 mtpa.

I hope that the articles in this issue on plastics in Medical Applications will be useful and give a better insight to all.

Rajiv Raval
Vice President
Plastindia Foundation.

Rajeev Chitalia

Dear Friends,

In my first message from the NEC Chairman's Desk, I would like to thank the members of Managing Committee of Plastindia Foundation for giving me this responsibility to steer Plastindia 2018 Exhibition to a Grand Success.

I am confident that with the help of Domestic as well as International Plastics Fraternity, we will be able to set world class standard to Plastindia 2018.

You all are aware that, Plastindia Foundation is the apex body of the Indian Plastics Industry, which, organises, the "PLASTINDIA" show, the 3rd largest Plastics International Exhibition in the world. A show of such a magnitude can only achieve success and grandeur with the contribution from the industry people, like you.
It is my proud privilege to address you through this medium and I, personally seek your help and support to lead PLASTINDIA 2018 – the 10th International Plastics Exhibition & Conference to scoring new heights.

I welcome you to be a part of the prestigious PLASTINDIA 2018, which, is to be held from February 7 – 12, 2018 at Gandhinagar, Gujarat.

With warm regards,
Rajeev Chitalia
Chairman - NEC

From the Editor's Desk

Kavita Shah

President - Mr. K. K. Seksaria
Vice President - Mr. Rajiv Raval
Hon. Treasurer - Mr. Raju Desai

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Dear Friends,

Modern healthcare would be impossible without plastics. Advancements in medical polymers offers endless versatility, making medical breakthroughs considered unthinkable 5-6 decades ago, commonplace today. In the past few decades, plastics have made health care simpler and less painful, reduced contamination, relieved pain and reduced medical costs as well as unleashed an endless possibility of new techniques and prostheses. People are living better, longer and have increasingly fulfilling lives. The incorporation of plastic into modern medicine has steadily increased in the last decade. Plastics represent the largest materials group in medical technology, with a share of 45%- of which standard thermoplastics dominate with over 80%, while engineering account for less than 20% of the plastics employed in medical engineering. Plastics find use in simple one time use products like syringes, gloves, blood bags, to a range of packaging including sterile packaging for medical instruments and drug packaging. Besides, plastics make possible surgical stitching material, operating instruments for minimal invasive surgery, prostheses, artificial organs.

The potential for polymers in the medical and pharmaceutical industries - endless as new materials come on stream, is discussed. Significant developments in plastics technology have coincided with the advent of innovative medical devices such as pacemakers, stents and hip-replacement devices. The advent and use of biocompatible plastics for medical devices that have paved the way for better and enhanced care giving are also discussed. Some of the materials to watch out for as discussed in this issue include Ketone polymers , Polyethylene and cyclic olefin copolymers (COCs), Bioresorbables, Fluoropolymers. Also discussed in this issue is Lean Six Sigma for Medical Device Design/Manufacturing that has special relevance to the medical and healthcare industry due to the loss of life and quality of life implications. Discussed in depth is Medical Textiles and nonwoven fabrics that play a vital role in the medical sector- from surgical gowns, masks and other wearable products to surgical drapes, pads, dressings and filtration materials

Three new sections have been introduced in this issue:Investment Opportunities in plastics in India , Make In India- The story continues, Academia corner

The editorial team takes this opportunity to welcome the new Office Bearers and Managing Committee of Plastindia Foundation 2015-2018.

Kavita Shah
Chairperson – Publication Committee
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Polymers - Medical Technology Materials

The potential for polymers in the medical and pharmaceutical industries is endless as new materials come on stream. Plastics have paved their way into every aspect of human life over last century and particularly over past twenty five years due to their unique properties. Significant developments in plastics technology have coincided with the advent of innovative medical devices such as pacemakers, stents and hip-replacement devices which have enabled medical solutions for all types of ailments and impairments. Along with cost effectiveness, the Medical Polymers differ on various counts in quality, processability, resistance to degradation and ability for storage under wider conditions etc. The article includes current technology trends resulting in developments of new materials.

The advent and use of biocompatible plastics for medical devices has two main benefits. The range of applications has paved the way for better and enhanced care giving. They have also enabled these safe and effective medical solutions to be available at much lower costs. This means they can meet the demands of modern medical science and technology and benefit a larger percentage of the masses at the same time.

Figures 1 and 2 display some medical devices made from plastics.

Fig. 1: Some intricate medical devices

Fig.2: Some of the devices made from PVC

Polymers as Medical Technology Materials

Polymers comprise nearly half of all medical technology materials used. As medical applications grow more sophisticated, manufacturers are turning to engineering thermoplastics to gain the performance they need in such end uses as:

- Drug delivery systems, e.g., drug packaging, inhalers and needleless injection devices;
- Diagnostic systems, e.g. functional parts and micro titer plates;
- Medical device components, e.g. clamps, Cannula, sterilization containers, blood filters and instruments for minimally invasive surgery; and
- Orthopedic implants: Plastics are now being used as orthopedic devices, where they align, support (the abdominal wall for example), correct deformities (heel joint for example), or improve the function of movable parts of the body (when used in a hip joint).
- Plastics prosthesis can replace a body part, taking over its main function. Plastics pill capsules release exactly the right dosage of its active ingredients at the right time.
- The need to ensure drugs are administered easily, safely and at the recommended dosage has fostered a trend toward smart products, such as insulin injection pens, powder inhalers for asthmatics and needleless syringes. In addition, manufacturers are developing diagnostic equipment, such as for blood sugar and blood pressure, as well as reliable, user-friendly and cost-effective medical devices.

Polymers & Respective Applications

Biocompatibility, ability to be autoclaved or subjected to sterilization, chemical resistance, transparency, and the ability to produce complex shapes make plastics an ideal choice for medical applications. Newer grades, additives and better processing techniques have made many plastics most suitable for medical applications. Some of these are:

- PVC (Polyvinylchloride) : Blood tubing, blood bags
- PES (Polyethersulfone) : Single and multi-lumen tubing, catheters
- PTFE (Polytetrafluoroethylene) : Catheter linings, single and multi-lumen tubing, synthetic blood vessels, endoscopes, surgical sutures, reconstructive surgery, soft tissue regeneration patches
- PE-UHMW or PE-LD & HD (Polyethylene) : Surgical cables, artificial tendons and orthopedic sutures, tubing
- PU (Polyurethane) : Breathable wound dressings
- EI (Polyetherimide) : Reusable and sterilizable applications, surgical skin staplers
- PC (Polycarbonate) : Medical instruments and containers with glasslike transparency, check valves and tubing connectors

- PS (Polysulfone) : Surgical and medical devices, clamps, artificial heart components, heart valves
- PEEK (Polyetheretherketone) : Dentistry products, rigid tubing
- PP (Polypropylene) : Heart valve structures

The following diagram (Fig 3) gives an overview of share of various materials in Medical Applications.

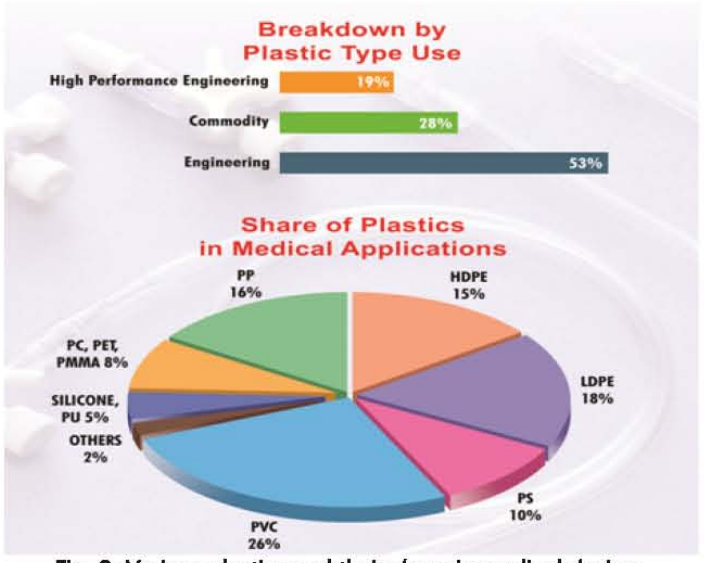


Fig. 3: Various plastics and their share in medical devices

PVC will Continue to Dominate

PVC, owing to its outstanding softness finds increased use in medical devices. However, owing to toxicity issues of polyvinyl chloride, benefits of other materials, including polypropylene and polyethylene were explored. Though polyvinyl chloride (PVC) would continue to dominate the non-invasive medical products and standard medical packaging markets, the future is likely to witness increased use of polypropylene and polyethylene.

In terms of end-use segments, medical product components represent the largest and the fastest growing end-use segment as compared to medical packaging.

The Medical Plastics Market

The medical plastics market can be segmented into two major categories based on its resin types: Radiation resistant, PVC, Polyethylene, Polycarbonate, Polyester, Polypropylene, ABS and SAN resins, Polystyrene, and based on its applications into medical packaging and medical products segments. The medical plastics market can also be geographically segmented into U.S, Europe, Asia Pacific and the rest of the world regions. Fig 4 shows the relative market share of different plastics in healthcare.

Global market for plastics in healthcare and diagnostics application sector forecasts to reach at US$34.9 billion, growing at a Compounded Annual Growth Rate (CAGR) of 7.2% during the analysis period 2011-2016.

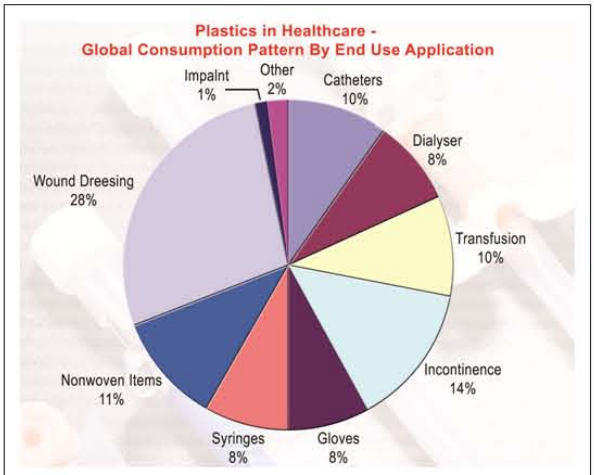


Fig. 4: Share of various *plastics in healthcare*

Europe accounts for nearly 35% of the global market value, while the Americas are not far behind to dominate Europe as the largest share for the analysis period 2011-2016, respectively. Asia-Pacific is the fastest growing region with a CAGR of 8.9% driving a market share of 27.8% by 2016.

On a global scale, Medical Instruments accounts for approximately 43% while Pharmaceutical packaging and Medical Supplies/Accessories claim second and third largest portions, respectively.

The demand for plastics in medical devices is propelled by its ability to produce low-weight medical devices. Plastics currently form one of the most important components of the Medical Disposable Industry. Medical device designers and engineers increasingly prefer plastics to conventional packaging materials such as metals owing to superior flexibility offered by plastics in fabrication process. Advancements in sterilization techniques, shift towards disposable devices, development of enhanced plastic materials, and technological innovations are factors driving the overall market growth and expansion. The development of novel materials such as biocompatible polymers for use in medical implants will furthermore provide the required impetus for the global medical plastics market. The United States represents the single largest market for medical plastics worldwide. The medical plastics market is projected to grow rapidly in the near future, particularly in developing countries such as Asia-Pacific and Latin America, driven by a gradual increase in demand for sophisticated medical devices, and enhanced medical care. Asia-Pacific constitutes the fastest growing market for medical plastics in the world.

Indian Market

India's medical devices market was worth $3 billion in 2011 and grew at roughly 15 per cent annually in that year. It is expected to grow at a 16 per cent compounded annual clip during the 2010-2015 period, far better than the 2-3 per cent growth expected in this sector in the US and Europe. This has put India among the top three emerging markets for direct investment by large medical device multinational companies.

Currently, over 75 per cent of medical devices sold in India is imported, though India enjoys significant global market share of some medical products, such as the low-cost intra-ocular lens manufactured by Aravind Eyecare. With a population of over 1.2 billion people, the $3-billion market translates into an extremely low average expenditure on medical technology: less than $2.50 per capita. This under-penetration presents a compelling market opportunity for companies looking to bring new medical technology products to India.

Drivers for Growth of Medical Technology Sector in India

- Growing awareness about health
- New technological innovations in the areas of diagnosis and treatment
- Economic growth leading to higher disposable incomes
- Increasing old age population
- Changing disease patterns (blood pressure, hyper tension, etc.) towards the ones requiring long term treatment
- Increased Public Spending in Healthcare
- Increased Private Investment in Healthcare
- Increased Penetration of Health Insurance
- Emergence of new models of healthcare delivery
- Public Private Partnership (PPP) route to Innovation

Composition of Medical Devices and Equipment Industry in India

Medical instruments and appliances used in specialties such as ophthalmic, dental and other physiological segments dominate the Indian medical devices and equipment market with a share of about 26%. It is flowed by orthopedic/ prosthetic goods segment accounting for 19% of the total market. Medical supplies such as bandages and disposables such as syringes, needles and catheters together constitute another 21% of the total market. The other significant segments are high-end specialty electro medical equipments and X-rays apparatus each accounting for about 10% of the total market of medical devices and equipments in India. Diagnostic kits segment constituted a high growth segment valued at US$133 mn during 2006 with a growth rate of 30% over previous year. The composition of medical devices and equipment industry in India is presented in figure (Fig 5):

The share of different categories of products, the contribution break-up is as follows:

Medical, Dental & Surgical Equipments	:	40%
Plastic Disposables	:	25–30%
Implants	:	20–25%

Recent Trends & Emerging Opportunities in Medical Plastics Industry

New materials, with improved properties are developed in order to satisfy the requirements of infection control standards.
New studies and tests are conducted to determine the biological reactivity of polymeric materials.

Currently, plastics are graded on a scale of Class I to Class VI, which is done by injecting extracts of the test material intracutaneously into rabbits and mice.

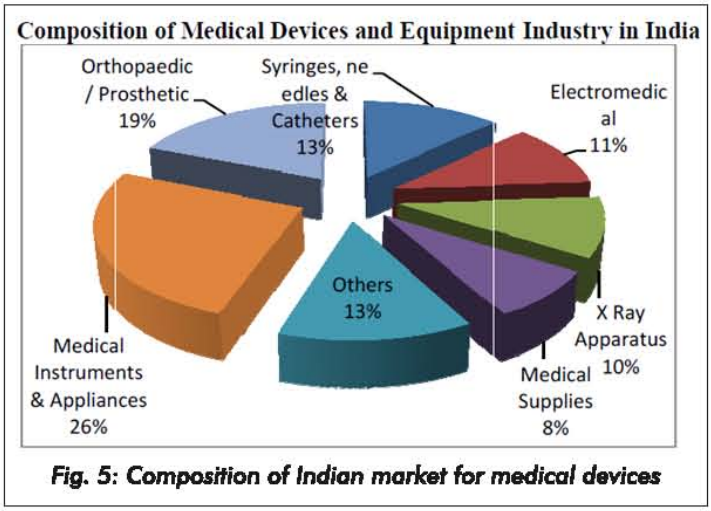


Fig. 5: Composition of Indian market for medical devices

Plastics not requiring implantation testing are graded Class I, II, III, or V and those plastics requiring implantation testing are graded Class IV or VI.

Some of the Salient Features and Developments in Using Polymers for Healthcare and Medical Applications are listed below:

- Monitoring shelf-life of polymers is important for performance. Tests for material performance include gel permeation chromatography (GPC) for molecular weight, capillary for viscosity, melt flow index for ease of flow, differential scanning calorimetry (DSC) for thermal transitions and qualitative analysis, and Fourier Transform Infrared Spectrometry (FTIR) for contamination and identification.
- Sterilization affects materials in different ways depending on the technique, from ethylene oxide and gamma irradiation to autoclave. The rewards are seeing a device operational and improving the quality of life for patients.
- Material specification includes Mechanical, Chemical, Biocompatibility, Electrical and Thermal Properties, as well as Processibility. It is expensive to take a new device to market because of the cost of design and tests to obtain performance data, as well as FDA approval.
- Key performance measures include substrate adhesion, durability and mechanical properties, thickness and swelling in body fluids, particle and leachable release, biocompatibility and degradation of implants.
- Blood contact polymers should not: absorb protein, release additives into the bloodstream, carry infection, cause clots or cancer, or provoke an immune response or irritation.

Recent Trends & Emerging Opportunities

- Biodegradable plastics have a role in temporary medical devices providing a function until the body is able to recover, for example in tissue scaffolding.
- In the past the material did not contain stabilizers or processing aids. Now a few antioxidants have been approved.
- Current healthcare trends include minimally invasive surgery:

device developments include a silicone-access port for multiple instruments; micro endoscopes; and remote handgrips that simulate real hand feeling.

- Coatings are used on medical devices for protection and to improve biocompatibility. Coatings are applied by dip coating, spray coating, brush, roll or blade.
- Silicones are used in applications varying from catheters to surgical instruments. Silver ions are incorporated, which are toxic to the bacteria, by destabilizing the cell membrane, deactivating sulphur-containing proteins and blocking oxygen-transport enzymes.
- The melt filtration of polymers is used for catheters and balloons. This can remove more than 80% of gels and other contaminants while retaining polymers' inherent mechanical properties.
- More advanced medical devices to perform minimally invasive surgeries with greater precision, the demands on polymer components and materials continue to escalate. This is particularly evident in vascular stent delivery and related devices.
- Today's vascular devices require catheter shafts that are smaller in diameter with thinner walls to reach new areas of the body with complex surgical tools.
- Thin wall polymer balloons are attached to the end of these shafts and used to expand vascular pathways and to deliver stents for permanent support. Manufacturing these thin wall polymer shafts and balloons requires advanced melt extrusion techniques which are dependent on polymers with substantially greater consistency and quality.
- Melt filtration process improves the quality of vascular catheters and balloon products, which will improve clinical performance and reduce the risk of product failure.
- Specifically formulated for precision catheter components, the custom polymers feature superior color accuracy and surface quality as compared to traditional generic color concentrates.
- New Radiopaque fillers offer superior quality that translates to improved performance at the extrusion step of the supply chain. It allows improved yields and thinner wall thicknesses, thereby pushing the limits of product design.
- Radiopaque fillers are added to polymers to make catheters and other medical devices visible under fluoroscopy or X-ray imaging. The filler affects the degree of contrast and the sharpness of the image to the extent that it influences the attenuation of X-rays passing through the body and the device.
- **Medical Packaging:** With increased performance requirements, medical packaging converters and material suppliers are faced with challenges to provide products to satisfy these needs. If the integrity of the package and sterility of the device is violated, the device is useless. National and International Packaging Standards such as ISO 11607-1; ISO 11607-2; etc,
- Not only are the materials used to pack devices becoming stronger, thinner, more protective and more flexible almost by the year, but the medical device regulators around the world are starting to agree on international standards for the packaging of medical devices. These standards will not only cover the actual packaging and labeling, they will also set out standards for testing the efficacy of the packaging and the methods used to produce it.
- **Medical Nonwoven Disposables:** Global Market to Reach US$20.9 Billion by 2017: Nonwoven disposables are rapidly making inroads into the medical sector, principally driven by growing consumer awareness against spread of infectious diseases. Diseases such as hepatitis and AIDS continue to further fuel demand from hospitals for clean, sanitary and disposable products for safeguarding patients and doctors from such infectious diseases. With hospitals looking at disposables as necessity, rather than luxury, nonwovens industry is witnessing developments in new manufacturing, compound and finishing processes.

Challenges & Needs for Globalization for Medical Plastics Industry

The need for Polymers in the Healthcare applications is immense. A bewildering array of Polymeric materials are required by the Healthcare Industry to deliver greater strength, flexibility, resistance to sterilization or bodily materials, or just simple aesthetic appeal.

The Indian Medical Plastic Industry has to face domestic and global market competition as well as meet Regulation and Compliance criteria. They need to work in close co-ordination with materials developers not only to meet the quality but also to reduce production costs, increase efficiencies, reduce lead times and to gain access to new techniques and technologies.

The need for Innovation resulting from Regulatory, Market and Cost pressures demand that Medical Device Manufacturers need developments in Medical Polymers. While this cannot be done without support and co-operation from resin producers, due to regulatory requirements, small volume consumption and possibilities of litigations, many suppliers are reluctant to serve this market.

Despite this situation, the growing desire to embrace suitability challenges makes manufacturers and suppliers to join together in the effort to continue delivering exceptional healthcare products.

The Indian Medical Plastics Industry needs to work with Global minds. In developed countries (including USA, Europe etc), the leadership and R & D manpower of the Medical Plastics Companies comprise of Indian Talent in a big way. People of Indian origin are rare resource and creators of Intellectual Property (IP) for their Companies and Employers.

Companies holding such IP can multiply revenues many fold. There is tremendous value in creating Intellectual Property which in the long run would serve India very well.

In order to foster indigenous medical plastics industry, there needs to be strong alignment of academic and industry to spur the development of an ecosystem conducive to innovation in Medical Technology.

D L Pandya*and D. D. Kale**
***CEO, Medical Plastics Data Service**
(www.medicalplasticsindia.com)
**** Ex Professor of Polymer Technology, Univ of Mumbai (UDCT)**

Emerging Polymers for Medical Devices

An Introduction to Emerging Polymers for Medical Devices

I spend a great deal of time with engineers who are working on new medical devices. They often need help selecting the best material for the parts and devices they are developing, a polymer that will make their new product functional and safe. But more frequently the focus is on how much will the material cost and what will be the final cost of the device?

Depending on the type of device they are producing, the importance of material cost varies. For high-volume, single-use, devices, the material cost is of greater importance than in a reusable device or most implanted materials. Additionally, when the device being developed has unique requirements, developers must consider what material will have the necessary physical, chemical and biological properties that will allow its use at the lowest possible cost.

So my work in selecting a material often starts with a series of questions:

- **Cost** — "How much will you use in a year" and "What are you willing to pay for this material?"
- **Physical properties** — "What are the requirements for the material and/or the part made from our selected polymer?" "How will the part be produced from the material?" "Will it be injection molded, extruded or machined?" "What will the component or the device need to do in its final form?" "Will it need mechanical strength?" "Will it need to resist breakage and when exposed to forces during use?" "Does the device or this component need to be transparent or will an opaque material be satisfactory?" "How flexible or stiff does this material and the parts made from it need to be?"
- **Chemical and biological properties** — "Will it be exposed to chemicals during assembly (solvent bonding) or in use (disinfectants or cleaners)?" "Will it have any contact with the human body; skin, tissue, blood?" "How will it be sterilized?"
- **Regulatory concerns** — "Has the material been used before in other FDA-cleared devices or approved by foreign regulatory bodies for use in other parts of the world?"

With answers to these questions and, usually, many others that will come up during development, the engineers and development teams can, in a relatively short time, come up with candidate materials.

Some of the newer materials on my watch list include:

- **Ketone polymers** – Polyether ether ketone (PEEK) and some of its copolymer forms
- **Polyethylene and cyclic olefin copolymers (COCs)** – Specifically ethylene vinyl acetate (EVA)
- **Bioresorbables** – Polylactic acid (PLA), polyglycolic acid (PGA), Polycaprolactone (PCL) and the various copolymers that can be made by combining these and other starting ingredients
- **Fluoropolymers** – Specifically, polytetrafluoroethylene (PTFE), perfluoroether (PFA) and fluorinated ethylene propylene (FEP)

Most of these materials have been around for a long time but their suitability for use in medical devices is only now being recognized and put to use.

PEEK Polymers

When PEEK polymers were first introduced, their high heat resistance, coupled with their remarkable inertness, made them an ideal material for applications that placed a device in contact with tissue and blood. PEEK polymers are not affected by most solvents, lipids or blood, and are completely unaffected by enzymes in the body. These properties make them ideal materials for long-term orthopedic implant applications such as bone screws, plates and pins, tissue anchors and suture screws.

More recently, PEEK has been used to replace metal as a hip stem component. As a metal replacement, the ketone polymers more closely match the flexibility of the native bone, especially when compared to steel or titanium hip replacement stems. That flexibility is vital as the bone into which the hip stem is placed tends to flex; a metal hip stem does not flex, resulting in its loosening over time, while PEEK components are not afflicted by this trait.

Although the PEEK polymers have been available for almost 25 years, it is only in the last 10 years that PEEK has been widely accepted for long-term, in-body applications. One of the reasons for its slow growth is that it is extremely expensive and has been subject to limited availability. Invibio has been the recognized supplier of PEEK since it first appeared in the market. But more recently Solvay and Evonik have emerged as suppliers of this specialty material. I am happy to see that there are more suppliers of such a unique material and expect that, with competition, the cost of the polymer may even moderate from its current pricing.

Polyethylene and Cyclic Olefin Copolymers

Polyolefin copolymers such as EVA and COCs offer new options for products traditionally made from other materials. For only a slight cost increase, EVAs offer many advantages. For example, the flexible grades do not have, nor do they need, plasticizers. Likewise, COCs are a remarkable material spanning a range of flexibility, at a reasonable cost. COCs can be used for containers, replacing glass or polyester and they are inherently cleaner, very clear and solvent resistant.

However, neither EVA nor COCs are readily solvent bondable so assembly to tubing or other polymers - as connectors for fluid administration sets, for example – likely would need to be done with either cyanoacrylates or UV light-cured adhesives. These adhesives are readily available from Dymax, Permabond, Loctite and others. EVA polymers are available from a number of suppliers including Celanese, Mitsubishi and LyondellBasel. COCs are supplied by Topas and others.

Bioresorbables

One of the most exciting areas of new material development in the device community is bioresorbables. One of the first to be investigated has been PLA. As a suture material, PLA will maintain its strength until the liquids with which it is in contact begin the dissolution process, eventually leading to the PLA's complete elimination from the body.

The other bioresorbables are polyglycolic acid (PGL), polycaprolactone (PCL) and several other copolymers. Together, they offer the medical device community a material that can perform a number of different applications. These materials, too, can be used as bone screws, small orthopedic plates or rods but they typically do not have the physical properties needed for any high-stress applications (e.g., bone reconstruction).

However, these materials are ideal when used as tissue anchors, vascular stents or internal meshes that allow cell seeding and reconstruction of an organ as in repairing a perforated heart. Tissue and organ scaffolding are some of the most recent applications well-suited to these unique materials. Another possible area of increasing use will be drug delivery. These applications comprise some of the most exciting opportunities in the area of medical polymers.

Current suppliers of the bioresorbables include Purac and Boehringer Ingelheim.

Fluoropolymers

Fluoropolymers are wonderful materials that come in many combinations and in many different forms. Most everyone knows about the common fluoropolymer, polytetrafluoroethylene (PTFE) originally marketed by DuPont with the tradename Teflon. In the medical device industry PTFE in its solid form can be used for in-body applications because it is very clean and inert in blood or tissue. But the material is very soft and is not useful for any load-bearing applications.

In forms other than solid, PTFE can be made into porous membranes or rods or tapes. These membranes can be used as filters, non-fouling surfaces or hydrophobic surfaces. Other forms of the fluoropolymer such as perfluoroether (PFA) and fluorinated ethylene propylene (FEP) polymers are melt processable by either extrusion or injection molding. Although the materials are difficult to process, products made from them have interesting properties such as inherently non-stick surfaces, high gas barrier properties and in some, transparency.

Suppliers of these polymers for the medical device industry are Daikin Americas, 3M Corp.and W.L.Gore & Associates.

Other Promising Materials

Among the emerging materials of interest are a few traditional, or legacy materials that are being redesigned to improve their properties for specific applications: These include polyesters, urethanes and improved thermoplastic elastomers (TPEs). TPEs are compounds based on polyolefin technology.

For both polyesters and polyurethanes, the breadth of material properties is dependent on the chemistry used to produce the polymer. Polyesters can be made rigid for bottles and containers, like the widely used polyethylene terephthalate (PET) polymer or made flexible with properties that closely match flexible polyvinyl chloride (PVC). The ability to engineer polyurethane polymers to a wide spectrum of properties allows them to be considered for almost any application. They can be soft enough to replace PVC in tubing or sheeting, or to serve as a soft gel-like wound covering, or they can be extremely rigid, like wheels or bumpers on carts.

Both the polyesters and the polyurethanes offer many of the properties common to some of the more widely used polymers, but at a significant cost penalty – two, three or even four times the cost of the polyolefins or flexible polyvinyl chlorides now being used. Suppliers of polyesters for the medical device market include Eastman and

DAK, while polyurethanes are available from DSM (formerly known as PTG) or Lubrizol (formerly known as Thermedics).

The Right Material Requires the Proper Manufacturing Technique

The combination of one or more of these newer, non-traditional polymers coupled with evolving manufacturing methods opens new pathways for sophisticated medical devices. Researchers are working on dissolvable sensors with electrically conductive circuits which function in tissue or the bloodstream for a predetermined period of time before being absorbed into the host tissue and then are eliminated from the body via its normal processes.

Some exciting new processing technologies are also helping change the landscape of new product development. The ability of additive manufacturing to produce functional parts with some of the high-temperature materials such as PEEK or polyphenylsulfone (PPSU) for long-term implantable components is just one such enabling technology. Another additive manufacturing process allows multiple materials, with different colors or different stiffness to be combined into a single part. A third additive manufacturing application takes advantage of high temperature materials making possible new mold-making methods that can incorporate features like conformal cooling in the mold as it is being made. Traditional cooling requires adding cooling channels to a mold after it is made, often resulting in significant temperature differences in non-cooled areas of the mold. The additive manufacturing process also can be used with high-temperature polymers to quickly make entire prototype molds, similar to metal molds, usable for producing limited-run injection-molded thermoplastic parts!

Other new processes that are giving extended properties to molded parts include the powdered metal and powdered ceramics injection-molding processes. By combining these manufacturing techniques with the newest materials technologies, manufacturers can create higher-temperature components that are often more resistant to wear, are more resistant to adverse chemical exposure and are usable in high-temperature environments.

Non-stick surface technology developed at MIT, and now commercially available from LiquiGlide is made possible by engineering the surfaces in a way that prevents even viscous liquids from adhering to the wall of containers. A similar effect is obtained using a fluoropolymer additive from Daikin America. The additive is used with polymers used to create bottles or other containers for high-value contents such as specialty biopharmaceuticals, (e.g., Botox and similar very expensive fluids) where any residual product in the container is the equivalent of losing hundreds or thousands of dollars of product. This same additive may have applications in medical devices that could benefit from a non-stick or anti-adhering surface, for example, non-fouling catheters to resist thrombus formation or other surface build-up.

Conclusions

There are so many exciting new materials and processing techniques that, alone or in combination, will enable the healthcare industry to create innovative, next-generation products. They will allow more effective treatments and the promise of better patient outcomes.

Courtesy- Med Device Online
www.meddeviceonline.com
Author, Len Czuba, President, Czuba Enterprises, Inc

Polypropylene Nonwovens to Steadfast Hygiene

Medical Textiles is one of the most rapidly expanding sectors as they are omnipresent in the field of human hygiene and health practices. These Medical Textile products range from simple gauze or bandage materials to scaffolds tissue culturing and its usage is based on a number of typical basic textile properties like softness and lightness, flexibility, absorption, filtering etc. One such important product for Medical textile is Non woven.

Emergence of Nonwovens: Typically characterized by their web forming process: dry-laid, air-laid, wet-laid, and spun-laid. Spun-laid is by far the most dominant process for producing medical

nonwovens, accounting for over 70% of all medical nonwoven tonnage.The massive dependence of spun laid medical nonwovens, and especially spun-laid polypropylene nonwovens, makes Polypropylene (PP) the key material. The PP Nonwoven medical products routinely demonstrate reduced cost to use, reduced laundering and distribution costs, reduced treatment time for the patient or labor savings for the healthcare provider. It accounted for over 68% of all raw materials used in medical nonwovens.

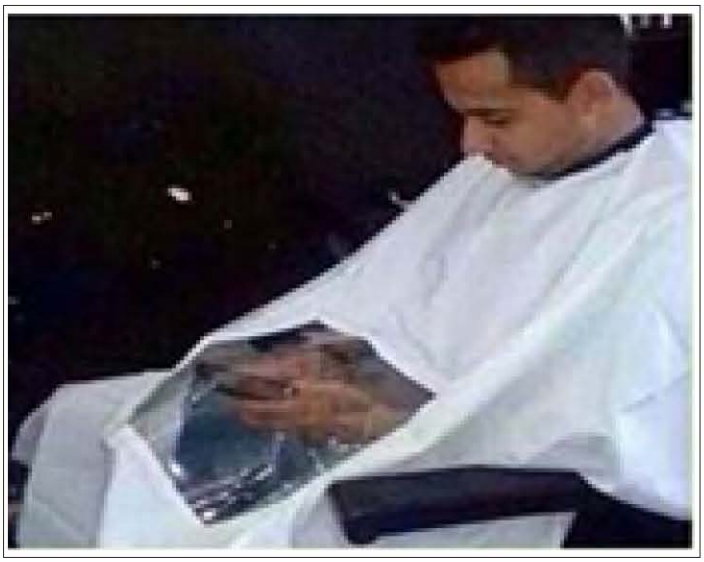
Polypropylene nonwoven products: It is possible to have Economical Manufacturing Process, Various Manufacturing technique options according to applications, sterilizable, Porosity, low weight / thinner-most fabric. Among all, Polypropylene nonwovens meet all the requirements for medical applications in ditto, namely:

- Biocompatible as don't leave any lint
- Good resistance to alkalis, acids and micro-organisms
- Good dimensional stability
- Elasticity
- Free from contamination or impurities
- Absorption / Repellency
- Air permeability

Added features and benefits of PP Nonwovens:

- Reduction of risk from microbes that cause disease
- Soft on skin
- Single use type
- Easy maneuverability
- Can be sanitized
- Easy to stitch

Innovative health care products: Nonwoven fabrics play a vital role in the medical sector. From surgical gowns, masks and other wearable products to surgical drapes, pads, dressings and filtration materials, they are now everywhere. Innovative textile products with Polypropylene nonwoven can both add significantly to effectiveness of medical treatments as well as patient comfort.



Most of the medical nonwoven products are single use items that have the advantage of eliminating sterilization or cleaning steps which are practised for reusable type products like linen. With the latest medical technologies, doctors and state-of-art hospitals are now using nonwoven fabrics as standard, which are not only economical but are fresh to use.

Adult/baby nappies, sanitary towels, Disposable bed sheets/spreads, Disposable curtains, Examination table /medical instruments covers, some of the examples of PP non woven medical textiles are currently being used.

Growth of PP Nonwoven usage in health care industries: As compared with other materials, PP Nonwoven is comparatively light weight, flexible and low cost. It offers ease of processing, non-ferrous properties and superior biocompatibility, single-use items. Some of the major trends that are impacting its growth are:

1) Rising incidence of Hospital Acquired Infections (HAIs)
Hospital acquired diseases/nosocomial infections/hospital associated infections represent a segment in the healthcare industry that needs critical focus due to poor infrastructure, high population and lack of adherence to Hygiene /sanitation practices.

2) Ensures complete protection
As these are single use type, the product is fresh at every usage which ensures complete protection to both the Doctors and patients. This is the factory made product supplied in completely sterilized conditions as ready to use material.

These properties are often combined to create fabrics suited for specific requirements, while achieving a good balance between product performance and cost.

Since the medical textile applications are directly related to the life of human beings, are required to undergo stringent testing and hygienic criteria. Polypropylene Nonwoven Single use medical wear fulfils all criteria. Some of them that are in currently in use:

- Caps
- Masks
- Pillows
- Isolation gowns
- Surgical gowns
- Bed sheets
- Surgical drapes and covers
- Surgical scrub suits
- Examination sheets

All these products are engineered for specific application.

Growth Drivers

The usage of PP medical non woven is nascent stage in India. The two most products which are in common use are masks and caps. Other products like examination sheet, gowns, drapes are beginning to enter in a small way. However potential exist for many new products like curtains, gowns , bedsheet, pillow cover , etc., . As India has become one of the preferred nations for medical tourism, the usage of this product is expected to increase in an exponential way.

Detailed project report for some of the product are available and be given on request.

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Lean Six Sigma for Medical Device Design/Manufacturing

Introduction

Lean and Six Sigma are proven Quality and Business Management Systems that have been used worldwide to produce outstanding and sustainable business results. Both Lean and Six Sigma are based on some fundamental process improvement principles which date back to 1920s. The Lean Six Sigma framework provides an integrated and structured methodology for designing and manufacturing zero defect products and services at the optimal cost. Although the Lean Six Sigma approach can be used for any industry, it has special relevance to the medical and healthcare industry due to the loss of life and quality of life implications. Much work has been done in the west regarding application of Lean Six Sigma in the medical device and health care industries. However, many challenges and opportunities exist in the understanding and application of Lean Six Sigma in the Indian medical and health care industries.

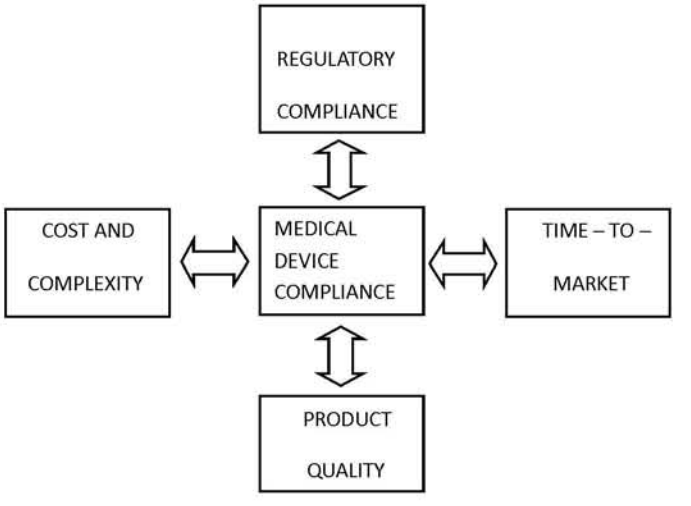

Figure 1: Medical Device Compliances Requirements

The Opportunity

The global medical device industry is estimated to be over US $ 300 Billion and expected to grow around 4.9% CAGR. The Asia Pacific market is expected to be a key growth driver in the global medical device market. Some of the major players in the global medical device market include Medtronic, Johnson and Johnson, Siemens, GE Healthcare, Phillips and Roche. The Indian medical device market is estimated to be over US $ 3 Billion and expected to grow over US $ 15 Billion by 2020. There is a significant opportunity in import substitution in the Indian medical device industry which can be tapped by Indian manufacturers. The Indian government opening up this sector for FDI and the "Make in India" initiatives offer further growth opportunities to this sector. However, there are many stringent compliance requirements in the medical device and health care industry that need to be complied with. The medical device and health care industry is driven and regulated by stringent government and manufacturing standards such as the US FDA (Food and Drug Administration) and other legal and regulatory standards (Figure 1).

Medical devices are classified by the FDA as Class I devices (such as tongue depressors, bandages, gloves, bedpans, simple surgical devices), Class II devices (such as wheel chairs, X-Ray machines, MRI machines, Surgical needles, catheters) and Class III devices (such as Heart Valves, Stents, Implanted Pacemakers, Silicone Implants, Hip and Bones Implants). The USP (United States Pharmacopoeia) further classifies medical devices depending on their intended use. Elaborate standards exist for manufacturing systems for the medical device and health care industries such as for clean room manufacturing and for identification and traceability. Some of the compliance standards for medical devices (implantable and non implantable) include ISO 3/4/5/6/7/8 for clean rooms, GMP, ISO 13485:2003 for medical devices and other stringent manufacturing requirements such as closed loop all electric molding machines, process automation for hands free operations, mold and machine technologies and training of personnel. For medical device manufacturing, it is also critical to select engineered plastics that meet the required rheological properties and physiological performance, manufacturing capability, single vs. repeat sterilization compatibility and bio compatibility requirements. Some of the commonly used engineered plastics for medical applications include Polypropylene, Polystyrene, Polyvinyl Chloride, Polyester, PLA and other bio absorbable plastics, Polycarbonate, Acrylic, PMMA, Polysulphone, Polyethersulfone, Polyetheretherketone, TPE, TPU, Silicones and Fluoropolymers. In comparison to the statutory, regulatory and manufacturing technology standards, the methodologies to apply world class Quality Management Systems seems relatively less understood and applied in the context of the medical device and health care industry. Although many world class Quality Management Systems and Standards such as ISO 9001:2008, Malcolm Baldridge National Quality Award, TQM, Kaizen, Deming Prize exist, a proven, structured and data based approach is required to comply with these standards and meet overall stakeholder quality expectations in the medical and health care industries. This paper presents a conceptual framework for application of Lean Six Sigma to the medical device manufacturing and health care industry.

What is Lean Six Sigma?

- Fundamentally, the Lean approach is a horizontal framework (it cuts across all functions/products of business) and has its roots in the TPS (Toyota Production System). It focuses on streamlining the entire manufacturing/service process by removing the non value added operations (reducing wastes of all kinds) and improve the overall yield by reducing the number of steps required to manufacture a product or service. Six Sigma is a vertical framework (specific intervention) which formally started in Motorola in the 80s and is a highly structured methodology focused to optimize processes/products with a defect rate of less than 3.4 defects per million defect opportunities (99.99975% defect free). Lean Six Sigma is a methodology where Lean and Six Sigma are employed concurrently, to optimize the process in terms of flow and waste reduction for optimized yield, and where the individual process steps are capable of delivering Six Sigma level of Quality.

- Lean Six Sigma is about the "Quality of Business" and not just the "Business of Quality". It is a customer driven, highly structured, self correcting, prescriptive and data based methodology that can be applied in all areas of business and across all products and services (from patient care to downstream medical device design and manufacturing). Lean Six Sigma works where logic and intuition fails. However, Lean Six Sigma level results require Six Sigma quality of efforts.

- From Sick Sigma to Six Sigma level of Quality performance

Zigma *	Defects/Million	Yield	Cost of Quality
1.5	500000	50%	Sick company
2	308537	69%	Sick company
3	66807	93.3%	Average company
4	6210	99.3795	15-25% of sales
5	233	99.9767%	5-15% of sales
6	3.45	99.9997%	<1% of sales

*** 3 sigma vs. 6 sigma process capability:** 66,807 prescriptions/medical device defects vs. 3.45 prescriptions/medical device defects out of 1 million defect opportunities (there may be more than 1 defect opportunities in a single unit). Intuition and Logic can only take you up to 2-3 Zigma. Zigma refers to process capability, whereas Sigma refers to process standard deviation.

- What is a Lean Six Sigma process? - A process where all non value added steps and wastages have been removed and where the specifications are at least 6 standard deviations away from the mean (Cpk = 1.5, Cp = 2). In a Lean Six Sigma process, there are no non value added operations, variation (spread) is under control and the process is centered (mean = nominal) (Figure 2).

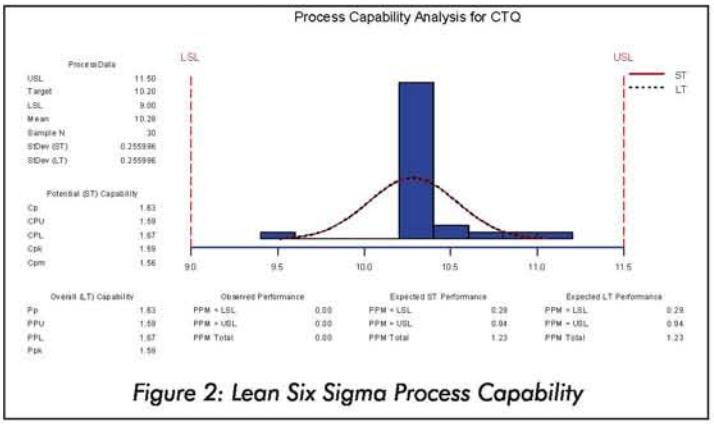

Figure 2: Lean Six Sigma Process Capability

The Lean Six Sigma Approach

As shown in figure 3, the Lean Six Sigma approach involves concurrently applying the Lean and Six Sigma frameworks for optimizing process by removing waste and non value added operations and making the process producing defect free products/services, every time. The Lean Six Sigma approach converts a business problem into a process related statistical problem, and then derives the statistical solution which leads to the business solution (Figure 4).

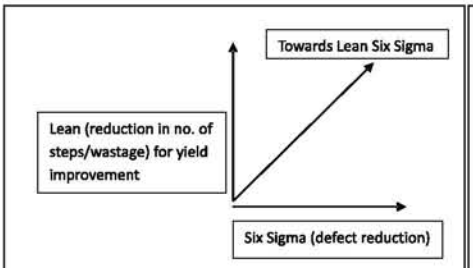

Figure 3: The Lean Six Sigma Methodology

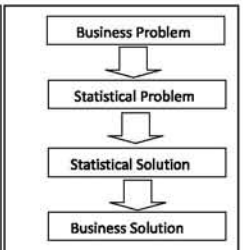

Figure 4: The Lean Six Sigma Approach

The Lean Six Sigma Methodology (RDMAIC and DFSS)

The Lean Six Sigma framework can be used for both designing a new product/service or to optimize an existing product/service without significant investment of new resources. Whenever a process or product exists, an attempt should first be made to optimize it without investing any significant resources through the Lean Six Sigma RDMAIC approach. If this does not give the desired results, DFSS (Design for Six Sigma) may be used to design a process/product from inception.

Figure 5: RDMAIC & RDMADV

RDMAIC and RDMADV can be used in tandem or separately to optimize existing and new products/process (Figure 5). The RDMAIC methodology is elaborated below.

- **R (RECOGNIZE)** – The area of business which needs to be optimized is identified. The areas are selected and prioritized depending on the strategic and financial impact on business. In the medical device manufacturing and health care industry, this area can be identified in the following areas: VOC (Voice of Customer) – could be for both internal and external customers, in the entire value chain from patient care touch points to downstream medical device in terms of Quality, Cost, Delivery, Service and Regulatory Compliance. VOB (Voice of Business) – Sales, Profitability, Growth. VOC (Voice of Employees) – Satisfaction, Retention. VOS (Voice of Suppliers) – Supply chain

challenges. VOCMP (Voice of Competitors) - competitive threats/opportunities. VOS (Voice of Society) – societal stakeholder needs.

- **D (DEFINE)** – Define individual project goals and internal/external customer requirements (CTQs – Critical To Quality) by VOC analysis. Make project charter with the problem and goal statements, time lines, operational definitions for CTQs and project team details (Black Belts, Green Belts, Champions).

- **M (MEASURE)** – Quantify the project CTQs (Critical to Quality) parameters. Ensure data is measurable, tractable and statistically valid. Perform MSA (Measurement System Analysis) and measure current level of process capability (Zigma level) for CTQs. Understand the gap between current and desired level of process capability.

- **A (ANALYZE)** – Analyze processes by detailed process mapping of the As-Is process. Understand and identify the non value added activities and wastes in the process using VSM (Value Stream Mapping) and subsequently eliminate the same. Also identify all probable vital and trivial root causes that may be affecting the customer CTQ, using 7 QC tools, 5 Why Analysis, Hypothesis testing, Regression, ANOVA, Logistic Regression, Chi-Square analysis, FMEA and all possible human and technology interfaces that provide insights into the processes. Very capable and user friendly statistical analysis software is now available which helps in interpretation of seemingly complex statistical calculations. For plastics processing, depending on the manufacturing process (injection molding, extrusion, blow molding and other value added processes) a holistic approach should be used to identify all possible contributing factors related to Material selection, Product Design, Tool Design and Manufacturing Processes (molding and post molding). Simulation modelling technologies (such as Moldflow, CFD, FEA for injection molded parts) may also be used to identify process variables that affect the CTQs. All possible root causes are short listed and statistically validated. This is critical as it is basically a "garbage in, garbage out" scenario. The quality and range of process variables (independent variables) identified will lead to the desired quality in the CTQs (independent variables). It is important that process optimization be performed only for the processes that are value added. Non value added processes and wastes should simply be eliminated.

- **I (IMPROVE)** – Mathematical models (also known as transfer functions) which quantify and explain the relation between the CTQs and process level root cause variables are derived by using optimization tools such as DOE (Design of Experiments), EVOP (Evolutionary Process) and process simulation studies ((CTQ = function (independent process variables)). Arriving at the optimal solution may not be possible with the intuitive approach as it does not account for the possible interaction effects between the process variables and auto correlation between various CTQs. Multiple concurrent CTQ optimization may also be required to achieve the optimized balance between various CTQs (such as Quality, Cost, Delivery etc.) Process re engineering is performed where the wastes and non values added activities are eliminated and processes are set to the optimized levels as revealed by the statistical/mathematical models. Process capability levels of the optimized process CTQs are measured to confirm the desired performance levels.

- **C (CONTROL)** – The achieved level of process CTQ performance is sustained by using tools such as SPC, Reliability Analysis and Process Audits. The focus is on controlling the key input process variables that affect the desired CTQs. Control the means (process variables, and the ends (CTQs)) will take care of themselves.

The DFSS approach for design of new products/processes can be employed using the RDMADV methodology (RECOGNIZE, DEFINE, MEASURE, ANALYZE, DESIGN, VERIFY). Here we RECOGNIZE the projects for design of new products/process, DEFINE the performance requirements and process capabilities, MEASURE the desired process capability, DESIGN the new product/process using tools such as FMEA/DOE/TRIZ and build prototypes, and VERIFY the performance using virtual/physical testing and SPC/Reliability studies.

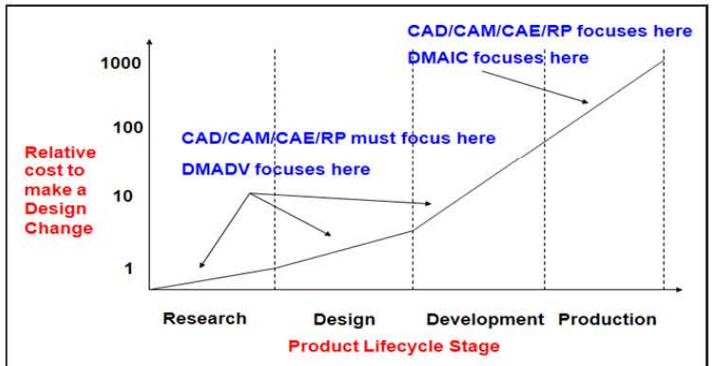

Figure 6: Relative Cost of Design Changes

Figure 6 shows the significance of First Time Right ROBUST design of products/processes to avoid costly delays and lost opportunities. The cost of design changes made during or after the production stage can be as high as 1000 times that of the cost of the same design change made during the Research or Design stage. In many cases, in addition to the cost impact of delayed design changes, the delays lead to lost opportunities. Figure 7 depicts the concept of Robust Design, where the output is not significantly influenced by changes (variability) in the input or process parameters. For example, robust airplane design has made air travel extremely safe, despite of unexpected and significant changes in weather conditions.

Design for Lean Six Sigma for injection molded Medical device (DFSS/DMADV) – a suggested approach for First Time Right Design (some steps may be used concurrently):

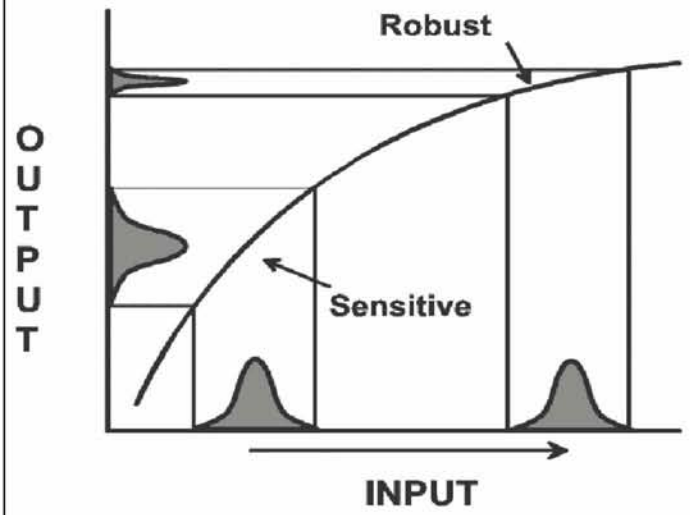

Figure 7: Robust Design

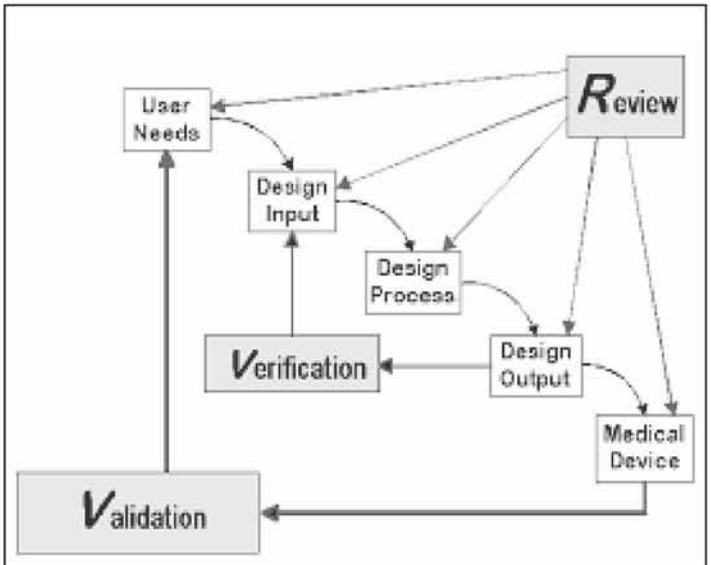

Figure 8: Verification & Validation

1. Basic Part Design (Functional, Regulatory and Business requirements)
2. Material selection
3. CAD, CAM, CAE - Structural/Thermal/CFD/FEA, Bio compatibility analysis
4. DFM (Design for Manufacturability studies - Moldflow, Process Design)
5. Rapid Prototyping (RP)
6. Design Review 1 (Verification and Validation – Figure 6)
7. Single cavity prototype
8. Design Review 2 (Tolerance Analysis, Reliability/Life testing)
9. Production Tooling Protocol (Tool Design Optimization)
10. Mold Construction Phase
11. Mold and Process Qualification (APQP, PPAP, DOE, SPC, Process Optimization as per regulatory and functional requirements)
12. Final Part Evaluation and Acceptance

Conclusion

Expected business results can be realized by employing the right technologies along with adoption of the right methodologies (Results = Technology x Methodology). Focus on technology or methodology alone may not bring the desired business results. Adoption of the Lean Six Sigma methodology along with regulatory standards/technology compliance can lead to operational excellence and world class delivery capabilities. This will allow the Indian medical device and health care industries to gain a compelling competitive advantage and realize significant business benefits due to import substitution, government initiatives for indigenous manufacturing and growing domestic/international market demand. It is also important to note that adoption of Lean Six Sigma is fundamentally an organizational culture change initiative and top management ownership and commitment is essential and vital. Lean Six Sigma can take any organization from Sick Sigma to Six Sigma!

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Hot Runner Technology for Manufacturing Medical Products

More than 70 millions of protective caps are required every year for the production of Mini-Spike and Transofix. The first product serves as a withdrawal and injection spike for multi-dose containers, the second one as a transfer device for sterile liquids, e.g. for drug admixture. In spite of the high number of pieces, precision has the highest priority when producing protective caps. "The force fit of the protective caps must be manufactured in such a way that on the one hand the caps do not get lost during transportation of medical products, but on the other hand can nevertheless be easily withdrawn," says Stefan Moser, a project manager at B. Braun Melsungen AG, Melsungen. "And this must also be possible when the user is wearing Latex gloves, which can additionally be moistened with liquids like solvents."

Until the conversion of production, the company had manufactured protective caps using two conventionally designed multi-cavity molds with multi-tip nozzles. The conversion of production was triggered by the fact that, first, those molds with a low number of cavities could no longer provide the required production volume and, second, the Mini-Spike tool had reached its wear limit. "It's the philosophy of our company to check at every conversion of production if and how we can save manufacturing costs," says Mr. Moser.

The tandem technology seemed to be appropriate to solve the quantity problem. By this method two different parts can be separately and individually injection molded in an overlapping injection cycle on an injection molding machine using a tandem mold provided with two parting lines. The volumes and the quantity of pieces can be set individually for each parting line.

The gating system of the tandem mold consists of an alternating slider with a bayonet socket, with one of the sides respectively locked and the other one unlocked for opening. "The design of the system is simple, rugged and not susceptible to malfunctions," says Joachim Hammer, a machine setter and quality controller at the supplier from Melsungen.

Implementation of tandem technology requires an injection molding machine with a relatively high installation height of the mold and an adapted programming. B. Braun decided to use a machine of the type Engel 200/90 V Electric with an electrical injection unit.

"The hot runner system is the highlight of the tandem mold," continues Mr. Moser. "This system does not only guarantee an equal filling of the cavities on both sides of the mold, but also a faultless gate point at the protective caps."

"Because of the high number of cavities 24+48 in the tandem mold, we first focused on a 24+48-drop hot runner system with individually controlled open single nozzles," says Walter Ehlert, responsible for consulting and sale at GÜNTHER Heisskanaltechnik GmbH, Frankenberg. For about 20 years B. Brown has been trusting in components provided by the hot runner specialist. "But it would have been too demanding and expensive to install such a system within the planned compact mold," says Mr. Ehlert. Since the hot runner with multi-tip nozzles did function well in the mold in stock, this technical alternative solution finally came into view. Mr. Ehlert describes the advantages of multi-tip nozzles for tandem production in the following way: "These nozzles have a very small structural shape, therefore they allow very small patterns in the mold, keeping the controlling effort low."

However, the use of multi-tip nozzles is often a compromise because there is only one control zone for four gates. Therefore the user cannot control the details of the process so well as with single nozzles. However, with "simple" materials this feature can be compensated for without any problems. "With regard to the costs, you can keep them much lower when using multi-tip nozzles for molds with a high number of cavities," says Mr. Ehlert. "And the controlling effort for manufacturing protective caps is only one third compared to individual nozzles."

Evacuation of pressure in the system

The concept of the hot runner system comprises twelve open multi-tip nozzles per parting line; the ones of the type 26ZHT18/2/67-S with two tips on the Mini-Spike side, and the others of the type 26ZHT18/4/67-S with four tips on the Transofix side. Valve gate technology was originally planned only for the connecting nozzle (sprue bar). However, since the mold was thought to work with a stiff sprue bar which moves away when the parting line 1 opens, valve gate technology was also provided for the injection molding machine along with the needle valve in the sprue bar. This has the advantage that the machine is able to continue conveying even with the sprue bar moving away to eject the parting line 1.

"However, at the beginning of the series production it was problematic with this configuration to evacuate the pressure quickly enough from the hot runner system," remembers Mr. Moser. "In principle, due to tandem technology, the material for each injection molded part has to be injected and conveyed, and finally the pressure has to be removed again from the system in half of the cycle time. With the protective caps, the material squeezed out of the system on the injection side, and the parts initially showed extreme stringing." The problem was gradually solved with the following measures: The machine valve gate nozzle was replaced by an open nozzle, the inner cross-section of the connecting nozzle was enlarged, and the machine program was optimized.

Today, the cycle time of the single part has been reduced by 10%, with two parts being produced at the same time due to tandem technology with alternating injection and cooling. To sum it up, good filling performance for all cavities, no stringing, good tear-off behavior are the parameters for which the hot runner system of the specialist from Frankenberg is substantially responsible.

When asked about his experience with the hot runner system since the beginning of the series production, Mr. Moser has to ponder for a while. Finally he answers: "The best hot runner system is the one you don't have to think much about. Since the beginning of the series production, the system supplied by GÜNTHER has really caused us no concern.

Source Courtesy: Allied Solutions (I) Pvt Ltd.
exclusive representatives of Gunther Hot Runner Systems in India.
info@alliedsolutions.com

Global Demand for Medical Device Packaging

Global Medical Device Packaging Demand to Rise 5.9% Annually Through 2017

World demand for medical device packaging is projected to increase 5.9% pa to US$25.7 bln in 2017, as per The Freedonia Group, Inc. Reflecting the operation of advanced and diversified medical product industries, the US, Western Europe, and Japan will continue to account for almost 60% of the total market. However, demand in these countries will expand below the average global pace as intensifying health care cost containment pressures and fierce multiple supplier competition weaken growth prospects for medical device production and heighten the price sensitivity of their producers to packaging costs. The fastest expanding medical device packaging markets will emerge in India, Mexico, China, and the more prosperous Africa/Mideast countries, where diversification, expansion, and stricter regulation of medical product industries are raising the quality and functional requirements of containers and related accessories. The US will continue to be the largest market for medical device packaging, as its advanced medical product producers commercialize new high value-added supplies, instruments and equipment with specialized packaging needs. Gains in West European and Japanese demand will also benefit from new product introductions, as well as from the upgrading of government and industry standards covering the barrier, security and tracking properties of medical device packaging. In the developing world, China will provide the largest and broadest sales opportunities for medical device containers and related accessories due to burgeoning domestic and export markets for its medical goods. Spurred by rising internal and external investment, China is evolving into a leading worldwide developer and supplier of technologically advanced medical products.

Based on adaptability to cost effective infection-resistant and security-enhanced formats, pouches and trays will continue to lead sales among container types. Growth in pouch demand will reflect ongoing advances in strength, puncture resistance and barrier properties, which will expand applications in the packaging of small- to medium-sized supplies and devices, including sharps. Multiple compartment trays will build sales as they virtually eliminate the risk of staff errors and the spread of infectious agents during the preparation of products for surgery and various other patient procedures. Clamshell packs will also fare well in the global marketplace as they match or exceed all the advantages of rigid trays while offering greater protection against product damage during transport and storage. Containers will make up about 80% of medical device packaging demand through 2017 and beyond. Among other medical device containers, blister packs and glass vials will account for the fastest expanding demand: the former from applications in the packaging of contact lenses; the latter from applications in the packaging of diagnostic reagents and related substances. By contrast, bags -- which are used primarily for the packaging of large and odd-sized products -- will decelerate based on the downsizing and miniaturization of many medical supplies and devices. Demand for boxes will also slow as cost considerations erode some secondary packaging. The fastest gains among medical device packaging accessories will be seen in high visibility labels and tamper-evident and other security accessories. Demand for these products will benefit from more strict government regulations and industry standards covering the safety, security, and functional features of medical device containers.

CAGR for plastics for healthcare packaging of 5.6% has been predicted through 2018 by BCC Research. The global plastic healthcare packaging market was estimated in terms of volume at nearly 9.6 billion lb in 2012 and is expected to surpass 10 billion lb in 2013. The market is expected to reach more than 13 billion lb in terms of volume by 2018, and register a compound annual growth rate (CAGR) of 5.6%. Healthcare plastics find increased use each year in applications in healthcare packaging. In these changing times and in context of the emphasis on healthcare cost control, plastics are expected to increasing their penetration in healthcare packaging. Until recently, most healthcare product markets grew unfettered by cost control. Only in recent years have cost containment efforts truly began to affect healthcare packaging and other markets within the healthcare industry. Plastic healthcare packaging products are segmented into two groups: medical and pharmaceutical. The former includes syringes, tubing, kits, intravenous (IV) bags, other bags and parts, trays, and a miscellaneous group. Pharmaceutical packaging products are made up of containers (mostly bottles and vials), closures (caps, lids, etc.), blister packaging, and a miscellaneous category that includes other bags, pouches, etc. According to BCC Research, containers, tubing, syringes and kits are the leading healthcare packaging applications, and account for about 65% of total plastic volume. BCC believes the healthcare packaging market will also be positively impacted by increased use of disposable products, an ageing population in the U.S. and Europe, a continued shift to contract packaging, growing overseas markets, and the emphasis on child-resistant/senior-friendly, and tamper-evident packaging.

Source Courtesy: www.plastemart.com

Global Demand for Disposable Medical Supplies

Global Demand for Disposable Medical Supplies to Rise Over 6% Through 2016

World demand for disposable medical supplies is forecast to expand 6.2% annually to US$198 bln in 2016. The upgrading and enforcement of infection prevention standards, coupled with an expanding volume of hospital, surgical, and outpatient procedures, will promote overall gains.USA, China, Japan, Germany, Russia, France, India, Italy, UK and Brazil will comprise the 10 largest national markets, combining to absorb nearly 70% of global demand in 2016. During the forecast period (2011-2016), average annual growth in these markets will range from 3.7% in Japan to over 11% in India, as per The Freedonia Group, Inc. Demand for disposable medical supplies in the United States, Western Europe, Japan, and most other developed countries will expand at a below average pace as their medical delivery systems are well established, meet the health care needs of most residents, and have already adopted stringent infection prevention standards. By contrast, growth in the BRIC countries and many other emerging economies will exceed the world average as health care sectors are expanded, modernized and adapted to formal infection prevention protocols. Among the major disposable medical supply product segments, dialysis disposables will post the fastest increases in global demand based on an expanding prevalence of end-stage renal disorders and the high frequency of therapeutic requirements. Other segments projected to command above average worldwide sales growth include diagnostic and laboratory disposables, respiratory supplies and devices, and infusion and hypodermic devices. The use of diagnostic and laboratory disposables will benefit from upward trends in cardiac testing and diabetes self-monitoring activities. An increasing base of allergy, asthma and COPD (chronic obstructive pulmonary disease) patients receiving regular treatment will boost demand for respiratory supplies and devices, especially prefilled inhalers. Rising preferences among medical providers for high value-added configurations with improved infection prevention safeguards will drive up sales of infusion and hypodermic devices. Drug delivery is another fast growing application for disposable medical supplies.

US demand for disposable medical supplies will grow 4.1% pa to US$49.3 bln in 2018, as per Freedonia. An increasing volume of patient activity attributable to an ageing population, a rising incidence of medical conditions, and the extension of health insurance coverage by the Affordable Care Act of 2010 will comprise the major forces that spur growth. The US disposable medical supplies market will also benefit from a heightened focus on infection prevention throughout the health care sector. Pressures from the Centers for Disease Control and Prevention (CDC), the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO), and other medical organizations will prompt hospitals, outpatient facilities, and other health establishments to follow protocols and standards aimed at keeping patients and staff personnel safe from exposure to dangerous, potentially life-threatening pathogens during medical procedures drug delivery products to remain fastest growing type. Based on an increasing number of patients who need surgery or long-term chronic care therapy, drug delivery and related products will remain the fastest expanding group of disposable medical supplies. Total US demand growth will outpace the industry average and reach US$13.4 bln in 2018. Safety enhanced devices for the minimally invasive delivery of parenteral medicines, inhalation therapies, and IV and dialysis solutions will lead growth. Disposable wound management products will register demand of US$10.1 bln in 2018, up nearly as fast as the annual industry average rate of growth from 2013. Polymeric tissue sealants, along with alginate, foam and collagen wound dressings, will realize the best growth based on enhanced safety and faster healing properties. Conversely, demand for bandages will expand at a below average pace due to limited pricing flexibility and the overall lack of proprietary types. First aid kits will fare the best among disposable wound management products, benefiting from trends promoting self-treatment. Advances in less invasive surgery will weaken the overall US market for traditional suture and staple wound closures. Compared to disposable medical supplies as a whole, nonwoven medical disposables will see above average growth in demand. The heightened focus on infection prevention in the health care sector will boost consumption of single use, high value-added nonwoven garments and textiles by hospitals and outpatient facilities. A rising prevalence of incontinence problems attributable to the ageing population trend will impact favorably on retail and institutional sales of nonwoven adult undergarments, shields, and other protective products. The best growth in demand among other disposable medical supplies will evolve in products with enhanced infection prevention, performance, and/or cost containment benefits. Included in this group are biological sterilization indicators, intermittent urinary drainage catheters, orthopedic surgical kits and trays, polymeric surgical gloves, reinforced waste disposal containers and accessories, single use labware, and specialty surgical instruments. By contrast, changes in patient care approaches or health insurance coverage will adversely affect growth prospects for several disposables including angioplasty catheters, blood glucose test strips, and single use patient room supplies.

Source Courtesy: www.plastemart.com

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Make In India- Polyproylene Non Woven in Hygiene

Looking back to look forward – Hygiene sector

India is generally trailing behind the world's trend on new product development and usage byabout 5 years. With exception of electronics, this is applicable to many sectors and in particular for plastics. While the period is narrowing down, the primary reason for delayed introduction is understanding the scale & economics of production, consumption & growth, investment sealing etc.,

Few such delayed developments witnessed in the recently in the field of plastics are summarised below.

PP Nonwoven development

Way back in 1990s, customers were well aware of the technology of manufacturing of nonwoven, its market and application. However large scale usage started in 2002 after a gap of almost 7 years. The usage also started first with the imported roll goods followed by indigenous production. Since then, the growth has been phenomenal for over 30% year after year in the initial period.

From just few hundred tons , the capacity has grown over 2 lakhs tons in just 7 years. One of the primary reason for this rapid growth is the availability of Chinese machines at an affordable cost (4cr) against the European manufacturers (40 cr plus)

The Chinese developed the machine suitable for Indian conditions with low scale of economics at an affordable cost which prompted many to jump into manufacturing. This followed the huge supply leading to consumption and high growth. Presently 3 Indian manufactures are also manufacturing the machinery realizing the potential.

This development as referred by late Management Guru C.K.Prakaladas "Gandhian Engineering". – Develop technology what India demands. At a later date, Customer will elevate to the high end machines following the world trend, but at initial stage , Gandhian engineering is very much needed.

Block bottom back developments

Similar example can be traced back to block bottom bag usage for cement packaging. This was known to the industry in early 2000s and the usage started with the imported bags. However the actual production started in India in 2010 after a decade, again the delay was due to the high cost of machinery.

Hygiene products developments

Presently the trend is towards manufacturing of hygiene products like sanitary napkin, baby diapers , adult incontinence, under pad etc. Some of these products are available in India for over 4 decades, however mostly supplied by few of multinationals and the market is limited to urban cities. The penetration level is in single digit for many products and the growth potential is huge especially in tier 3 cities and rural areas. The high cost of machinery is one such deterrent to the growth.

Presently low cost machinery are available which would make the project feasible. Few innovators in India developed both hand-made and semiautomatic machines to manufacture the sanitary napkin for localised supply . The service of NGO's women arm are utilized to market the product to rural women besides providing employments.

Another interesting development is the manufacture of incinerator for safe disposal of used napkins. While this has been installed at many corporate offices in the rest rooms of female folks , this is being considered by few state governments to install in girls high school. Added to that , sanitary napkins dispensing machines are also available.

Both central and many state governments are promoting schemes for large scale usage of sanitary napkins among rural women. The Ministry of textile under Technology Up gradation Fund (TUF) scheme providing both interest and capital subsidy for the plant and machinery.

Investors can look at these options for encashing the opportunities.

Author
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FinOlex INDUSTRIES

Finolex Industries Ltd. (FIL) is India's largest manufacturer of PVC Pipes & Fittings and the second largest PVC resin manufacturer. FIL is headquartered in Pune and operates through its state of the art manufacturing plants located in Pune, Ratnagiri in Maharashtra and Masar in Gujarat. It is the first Indian PVC–U Pipes manufacturer to be awarded the IS/ISO 9001:2008 certification.

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Sr Engineer/Engineer—Production: - B.E.(Mech/Prod) candidate having around 5-7 years' experience in production function. His primary responsibilities include in-depth knowledge of plastic extrusion /moulding process.

Interested candidates are requested to send their detailed resume to **vkp@finolexind.com** mentioning clearly the post applied for.

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Address: D-1/10, M.I.D.C., Chinchwad, Pune – 411019.

Investment Opportunities in Hygiene in India

Sanitary Napkin Project

"Change is only constant" in the world. This is aptly applicable to all and in particular to the industrialist. Existing and new Entrepreneurs are constantly looking for change through exploring opportunities for investment in potential areas primarily to sustain as well as to expand the business.

This "Investment opportunities corner" is therefore introduced keeping in mind the requirements by the industry. This column will attempt to highlight the new opportunities emerging to the Indian entrepreneurs and this column will act as a tip for investors.. Readers are advised to explore further into this subject to study the pros and cons in details.

Product type	: Sanitarty napkin without wing
Present Consumption	: 2.6 billion units
Penetration	: 12% (Vs world 75%)
Per capita consumption	: 65 (Vs world 365)
Total potential	: 125 billion units
Estimated realisitic Potential	: 22 Billion Units (9 times)
Growth	: 18 %
Growth Drivers	: Low penetration, Poor accessability, Affordability (high cost) Poor reach in the rural areas, Many Govt schemes,
Major manufacturers	: Majorly dominated by MNCs Few local suppliers.
No. of Raw Materials	: 5 (4 locally available)
Machinery	: To be Imported

Detailed project report available on request

Author
V.Kannan & Mr. Shrichand Santani Reliance Industries Limited, Mumbai

Project Summary - Sanitary Napkins		
	Unit	Value
Capacity	Cr Pcs	15.84
Capex	Rs. Lakhs	413.9
Est. Cost of Project (Capex + Working Capital)	Rs. Lakhs	610.2
10 Years Average		
EBITDA	Rs. Lakhs	296
ROI	%	42%
Capex/EBITDA	No	1.4
Simple Payback	Yrs	4.5
NPV	Rs. Lakhs	396
IRR	%	27%

Academia News

Safaigiri Award for Dean of Engineering College's patented Plastic Tar Road Technology

Dr. R. Vasudevan patented the environment-friendly 'plastic tar road technology', which uses plastic waste to lay roads. These are three times more durable than regular bitumen roads, helping save not just waste but also crores of rupees over the years.
Dr. R. Vasudevan is a Dean & Prof. in Department of Chemistry, Thiagarajar College of Engineering, Madurai. He has a teaching experience over 35 years and 20 Publications to his credit. He has undertaken various projects from AICTE, Department of Science and Technology and Central Pollution Control Board.

On 2nd October 2015, Gandhi Jayanti day, he has been awarded "Safaigiri Award" from Honourable Prime Minister Shri Narendra Modi for his valuable contribution of utilization of Recycled of Plastics in Road Construction. He also has patent for utilization of Plastics Waste to his credit.

The India Today Group launched the Safaigiri Summit and Awards 2015, which has identified champions, whether individuals or institutions, in 13 categories who will be awarded for their inspiring work. A jury of eminent citizens selected the champions.

National Level Technical Quiz on Plastics in Packaging

The Department of Printing and Packaging Technology, SIES Graduate School of Technology, Nerul, Navi Mumbai, being the student chapter of Indian Plastics Institute, Mumbai organized "P-Pack 2015", a National Level Technical Quiz on Plastics in Packaging. Held on September 15, 2015, this was a first ever quiz on a National scale specifically on plastics in packaging, and that too on Engineers' Day celebrated in India on the birthday of Sir Mokshagundam Visvesvaraya. The P-Pack event was held under SIES Graduate School of Technology's Flagship Annual Inter-collegiate Technical Festival "Cognition", which encompasses many events in varied fields like IT, Computer Engineering, Electronics and Mechanical Engineering.

P-Pack has an aim of bringing the best of the students from B.E/B.Tech courses in plastic/polymer/packaging related fields and put their knowledge to test alongside the best minds from all over India, standing a chance to win attractive prize money of Rs.20,000/- for the winner and Rs.15000/- & Rs.10000/- for 2nd & 3rd placed teams respectively. Each team consists of two participants who are nominated by the Head of Departments of respective Institutes.

The event got an overwhelming response since twelve teams participated. The teams that took part in the preliminary rounds in the morning of September 15 were: 2 teams from Madras Institute of Technology, Chennai; 1 team from Kamraj College of Engineering & Technology, Madurai; 2 teams from L. D. College of Engineering, Ahmedabad; 2 teams from MIT, Pune; 1 team from M. G. University of Engineering, Kottayam; 1 team from MIT, Aurangabad; 1 team from Institute of Chemical Technology, Mumbai and 2 teams from SIES Graduate school of Technology. Shri. Umang Shah, IPI Mumbai Chapter chairman inaugurated the event.

To add value to this extravagant event, Mrs. Neha. N. Israney, Lecturer in Plastic Engg. Dept. at Shri Bhagubhai Mafatlal Polytechnic, Mumbai, was invited to give a 45-minute guest lecture on "Plastic Waste Management" in the afternoon, which was an eye-opener of sorts for the audience present. Three preliminary rounds were conducted out of which 5 teams qualified for the Final Stage. Immediately after the guest lecture the final stage was held. After the gruelling and tense five rounds, the team from Institute of Chemical Technology, Matunga walked away with the Winner's prize followed by Madras Institute of Technology getting both 2nd and 3rd prize. The Prizes were given away by Dr. E. Sundaresan, IPI Governing Council Chairman.

Kisaan Raja

Plasticulture – Path Ahead

Irrigation is the most important element in agriculture process. And judicious use of available water is the need of hour. As per official data around 46.34 percent of India's net sown area of around 140.80 million hectares was under irrigation till 2011-12. To achieve the target of total irrigation massive fund of Rs. 50,000 + crore is needed as per the experts. In the Union Budget of 2015-16 Rs.5300 crore has been allocated. NABARD has set a target of providing Rs.30,000 crore as credit to farmers for next three years.

"Irrigation efficiency can be improved by adoption of modern methods of irrigation to achieve the goal more crop per drop."

Plasticulture activities are targeted towards increased use of plastics in agriculture thereby enhancing availability of water and improve productivity from the farms, better packaging for storage and transportation to reduce post harvest losses. This is a quick summarization of activities which has huge potential in terms of consumption of plastics in millions of tons with great challenges.

Agriculture needs continuous infusion of innovation and technology in ensuring global food security, poverty reduction and environmental sustainability. Socio-Economic and Caste Census (SECC) 2011 released in 2015 indicates that out of 24.39 crore households in the country, 17.91 crore lived in the villages and among them 10.69 crore were considered as deprived households. As per SECC, 31.26 percent of total rural households are still broadly identified as poor where the main earner has an insecure and uncertain source of income. Agriculture is critical for those who live below the poverty line.

Activities Carried out so far and Path Ahead

We started with promotion of drip irrigation among small and marginal farmers who are living quietly in remote corners where finance for buying drip sets is available to them from money lenders. While visiting these remote villages any urbanite would get amazed that civilization exists in these remote corners in India. There are dedicated teachers who are running ZP schools and boys & girls from these villages still walk many kilometers for attending schools. Most farmers who were part of JLG were able to sign on their bank passbooks. This was satisfying experience. These villages are clean, and barring few cases, there are toilets in the villages. However rain fed agriculture does not create enough income for the families and our intervention boosted the yield by 300 % and sustaining such yield would change the livelihood of these villages.
The model which we adopted was as below…

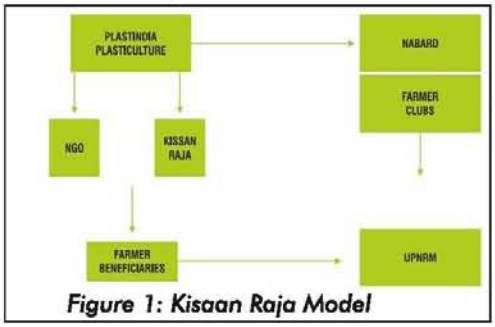

Figure 1: Kisaan Raja Model

We need to keep improving our model to help farmers and help ourselves which is measurable in terms of productivity from farm land for farmers and increased consumption of plastics for us. The story is covered in detail in the form of book, Kisaan Raja.

We all know that plastics can enhance productivity which was well demonstrated in Israel, China, USA, Europe, Japan, Taiwan, Korea and many other countries. But every country is different in terms of economic, socio political, climatic and land holding pattern. We need to create development models which would suit our conditions. We also need to improve upon our models so that it covers maximum farmer families
Plastindia Plasticulture with support from OPPI would escalate plasticulture activities to all India level by holding Demonstration cum Exhibition named as Kisaan Raja. These exhibitions are different from traditional exhibitions. These exhibitions will be held at the district and taluka levels in villages at the doorsteps of farmers. One of the slogans adopted by us was "Drip at Your Doorsteps"

Pictorial walk through of the Plasticulture Model

The villages selected were on an average 25 kilometers away from state highways where the civilization exists with ZP schools, post offices but no banks or hospitals with occasional electricity.

Picture Cluster 1
It was a satisfying experience that we could make the barren land


1. a. Barren Land- Any urbanite will be amazed that civilization exists in such barren areas, where farmers look at the sky for Rain God


1. b. Barren Land with Drip Laterals laid


1. c Cotton Crop on Drip Irrigation


1. d Flowering of Cotton ready for harvesting

green with very little quantity of water that was available. It brought smiles in the villages.

Planning and Execution

Lot of efforts have to be put in by conducting meetings at the farms or temples in the villages. Following is a pictorial walk through of planning and execution of Demonstration and Execution.

Picture Cluster 2

2. 1 Meeting Villagers

2.2 Kisaan Raja Opening by District Collector

2.3 Addressing Farmers during the Exhibition

2.4 Demo Plot getting ready for Drip

2.5 Visit to Demo plot

2.6 Growth of Cotton Plants

2.7 Bumper Yield of Cotton

2.8 Bumper Yield of Cotton

New Models

Plasticulture activities will continue with drip irrigation however farmers are positively inclined to use more of plastic products. Though still skeptical due to fear of quality of plastic that gets supplied to them. Inadequate rainfall this year has changed perception of progressive farmers who are normally opinion makers in the villages.

They are now asking for pond liners to create small ponds without waiting for the subsidy. These ponds will be a reliable source of water for the drip systems.

Pond Liners

At Kotagiri project of Plastindia Foundation we have planned three small ponds in the hilly terrain. Our NGO from Aurangabad has been working with farmers to create huge reservoirs to accumulate rain water which would eventually bring up water table.

3.a Small Pond at Kotagiri Taluka Nilgiri District of Tamilnadu.

Picture 3.b Shirpur Pttern Dam at Morhira, Aurangabad

Picture 3.c Larger Pond

Farmers now do not want to wait for subsidy to come to their steps and create ponds. Plastindia Plasticulture would encourage group of farmers to create more ponds

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Polyethylene Films

Horticulture has become a key driver for economic development in many states in the country. It contributes to 30.4 percent to GDP of agriculture from nearly 13 percent of total cropped area and support nearly 20 percent of agriculture labor force. During 2013-14 horticulture production was 277.4 million metric tons in comparison to food grain production of 265 million metric tons. Protected cultivation of horticulture can give 5 to 12 times of production but in India protected cultivation is approximately on 25,000 hectares whereas in the world protected cultivation is spread over 623,302 hectares. There would be huge requirement for polyethylene films in India starting from Greenhouse films, Low and High Tunnel films, Mulch films etc.

Mulch films and shade nets should be able to tolerate modern pesticides. Then comes the low tunnel and medium tunnels. The film has to be pesticide resistant. Many farmers are going away from

greenhouses which they find expensive and they also have marketing issue with the products that they cultivate in the greenhouses. They are now preferring shade net houses.

Picture 4.1 Mulch Films

Picture 4.2 Low Tunnel Films

Picture 4.3 Medium Tunnel Films

Picture 4.4 Green House Films

Shade Nets

Farmers prefer to grow vegetables in shade net houses considering Indian climatic conditions. At Kotagiri we have planned a small shade net house for nursery.

Picture 5.1 Shade Net at Kotagirifor Nursery at Kotagiri, Project funded by Plastindia Foundation.

Picture 5.2 Typical Shade Net House

Crop Protection Films

Farmers are under too much pressure due to unseasonal rains and hail storms. They feel increasing need for Crop Protection films. These are basically wide width films which has varied thickness across.

Picture Cluster 6:Crop Protection Films

All above are few examples of our future targeted activities would be.There would be huge consumption of polyethylene in various agri film areas as present consumption is negligible.

If we take example of polyethylene consumption for mulch film considering area under irrigation of 70 million hectares, at 10% market penetration the quantity of mulch film requirement comes to 13 lakh tons.

Indian Plastic industry needs to get geared up for this demand. There are few companies making and selling mulch and other agri films but the demand would be much more.

At present lot of these films get imported in the country which are expensive and can not reach all the farmers. Plastindia Plasticulture would create different models of development so that films made in India are sold to farmers in the remotest areas.

Use of modern pesticides have made these films quite sophisticated

which should be considered very seriously by industry players who would participate in promotion of their films in agriculture. World over agriculture is a serious business for the plastics industry.The key drivers behind the development and use of agricultural films have been: extending the growing season for crops; and raising the yield. With the growth in world population, issues of food security and scarcity are becoming increasingly important.

Polyethylene films have made a substantial contribution to the increase in agricultural production over the past 50 years through the development of products used for mulch, silage and greenhouse applications. AMI estimates of 2010, worldwide demand for PE films in agricultural applications at 3.6 million tons. Asia holds by far the largest share of the market at 60%, with China the world's largest single market at around 1.5 million tons. However, Europe also makes significant use of agricultural films, accounting for 19% of world demand.

Plastindia Plasticulture committee is now planning the promotion of plastic products by way of

a. Exhibition cum Demonstration – Kisaan Raja Exhibition done in past is one model. However this model will keep changing as we move from one geographical location to another within India. This is mainly due to the change in crop pattern with change in geographical location.

b. Mobilization of Plastic Products manufacturers – Most farmers complain about quality of plastic products used by them. We need to address this situation.

c. Creation of Demo installations and Pilot projects. Use of plastic films has become a necessity due to insufficient rains this year. Farmers have realized this and are eager to adopt use of mulch films, shade net house, tunnel films, silage films, pond liners.

d. Pilot projects for Subsoil drainage and reduction in soil salinity. This type of pilot projects will cover large land parcels. These farmers will be targeted for further promotion of drip, sprinkler irrigations and for use of plastic films.

e. Village Adoption – Clusters of villages would be identified for funding from NABARD and other funding organizations which would be done through NGOs. Role of Plasticulture Committee would be of a facilitator.

f. Technology adoption – we realized that apart from new technologies in plastics we need to work with other agencies who are also making efforts to improve agricultural productivity with new and or advance technologies. In Kotagiri project of Plasticulture Committee we have adopted solar power for pumping water from the well, power fence on solar energy to keep animals away from the field. This is one example however there are many organizations who are working in this broader space of agriculture where we need to networking.

Use of PVC pipes for water transportation and use of drip and sprinkler irrigation has been known to farmers in India. In our previous interaction with farmers of Jalna we realized that small and marginal farmers do not have money to buy drip set even for their one acre land. We had NABARD with us who helped the farmers with small loans through NGO. Therefore promotion of drip and sprinkler irrigation does remain as priority and all other plastic products follow thereafter. This makes our Kisaan Raja model more relevant.

Plastic industry has come together in past for creating BIS standards for Plastic Woven Sacks (PWS). Two standards, one for food grain and other was for sugar. Jute lobby did not want this to happen fast and there was lot of resistance. However we did succeed. Existence of standard brought discipline to the trade as technical specs were available for tenders to quote.

Similarly lot of new standards need to be created for use of plastic products such as mulch films, tunnel films greenhouse films etc.which are for Indian climatic conditions. The existing standards need to be modified to accommodate new materials like metallocene polyethylene and others. This is going to be team work and all players need to come together and make this happen.

Plastindindia Plasticulture Committee together with OPPI is committed to interact with industry members, NABARD, Central and various State Governments particularly Ministries of Agriculture and Irrigation, Research organizations under Central and State Governments, CASR laboratories and National Research Centers, Bureau of Indian Standards NGOs and farmers of India.

This mammoth task needs contribution from everybody and I would request everybody who is reading this article to make positive contribution to this noble cause.

"Next Kisaan Raja during Kharif season at Marathwada, Maharashtra"

Jai Hind.

Author
Dr Yatish B. Vasudeo,
Chairman Plasticulture Committee,
Plastindia Foundation.

Environment and Plastic Image Committee

Student's Awareness Programme on "SWM and Plastics" at Sinhagad Springdale School, Warje, Pune, by Mrs Kalpana Andhare on 10th September. Uptill now more than 30 schools have been covered and 1lac school students directly addressed in 3 months.

Principals Awareness Program Pimpri - Chinchwad (Pune) 9 Sept 2015 200,00 students would get the information through 160 School Principals

In Satara on 15 Sept 2015 - Awareness Program for Village Sarpanchs (Village Heads) in Satara District

Solapur University, Program for Principals on Municipal Commissioner 19th Sept 2015 - 140 Principals Present Chief Guest Mr Vijay Kallam, IAS

19th Sept 2015 Juhu Beach international Coastal Clean Up Day

Cycle Rally Kolhapur 100 Cyclists 10 km

Madurai Awareness Program 8th Oct 2015 - 150 School Principals also Present Dr Vasudevan, Plastic Road Man of India, who was felicitated by the Prime Minister on 2nd October for his Outstanding Work

Founder Members Activities

ORGANIZATION OF PLASTICS PROCESSORS OF INDIA

31st ANNUAL MEET OF ORGANIZATION OF PLASTICS PROCESSORS OF INDIA– AUGUST 28, 2015

The 31st Annual Meet of **ORGANIZATION OF PLASTICS PROCESSORS OF INDIA** was held on August 28th, 2015 at Golconda Ballroom, Trident, Bandra Kurla, Mumbai.

Dr. Habil Khorakiwala, Chairman, Wockhardt Limited was the Chief Guest. He delivered a talk on – **"UNIQUE ORGANIZATION – PAST : PRESENT :FUTURE".**

Mr. C. Bhaskar, President, OPPI in his Welcome Address stated - "how do I introduce someone who is at the same time an entrepreneur, a social Industrialist, an educationist, a diplomat and most of all, a philanthropist. The invitation Cards that you received for this evening's Get-Together do carry a summary resume of Dr. Khorakiwala. But that only tells a bit of the story."

Introducing Dr. Habil Khorakiwala to the audience, Mr. C. Bhaskar stated – "he founded Wockhardt in 1967. A keen disciple of 'Change Management' his visionary and astute leadership has resulted in Wockhardt emerging as a leading pharmaceutical and biotech conglomerate, driven by research and strategic thinking on a global scale. In his words "Sometimes you have to go to places which are unknown or come across totally new experiences." Over the years Wockhardt has had its share of difficult times and has overcome these adversities too and on this Dr. Habil Khorakiwala says "I always thought that every time there are difficulties, it provides opportunities and challenges. Overcoming them proves your mettle."

Mr. Bhaskar further stated – "Dr. Habil Khorakiwala strongly advocates that the only way towards rapid growth is to be customer focused and he has ensured that this approach has filtered down to every decision and action at Wockhardt. His signature style encompasses an open culture, participative management, continuous improvement & innovation and empowerment. After all, he says, "Good Management is good management and it works everywhere."

Mr. C. Bhaskar, President, OPPI, drew the attention of the Chief Guest Dr. Habil Khorakiwala to the Awareness and Education Programme on "Plastics And The Environment" that the OPPI has been undertaking for over 8 years. He stated – "Striving to inculcate responsible use of plastics, we have reached nearly 1,10,000 students in 341 schools in Mumbai, Navi Mumbai and Thane, besides the schools in Gujarat covered under a Programme conducted by Gujarat State Plastic Manufacturers Association in collaboration with the OPPI. This is a worthy cause, and I would request Dr. Habil Khorakiwala to consider Wockhardt's involvement in this programme".

Dr. Habil Khorakiwala, in his address on – **"UNIQUE ORGANIZATION – PAST : PRESENT : FUTURE"** stated that when Wockhardt decided to go global, he built-up a Research Organization, invested in R& D, and acquired Companies in USA, FRANCE, U.K.,IRELAND and GERMANY. Simultaneously, Dr. Habil Khorakiwala also started exporting products from India. Thus in a span of 10 – 12 years Wockhardt completely transformed itself from a domestic company to a Global Company. By 2010 – 2011, 80% of the business was out- side India.

Dr. Habil Khorakiwala mentioned that the Company Leadership played very vital role when the company faced financial crises. He further stated that when he faced the financial crises the top management stayed with him, creditors gave longer credits, the Bankers gave Rs. 250 Crores to tide over the crises. During the crises there was hardly any turnover at Senior Level as it happens in many organizations.

Dr. Habil Khorakiwala mentioned that he turned around his company by introducing complete automation and SAP.

Dr. Habil Khorakiwala concluded his address by saying – "10,000 of us in Wockhardt live by our corporate vision everyday and I firmly believe that we all are here to impact the World and not to be impacted by it".

Q & A Session Panelists were – Mr. Vijay Taparia, Executive Director, The Supreme Industries Ltd., and Mr. Ashok Goel, Vice Chairman and Managing Director, Essel Propack Ltd.

Mr. Manish Minocha, Treasurer, OPPI proposed Vote of Thanks on behalf of Organization of Plastic Processors of India. He said – "our grateful thanks to the Gold Sponsor – The Supreme Industries Ltd. and also to the Silver Sponsor – ONGC – Petro – Additions Ltd. (OPAL). We also thank Indian Oil Corporation Ltd., Xpro India Ltd. and SCJ Plastics Ltd. for actively and financially supporting OPPI events".

31st OPPI ANNUAL MEET – 28 AUGUST 2015

Mr. M.P. Taparia, Managing Director, Supreme Industries Limited presenting a bouquet to Dr. Habil Khorakiwala Mr. Ashok Goel, Ex-president, OPPI looks on

Dr. Habil Khorakiwala delivering a talk on "UNIQUE ORGANIZATION - PAST : PRESENT : FUTURE"

Dr. Habil Khorakiwala & Mrs. Nafisa Khorakiwala with OPPI Executive Committee Members

Dr. & Mrs. Khorakiwala with ONGC-Petro Additions Ltd. (OPaL) team and others

Mr. Trinath Behera, CFO, ONGC-Petro Additions Ltd. (OPaL) presenting memento to Dr. Habil Khorakiwala on behalf of Organisation of Plastics Processors of India

View of the audience

INDIAN PLASTICS INSTITUTE

XPRO India Ltd. Endowment Lecture held on 7th August 2015

XPRO India Ltd. Endowment Lecture held on 7th August 2015 at AIPMA Auditorium, Andheri (East), Mumbai, organised by Mumbai Chapter.

The event started with a welcome address given by Mr. Umang Shah, Chairman and Dr. S. T. Mhaske, Vice Chairman of IPI Mumbai Chapter.

Shri Ashish Desai, Director, Jyoti Plastics Works Pvt. Ltd. delivered excellent Endowment Technical Lecture on "Improving Quality using Six Sigma Methodology". The highly useful content of the lecture was well acknowledged by the members who all praised his lecture.

Shri Gaurang Shah, Director, Madhu Machines and Systems Pvt. Ltd. delivered a Technical Lecture on "Improvement in Quality and Efficiency Via Advanced Mold Technology". Mr. Shah's speech was very informative and well received by all the participants.

Other dignitaries present during the presentation were Dr. E. Sundaresan, Chairman, GC, Mr. Atul Kanuga, President, Mr. Francis Pinto, Vice President, Prof. M. A. Shenoy and Mr. Jayant Kamat.

Finally, Mr. Umang Shah, Chairman, Mumbai Chapter, proposed vote of thanks.

Inauguration of IPI Student Chapter at Solapur University Organised by IPI Pune Chapter

We are pleased to inform that Indian Plastics Institute Pune Chapter inaugurated its First Student Chapter tie up with Solapur University on 19th September 2015 at Solapur University Auditorium, Solapur. Chairman, IPI Pune Chapter Dr. S. Radhakrishnan briefed about the IPI Student Chapter and its benefits.

Photo shows IPI student chapter certificate being presented to Dr. N. N. Maldar, Vice Chancellor Solapur University by Dr S

Radhakrishnan Chairman, IPI Pune Chapter in presence of Shri Kallam, IAS, Municipal Commissioner of Solapur.

IPI Vadodara Chapter

IPI Vadodara Chapter and its members are pleased to share an **ONE OF THE KIND EVENT** that was conducted by our member **Dr. Nitin Bhate at the Baroda High School, Bagikhana, Vadodara.**

Dr. Bhate, leads the committee of School programmes as well as Students Chapter for our Chapter and under this committee, he has been continuously pursuing the good work of Educating the School children on "Plastics and Waste Management" Topics.

While other schools who are developed and so called modern will have the necessary AV equipment where we have been carrying out the programmes on regular basis.. However, here the challenge was that the school does not have the Assembly Hall even and then to deliver the talk on the subject without the ppt was the big challenge...

But as the pictures say many words.. Mr. Bhate conducted the 90 minute talk with children in the OPEN to sky arrangement which was best possible for the session...

The session on Introduction to plastics and its waste management was conducted by Dr. Nitin Bhate as a part of one of the permanent projects of IPI, Vadodara Chapter at BHS Bagikhana on **1st Sept.'15 for about 150 children** (3 divisions) of class X.

Plastics is introduced to them in their curriculum and it is necessary to educate them about the same. Since the number was large the challenge was to conduct the **1.5 hr session without ppt presentation.** Charts explaining the basics of polymers were displayed and explained. Addition and condensation polymerization were made self explanatory by addition to one another and form a pair and ditch the fourth one.

Introduction to plastics and waste management should not only include the polymer classification and applications but also the significance of the recycling codes and the recycling scenario. For this a **card game conceptualized by Dr. Nitin Bhate called "Plastic Fundas"** was played by the students. **15 packs of cards were used in groups of 10 respectively.**

The card included an image followed by the name of the plastic (this was to make them aware of the plastic used for the given application). This was followed by the type of plastic (commodity, engineering, resin, elastomer). The category to which the plastic belongs (thermoplastic or thermoset) was also included. This was followed by the mode of polymerization (addition or condensation). Whether the given plastic/resin/elastomer can be recycled or needs to be incinerated was also given. A salient feature of the given polymer was also included. On the lower right corner the recycling code (1-7) was given. Two cards for recycling and incineration with the rate card for recycling or incineration formed a part of the card game. The idea was to make a deal with the players having these cards to recycle or incinerate the cards with the player. Additionally there were Wild cards based on the Scientists who have contributed to the field of polymers. 7 cards were given to each player. The player to discard the cards first is the winner. The objective of the game was to educate the students about plastics and to create awareness about proper disposal of different types of plastics. It was a fun filled activity thoroughly enjoyed by the students.

This concept will also be tried out in other Senior students studying 'Polymer Chemistry' as a subject. Additionally it will be extended in all the schools where IPI sessions are conducted in future.

INDIAN PLASTICS FEDERATION

Launch Function of Indplas'15 at Ahmedabad

Indian Plastics Federation. Kolkata organized a launch function of the upcoming INDPLAS'15 Plastics Exhibition at Hotel Hyatt Regency, Ahmedabad on 14th August 2015. The function was addressed by Mr. Pradip Nayyar, President-IPF and Mr. Ashok jajodia, Chairman-Indplas'15, Mr. Ramesh Kr. Rateria – Co-Chairman – Indplas'15 and Mr. K. K. Seksaria, Past President-IPF along with Mr. Nitin Shah, President-GSPMA and Mr. Rajiv Raval, Treasurer, Plastindia Foundation, Mumbai. The function was well attended by distinguished guest from Gujarat Plastic Industry.

IPF AWARDED AT INDIAN ASSOCIATION CONGRESS (IAC)

Indian Plastics Federation received two awards at 5th Indian Association Congress 2015 organised by CIMBLOBAL at The Lalit Ashok, Bengaluru on 21st and 22nd of August 2015. The awards were given for best Use of Social Media Award 2015 (Industry) and Best PR Campaign Award 2015 (Industry) .

The Indian Association Awards ceremony was the 1st Association Excellence Award 2015 introduced by the organizers . Backed up by the global recognition of IAC and its credibility, the India Association Awards is an unparalleled recognition which was well appreciated by all. The jury, respected professionals from various industries as judges, also

had taken into view, peer reviews which made it the most credible and sought after awards. Since no IPF representative was present to take the awards during the seminar, the awards were handed over to IPF at an award function held in the Conference Hall of the Federation on 10th September 2015. Ms Anitha Niranjan, Executive Director of CIMGLOBAL presented the trophies to Mr. Pradip Nayyar, President, IPF and other senior members.

REPORT ON " INDPLAS'15" TO BE HELD IN KOLKATA FROM 27-30TH NOV. 2015

The countdown for Indplas'15 - the most Vibrant and Promising Plastics Exhibition of India has begun. The Indplas'15 will be held in Kolkata from 27-30 November, 2015 at Science city ground, Kolkata. All the preparation for organizing the show has been complete and we now look forward to welcome the plastics fraternity to the "CITY OF JOY". There is big enthusiasm among the exhibitors and visitors regarding Indplas'15 and we assure everyone for comfortable and successful exhibition.

Visitors can get themselves pre-registered online at our website www.indplas.in for a trouble free and easy access to the fair ground. Large numbers of visitors all over India and overseas have already got themselves registered. We request you to register yourself immediately.

There are various opportunities for those who could not manage to participate this time. One can place advertisement in the exhibition directory and place advertisement on " SPOT & SITE" inside the exhibition ground. Advertisement always pays back and gives good recognition . we request you all to place you ad on our website.

Team Indplas'15 is building a Theme pavilion, which will be a talk of the show during the exhibition. It will showcase the use, application and benefits of Plastics. A life without Plastics- "unimaginable " . Don't miss to see the Theme pavilion during your visit to Indplas'15.
Team Indplas'15 look forward to see you and welcome you all in Kolkata.

For any further information about the exhibition, you may contact:

Mr. Ashok Jajodia- Chairman Indplas'15 EOC
E mail : ashok.jajodia@indplas.in
Mobile : 9831010537

CENTRAL INSTITUTE OF PLASTICS ENGINEERING & TECHNOLOGY

Inauguration of Hostel Blocks at CIPET Centre, Aurangabad

The newly constructed Hostel Blocks at CIPET Aurangabad was inaugurated by Shri Hansraj Gangaram Ahir, Hon'ble Minister of State for Chemicals & Fertilizers, Govt. of India – at a professionally organized function on Friday, July 10, 2015.The
construction of Hostel blocks for boys & girls with the built up area of 5549 sqm. has been completed at cost of Rs. 12.13 Cr. The Hostel Blocks can accommodate 300 boys and 100 girls separately.
In his Presidential Address, Shri Hansraj Gangaram Ahir, Hon'ble Minister of State for Chemicals & Fertilizers, Govt. of India, informed that Aurangabad has potential for further industrial development since the proposed Delhi-Mumbai Industrial corridor is expected to come up which will connect Aurangabad with major industrial cities. Coherently, by leveraging the existing expertise in the field of Automobile, Printing, Beverage Rubber & Plastics, etc. it can become one of the most preferred destination of establishing MSEs, So, Aurangabad region needs augmentation of skill development to create one million skilled work force in the next 10 years through various programmes in the long and short term plans. The development of larger industrial parks and special economic zones and proportion of investment in Automobile, Pharma, Polymer and Breweries Industries will bring more investment and employment to this region.

He also informed that CIPET Aurangabad is also doing commendable job in training the students to create the pool of skilled workforce required for the development of plastic industries in Maharashtra in particular and country in general.

IPLEX 2015

CIPET stall at IPLEX '15 Exhibition held at Bengaluru from 25-27th September, 2015 was inaugurated by Shri Surjit K. Chaudhary,I.A.S., Secretary, Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Govt. of India.
CIPET stall had displays about:

- Petroleum Chemicals & Petrochemical Investment Region (PCPIR)
- Setting up of plastic park,
- 6th National Awards for Technology Innovation in Petrochemicals & Downstream Plastics Processing Industry,
- Setting up of Centre of Excellence in petrochemical sectors etc.
- and also had display's about various new schemes announced for the plastic industries by DCPC.

GUJARAT STATE PLASTIC MANUFACTURERS ASSOCIATION

PLEXPOINDIA 2016 : Exhibitors' Meet-to-greet function

GSPMA is organizing its 7th edition of PLEXPOINDIA 2016 at The Exhibition Centre, Gandhinagar (Gujarat) during 7th to 11th January, 2016.

Exhibitors' Meet-to-greet function held on 13th Oct'15 at Hyatt Regency, Ahmedabad. The function was presided over by Shri K. K. Seksaria, President, Plastindia Foundation. The Guests of Honor at the function were Shri Shama Sundara, Zonal General Manager, GAIL (India) Ltd. and Shri N. K. Balgi, Director on Board, Ferromatik Milacron Ltd.

Shri Nitin Shah, President-GSPMA addressed the gathering. Shri Tushar Parikh, Chairman-Plexpoindia'16 briefed about forthcoming event, followed by Screening of promotional film and presentation. Shri K. K. Seksaria, President, Plastindia Foundation delivered inaugural address on this occasion. Shri Samkit Shah, Hon.Secretary-GSPMA proposed vote of thanks.

Participation in IPLEX'15 & INDIAPACK 2015

Recently, GSPMA participated in IPLEX'15 – International Plastics Exhibition held during Sept 25-27, 2015 at Bengaluru. Also participated in INDIAPACK 2015 – 6th International Packaging Exhibition (concurrent with World Packaging Congress) at Mumbai. GSPMA has promoted its activities & forthcoming Plexpoindia exhibition through its booth at the above exhibitions

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Delegation to visit CHINAPEC Exhibition

GSPMA led special delegation to visit CHINAPEC 2015 held during 21st-23rd September, 2015 at Taizhou, China PR. During the visit promotional activities of GSPMA and regarding forthcoming Plexpoindia 2016 exhibition were carried out.

The Plastics Export Promotion Council

The Plastics Export Promotion Council is sponsored by the Ministry of Commerce & Industry, Department of Commerce, Government of India, represents the exporting fraternity in the Indian Plastics Industry. Plexconcil celebrated its DIAMOND JUBILEE on FRIDAY the 25th SEPTEMBER 2015 at THE GRAND HYATT MUMBAI, Mumbai which also included the Export Award Function.

Dr. Hiru N. Patel (Past Chairman of Plexconcil & Founder president IPI) was the Chief Guest and Dr. J J Rawal (Astrophysicist, President-Indian Planetary Society & former Director-Nehru Planetarium.) was guest of honour on this occasion.

Top & Second best Export Award for the year 2013-14 & 2014-15 were given based on the FOB value of exports in the year for various product categories.

Category of Award	Name of the Award Winner	Position in 2013-14	Position in 2014-15
BOPP Film	Vacmet India Limited	Top Exporter	Top Exporter
BOPP Film	Maher Poly Films Ltd.	Second Best Exporter	Second Best Exporter
Decorative Laminates	Greenply Industries Ltd.	Top Exporter	Top Exporter
Decorative Laminates	Merino Industries Ltd.	Second Best Exporter	Second Best Exporter
Drip Irrigation Systems	Jain Irrigation Systems Ltd.	Top Exporter	Top Exporter
Electrical Accessories of Plastics	Rk Engineers Pvt.Ltd.	Top Exporter	Top Exporter
Electrical Accessories of Plastics	Brilliant International	Second Best Exporter	
Electrical Accessories of Plastics	Electrofocus Electricals Pvt. Ltd.		Second Best Exporter
Engineering Components of plastics	Shaily Engineering Plastic Ltd.	Top Exporter	Top Exporter
Engineering Components of plastics	Pradip Polyfils Private Ltd.	Second Best Exporter	Second Best Exporter
FIBCs (Jumbo Woven Bags)	Flexituff International Ltd.	Top Exporter	Top Exporter
FIBCs (Jumbo Woven Bags)	Big Bags International Pvt. Ltd.	Second Best Exporter	Second Best Exporter
Fishnets/Fishing Line of plastics	Garware Wall Ropes Ltd.	Top Exporter	Top Exporter
Fishnets/Fishing Line of plastics	India Nets		Second Best Exporter
Fishnets/Fishing Line of plastics	Chidambaram Fishnets Pvt. Ltd.	Second Best Exporter	
Fittings for Pipes & Hoses (of plastics)	The Supreme Industries Ltd.	Top Exporter	Top Exporter
Fittings for Pipes & Hoses (of plastics)	Prince Industries	Second Best Exporter	Second Best Exporter
Floor Coverings (of predominantly plastic materials)	RMG Polyvinyl India Ltd.	Top Exporter	Top Exporter
Floor Coverings (of predominantly plastic materials)	Premier Polyfilm Ltd.	Second Best Exporter	Second Best Exporter
FRP/GRP Products	Kemrock Industries and Exports Ltd.	Second Best Exporter	
FRP/GRP Products	Pentair Water India Pvt. Ltd.	Top Exporter	Top Exporter
FRP/GRP Products	Chemical Process Equipments Pvt. Ltd.		Second Best Exporter
Gifts/Novelties, Statuettes & Other Ornamental Articles, Of Plastic	Champs Corporation	Top Exporter	Top Exporter
Gifts/Novelties, Statuettes & Other Ornamental Articles, Of Plastic	Viva Global	Second Best Exporter	Second Best Exporter
Hair combs/brushes of plastics	Crystal Plastics & Metallizing Pvt Ltd.	Top Exporter	Top Exporter
Hard Resilene Lenses			
Essilor Manufacturing India Pvt. Ltd.	Top Exporter	Top Exporter	
Houseware (other than thermoware/insulated ware)	Princeware International Pvt. Ltd.	Top Exporter	Top Exporter
Houseware (other than thermoware/insulated ware)	Family Plastics and Thermoware	Second Best Exporter	Second Best Exporter
Human Hair & its products	Srinivasa Hair Industries	Top Exporter	Top Exporter
Human Hair & its products	Indian Hair Industries Pvt. Ltd.	Second Best Exporter	
Human Hair & its products	Gupta Enterprises		Second Best Exporter
Masterbatches	Prayag Polytech Pvt. Ltd.	Top Exporter	Top Exporter
Masterbatches	Plastiblends India Ltd.	Second Best Exporter	Second Best Exporter
Metallised Polyester Film	Vacmet India Limited	Top Exporter	Top Exporter
Metallised Polyester Film	Uflex Limited	Second Best Exporter	
Moulded/Extruded packaging items like Boxes, Cases, Crates, Carboys & Similar Articles Of Plastic	Alkon Plastics Pvt. Ltd.	Top Exporter	Top Exporter
Moulded/Extruded packaging items like Boxes, Cases, Crates, Carboys & Similar Articles Of Plastic	Ostern Private Ltd.	Second Best Exporter	Second Best Exporter
Other Brushes/brooms of plastics (other than hair brushes & tooth brushes)	Jewel Consumer Care Pvt. Ltd.	Top Exporter	Top Exporter
Parts of Writing Instruments	Cri Limited	Top Exporter	Top Exporter
Pipes & Hoses of plastics	Jain Irrigation Systems Ltd.	Top Exporter	Top Exporter
Pipes & Hoses of plastics	The Supreme Industries Ltd.	Second Best Exporter	Second Best Exporter
Plastic footwears and components thereof	Condor Footwear (India) Ltd.	Top Exporter	Top Exporter
Plastic Furniture	Prima Plastics Ltd.	Top Exporter	Second Best Exporter
Plastic Furniture	National Plastic Industries Ltd.	Second Best Exporter	Top Exporter
Plastic Mats	Sapana Polyweave Pvt Ltd.	Top Exporter	Top Exporter
Plastic Mats	Streamflow Polyweave Pvt. Ltd.	Second Best Exporter	Second Best Exporter
Plastic Medical Disposables/surgical items (incl syringes)	Poly Medicure Ltd.	Top Exporter	Top Exporter
Plastic Medical Disposables/surgical items (incl syringes)	Terumo Penpol Ltd.	Second Best Exporter	Second Best Exporter
Plastic Polymers	Reliance Industries Ltd.	Top Exporter	Top Exporter
Plastic Polymers	Dhunseri Petrochem Ltd.	Second Best Exporter	Second Best Exporter
Plastic Shopping/Carrier/garbage Bags	Narendra Plastic Pvt. Ltd.	Top Exporter	Top Exporter
Plastic Shopping/Carrier/garbage Bags	Kuladay Technopack Pvt. Ltd	Second Best Exporter	Second Best Exporter
Plastic Stationery (excluding writing instruments)-mathematical instruments, files, plastic covers etc	Pelicans Automotive & Promotional Products Pvt. Ltd.	Top Exporter	Top Exporter
Plastic Stationery (excluding writing instruments)-mathematical instruments, files, plastic covers etc	Allied Instruments Pvt. Ltd.	Second Best Exporter	Second Best Exporter
Plates/Sheets/Films/Etc of plastics (Other than polyester/PET/BOPP)	Sheela Foam Pvt. Ltd.		Top Exporter
Plates/Sheets/Films/Etc of plastics (Other than polyester/PET/BOPP)	The Supreme Industries Ltd.	Top Exporter	
Plates/Sheets/Films/Etc of plastics (Other than polyester/PET/BOPP)	Ecoplast Limited	Second Best Exporter	Second Best Exporter
Polyester Film	Garware Polyester Ltd.	Top Exporter	Top Exporter
Polyester Film	Vacmet India Ltd.	Second Best Exporter	Second Best Exporter
PVC Foam Board/Sheets	Jain Irrigation Systems Ltd.	Top Exporter	Top Exporter
Pvc Leathercloth/Artificial Leather	Manish Vinyls Pvt. Ltd.	Top Exporter	Top Exporter
Pvc Leathercloth/Artificial Leather	Polynova Industries Ltd.	Second Best Exporter	Second Best Exporter
Ropes/Cordage	Tufropes Pvt Ltd	Top Exporter	Top Exporter
Ropes/Cordage	India Nets	Second Best Exporter	Second Best Exporter
Self-Adhesive Tapes	Powerband Industries Pvt. Ltd.	Top Exporter	Top Exporter
Self-Adhesive Tapes	Hindustan Adhesives Ltd.	Second Best Exporter	Second Best Exporter
Sunglasses/Spectacle Frames	Styl Rite Optical Industries	Top Exporter	Top Exporter
Tarpaulins	The Supreme Industries Ltd.	Top Exporter	Top Exporter
Thermoware/Insulated ware	Tokyo Plast International Ltd.	Top Exporter	Top Exporter
Thermoware/Insulated ware	Asian Plastowares Pvt. Ltd.	Second Best Exporter	Second Best Exporter
Tooth Brushes, incl dental plate brushes	Jewel Consumer Care Pvt. Ltd.	Top Exporter	Top Exporter
Top Merchant Exporter (Eastern Region)	Sree Maa Enterprises	Top Exporter	Top Exporter
Top Merchant Exporter (Northern Region)	DCS International Trading Co Pvt. Ltd.	Top Exporter	Top Exporter
Top Merchant Exporter (Southern Region)	Gupta Hair Products Pvt. Ltd.	Top Exporter	Top Exporter
Top Merchant Exporter (Western Region)	Cello International Pvt. Ltd.	Top Exporter	Top Exporter
Travelware	Samsonite South Asia Pvt. Ltd.	Top Exporter	Top Exporter
Woven Sacks/Bags/Fabric (Other than FIBCs)	Mayur Wovens Pvt. Ltd.	Top Exporter	Top Exporter
Woven Sacks/Bags/Fabric (Other than FIBCs)	Reliance Industrial Infrastructure Ltd.	Second Best Exporter	Second Best Exporter
Writing Instruments (excluding parts)	Cello Writing Aids Pvt. Ltd.	Top Exporter	Second Best Exporter
Writing Instruments (excluding parts)	Luxor International Pvt. Ltd.	Second Best Exporter	Top Exporter

The All India Plastics Manufacturers' Association

Omani Delegation at Taj Palace, Mumbai on 13th August 2015

A high level Omani business Delegation led by **His Excellency Dr. Salim Ben Nasser Al Ismaily, Chairman of the Sultanate of Oman's Export & Investment promotion arm - Ithraa** visited New Delhi & Mumbai between 10th and 13th August 2015. The 35 member business delegation was focused on Plastics, Petrochemicals and Food products as the companies were looking to appoint Indian importers, distributors, agents, suppliers and joint venture partners in India and to attract foreign investments to Oman. AKT Strategic Consulting LLP (www.aktconsulting.co) project managed the entire visit.

The All India Plastics Manufacturers' Association (AIPMA) partnered with **AKT Strategic Consulting LLP to organise B2B meetings of its members with Omani delegates** to promote business between the 2 countries. Seminars were also organised in both New Delhi and Mumbai to help raise awareness of Omani business capability amongst Indian buyers and investors.

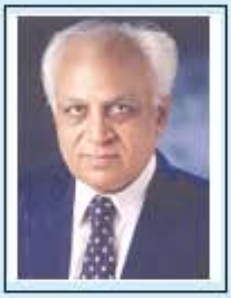
Around 20+ members of AIPMA have participated in this international delegation to explore business opportunities in Oman. Following 3 Companies participated in this meeting from AIPMA Managing Committee.

1) Prayag Poly Tech Pvt. Ltd.
2) Mitsu Chem Pvt. Ltd.
3) AVI Global Plast Pvt. Ltd.

The response from Indian companies to the range of plastic and petro products that were on offer from Oman was excellent. There were several fruitful introductions and interactions over the 4 day period and a number of business outcomes are expected out of them.

Mr. A. K. Tareen, Ithraa's official India Representative and Chairman of AKT Strategic Consulting said ' Our partnership with AIPMA proved to be extremely valuable to build long term ties between Omani and Indian companies in the plastic sector. On behalf of the Omani government and the companies, we would like to place our immense gratitude to AIPMA for their active support, guidance and participation. We hope to undertake several new initiatives with AIPMA in the future for the mutual benefit of AIPMA members as well as Omani companies.'

HEARTIEST CONGRATULATIONS



Arvind M. Mehta
Chairman Governing Council AIPMA
Past President – AIPMA & Plastindia

July 27, 2015

Appointment of Shri Arvind Mehta as Chairman Empowerment Committee, Plastindia International University Vapi (Proposed)

It is a matter of pride for AIPMA that our Past President and Chairman Governing Council Shri Arvind Mehta has been elected by the Plastindia Managing Committee as Chairman, Empowerment Committee, Plastindia International University (Proposed).

The Plastindia International University is going to be set up at Vapi, Gujarat in 35 acres of land. It is for the technical education, to provide the industry with technically qualified youth to supplement huge growth of Plastic Industry of India. They can support the plastic industry as the Technical Head or CEO and / or even start their own unit. The education level targeted is of global standard.

This land was purchased by Shri Arvind Mehta himself during his tenure as President of Plastindia Foundation from 2006-2009.

Mr. Raju Desai has been nominated as Member of Main Committee of PIU and Mr. Harish Dharamsi as Special Invitee of PIU Project.

AIPMA has made some recommendations on the Draft Waste Management (Solid & Plastic) Rules 2015 Notification.

AIPMA is part of the member Notification Designing Team along with MoEF and ICPE.

Plastindia Foundation Activities

1. New Managing Committee - Plastindia Foundation 2015-2018. (not seen in the picture) Gautam Gandhi and Prof (Dr) S K Nayak

2. Indian Plastics Federation felicitating K K Seksaria for being elected as President of Plastindia Foundation for the term 2015-18

K K Seksaria, President, Plastindia Foundation was felicitated by Indian Plastics Federation in a ceremony organised at Kolkata. In the picture left to right Ashok Jajodia, Hon. Secretary, Ramesh Rateria, Vice President, K K Seksaria, Pradip Nayyar President, and Sisir Jalan Hon. Joint Secretary of Indian Plastics Federation

3. Exhibitors' Meet-to-greet function - Ahmedabad. Mr K. K. Seksaria, President, Plastindia Foundation was invited as Chief Guest in Exhibitors' Meet-to-greet function held on 13th Oct'15 in Ahmedabad by Gujarat State Plastic Manufacturing Association

Mr Nitin Shah, President-GSPMA felicitating Mr K K Seksaria

4. Visit to T Plas 2015 - - Plastindia Foundation was present as an Exhibitor at T Plas 2015, INTERNATIONAL TRADE FAIR FOR PLASTICS AND RUBBER INDUSTRIES held from August 26 – 29, 2015 with a 12 Sq mts stall booth to promote Plastindia 2018. Meetings with various Thai and Malaysian Associations were organised and presentation on Plastindia 2018 was given.

Malaysian Plastics Manufacturing Association (MPMA) (L-R) Mr Eddie Shum Sai Kai, MPMA (Parek Branch), Mr Johnson Phoon, Chairman MPMA (Parek Branch) ,Ms Shital Patel, Plastindia Foundation, Ms May Chein, Pilatus International, Ms Leena Hate, Plastindia Foundation

Plastics Institute of Thailand(L-R) - Ms Leena Hate , Plastindia Foundation, Ms Shital Patel, Plastindia Foundation, Mr Kongsak Dabhua of Plastics Institute of Thailand, Ms May Chien, Pilatus International

5. Visit to Asia Mold 2015 Mould & Die Exhibition -Plastindia Foundation was present as an Exhibitor at Asia Mold 2015 Mould & Die Exhibition held from September 15-17, 2015 with a 9 Sq mts stall booth to promote Plastindia 2018.

Meeting with Hongkong Productivity Council (HKPC) Ms May Chien, Pilatus International, Ms Mamta Oza, Plastindia Foundation, Mr Lau Ka Fai , Cadet Engineer from HKPC, , Ms Shital Patel, Plastindia Foundation, Ms Stephanie, Pilatus International

Meeting with Mesago Messe Frankfurt (L-R) Mr Louis Leung, Deputy General Manager Messe Frankfurt, Ms Sulbha Mane Plastindia Foundation, Ms May Chien, Pilatus International, Ms Mamta Oza, Plastindia Foundation, Ms Anja Faulhaber, Deputy Head of Division Mesago Messe Frankfurt Group, Ms Shital Patel, Plastindia Foundation, Mr Sascha F. Wenzler, Vice President Mesago Messe Frankfurt Group

6. IPLEX 2015 – Plastindia Foundation participated in IPLEX 2015 held at Bengaluru from 25-27 Sept 2015 with a 9 sq mts stall

K K Seksaria President Plastindia Foundation speaking as Guest of Honour at IPLEX 2015

Mr K K Seksaria ,President Plastindia Foundation at PIF stall

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An apex body of major Associations, Organisations, and Institutions connected with plastics, is the epitome of growth opportunities and development for the plastics industry. In that endeavour, it undertakes various activities for the national progress through plastics such as:

PLASTINDIA 2018
GANDHINAGAR, GUJARAT 7-12 FEB, 2018

Plastindia Exhibitions - A triennial event is contributing infinite opportunities since 1990. From 19,600 sq.mtr. area with 486 exhibitors from 15 countries in 1990 has enveloped into 1,25,000 sq.mtr. of space with 1600 exhibitors from 32 countries in 2015 along with concurrent events like Proplast, International Conference, B2B Meets, Plasticon Awards.

PLASTINDIA PLASTICULTURE

Plasticulture - A strategic initiative that promotes the use of plastics in agriculture through conservation of water through use of Micro Irrigation Systems and other innovations.

PLASTWIN

Plastwin - A program that brings together various companies of India and other leading companies across Europe/ world under one roof. The program facilitate international linkages, partnerships and trade opportunities for the Indian and global companies.

Plastindia International University - A unique initiative that will churn out trained graduates for the polymer industry armed with the right fundamentals, practical knowledge, hands on training, research and innovations etc.

PLASTINDIA 2018
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