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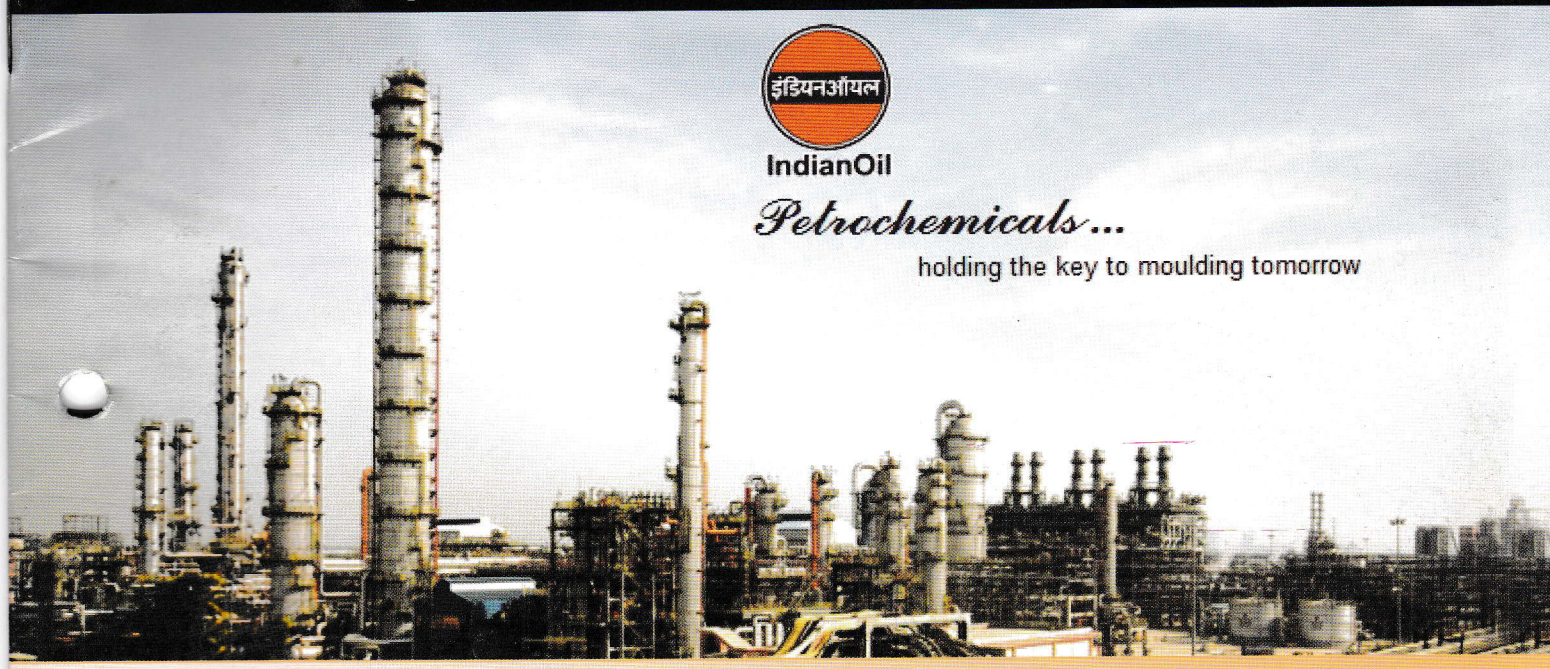

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Editorial

Dear Members,

Happy Diwali to all my Friends..!!!

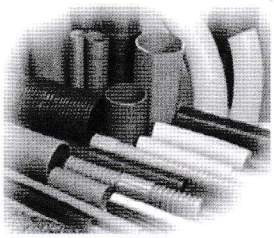
Diwali or **Deepavali** popularly known as the ***festival of lights***, is an important five-day festival in Hinduism and Jainism, occurring between mid-October and mid-November. For Hindus, Diwali is the most important festival of the year and is celebrated with families performing traditional activities together in their homes.

You must be wondering as to why I am talking about Diwali, something very far from the Plastic Industry , but I feel let us put our hands together and know the significance and importance of these five days. Deepavali celebrations are spread over five days. All the days except Diwali are named according to their designation in the Hindu calendar. The days are:

- **Dhanatrayodashi or Dhan teras or Dhanwantari Triodasi**:Dhan means wealth and Trayodashi means 13th day. This day falls on the 13th day of the second half of the lunar month. It is considered an auspicious day for buying utensils and gold. This day is regarded as the Jayanti of God Dhanvantri who came out during the churning of the great ocean by the gods and the demons.
- **Naraka Chaturdashi**: Chaturdashi is the 14th day on which the demon Narakasura was killed by Krishna – an incarnation of Vishnu. It signifies the victory of good over evil and light over darkness. In southern India, this is the actual day of festivities. Hindus wake up before dawn, have a fragrant oil bath and dress in new clothes. They light small lamps all around the house and draw elaborate kolams /rangolis outside their homes. They perform a special puja with offerings to Krishna or Vishnu, as he liberated the world from the demon Narakasura on this day. It is believed that taking a bath before sunrise, when the stars are still visible in the sky is equivalent to taking a bath in the holy Ganges. After the puja, children burst firecrackers heralding the defeat of the demon.
- **Lakshmi Puja**: Lakshmi Puja marks the most important day of Diwali celebrations in North India. Hindu homes worship Lakshmi, the goddess of wealth, and Ganesh, the God of auspicious beginnings, and then light lamps in the streets and homes to welcome prosperity and well-being.
- **Bali Pratipada and Govardhan Puja**: In North India, this day is celebrated as Govardhan Puja, also called Annakut, and is celebrated as the day Krishna – an incarnation of god Vishnu – defeated Indra and by the lifting of Govardhana hill to save his kinsmen and cattle from rain and floods. For Annakut, large quantities of food are decorated symbolizing the Govardhan hill lifted by Krishna. The day commemorates the victory of Vishnu in his dwarf form Vamana over the demon-king Bali, who was pushed to the nether-world, and the return of Bali to earth from the nether-world. In Maharashtra, it is called as Padava or Nava Diwas (new day). Men present gifts to their wives on this day. It is celebrated as the first day of the Vikram Samvat calender, in Gujarat.
- **Bhaiduj**: on this day, brothers and sisters meet to express love and affection for each other (Gujarati: Bhai Bij, Bengali: Bhai Phota). It is based on a story when Yama, lord of Death, visited his sister Yami. Yami welcomed Yama with an Aarti and they had a feast together. Yama gave a gift to Yami while leaving as a token of his appreciation. So, the day is also called 'YAM DWITIYA'.

May all of you have a safe and a joyous diwali. Wish you a great year ahead.

Pradip Nayyar
Editor



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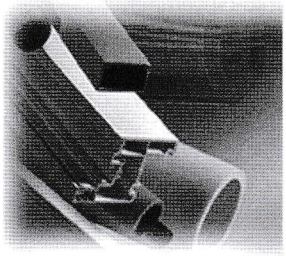

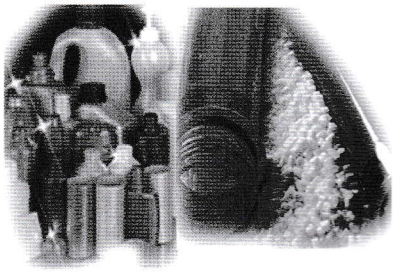

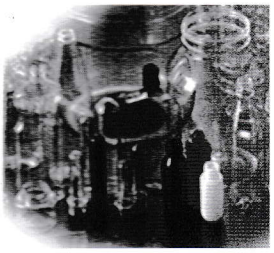

PRESIDENTIAL ADDRESS

Dear Members,

This is my **second message** to you after taking over as **President of the Federation in my second term**.

By the time this edition reaches you many of you may have returned from Dusseldorf after attending the K-2010 exhibition. This is the world's largest exhibition on plastics and if any member is willing to share his experience from the 'K-Show' he may kindly send the same to the Secretariat and we can publish the same for information of our other members.

In this issue I would like to share with you a new area of application that is being developed with the help of **Nano Polymers.**

An elegant process which simply and cheaply covers small particles of polymer with a layer of silica-based nanoparticles has been developed by research chemists. The final result provides a highly versatile material that can be used to create a range of high performance materials such as self healing paints, and clever packaging that can be tailored to let precise levels of water, air or both pass in a particular direction. This process has helped create a "soap free emulsion polymerization process" which makes colloid particles of polymer dispersed in water and in one simple step introduces nanometre sized silica based particles to the mix. This silica based nanoparticles (about 25 nanometre in size) then coats the polymer colloids with a layer "battering" it almost like a fish battered in bread crumbs. This process creates a very versatile polymer latex product. It can be used to create scratch resistant paints in which the scratches heal themselves. It can be fine tuned to produce polymer based packaging which will allow water or air to pass through the packaging in tailored ways. The resultant rough textured spherical shapes also lend themselves to the creation of sheets with polymer that present much more surface area than usual, allowing more efficient interaction with other materials. By exposing the material to a second simple step which deposits another polymer layer on top of the already silica based nanoparticles "battered" polymers, it helps to produce particles with an even greater range of properties and uses. The end product is versatile, and the process is easy and cost effective. This new process dramatically cuts the time needed to create such materials and its single step can already be produced on a mass scale with currently used industrial equipment. The useful product can easily be made up to around 45% of the volume of each water-based solution used in their process.

Another use for the material could rely on its capabilities to allow for certain amounts of air or water to pass, with an obvious potential for package-manufacturing industries. Potentially interested buyers will be pleased to know that the manufacturing process for this material doesn't cost much and is easily possible on existing technology and equipment.

The scratches of a car could soon be repaired with no stress. It can even withstand coin attacks. It is possible to speed up the entire process by pouring some warm water over the affected area that would probably repair it in a matter of minutes. The translucent, synthetic resin has a high density, which allows it to slowly refill the damaged portions in time, as long as they're paint-deep. So far, it's only been designed to cover dark-colored cars, but the developers are confident that it can be applied to lighter tones as well. The manufacturers claim its effects last for approximately three years.

We are coming to the end of the Big Bengal festival season. Durga Puja, the main festival in West Bengal is over and I wish all members a "Shubo Bijoya". Deepawali will be celebrated in the first week of November and on this occasion I convey my heart felt good wishes to all members for a **Happy Deepawali**.

With Regards,

Sourabh Khemani
President

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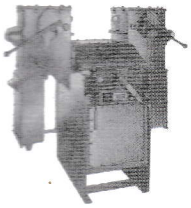

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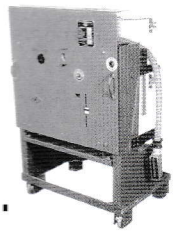
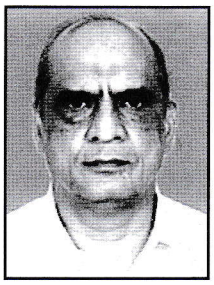


From the Desk of

The Hony. Secretary



Dear Members,

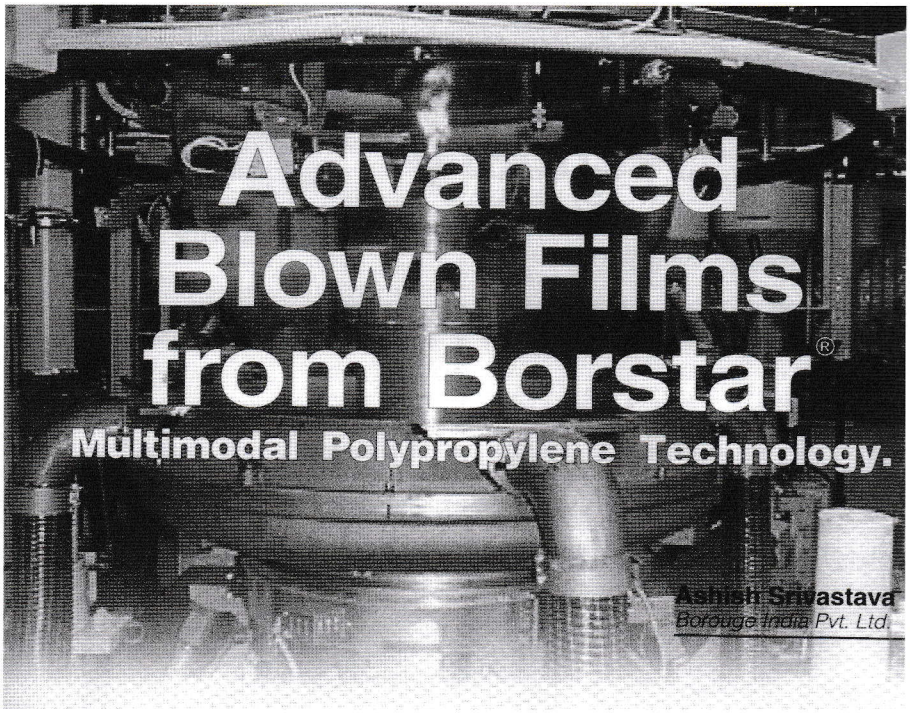
It gives me great pleasure to be able to write to you once again. This issue will coincide with the Deepawali festival and on this auspicious occasion I convey my good wishes to all members of IPF along with their families.

The new team has already started its work. Members have been coopted and Special Invitees nominated to the Executive Committee. The Editorial Board sub-committee has already been constituted.

Members may be aware that at the initiative of IPF a Poly Park has come up at Sankrail, in Dist. Howrah. At the time of this initiative IPF was expecting WBIDC to give it a plot of land free of cost for development of a Centre of Excellence at Sankrail. A plot of land has been earmarked for this purpose. Though much time has passed IPF has not been granted possession of this plot of land. We have now taken up this matter with the Hon'ble Minister of Commerce & Industries, West Bengal who is also Chairman of WBIDC to give possession of this plot of land at a token cost, if it is not possible for them to give us the same free of cost. We now expect that some positive development may take place for construction of the Centre of Excellence.

With best wishes for a HAPPY DEEPAWALI once again.

Ramawatar Poddar
Hony. Secretary



Introduction

Polypropylene (PP) was almost exclusively manufactured by Cast film, BOPP and TQ routes. When PP was used in the traditional blown film process with air cooling there were three main problems areas:

- Poor bubble stability due to low melt strength
- Poor MD tear due to PP's linear molecular structure
- Poor optical properties, mainly caused by slow cooling of the blown film process

Off late there has been significant position change as far as Polypropylene suitability for upward blown film process is concerned. Now there are new generations of Polypropylene grades available for conventional blown film process. This has opened up all together new and exciting applications and allows significant economic advantage to the converter.

The new generation of PP blown film allows processing on conventional PE extruders with air cooling due to superior melt strength for good bubble stability which has been the main problem in the past.

Borouge & the Borstar® technology can today offer two advanced tailor-made products for processing on conventional blown film lines with air cooling. The new products are special random and heterophasic copolymers which combines transparency, heat resistance as well as toughness.

Why PP for blown films with air cooling?

- Huge blown film capacity available normally running PE
- New hugely competitive environment for film producers
- There is need for differentiation and developing niche markets

Advanced Blown film products from Borstar® Multimodal PP technology offer the following features for the value chain:

- Step change in purity / organoleptics
- Improved sealing and optics
- Excellent processability
- Stiffness / potential for down gauging
- No investment / low cost
- Substitution of CPP
- Access to niche applications and small series
- Heat resistance

Types of Polypropylene

There are three main types of Polypropylene

- PP Homopolymer
- Random copolymer
- Heterophasic copolymer

PP Homopolymer (nucleated or non-nucleated) are characterized by their high stiffness, excellent heat resistance, excellent moisture barrier, good transparency and high tensile strength for film applications.

Random copolymer (nucleated and non nucleated) are soft and have very good transparency and heat seal characteristics. They also give very good gloss to the product. By using special nucleating systems, films with superior optical properties can be produced in the blown film process.

Heterophasic copolymers have ethylene propylene rubber as a separate phase incorporated during polymerization, which means that films are characterized by matt surface and low transparency. The high toughness and good stiffness, as well as extremely wide temperature (from freezing to sterilizing) are the dominant properties of this material.

Process ability of PP on conventional PE blown film equipment with air ring

Polypropylene is easily processed on the conventional blown film equipment. For the best results there are some pre requisites which are mentioned below:

Screw Configuration

Polypropylene should be processed using screws wit a shear and a mixing part and a length of 28-33D. It is desired to have screws with longer L/D ration to have better melting of the material and melt homogenization.

Melt Temperature

In general the melt temperature depends on the MFR of the processed material. The lower the MFR, the higher the temperature required in the extruder (figure1). It has to be considered that this temperature may vary depending upon the screw design and the layout of the extruder.

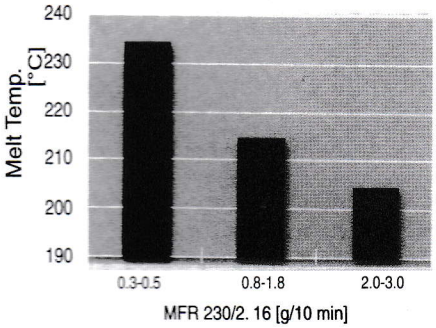


Figure 1
Die Gap / Blow up ratio

Polypropylene are best process able in the die gaps of 1.2 to 2.0mm. Narrow die gaps support higher tear resistance in the machine direction. In addition narrow die gaps ensure high die pressure. According to the experience, the blow up ration should be between 1:2 to 1:3

Cooling

Cooling is very important from the point of view of achieving high transparency in the film and toughness. It is desirable to have low temperature at the cooling ring as well as internal cooling of the bubble. Temp around 10-15Deg C is desired. Air cooling 10-15DegC will enhance the clarity. Figure 2 shows the die gap / BUR and cooling requirements.

BUR 2 : 1 - 3 : 1

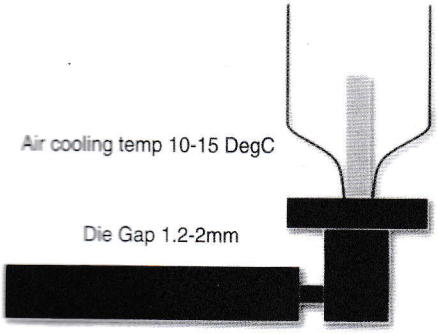


Figure 2
Borealis / Borouge PP grades for blown film applications

Borealis / Borouge offer the following two grades for PP blown film

Borpact™ *BC918CF*
Borclear™ *RB707CF*

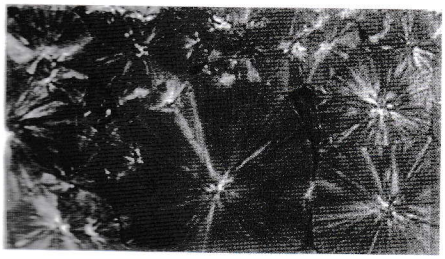
Each of the above grades is designed to offer differentiated properties to the final film.

Borpact™ BC918CF

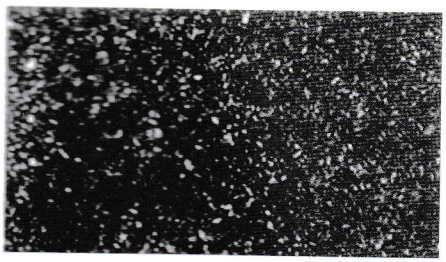
This grade is unique as it is produced with state-of-the-art Borealis Nucleation Technology (BNT) which enables the material to have very strong nucleation effect, enhancing the performance for stiff & clear films. There are some unique features of BNT technology which are highlighted below:

- A consistent & better dispersion of the nucleation effect resulting into repeatability and reliable behavior in processing and properties
- Inert, no reaction with the other additives
- No taste or odor

Tensile Modulus

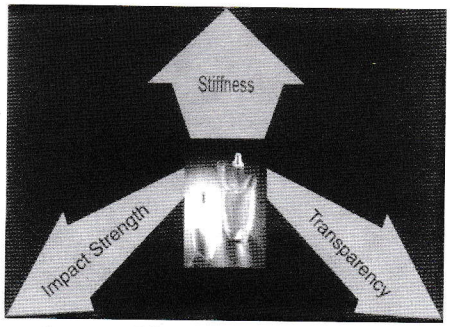


Non nucleated 1200 MPa



BNT 1450 MPa

Since the grade has in situ nucleation, it gives unparallel properties to the film. Some of the unique properties are shown in the following figure



Borpact™ BC918CF can be used in the following applications:

- Stand up pouches
- Bread packaging
- Over wrap film
- Food packaging
- Bag in box
- Carrier base for PP based peel able film
- Retort / Microwavable
- Lamination

Borclear™ RB707CF

Borclear™ RB707CF is designed for high clarity applications. It has very good melt strength. It gives superior stiffness over PE film and better heat resistance. It is a barefoot material with very good printability. The main applications of RB707CF are as under:

- Lamination film
- Skin and core layer in bread packaging film
- Collation shrink film
- Enhanced blending in PE film
- FFS films
- Microwavable film

Properties of Borpact™ BC918CF & Borclear™ RB707CF

The salient features of these grades are as under:

Property	Borclear™ RB707CF	Borpact™ BC918CF
MFR 2	1.5	3.0
Flexural modulus	800	1450
Vicat Softening	125	154
Haze	< 8	< 13
Gloss	> 70	> 35
Type	Random	Block

Borclear™ Offer High Clarity and Superior Sealability
Borpact™ Combines High impact, Stiffness and Clarity

The combined use of PP and PE in blown film makes it possible to combine typical advantages of PP like:

- High stiffness
- High heat resistance
- High moisture barrier

With typical advantages of PE like

- High tear resistance in MD
- Good seal ability
- High gloss, good optical, easy processing

Possibilities of combining PP with PE

- **Monolayer**

Based on our experience, PP can be compounded upto 30% with PE in monolayer extruder for enhancing the stiffness and heat resistance

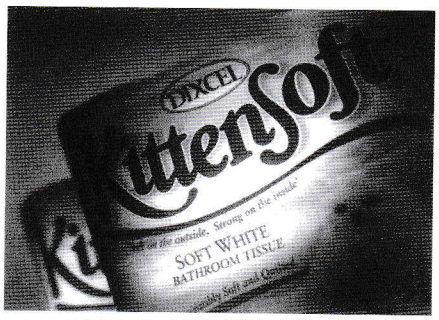
- **Multilayer**

In multilayer co extrusion combining pure PP with PE requires a tie layer. The tie layer between PP and PE can be either a third polyolefin with adhesion to PP and PE (e.g. EVA) or a compound of PP/PE. mLLDPE(>15%)can be added if the film delaminates

Application Examples

There are numerous applications where Borpact™ BC918CF & Borclear™ RB707CF may be used. Some of the applications are explained as under:

Over wrap



A-LLDPE, B-BC918CF, A-LLDPE

Bread Film

A-RB707CF, B-BC918CF, A-RB707CF

Coextrusion and FFS

A-Borstar PE, B-RB707CF, A-Borstar PE

Summary

The new polypropylene (PP) developments regarding polymer structure (new co-polymers Borclear™ RB707CF and Borpact™ BC918CF) and special nucleation systems (BNT) make it possible to use PP much more economically in blown film technology with air cooling. Borstar® multimodal PP technology opens new property windows for blown film with superior process ability, stiffness, transparency, gloss, toughness, heat resistance, seal ability which until now was only achievable with CPP / OPP technology.

Clearly there are immense benefits of Borclear RB707CF and Borpact BC918CF when used in combination or in blend with PE in multilayer and monolayer films. Very good quality films can be developed by blending the two PP grades and with PE as per the end use requirement. While Borclear RB707CF is used where clarity, moderate stiffness & seal ability is important, Borpact BC918CF is used where we need high stiffness and good linear tear. However, careful approach is required towards proper machine configuration and process conditions.

About Borouge

Borouge is a leading provider of innovative, value creating plastics solutions. A joint venture between the Abu Dhabi National Oil Company (ADNOC), one of the world's major oil companies, and Austrian based Borealis, a leading provider of chemical and plastics solutions, the company's footprint reaches across the Middle East, Asia Pacific, the Indian subcontinent and Africa. Established in 1998, Borouge employs approximately 1,400 people, has customers in 50 countries and its headquarters are in Abu Dhabi in the UAE and Singapore.

Building on the unique Borstar® technology and their experience in polyolefins for more than 50 years, Borealis and Borouge provide innovative, value creating plastics solutions for the infrastructure (pipe systems, and power & communication cables), automotive and advanced packaging markets.

Today Borealis and Borouge manufacture 4 million tonnes of polyolefins (polyethylene and polypropylene) per year. Borouge is currently tripling its polyolefins manufacturing capacity to 2 million tonnes per year (t/y) by mid-2010 and an additional 2.5 million t/y is scheduled for 2013. The companies continue to invest to ensure that their customers throughout the value chain, across the globe, can always rely on product quality, consistency and security of supply.

Borouge and Borealis are committed to the principles of Responsible Care® and proactively contribute to addressing the world's water and sanitation challenges through their Water for the World™ initiative.

www.borouge.com;
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Troubleshooting guide for PP Blown film process

Problem	Reason	Solution
Melt fracture Poor microstructure Stripes in the film	Too low melt temperature Too side die gap Oxidation in the die head	Change to narrow die gap Add PPA Remove and clean the die insert Check the height of the calibration basket Increase the temperature on the die head
Creases / Wrinkless in MD / TD	Too low melt temperature at nip rolls and A frames	Reduce cooling rate Increase the out put Lower the distance between the die head and nip rolls Increase the melt temperature
Delaminating	Common problem when combining PE/PP	Add > 15%m LLDPE in all layers for improved adhesion
Poor bubble stability	Too much air cooling or too high melt temp Too wide die gap	Reduce the air or adjust air flow / design Lower the melt temperature Change to narrow die gap 1.2-1.5
Blocking	Too high temperature	Decrease the melt temperature Modify additive package (Slip+AB)
Poor optical	Too high FLH and air temperature Old product left in the extruder	Lower the FLH Purge the extruder Use chilled air

Pretreatment Strategies for Biodegradation of Polyethylene and Polypropylene

A. Arkatkar & M. Doble
Dept of Biotechnology,
Indian Institute of Technology, Chennai

Parasu Veera Uppara
Vice President,
Reliance Technology Group, Reliance Ind. Ltd., Mumbai

Abstract

Polyolefins that include polyethylene and polypropylene are the most ubiquitous plastics used currently in day to day life. They are also one of the most recalcitrant polymers and so they persist in the nature as waste after their useful life causing environmental problems at sea and land. These polymers disposed in the open; degrade slowly due to the action of light, heat and microbes. This review discusses various approaches available to speed up the process of biodegradation of polyolefins using different pretreatment strategies.

Introduction

Global commodity polymer consumption in 2009 was 176 million metric tons. In general, polyolefins account for over 60 percent (~100 million metric tons) of total commodity plastics consumption. In 2009, average per capita polyethylene (PE) and polypropylene (PP) consumption in Indian subcontinent was approximately 2 kilogram per person, against approximately 55 kilograms of PE and PP in West Europe. Countries with large populations, such as China and India and rapidly expanding economies, therefore, have tremendous growth potential for per capita polyolefin consumption [1]. Plastic waste badly affects the flora, fauna & animals in the environment. The increased cost of solid waste disposal as well as potential hazards associated from waste incineration has lead to serious concern [2].

This review investigates pretreatment as an approach to enhance the biodegradation of polyolefins. This type of degradation works as a synergy between the environmental factors and microbes which utilise this polymer as a carbon source. All these three polymers have, although the same repeat units have different chain branching, arrangement and packing density that leads to differences in their properties.

1.1 Biodegradation

Biodegradation is defined as a process which occurs due to the action of enzymes that are secreted by living organisms (bacteria, fungi etc.) leading to its chemical decomposition [2].

The first requirement for biodegradation of any polymer is the formation of biofilm, which is defined as a layer of deposition of the microorganisms and their secreted polysaccharides etc on the polymer surface [2, 3]. Following a stepwise procedure the polymers are then broken down to low molecular weight oligomers (probably due to the enzymes secreted by the microorganisms) which can be easily assimilated by the microbes. The ultimate degradation leads to the formation of CO_2 and water. The prerequisite for this process to take place is that the microorganism should have the ability to adhere to the polymer surface and the capability to utilise the polymer as its sole carbon source.

In natural conditions, the degradation of plastics is a very slow process and it depends on number of environ-mental factors such as temperature, humidity, pH and solar energy; polymer properties and biochemical factors (Fig.1). The most problematic plastics are polyolefins as they are resistant to microbial attack, due to the absence of any active functional groups.

Factors affecting the rate of biodegradation of polyolefins include the following [4].

1. Lack of active functional group
2. Highly hydrophophic nature
3. High molecular weight
4. Physical form (films, pellets, powder or fibers)
5. Distribution of crystalline and amorphous regions
6. Structure of the polymer(linear chain or branching)
7. Chemical composition of the polymer (blends, presence of additives, UV stabilizers, and antioxidants etc.) [2]

1.2. Mechanism of polyolefin degrada-

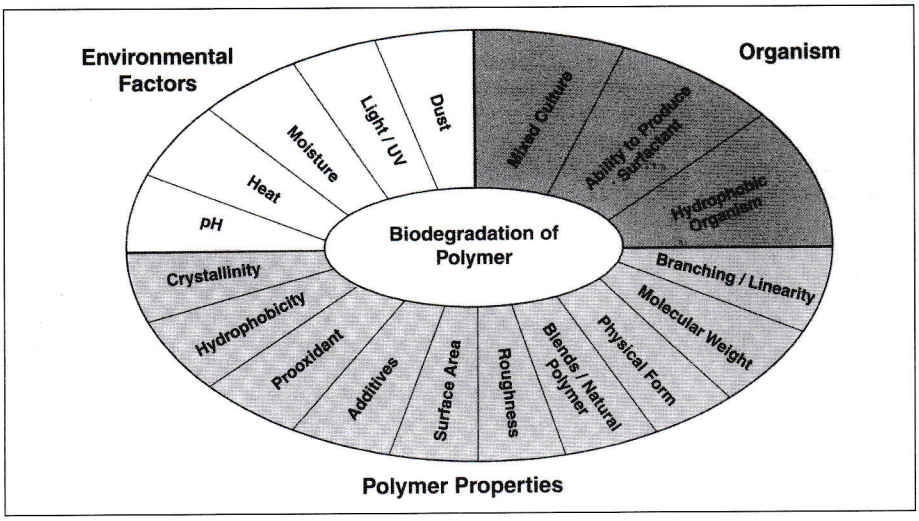


Fig.1) Factors that influence biodegradation [2, 3]

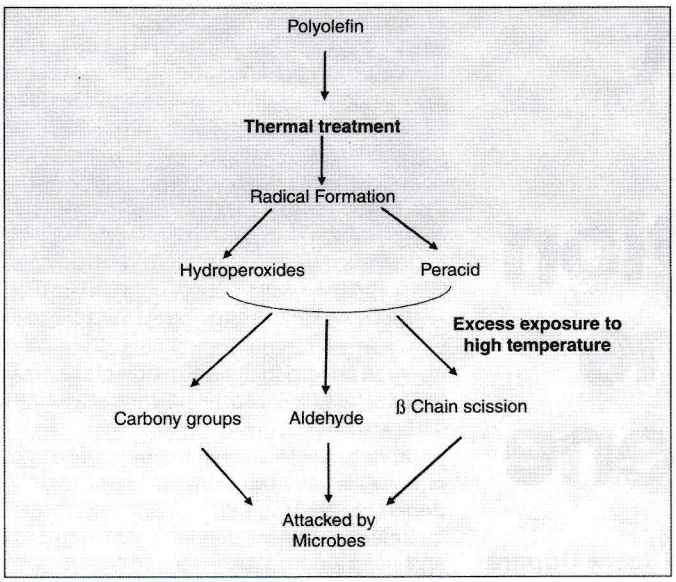


Fig. 2) Mechanism of Polyolefin degradation after thermal pretreatment. [3, 4, 9, 10, 11, 12, 13, 14, 15, 16]

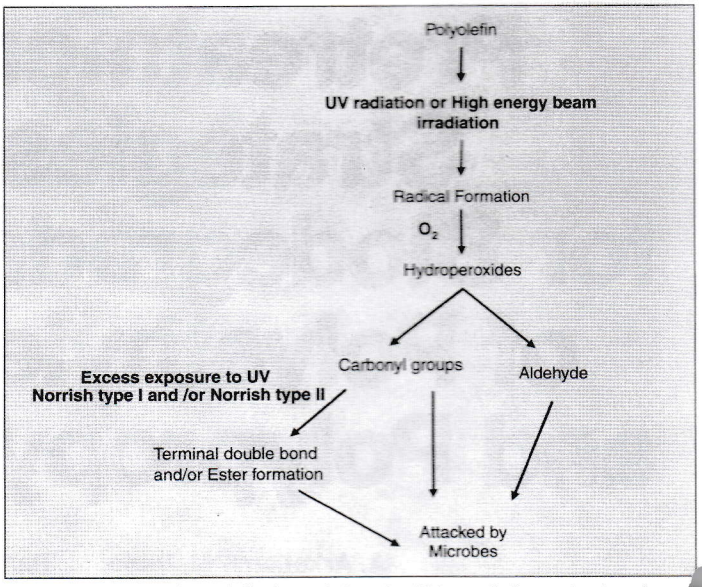


Fig. 3) Mechanism of Polyolefin degradation after UV or radiation pretreatment. [3, 4, 9, 10, 11, 12, 13, 14, 15, 16]

tion after pretreatment .

Few reports have been published that describe the mechanism of biodegradation of polyolefins. The mechanism of photodegradation of polyethylene followed by its biodegradation has been proposed and verified. During photooxidation, cleavage occurs predominantly at the weak links which have lower bond energies. This leads to the formation of free radicals. The cleavage can occur not only due to its exposure to UV-radiation, but also due to heat, ionising radiation and mechanical stresses. The radicals that are generated can react further with atmospheric oxygen and trigger the oxidation of the polymer. This reaction continues in a stepwise fashion producing carbonyls, aldehydes, peracid and acids [5, 6, 7, 8] as shown in Fig. 2.

The carbonyl group, if exposed again to UV, can follow Norrish type I and / or Norrish type II reaction to generate terminal double bond or ester group [4, 9, 10, 17] (Fig. 3). In the case of biodegradation, microorganisms can assimilate these abiotic intermediates, thus complicating the degradation products found in the environment. The rate of degradation is sensitive to microbial population, moisture, temperature, and oxygen in the environment [18, 19]. From these two figures one could conclude that depending upon the pretreatment, thermal or UV, the type of products could be different. In nature (polymers dumped in open), will undergo both these pretreatments.

The mechanism of the biodegradation of polyethylene shows similarities with the β - oxidation of fatty acids and paraffins in man and in animals [10]. The initial abiotic step involves the oxidation of the polymer chain, which leads to the formation of carbonyl groups. During microbial assimilation, a decrease in carbonyl group is noted. The carboxylic acids formed react with coenzyme A (CoA) to remove two carbon fragments, acetyl-CoA. The latter is metabolized in the citric acid cycle to produce carbon dioxide and water as the final degradation products [2, 3, 4]. Photo-oxidation enhances the rate of biodegradation of the polymer. It leads to the scission of the main chain in the polymer, thereby leading to the formation of low molecular weight products. This results in the generation of large surface area due to its embrittlement and also a greater degree of hydrophillicity due to the introduction of carbonyl groups. These factors further promote the biodegradation of the polymer [2].

Pretreatments

Pretreatment of the polymer using physical or chemical methods prior to biodegradation have been found to enhance the process.

2.1 Physical

2.1.1 UV

Polymer dumped in the open undergo this kind of pretreatment, sunlight being a rich source of UV radiation initiates this photo oxidation process. Photo oxidation leads to the formation of radicals. These radicals propagate forming further radicals in the polymer thereby increasing its reactivity [2, 3, 12]. The intensity of the light plays a major role in this pretreatment. Peroxides and hydro peroxides formed during photo initiation absorbs the UV radiation carrying the reaction ahead, this reaction generally terminates by the formation of carboxylicic groups or other functional groups including esters, ketones, alcohols and double bonds [4, 9, 10, 11, 12, 13, 14, 15] resulting in cleavage of the polymer chain. This pretreatment leads to a decrease in the weight average molecular weight of the polymer [20, 21]. LDPE irradiated for 60 hrs showed a weight loss of 6.2 % as compare to untreated LDPE *with Bravebacillus. brostelensis* for 30 days [22]. UV irradiation increased the biodegradation by 25%. UV irradiation of polyethylene for 500 hrs enhanced the growth of *Penicillium simlicissimum YK* when compared to the results with untreated polymer [23].

2.1.2 Thermal

Pretreatment makes the polymer more potent to microbial attack. As mentioned earlier in the mechanism of biodegradation, thermal treatment also oxidises the chain there by introducing functional groups. Formation of oxidised products also makes the polymer more hydrophillic which is conducive for the attachment of the organism. Studies carried out in our laboratory exemplify the advantages of thermal oxidation on the extent of biodegradation of polyethylene and polypropylene [2, 21, 24]. LDPE thermally treated at 150°C for 120 hrs showed increase in carbonyl index by 23% and when treated with fungi *Phanerochaete chrysosporium* showed increase in double bond index in three months indicating chain size reduction [25]. Carbonyl index is the infra-red spectrum peak corresponding to carbonyl group divided by the peak corresponding to

methylene group. Formation of carbonyl peak is an indication of introduction of oxygen in the polymer rchain.

Marine strains namely *Bacillus sphericus* GC subgroup IV (Alt), *Bacillus cereus subgroup* A (BF20), *Brevun-dimonas vesicularies* (BF10) and *Curtobacterium flaccumfaciens* (BF12) utilise LDPE and HDPE films in mineral salt medium under in vitro conditions as carbon source [24]. Tensile strength of thermally pretreated LDPE and HDPE and untreated starch-blended LDPE decreased by 27%, 14.8% and 30.5%, respectively, with *B. sphericus* and the corresponding decrease in crystallinity was 8%, 2.2% and 8.5%, respectively. In this current study, weight loss of 19% with thermally pretreated LDPE (100º C for 10 days), 10% with unpretreated LDPE, 9% with thermally pretreated high-density polyethylene (HDPE) and 3.5% with unpretreated HDPE reacted with *B. sphericus* were observed here [21].Thermally pretreated pure polypropylene (PP) showed 7.1% and 10.1% weight loss in six and twelve months respectively, while untreated PP showed a weight loss of only 0.42% in 12 months with mixed soil microorganism [24]. Experiments conducted in our lab showed that short SUV (short UV) pretreated PP and thermally pretreated PP showed a weight loss of 2.7% and 0.7% respectively where as untreated PP recorded no weight loss after subjected to biodegradation with pure culture of *Bacillus flexus*. (Fig. 4)

All these studies clearly indicate that thermal pretreatment enhances biodegradation of polyolefins considerably. But the temperature and duration needs to be optimized for each polymer to achieve the best results.

2.1.3. High-energy radiation

2.1.3.1 Electron beam radiation:

Electron-beam radiation is a concentrated and highly charged stream of electrons. It is a form of ionising energy that is generally characterised, by its low penetration and high dosage rates. Electrons may be collimated by holes and slits & since they are electrically charged, they may be focused and energised by electro-magnetic fields. The energy of the electrons impinging on the polymer is absorbed by it; producing radicals which can subsequently initiate several reactions in the polymer. The energy (keV or MeV), current (mA) and power (kW) of the acceleration are tuned depending upon the thickness and density of the product to be treated. Irradiated polymeric materials become brittle (deteriorate) due to reduction in its molecular weight [26]. Other changes that could happen include loss in the chain length of the polymer; decrease in cross linking and modifications in the crystalline domain. This degradation mechanism is accentuated by the presence of air leading to simultaneous oxidation [27]. It should be noted that deterioration is different from biodegradation, the latter leads to the incorporation of functional group in the polymer and the former could be a mechanical change.

Fig. 5 show the ketocarbonyl index calculated from the FT-IR (Fourier transformed Infra red) spectrum data of 0 and 5 Mrad electron beam irradiated samples of polypropylene. The 5 Mrad irradiated sample shows an increase in the ketocarbonyl index. The incorporation of this carbonyl could imitate the biodegradation process. The ketocarbonyl index increases with increases in dosage level.

(S5-0 Mrad and S6-5 Mrad) using FT-IR

2.2 Chemical

Chemicals can affect the strength, flexibility, surface appearance, colour, dimensions or weight of plastics. Chemicals can attack the polymer in the following ways

1. Attack the chain resulting in the reduction in its physical properties.

2. React or oxidise the functional groups in or on the chain. Depolymerisation can also take place during this process.

3. Form radicals.

4. Bring out physical changes, including absorption of solvents; change its strength, electrical properties, colour, etc., resulting in softening and swelling of the plastic.

5. Allow solvent to permeate through the plastic leading to its dissolution, and

6. Develop stress-cracking due to the interaction of a "stress-cracking agent" with molded-in or external stresses.[2]

Polypropylene is resistant to all the acids and bases in dilute concentration at room temperature. Sulphuric, nitric, and chromic acid (CrO_3 + H_2O) oxidise PP. Hydrochloric acid treatment of polypropylene changes the color due to its reaction with stabilisers added to the polymer from light brown to dark brown depending upon the concentration of the acid and the reaction temperature. PP does not show any effect after sulphuric acid treatment up to a concentration of 70%. However, with 80% sulphuric acid, a decrease in its weight and tensile strength is observed [2, 28]. The acid attacks the amorphous regions of the polymer and forms cracks on the surface.

An increase in sulphuric acid concentration to 98% over a 75 days treatment period at 100° C, leads to 80% decrease in the tensile strength of the polymer. However, when the temp-erature is reduced to 60° C no damage in PP is observed [2, 28]. The following (Fig. 6) chain reaction is proposed during the oxidative degradation of PP by sulphuric acid in the liquid phase and the same reactions are observed with LDPE & HDPE as well [29].

This mechanism is termed as sulphonation - desulphonation which leads to the dehydrogenation and ultimately to charring of the polypropylene. The FTIR data of LDPE, HDPE and PP after acid treatment show negative peak at 1740cm^{-1} indicating that sulphuric acid attacks and destroys carbonyl impurities. FTIR of LDPE treated

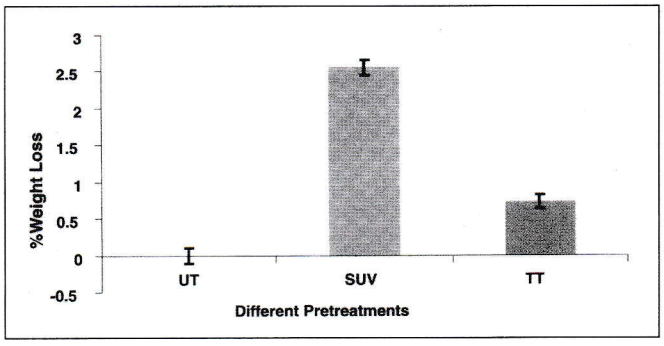


Fig. 4) Comparison of percentage weight loss between unpretreated and pretreated PP in 6 months

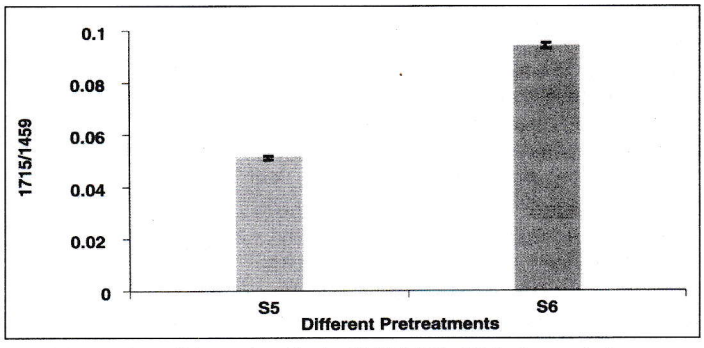


Fig. 5) Comparison of Ketocarbonyl Index (1715/1456) of PP before and after electron beam irradiation.

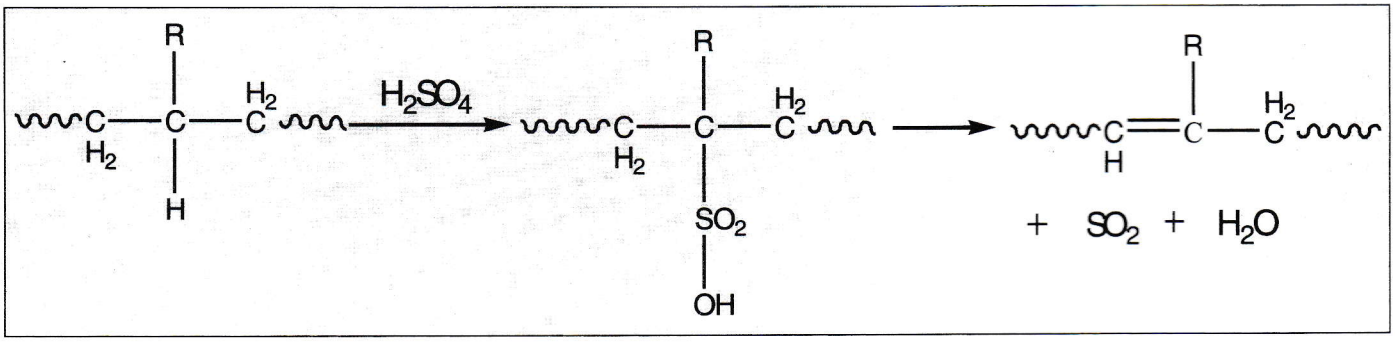


Fig. (6). General mechanism of action of sulphuric acid on polyolefins [2, 29].

with sulphuric acid shows the formation of vinylidene unsaturation in the polymer [2, 29]. Polypropylene did not show any change in tensile strength and weight loss when treated with 0-60% acetic acid at 100°C. However, with 70% acetic acid, a drop in strength is observed. PP treated with nitric acid at various concentrations (10-40%) and temperature (20-100°C) showed that at 100°C its strength decreased considerably, while the weight loss remained unchanged [2, 28]. The amorphous part of the polymer is oxidised by nitric acid after penetrating into it, while the crystalline portion remains intact. It is stable at low concentration of nitric acid (up to 60°C); but breaks down completely with in the course of a few days at concentration above 10% at 100°C. Chromic acid treatment fails to bring about any significant change to polypropylene. It appears to attack the crystalline and amorphous regions at approximately the same rate, thereby removing layers of the polymer uniformly and revealing the microstructure of the interior [2, 28].

Fig. 7 shows changes in the ketocarbonyl index after chemical pretreatment experiment conducted in our lab with pure PP films. As compared to reference PP i.e., PP without any pretreatment, sample S1 (PP pretreated with Fenton's II reagent) S3 (PP pretreated with Aquaregia), and S4 (PP pretreated with nitric acid) shows increase in the ketocarbonyl index indicating the oxidation of the polymer, where as the sample S2 (PP treated with Fenton's III reagent) didn't show any increase in the ketocarbonyl index thus showing that the treatment had no effect on the polymer.

In Fig. 8 it can be seen that when S1 (PP pretreated with Fenton's II reagent) and S3 (PP pretreated with Aquaregia) were subjected to biodegradation with B.*flexus* pure culture for 12 months, it was found that the ketocarbonyl index decreases, thus showing that the organism was able to utilize the polymer due to the formation of the ketocarbonyl functional groups after the pretreatments. On the contrary when PP without any pretreatment was subjected to the same biodegradation conditions no such changes were observed. The results thus support the theory of enhancement of biodegrading polymer after pretreatment & synergism between pretreatment and biodegradation of polymer.

Future Trends

The study of synergy between the pretreatment and the biodegradation of polymer in particularly polyolefins is a growing topic of interest. The pretreatment strategies are proving to the better option than directly subjecting the polymer for biodegradation.

Polyolefins with methylene repeat units are highly recalcitrant, have high molecular weight, and have hydrophobic surfaces making them difficult for the microorganism to form stable biofilm, oxidation of the polymer during pretreatments generates functional groups which can be helpful for the attachment of the organism to the polymer and in turn for the formation of biofilm.

The future developments in the same line can be to study of biodegradation of pretreated blend polymers or polymers with Prooxidants. As a preliminary step an understanding of the degradation mechanisms of both natural & synthetic polymers is essential. The knowledge of biodegradation mechanisms of the polymeric material will further help in the development of new materials having a high environmental acceptability & recyclability.

On the other front the screening of proper microorganism is also an important factor. The organism which can produce biosurfactant will be useful in such studies, as surfactants are amphiphiles having both hydrophilic and hydrophobic groups, which reduce the interfacial tension at the surface of the liquid or at the interface of two immissible liquids. They increase the solubility, bioavailability, and biodegradation of hydrophobic or insoluble organic compounds [2,30]. The manipulation of the capacity of microbes can contribute in the future biodegradation studies, charecterisation of the genes responsible for the production of degrading enzymes and its regulation by using current genetic engineering tools, modified microorganisms degrading the recalcitrant polyolefins can be produced.

Biodegradation being a slow process; the mathematical on paper calculation of the period required for the pre-treatment and biodegradation of the polymer can help for designing an experimental set up. Algorithms are developed for the degradation of linear and branched polymers. The algorithms of the chain scission mechanism which can be induced by any physical treatment on the polymer like exposure to UV, y, ionising radiation; thermal; chemical; or mechanical stimuli has been established [31]. This study can help us to develop special recycling techniques, required to achieve biodegradation, and degradation tenure of polymer [2,32, 33, 34].

Polymer Scenario

For the fourth consecutive month, most of China's petrochemical imports fell in the month of July. The dip has been triggered by a continued slowdown in the country's economy, weak downstream and new capacity additions from Sinopec, including its Tianjin and Zhenhai crackers, as per ICIS. A further fall in demand for petrochemical products is expected if China implements strict measures to curb speculation in the property market.

Sinopec started commercial production at its 3 mln tpa petrochemical complex at Tianjin in early May, while Zhenhai Refining & Chemical Co (ZRCC), started up its 1 mln tpa cracker and downstream units in April. China's ethylene imports dropped 31% yoy in July to 64,502 tons, and its butadiene imports plunged 67% to 9,279 tons, according to data released by China Customs. Polyvinyl chloride (PVC) saw a 29% y-o-y decline in imports to 121,188 tons in July. Imports of some products, including ethylene, monoethylene glycol and aromatics like benzene and toluene, saw a month-on-month rise as demand increased with the onset of the traditional peak manufacturing season.

A series of seemingly temporary factors has kept global polyolefins markets very tight as per ICIS. Few long existing factors have also contributed to supply constraints, making it easier to absorb new capacities.

Reduced feedstock availability in the Middle East – including ethane and liquefied petroleum gas (LPG). LPG has been tight because of factors including reduced refinery operating rates and increased demand from petrochemicals in the Middle East.

Technical glitches and plant shutdowns in the Middle East amid longer than expected time taken by new plants to stabilise because of manpower, technical and other issues.

Logistics factors, including port congestion, repositioning problems with ethylene vessels, lack of sufficient ethylene vessels and not enough container vessels. Shortage of enough shipping space restricts operating rates because this prevents arbitrage (e.g. polyolefins to Europe from the Middle East).

Europe's inability to sell gasoline in big volumes to the USA, pushing down operating rates at refineries down, thereby restricting the availability of feedstock to petrochemicals.

A fall in US gasoline demand is restricting propylene availability in Europe most of the propylene comes from steam crackers so lack of naphtha is the problem here.

Lack of spending on maintenance is reportedly the cause of numerous outages in Europe.

Lack of enough low-density PE (LDPE) capacity, pushing plants that do exist being pushed so hard to meet demand that outages are occurring very frequently.

Shortage of butene-1 has been restricting linear-low density polyethylene (LLDPE) for over a year.

New PP and PE offers from the Middle Eastern suppliers for September have been awaited in global markets as they are taken as a reference for the future direction of the market trend. The new offers are now slowly surfacing in China and Turkey at higher levels despite the shadow of falling crude oil prices.

Despite the fact that crude oil plunged to $71/bbl as of this week after hovering in the $80-82/bbl spread in the early days of August, spot ethylene and propylene continue to firm up in Asia on the heels of restricted supplies. Spot ethylene was even traded in four digit figures for the first time in three months as of yesterday.

In China, a new Saudi Arabian producer has started to offer LLDPE c4 film for September with large increases of $150-160/ton when compared to their latest offers in August. The producer aims to remain firm on its offers, justifying the price hike by pointing to their limited allocations.

However, he complained that they cannot conclude deals as buyers are showing resistance to these high levels as they are being influenced by lower crude oil values. Another producer from Saudi Arabia revealed its September HDPE and LLDPE film prices for next month with $80-90/ton increases over August.

A source from the company commented that buyers are hesitant to conclude deals at the new levels. However, the producer opines that they can achieve sales to some trading companies who are bound to maintain their long term relationships with them.

An LDPE producer from the Middle East sustains its offers at the same levels this week after having announced increases of $20/ton for September. The producer says that they are planning to maintain their firm stance at the current levels even though market conditions are slowing.

In the PP market, a global producer has started to offer Middle Eastern PP raffia to China this week. Blaming tight supplies caused by the regional shutdowns at PP plants, the producer applied large hikes too as they lifted their new offers by $70/ton when compared to their previous offers. Parallel with these developments in China, buyers in Turkey have recently started to receive offers for PP and PE from the Middle East.

Initial offers from the bonded warehouse of a regular Middle Eastern seller have emerged $70-90/ton higher for HDPE film and $50/ton for LLDPE film with respect to August done deals for the same origin. However, buyers receiving these initial offers commented that they found them too high to accept for now.

A buyer also received an HDPE film offer for another Middle Eastern origin, representing an $80-100/ton increase over August done deals while an LLDPE film offer for a different origin from the region received by a buyer indicates a $50-70/ton increase over early last month.

In the PP market, buyers are receiving new September offers from different Middle Eastern suppliers at levels standing at least $100/ton above the beginning of August. Suppliers have raised their offers to Turkey gradually throughout this month while there is stiff resistance to the new offer levels with buyers' bids standing $50/ton below the recent offers.

Ethylene spot prices climbed to a three-month high of $1,000/tonne (€790/tonne) in southeast Asia amid a scramble for spot material following cracker outages this week, market sources said on Thursday. A deal for a 3,000-tonne cargo loading first half September was reported at $1,000/tonne FOB (free on board) southeast (SE) Asia mid-week while bids to purchase more September shipments were mentioned in the mid to high $900s/tonne FOB SE Asia. "Because of the cracker troubles, supply is getting shorter," said an olefins trader based in Japan.

Market sources said Shell had shut its 800,000 tonne/year mixed feed cracker in Singapore early this week due to unspecified issues, and the producer could be in the

market to buy some ethylene spot cargoes to cover contractual obligations.

It was not immediately clear if the plant had restarted but operations had not been stable this month, they added. A company spokesman had earlier declined to comment on operational matters. Separately, Japan's Mitsui Chemicals shut its 617,000 tonne/year naphtha cracker in Ichihara, Chiba prefecture, on Thursday due to mechanical issues. It was not clear if the Japanese producer would need to buy ethylene from the spot market as the duration of the unplanned outage had yet to be confirmed, market sources said. The cracker outages are also likely to exacerbate the already tight supply situation in northeast (NE) Asia. Selling ideas remained above $1,000/tonne CFR (cost and freight) NE Asia, with discussions underway in the region, sources added.

Shell Chemicals announced the successful first turnaround at the CSPCL - "Nanhai" petrochemicals joint venture complex in Guangdong, China. Nanhai is a joint venture with China National Offshore Oil Company (CNOOC). The turnaround was completed while simultaneously carrying out the debottlenecking of an ethylene cracker and process units. Both were finished ahead of time and within budget. Debottlenecking the ethylene cracker, ethyleneoxide/ethylene glycols, and styrene monomer/propylene oxide process units will improve the site's competiveness by increasing capacity and reducing unit costs. After the debottle necking, the annual ethylene capacity went from 800 kilotonnes per annum to 950 ktpa, with total petrochemical production capacity at the plant increasing from 2.3 million tons to 2.7 million tons.

"Executing a turnaround and simultaneous debottlenecking project on this scale, within budget and on time is impressive and highlights the robust working partnership between Shell and CNOOC," said Ben van Beurden, Executive Vice President, Shell Chemicals. "The decision to increase capacity at Nanhai supports the Shell strategy to grow selectively and to continue to remain a leader in the expanding Asian petrochemicals market. "The debottle necking project included construction of an eighth liquid cracking furnace for light and heavy feedstock. Four out of five derivative plants were debottlenecked by 10% to 30%.

The planned turnaround took place in March and April this year. In addition to a broad range of planned maintenance activities, more than 1,000 pressure vessels were opened for statutory inspections. The project also included significant instrumentation work. The CNOOC and Shell Petrochemicals Company Limited (CSPCL) is 50% owned by Shell Nanhai BV, a Shell company, and 50% owned by the CNOOC Petrochemicals Investment Company Limited. It began operations in January 2006 and supplies products primarily to Guangdong and the high consumption areas of China's southeast coastal economic zones.

Capacities include:

Ethylene - 950,000 tpa
Propylene - 500,000 tpa
Butadiene - 165,000 tpa
Low Density Polyethylene - 250,000 tpa
High Density Polyethylene - 260,000 tpa
Polypropylene - 260,000 tpa
Mono-Ethylene Glycol - 350,000 tpa
Styrene Monomer - 640,000 tpa
Propylene Oxide - 290,000 tpa
Polyols - 170,000 tpa
Propylene Glycol - 60,000 tpa

Qatar's production of polyethylene for September shipments is expected to be down, as per Platts. This reduction in low density polyethylene allocation from Qatar Petrochemical Company (Qapco) in September, is expected to increase tightness in Asia. PE from Qapco and Qatofin from both companies has been reduced this month. Reduction of ethylene feedstock from the Ras Laffan Olefins (RLOC) ethane cracker since August has affected supply of LLDPE from Qatar.

The Ras Laffan cracker supplies feedstock ethylene to the PE lines in Mesaieed via a pipeline. LDPE supply is also tight, as apparent with Qapco's lesser than normal LDPE allocation for September shipments. RLOC's 1.3 mln tpa ethane cracker has reduced operating rates until the middle of 2011 due to a technical issue. Qatofin runs a 450,000 tpa LLDPE at Mesaieed, while Qapco has two LDPE lines with a combined capacity of 360,000 tpa. Production in the Middle East during the summer months is generally lower due to the high heat affecting the plants.

South Korea's Honam Petrochemical will pay about US$1.25 bln in cash to acquire Titan Chemicals Corporation, as per Plasteurope. Following an initial takeover of 72.6% of the shares held by Titan head and the state-run Permoladan Nasional, Honam plans to squeeze out the remaining shareholders. The takeover propels Honam, the petrochemical division of Korea's Lotte Group into the league of leading Asian ethylene manufacturers. The company's C2 capacity, currently at 1.75 mln tpa will rise to about 2.5 mln tpa as a result, while revenues are expected to increase to EUR 8 bln.

Titan is considered to be Malaysia's largest olefin and polyolefin manufacturer. Since its 2006 takeover of Indonesian polyethylene producer PT Petrokimia Nusantara (PT Peni, Jakarta), the Malay company is widely believed to be South East Asia's second-largest polyolefin manufacturer. Titan operates 10 plants at its Malay production sites in Pasir Gudang and Tanjung Langsat, as well as in Indonesia. Company sales last amounted to US$ 1.64 bln. All in all, Titan has capacities for 1 mln tpa of PE, 480,000 tpa of PP, 100,000 tpa of butadiene and 38,000 tpa of BOPP film.

LyondellBasell Industries NV, one of the world's biggest plastic and chemical producers, will end its business operations in Iran to shield itself against penalties the U.S. could soon impose on companies for violating trade sanctions. The Dutch-based company's board approved the decision early this month after months of deliberation, according to David Harpole, a LyondellBasell spokesman. In the past year, a number of companies—including many of Iran's gasoline suppliers—have cut business ties with Iran because of worries about legal consequences in the U.S. and elsewhere, and public-relations concerns.

They include Royal Dutch Shell PLC, which halted gasoline sales, and Toyota Motor Corp., which suspended car exports. Access thousands of business sources not available on the free web. Learn More LyondellBasell's decision means it will stop all licensing of its proprietary technology and services to Iranian petrochemical companies, which have depended heavily on technology from European concerns to produce plastics and other high-value products derived from natural gas.

On the Indian market front, shutdowns are planned for about 2 weeks at GAIL's PATA Plant and also at Haldia. Meanwhile, IOCL has been ramping up capacity and is believed to have sold over 20,000 MT of polymer. This should keep supplies available consistently through the next few months. The imminent startup of Borouge plant in Abu Dhabi would see some material coming into the Indian market. All this is likely to keep the pressure on the suppliers to find space for their product and also offer better pricing to the customers.

With inputs from Team Polymer Update.

Contd. to Page - 19

SEMINAR ON
"INNOVATIONS IN PLASTICS PROCESSING" ON 22ND SEPTEMBER, 2010 AT KOLKATA

A view of the audience during the National Anthem

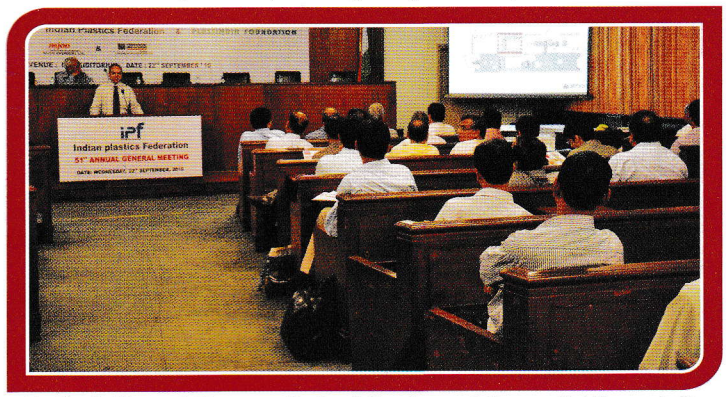
Mr. Sourabh Khemani, President, IPF lighting the lamp

Mr. Sourabh Khemani, President, IPF giving a Memento to Mr. Ashok Goel, President, PIF

L to R : Mr. M L Lahoti, Past President, IPF & PIF, Mr. Ashok Goel, President, PIF, Mr. Sourabh Khemani, President, IPF, Mr. Pradip Nayyar, Editor, Plastics India, Mr. K K Seksaria, Hony. Treasurer, PIF & Past President, IPF are present at the senimar hall

Mr. Ashok Goel, President, PIF Inaugurating the AGM Special Issue of IPF

Mr. Ashok Goel, President, PIF Inaugurating a CD - A Step Forward



Mr. Pradip Vanwani, Manager - Design & Development, Ferromatik Milacron India Ltd., giving the presentation

Mr. Sunil Jain, President, Rajoo Engineers Ltd., giving the presentation

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K – 2010

International Trade Fair on Plastics and Rubber

Messe Düsseldorf, Germany-

27th Oct. To 3rd Nov' 2010.

****

As we embarked on this beautiful city of Düsseldorf, we were all thrilled at the charged atmosphere and aroma of Plastics and related activities.

The K- Fair Ground called Messe Dusseldorf, was all decked up to receive huge crowd with marked / disciplined parking for designated vehicles. Regulated access control entry system, conditioned air inside the halls could keep us warm though the temperature outside was hovering around 8 – 12° C.

Coming to the Exhibition, spread across 17 halls this time K 2010– had housed more than 3500 exhibitors with a participation **of 130 + Indian companies'**. All international plastic Industry's big names including; Battenfeld, Cincinnati, Ferromatic, Rollepal, Amut, Heintzmann, Unicor, Ramix, Eco-plas, Romi, Uniplas, Periplast, Weber, offered everything a plastic enthusiasts was looking for.

Extrusion machineries, Tape Lines, Recycling Machineries, Pulverisers, Injection Moulding, Blow Moulding, Compression and Transfer moulding, Thermo forming, Finishing, Printing, Decoration and Marking, Welding, Jointing, Bonding, Moulds and Plastic Application technology for Automobiles. Equipments for Control and regulation, Testing, Material Handling, Handling technology.

Some o the innovative and new advanced machines we could feel were Eco-plas : Wood + Plastic combined moulding, Double and Triple wall corrugated pipe lines in higher diameters, Fully Automated socketing, belling machines, with shortened cycle time, PVC-O pipe lines, online- offline printing, embossing machines, Tailor made solutions for Injection moulding, Cutting edge technologies in Plastics.
We could find the advanced applications in achieving:

Shortening production times, Raising throughput, Shortening product changeover times, Integrated production processes, Optimising sub-processes Energy efficiency, Materials efficiency etc.

Compared to K-2007, Exhibitors and visitors at **K-2010** were more than in the past in fact, thanks to the wide network of supporting partners, and associations, and advertisements.

K-2010 was not only a wide International showcase of machinery and equipment but also a relevant window for raw materials, finished and semi finished products, materials and appliances.

K-2010 was the best place for plastic people like us to set our vision or take a look at the latest solutions, innovations, technologies to catch up with and **Be Inspired.**

Shyamlal Agarwal
Convenor – K 2010 Exhibition Committee

NEWS AROUND THE WORLD

Boeing 787 plastic plane debuts at Farnborough

The Farnborough Airshow, reaches its climax with the famous Weekend Flying Display.

The plastics headlines have been grabbed by Boeing's revolutionary new "plastic plane," the 787 Dreamliner, which is the first plane to be made from 50% carbon fibre composite material.

Richard Woolverton, an employee of Vought Aircraft Industries – which constructs wings and fuselages (to name a few) for contracting firms like Boeing, Lockheed Martin, and Northrop Grumman – Woolverton is helping to build Boeing's revolutionary new 787 Dreamliner Aircraft.

The first of its kind, the 787 Dreamliner will be made primarily of composites (carbon fiber-reinforced plastic) rather than the aluminum that composes other commercial jets. This will allow it to burn 20 percent less fuel and travel faster, for longer distances.

"This jet is really is a quantum leap in commercial aviation," says Woolveton. "It also will have 30 percent larger windows and pressurize at lower levels, so your ears and sinuses won't pop as much."

New process for mass production of automotive thermoplastic components

Researchers from the Fraunhofer Institute for Chemical Technology ICT in Pfinztal have now found a solution to this problem by developing a new class of materials designed for large-scale use in vehicle construction: thermoplastic fiber composite materials.

Once they have reached the end of their useful life, they can be shredded, melted down and reused to produce high-quality parts. And they also perform significantly better in crash tests: thermoplastic components reinforced with textile structures absorb the enormous forces generated in a collision through viscoelastic deformation of the matrix material – without splintering.

Researchers had previously failed to come up with a suitable manufacturing technique for thermoplastic composite structures made from high performance fibers, but the ICT engineers have now developed a process suitable for mass production which makes it possible to manufacture up to 100,000 parts a year. The cycle time to produce thermoplastic components is only around five minutes. Comparable thermoset components frequently require more than 20 minutes.

The Fraunhofer researchers have named their technique thermoplastic RTM (T-RTM). It is derived from the conventional RTM (Resin Transfer Molding) technique for thermoset fiber composites. The composite is formed in a single step.

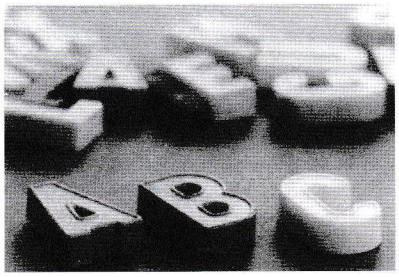
The preferred types of reinforcement comprise carbon or glass fibers, and the researchers have also developed highly specialized structures. The next step involves injecting the activated monomer melt into the molding chamber. This contains a catalyst and activator system – chemical substances that are required for polymerization. The ingenious part is that the researchers can select the system and the processing temperature in a way that enables them to set the minimum required processing time.

To improve the crash behavior of the vehicle's overall structure, the ICT engineers also calculated the optimum fiber placement.

Another advantage of the T-RTM proces is that the cost of the thermoplastic matri material and the cost of its processing ar up to 50 percent lower than the equivalen costs for thermoset structures.

Over the next few years it is anticipate that these kinds of components will start t be used in vehicle and machin construction as well as in the leisur industry.

Safer plastics that lock in potentially harmful plasticizers



Scientists have published the first report or a new way of preventing potentially harmful plasticizers from migrating from one of the most widely used groups o plastics.

The advance could lead to a new generation of polyvinyl chloride (PVC) plastics that are safer than those now used in packaging, medical tubing, toys, and other products, they say.

Their study is in ACS' Macromolecules "Phthalate Plasticizers Covalently Bound to PVC: Plasticization with Suppressed Migration."

The team notes that manufacturers add large amounts of plasticizers to PVC to make it flexible and durable. Plasticizers may account for more than one-third of the weight of some PVC products.

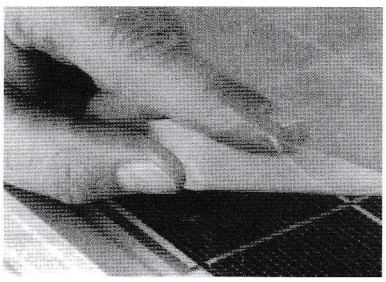
Phthalates are the mainstay plasticizers. Unfortunately, they migrate to the surface of the plastic over time and escape into the environment.

As a result, PVC plastics become less flexible and durable. In addition, people who come into contact with the plastics face possible health risks.

The US Consumer Product Safety Commission in 2009 banned use of several phthalate plasticizers for use in manufacture of toys and child care articles. The scientists describe development of a way to make phthalate permanently bond, or chemically attach to, the internal structure of PVC so that it will not migrate.

Laboratory tests showed that the method completely suppressed the migration of plasticizer to the surface of the plastic. This approach may open new ways to the preparation of flexible PVC with permanent plasticizer effect and zero migration.

A transparent polymer sticker on the face of solar panels increases efficiency by 10%



The polymer sticker performs three major functions: It prevents light from reflecting off solar panels, it traps light inside the semiconductor materials of the solar panel which convert the rays into electricity and it disperses the light as it encounters the semi-conductor materials so it has a larger chance of being absorbed.

The technology is cheap and, unlike other designs aimed at improving solar panel efficiency, this technology can be applied to existing panels. Tests from the United States National Renewable Energy Laboratory show the company's thin-film stickers increase the power output of solar panels by between 4% and 12.5%.

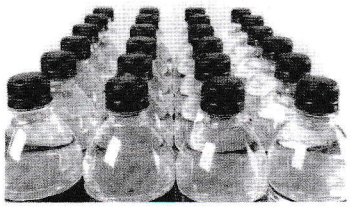
Asia is the Largest Consumer of PET Followed by Europe

The demand for PET is highest in Asia, with China driving the majority of global demand. As per GBI Research, demand in advanced countries like Japan has largely stabilized. There is a huge consumption potential in largely populated countries such as India and China.

The strong economic growth along with the large population enables the large consumption of Carbonated Soft Drinks (CSDs) and bottled water in the region. The rapidly changing lifestyle of people in the region supports the consumption of packaged food.

China has also grown rapidly in the capacity and production of petrochemicals. China is the largest producer of PET in the region and exports to many countries.

Asian demand by volume for PET in 2009 was nearly 4.7 mln tons. Europe is the second largest consumer of PET in the world. Russia, Italy and Germany are the major consuming countries in Europe. The demand in some Western European countries, such as Germany, France, Spain and the UK, is approaching the maturity stage. Growth in European PET demand is driven mostly by Russia. The demand for PET in Europe was around 3.7 mln tons in 2009. The North American economy is the most developed and advanced, and the scope for growth is lowest as the demand is close to saturation. However, certain new and upcoming applications of PET are driving the North American market. The North American demand for PET in 2009 was close to 3.1 mln tons in 2009.



The PET demand in South and Central America is growing fairly strongly. This region consumed around 2 mln tons of PET in the year 2009. The Middle East and African demand for PET is the second fastest growing after that of Asia. The Middle East and Africa region consumed around 1.2 mln tons PET in 2009.

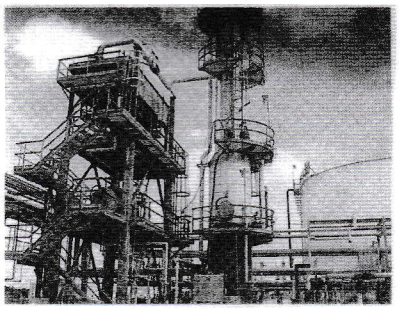
CSD is the largest market for PET globally. Because of its light weight, toughness and clarity, PET is the most preferred material for CSD bottles.

Bottled water is the second biggest PET consuming market globally. CSD and bottled water together account for more than 65% of the global PET demand. However, the packaged food segment is also a very important and growing market for PET.

Prevention of costly downtime from power outages at petrochemical plants

Unplanned downtime at petrochemical plants due to electric power failure is more common and costly than the total of fires, floods, earthquakes, network outages, service failures, and hardware problems combined. Recent economic studies estimate the cost of downtime to the US economy due to power outages exceeds US$150 bln annually.

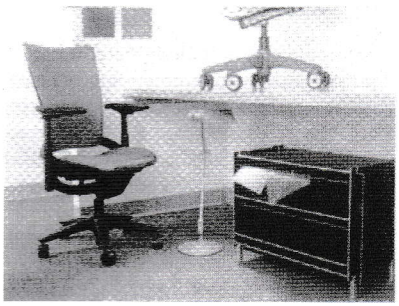
The health and safety implications of outage incidents can include catastrophic accidents and releases, making the system vulnerable to subsequent outages. 80% of outages at industrial plants are the direct result of the distribution system inside the plant, i.e., failed equipment and systems belonging to, and maintained by, the industrial plant.



There are a variety of new solutions being developed in the utility industry using Exacter technology that identify failing equipment in the formative stages - long before an outage incident.

Petrochemical plants finally have a utility-grade early-warning system that allows them to remove failing equipment long before an outage shuts the plant down.

Specialty compounded polypropy -lene resin as alternative to Long Glass Filled PP



A new polypropylene technology: Thermylene® P8 specialty compounded polypropylene resin has been launched by Asahi Kasei Plastics North America Inc. This is a material innovation that gives customers superior creep resistance at room temperature and comparable creep resistance at elevated temperatures when compared to long glass filled PP.

Thermylene P8 materials build upon the strengths of Asahi Kasei's polypropylene portfolio opening the door to applications traditionally specified in long glass PP while providing the economical benefits of short glass polypropylene.

It is a world-class polymer formulated for optimized interfacial adhesion between matrix and reinforcement and to balance

impact and strength. Available in varying glass levels and endless colors, Thermylene P8 can be used in Automotive, Electronics, Furniture, Bath & Spa, Building and Construction.

A thin Mylar-based sensor film significantly reduces warped, rejected composite parts

Pressurex®, a thin Mylar-based sensor film that maps and measures the amount of interfacial stress exerted on honeycomb cores, composite lay-ups and bonded surfaces within composite structures has been introduced by Sensor Products Inc.

By using Pressurex® to see how surface stresses are distributed, an engineer can observe inconsistencies and misregistration in composite parts and thereby greatly reduce the yield defect rate.

Other applications include determination of press planarity in lamination processes, monitoring of vacuum bagging pressures, confirmation of pressure uniformity on wound filaments parts, and calibration of tools and equipment.

The film is available in sheets or rolls. When placed between contacting or mating surfaces, the film instantaneously and permanently changes color. This color change is a direct result of the amount of pressure applied. Comparison of color variations to a color correlation chart (conceptually similar to interpreting Litmus paper) can help determine precise pressure magnitude.

Depending on the requirements of the project, additional graphical and statistical data can be retrieved from the film through Topaq®, an optical analysis system that can be bought or leased from Sensor Products Inc. or used by their staff.

It has been used in the aerospace industry to determine the exact amount of pressure causing cracks in the inner spars of a helicopter's main rotor blade. A large sheet of Pressurex® was inserted into the bonding tool, bagged up, and pressurized in the autoclave. When the film was removed, the exact amount of pressure causing the crack was determined.

Latest green formulations for surfactants personal care and home care markets

Leading regional industry players will gather at the conference to address pertinent issues influencing the surfactants industry, the latest trend in Asia personal care and homecare industry and the potential for surfactant and other raw material suppliers.

10th Asia Surfactants Personal Care and Home Care Markets conference convenes on 16-17 September in Shanghai to capture the eco-conscious consumer with the latest green formulations. China's implementation of new cosmetic regulations on April 1, which stipulate that foreign companies register new materials or ingredients in products imported into China, is causing confusion and placing new burdens on companies.

Hence, at this conference, Shanghai Jahwa United Co. Ltd is invited to share some guidelines on what the industry can do to plan and prepare for product launches in China. The Shanghai conference will also focus on the new facilities that were opened in greater China. The meet will discuss if these new facilities, set up to meet the needs of the growing Chinese and wider Asian markets, allow demand to catch up with supply.

As the quantity of bio-based raw materials balloons, the conference will directly address the issue and explore the impact of these materials as more of them are commercialized. And to the benefit of producers, the meet will give insights on how they can capitalize on this immense potential and compete effectively.

The conference promises to provide first hand information on how companies are following the principles of hig sustainability and delivering natura source of raw materials and ingredients.

Green metal-to-plastic conversion wit innovative plastics helps divers industries

To accelerate the trend toward replacir metals with high-performance, durab and versatile thermoplastic compound SABIC Innovative Plastics ha collaborated with Swiss software mak KISSsoft AG. KISSsoft is now applyir gear sizing calculations for 17 grades SABIC Innovative Plastics' LNF specialty compounds, including higl temperature, internally lubricated ar fiber-reinforced grades.

Now, engineers and designers can repla trial and error with validated data parameters such as strength, temperatu resistance and tooth flank wear significantly streamline their gear desig process. This new solution can help a wi range of industries, from healthcare ar automotive to food services, leverage tl advantages of plastic gears to redu system cost, greatly expand desig freedom, lower weight and deliver high performance.

Metal-to-plastic conversion represents major trend and a significant improveme in gear technology. Plastic gears deliver number of improvements over tradition metal, beginning with significant enhanced design freedom.

Molding instead of machining enables ne configurations while avoiding the costs secondary operations. The light weight of plastics also reduces inertia f greater gear efficiency. Additionall moving plastic parts are significant quieter than metal, helping to redu ambient noise from machinery.

The first group of SABIC Innovati Plastics' LNP materials to be validat includes reinforced grades using short a long glass fibers and carbon fibers, vario lubricant technologies and eight differe base polymers. The two companies a working to expand this portfolio.

Reverse Printed LDPE Extrusion Coating on 2 sides of HDPE Woven Sacks

Plastics, has become an intermediary medium between the product to be packed and a consumer. Products to be packed are of diverse variety; therefore plastic, which offers numerous advantages such as moisture proof and light weight are required.

Plastic Woven sacks are light weight and less bulky and therefore the amount of the packed contents would be more for the same weight. What a consumer needs is good aesthetics, appealing branding and good packaging materials which offer good mechanical properties.

Good mechanical properties include tensile strength, elongation and bags which do not tear off when thrown from a height. Low Density Polyethylene extrusion coating which was initially perceived as extrusion coating to polyethylene woven sacks and tarpaulins today comes with more number of end uses.

LDPE extrusion coating needs development of new end uses such as PE/PP Reverse Printed Laminated Woven Sacks and PP Laminated Leno bags. For successful business, high volumes in polyethylene extrusion coating i.e. machines with wider widths and high output plants, need to be looked at by entrepreneurs.

Local and imported machines which offer good line speeds and with which the product is of a better bond and seal strength needs to be looked at by the entrepreneurs. Aesthetics and branding of a product with polyethylene extrusion coating, a catalyst for the growth of this business would help this industry grow at a fast pace. Flexible converting industry could be classified as:

- Adhesive Laminating Industry
- Co-extrusion Industry
- Extrusion Coating Industry

Extrusion coating is a continuous process of applying a thin film of polyethylene to a non-plastic packaging substrate such as paper, paperboard, metal foil, polymeric film substrate or even a non-woven fabric. There are typically three stages in the extrusion coating process.

First, polyethylene pellets are made molten by the blending action of an extrusion screw inside an extruder. Then the flux of molten polyethylene is forced through a flat die to extrude a film that is only a few microns thick. Finally, the film is laid on a substrate and cooled until adhesion is tight. One of the first flexible packaging applications for extrusion coating was the use of LDPE on butcher paper in the 1950s. Because of its processability, adequate moisture barrier, heat-sealing properties, and relatively low cost, LDPE soon became the dominant material used in extrusion coating applications.

As recently as 2003, LDPE was still by far the most commonly used polymer in European extrusion coating, accounting for 90% of the 600,000 mln ton market. However, new packaging performance requirements and higher capacity demands, coupled with environmental and economic incentives to down-gauge materials and continuously reduce costs, are now challenging converters to extrude a wider portfolio of polymers.

Films are the largest market for LDPE, split 50:50 between packaging and non-packaging. Food packaging includes baked goods, dairy products, frozen food, meat, etc. Non food packaging includes industrial liners, heavy-duty sacks, multi-wall sack liners, shrink wrap, grocery sacks, merchandise bags and garment bags.

Extrusion coating is the second largest market for LDPE worldwide. Typical applications include the coating of paper and paperboard products for packaging liquids such as milk and juices, the coating of foil to provide a heat-seal layer in multi-layer film structures, and the coating of paper and woven cloth to provide a moisture barrier. LDPE is readily heat sealed.

The range of low density PE includes those with a variety of slip and anti-block agents, such as required in bulk packaging where low slip for good stackability is needed. Low density polyethylene is flexible and tough.

In India, the industry market share of extrusion coating out of total low density polyethylene is 20%.

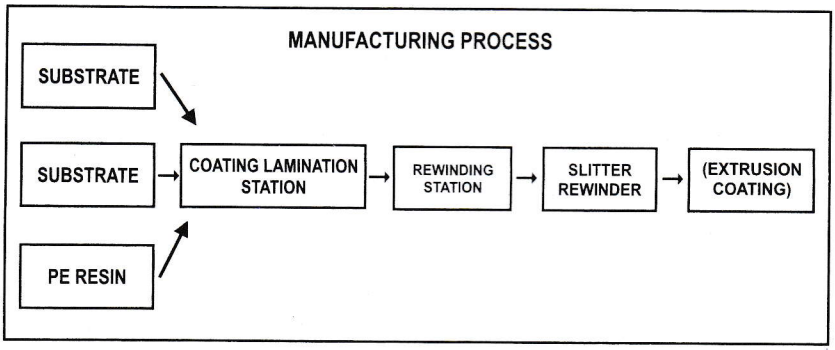
Extrusion Coating of different laminates (composites) with a film of thermoplastic material is the following:

- In the extruder, PE or PP is processed into a homogeneous melt and formed into a melt web in the die head.
- The material web (substrate) is fed into the nip between the laminator roll and pressure roll.
- The melt web applied to the substrate sticks as a film to the surface of the substrate. As a result of the contact pressure operated by the pressure roll and the temperature of the melt, the plastic film and the substrate are completely adhered to each other.

Films initially were perceived as monolayer propagated to multilayer films and has extended to flexible packaging laminates and extrusion coating. Both these plastic products involve lamination, for the former an adhesive lamination and the latter heat lamination.

Both these laminates involve a common material, polyethylene. Local machinery is available for these products. Extrusion coating involves products with a good bond strength or seal strength. The common function of films made out of film extrusion process prevents packaged products from dust and moisture.

Established End Uses
- Multiwall paper sacks for cement, pesticide packing
- Pouches for snacks and confectionery
- Liners for corrugated boxes and wooden chests
- Composite containers such as paper



tubes, drums etc.
- Carton stock for detergents, breakfast cereals, etc.
- Wrappers for cigarette packs, match boxes, soap, tea, food Packages, engineering parts, etc.
- Battery wrap for leakproof dry cells
- Strip packaging of pharmaceutical tablets.

Reverse Printed Low Density Polyethylene Extrusion Coating on 2 sides of high density polyethylene woven sacks instead of extrusion coating on top & bottom to avoid slippage of bags during stacking to more number of rows with the help of 2 dies on the sides (Validated by P K Patkar, J P Industries).

For creating a brand, these bags could be used by chemical, cement, salt, sugar manufacturing companies as well as foodgrain producers such as rice, flour, cereals, and pulses end users.

- Rs 1.5 per bag additional in comparison to normal flexographic printing (eg 6 colour). Excellent aesthetics, since printing on plain surface.

- Potential Rice: 89 mln tons in 09-10 (E) 43 KTA, Wheat: 81 mln tons in 09-10 (E) 38 KTA, Sugar: 23 mln tons in 09-10 (E) 11 KTA, Cement 159 mln tons 80 KTA in 09 - 10.

- These bags with 2 side extrusion coating could be used by chemical, cement, salt, sugar & foodgrain such as rice, flour, cereals, and pulses endusers. Gussetted bags with Extrusion Coating (2 side coating) of LDPE film on HDPE Woven Sack (Reverse printed LDPE film on the outer side, LDPE in between laminated to HDPE Woven sack, 10 inch lamination on 2 sides (5 inch each, 20 micron of LDPE Reverse Printed film & 25 micron for extrusion coating): 25 kg (19 inch*28 inch)-12 gms, 50 kg (24 inch*36 inch)-25 gms. LDPE Reverse Printed film on top & bottom: 25 kg-25 gms, 50 kg-50 gms

- Without gusset, PE Reverse printed bags with top & bottom coating could be stacked upto 5 to 7 rows
- With gusset, PE Reverse printed bags with top & bottom coating could be stacked upto 15 to 20 rows
- With antiskid additives, PE Reverse printed bags with top & bottom coating could be stacked upto 20 to 25 rows. The cost of antiskid additive is Rs 2-3/kg in addition to the raw material cost for top & bottom coating in comparison to Rs 1.5 per bag in comparison to normal flexographic printing for 2 side coating.

- Existing method of printing - Flexographic printing on HDPE Woven Sacks without Lamination

Enduses for company name, logo

Foodgrain Production in 2009-10 estimated at 218.19 MT

Rice - 89.31 mln tons

Wheat - 80.98 mln tons

Tur - 2.56 mln tons

(Source:http://indiacurrentaffairs.org/foodgrain-production-in-2009-10-estimated-at-218-19-mt)

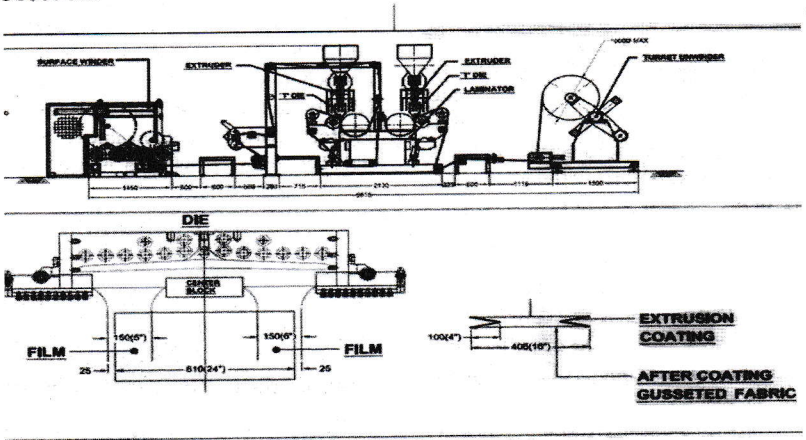
Sugar - Indian sugar production estimated to 23 mln tons for 2009-10.

Cement - Cement Production in 2009-10

According to the Cement Manufacturer's Association, cement desptaches during 2009-10 were 159.43 mln tons.

(Source:http://www.ibef.org/industry/cement.aspx)

Chemical Industry is an important constituent of the Indian economy. Its size is estimated at around US$35 bln approx., which is equivalent to about 3% of India's GDP. The total investment in Indian Chemical Sector is approx. US$60 bln.



The Indian Chemical sector accounts for 13-14% of total exports and 8-9% of total imports of the country. In terms of volume, it is 12th largest in the world and 3rd largest in Asia. Currently, per capita consumption of products of chemical industry in India is about 1/10th of the world average.

The industry size is projected to more than double, to reach US$80-100 bln by 2010. Indian chemicals industry, which includes basic chemicals & its products, petrochemicals, fertilisers, paints, gases and pharmaceuticals, is one of the oldest industries in the country.

In said diagram, tandem extrusion coating line which consists of two separate set of Extruders, Dies & Laminator Stations. In tandem extrusion coating line, tubular fabric will be coated on both sides at time. Coating on both edge of tubular fabric, the same is possible by providing less bid type die having center blocking arrangement on it. After coating on tubular fabric, the same will be converted into gusseted tubular fabric in another machine.

Branding of farm produce to distinguish a good quality produce with the help of polyethylene reverse printing on 2 sides of high density polyethylene woven sacks which could include the name of the farmer or other end users would lead to the delivery of good quality produce from wholesaler to retailer.

An effective packaging material which helps in identifying the name of the company of the manufacturer of chemical, sugar, salt etc and to distinguish a quality product, these polyethylene reverse printed lamination on 2 sides of woven sacks on which the company name & address would be printed would be an effective packaging material.

Plastics are materials which can store numerous products. Storage, handling and transportation with plastic products bring in ease of handling during various stages owing to its light weight characteristic. Plastics are like a stepping stone to success for agribusiness.

Plastics, a growing phenomenon which initiated with films for packaging have further propagated to bags for agribusiness. Plastics are a boon to farmers and have gained significance in agribusiness with monetary advantages to them.

Plastics and paper work together on nonround packs

Greiner moved from round to rectangle in its new thermoformed PP tub.

Pan-European plastics processor Greiner Packaging (Kremsmünster, Austria) is supplying its first nonround k3 packs to Kerrygold for that food processor's new "extra" range, sandwich spreads made from Irish butter and rapeseed oil. K3 refers to *Kunststoff-Karton Kombination*, German for "paper-plastics combination."

The core element of the new packaging is a white thermoformed polypropylene (PP) tub that holds 250g and is enclosed with a cardboard wrap made of recycled cardboard. The cardboard wrap gives the tub stability and protects it from UV light. Its outer surface is printed in six colors, and its inner surface is single-colored and provides information on environment-relevant aspects regarding the cardboard wrap. It also offers a competition. A three-colored printed label is attached to the tub bottom. A thermoformed lid processed from seven-color printed sheet tops off the package.

The processor says only six months were needed from packaging concept until the first delivery. The tub of the not-round k3 packaging and the lid were developed at different Greiner locations at the same time.

Greiner Packaging, www.greiner-gpi.com

Bubble popping not just for kids

U.S. demand for protective packaging is forecast to climb 6.2% per year to $5.2 billion in 2015, reflecting an upswing in manufacturing output, said the latest study from The Freedonia Group Inc., a Cleveland, OH-based industry market research firm.

The fastest growth is expected for air pillows (expected to climb 8.7% to $295 million in 2014), foamed plastics (expected to rebound substantially from a depressed base in 2009), and bubble packaging, which will be aided by favorable outlooks for manufacturing activity and electronic shopping. Gains in foamed plastic protective packaging will reflect a significantly improved outlook in the manufacturing sector.

The Freedonia Group Inc., www.freedoniagroup.com

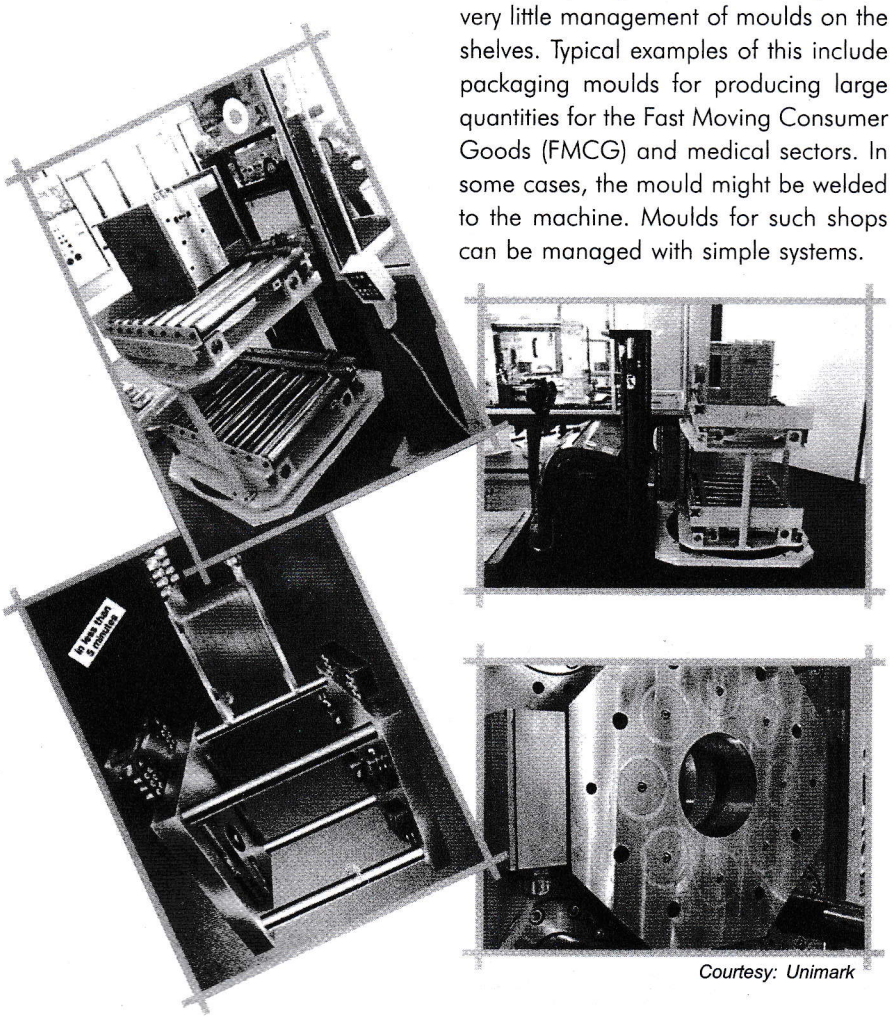
Mould management

A formula for efficient production

In moulding shops which require frequent changing of moulds, there are several issues pertaining to cost, time and energy efficiency that need to be addressed. Today, there are many means to achieve reduction in time losses to manageable levels. This article takes a closer look at solutions that vary from simple logical measures that can be taken in most moulding shops to advanced solutions that help manage large mould programmes.

Y R Anand

Generally, there are two types of moulding shops that pose interesting questions in mould management. The first type includes those which have long runs of production with every mould requiring almost no change and very little management of moulds on the shelves. Typical examples of this include packaging moulds for producing large quantities for the Fast Moving Consumer Goods (FMCG) and medical sectors. In some cases, the mould might be welded to the machine. Moulds for such shops can be managed with simple systems.



Courtesy: Unimark

The second type includes those that require regular to very frequent mould changes. Requirements which increasingly face injection moulding companies include small series, different product versions, just-in-time production and delivery. A typical example is that of a moulding shop for automotive parts.

The need for mould management

In the case where moulds require frequent changes of models or variations - for instance the automotive industry - machines require myriad of parts with short batches. This results in frequent changeover procedures, when machines stand idle and fail to return profits, even though they continue to consume energy.

The cost implication of this is not significant while dealing with low end parts and machines. However, for machines with high clamping forces (with expensive moulds) or with advanced technology machines, these changeovers may add up to significant costs. Most companies look at the substantial number of machine hours lost, but fail to calculate the time lost for the mould costs and all the auxiliary equipment costs, all of which remain idle while changing moulds. Together, these could add up to big figures. One way to overcome the higher set-up times for every mould could be to produce larger quantities to improve machine utilisation, but this would add to inventory carrying costs.

The first step to good management of moulds and changes is to standardise a few parameters. This can lead to substantial time savings. A mould change typically has two parts to its management:

- Supply lines like water, oil, air, vacuum, electric supply
- The actual mould change

Managing supply lines

The most common supply line to a mould is the mould temperature controller. As the demand for technical parts is increasing, this is being increasingly deployed. In high speed mouldings (like packaging, PET) these supply lines could be typically cold water from chillers. In case the moulds have hydraulic or pneumatic lines for core pulls, and additional equipment like auto closures etc, then the need for quick connections also goes up.

A simple way to manage fast changes is to use individual colour coded quick release couplings, preferably with non-spill shut off mechanism. Many productions shops have already adopted such practices. The next logical step is to fix good quality manifolds to the machine by the side of the machine. Certain manifolds also facilitate the connecting of all lines in one go. The basic requirement for this is to make the number of lines standard for a particular size of machines. This allows all the water/oil lines used for mould temperature controllers to be connected in one go.

It is also possible to have complex manifold systems combining the temperature lines with pressure lines, pneumatic lines, vacuum and even electric connectors. However, in this case the planning must be really foresighted and should take the entire mould programme into consideration.

Speeding-up mould change

A frequently asked question among moulders is: How can the mould changes on injection moulding machines be performed economically, ergonomically, flexibly and safely? With large moulds, it is almost certain that they will be changed vertically with the help of cranes. Only with extreme automation are large moulds changed horizontally.

However, a large number of moulders need to change moulds horizontally and many of them do not have overhead cranes. In such cases, the solution lies in perfect preparation while the previous job is still running. This is of crucial importance for a fast changeover. Checklists help ensure that nothing (for example the appropriate hoses) has been missed out. A well-organised cart with all the required tools and bolts should be available prior to every set-up. This means that everything is in place as soon as the machine stops. Nothing needs to be searched for or fetched, thus eliminating any possibility of time wastage.

A standardised clamping system should be chosen while designing the tools. It is important that the back plates are of the same size when the moulds are mounted directly. This allows the use of same bolts and their position throughout. Work can be made even easier by using clamping elements that remain attached to the machine and that can be used flexibly for other moulds. If a large number of in-house moulds are used, it is advisable to standardise the clamping platens. There are simple mechanical rapid clamping systems available which can be left in place on the platens permanently. With such help, moulds can be changed in just a few minutes.

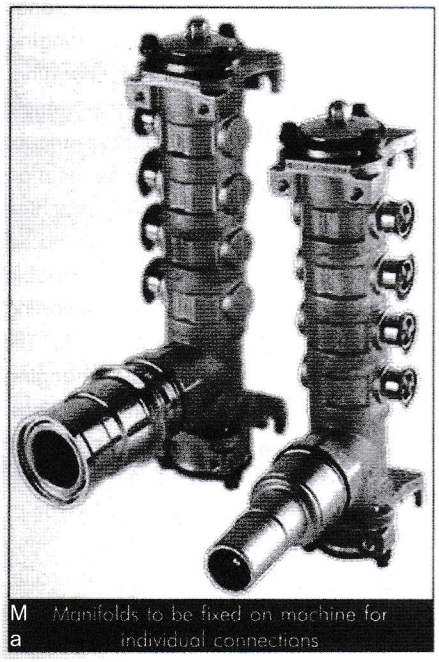
Types of mould change systems

There are several ways to quickly clamp the mould to the machine platens. The simplest is to use quick clamping elements that are placed permanently on the machines platen in fixed positions. Other basic types of rapid clamping systems in the market include mechanical, hydraulic and magnetic mould change systems.

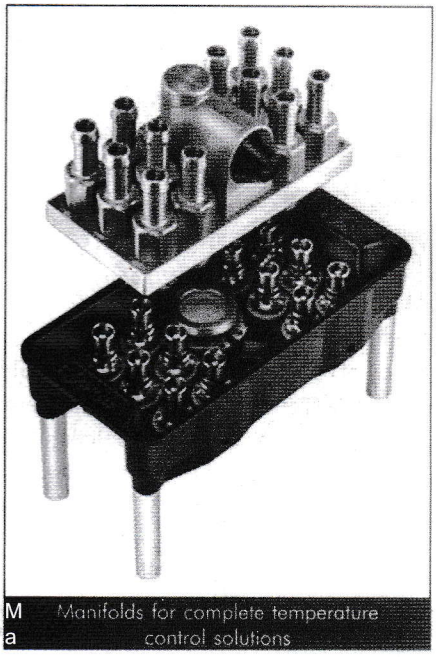
Mechanical mould change systems

Mechanical systems always use some kind of mechanical interlocking between the machine platen and the mould back plate, without having to physically turn bolts on individual clamps.

In this type of system, there exist two bayonet plates fixed to both the machine platens. Each mould is fixed with a clamping ring on each side.



Manifolds to be fixed on machine for individual connections



Manifolds for complete temperature control solutions

Their interlocking clamping rings swivel in the bayonet plate when the handle is moved, locking the two halves of the clamping ring and providing a strong bond between the mould & the machine.

In these systems, there is loss in daylight of the machine to accomodate the bayonet plates. In addition, every mould has to be modified with counter bores and tapped holes to fit the clamping rings. Moreover, if it is a custom moulding shop with the moulds provided by the customer, then it is not a practical proposition to implement. In addition, the machine nozzle tip and the ejectors have to be extended to pass through the bayonet plates. And if there are multiple ejectors then it poses more challenges. These are relatively inexpensive to install for a small number of moulds. The total cost for a programme can be very high if the number of moulds is large, because clamping rings are needed for every mould.

Hydraulic mould change systems

The hydraulic clamping systems use multiple hydraulic elements fixed to both sides of the machine platen. Since they are clamped at fixed positions, the mould back plates have to be necessarily of standard dimensions to fit the clamping elements' positions. The big advantage of this system is that it is relatively well priced, needs no modification of the machine and is easy to implement. For custom moulders, the only hurdle could be to have standard size back plates. These systems can be used for horizontal or vertical loading systems.

Magnetic mould change systems

One of the most interesting mould change systems is a magnetic system. This is the most expensive solution but also allows a lot of flexibility. However, there are several myths surrounding these systems.

Contrary to popular belief, these are totally fail safe systems. In case of a power failure, the moulds will not fall down. The magentism is permanent in nature and to open the clamp, the poles have to be reversed with power. Currently, magentic systems are being supplied for large clamping force machines up to 4,000 T. The larger the machines, the larger will be the number of poles.

One of the most interesting mould change systems is a magnetic system. This is the most expensive solution but also allows a lot of flexibility

Further, the magnet plates need to be fixed to the machine platens, resulting in loss of daylight. The nozzle tip and the ejectors have to be extended to go through the magnet plates. Multiple ejectors can be accomodated, but the ejector positions cannot be changed subsequently. Additionally, the magnetic systems do cost significantly more than the hydraulic systems.

The alternative 'vehicle'

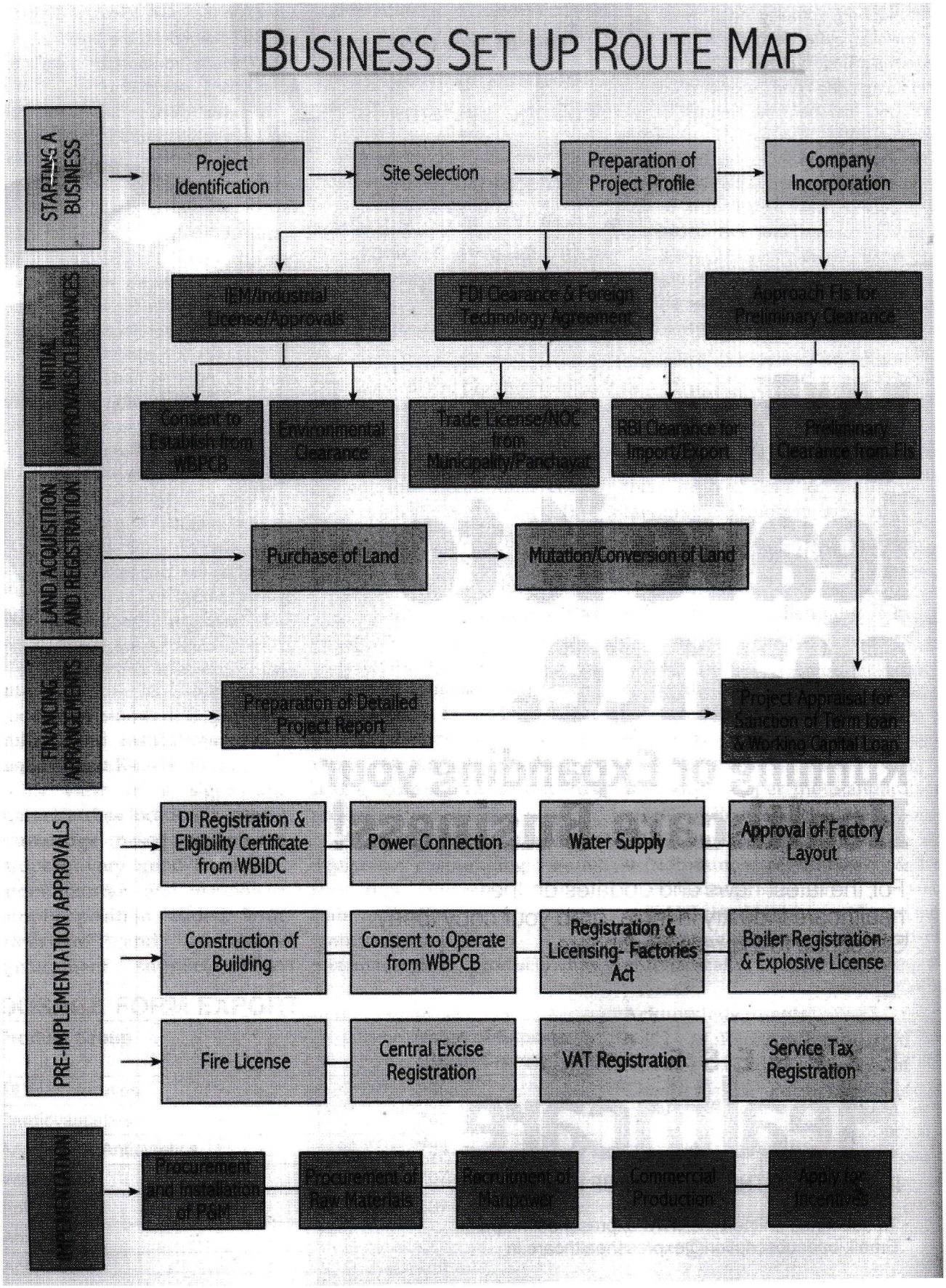
Another solution for mould changing without overhead or slinging cranes could be a simple mould-changing vehicle for horizontal mould changing. The use of a mould-changing vehicle is appropriate, if no overhead crane or slinging crane is available at the location where the injection moulding machine has to be installed. This system is based on an electric forklift, which is capable of precise manoeuvring and positioning mainly due to its electric steering. Its lifting unit also makes mould changing possible on machines of different sizes. At the same time, the moulds can be put into storage on vertically-arranged shelves. For this purpose, electronics provide for smooth and precise lifting and lowering movements. Both roller conveyors are equipped with guide strips, in order to laterally align and secure the mould on the roller conveyor during the transfer. The moulds are prevented from failing during transport by means of a front locking mechanism.

A swivel device allows the roller conveyors to be moved into the required position for the transfer, which facilities manoeuvring of the mould-changing vehicle. Thus, mould changing is also possible in the most confined of spaces and is, in addition, faster, safer and more efficient. Conversions to the injection moulding machines for improvement of access are also not necessary.

The roller conveyors are additionally equipped with a laser pointer for the purpose of horizontal positioning. When the correct transfer height is reached, this can be easily read off by means of suitable markings on the injection moulding machines or on the mould shelves.

Potential for process optimisation

Further measures aimed at reducing set-up times include the use of a pre-heating station for moulds and the provision of several cylinder modules. The advantage of the latter when changing colours to a completely transparent material is that it eliminates the cleaning process which might be very time-consuming. There still exists a lot of untapped potential for optimising the set-up process in many injection moulding shops. Besides, set-up time reductions of up to 50 per cent are not unusual, if careful planning and thought is applied to all aspects of the mould and machine. ■


BUSINESS SET UP ROUTE MAP
STARTING A BUSINESS
Project Identification
Site Selection
Preparation of Project Profile
Company Incorporation
INITIAL APPROVALS/CLEARANCES
IEM/Industrial License/Approvals
FDI Clearance & Foreign Technology Agreement
Approach FIs for Preliminary Clearance
Consent to Establish from WBPCB
Environmental Clearance
Trade License/NOC from Municipality/Panchayat
RBI Clearance for Import/Export
Preliminary Clearance from FIs
LAND ACQUISITION AND REGISTRATION
Purchase of Land
Mutation/Conversion of Land
FINANCING ARRANGEMENTS
Preparation of Detailed Project Report
Project Appraisal for Sanction of Term loan & Working Capital Loan
PRE-IMPLEMENTATION APPROVALS
DI Registration & Eligibility Certificate from WBIDC
Power Connection
Water Supply
Approval of Factory Layout
Construction of Building
Consent to Operate from WBPCB
Registration & Licensing- Factories Act
Boiler Registration & Explosive License
Fire License
Central Excise Registration
VAT Registration
Service Tax Registration
IMPLEMENTATION
Procurement and Installation of P&M
Procurement of Raw Materials
Recruitment of Manpower
Commercial Production
Apply for Incentives

SUMMARY OF STEPS FOR SETTING UP A BUSINESS UNIT IN WEST BENGAL

Phases	Functions	Activities
A	Starting a Business	◆ Project Identification ◆ Site Selection ◆ Preparation of Project Profile ◆ Company Incorporation
B	Initial Approvals / Clearances	◆ Filing IEM/Obtaining Industrial License/Approvals ◆ FDI Clearances/Foreign Technology Agreement ◆ Approach FIs for Preliminary Clearance ◆ Consent to Establish from State Pollution Control Board ◆ Environmental Clearance ◆ Trade License / NOC from Municipality / Panchayat ◆ RBI Clearance for Import /Export ◆ Preliminary Clearance from FIs
C	Land Acquisition & Registration	◆ Purchase of Land ◆ Mutation / Conversion of Land
D	Financing Arrangements	◆ Preparation of Detailed Project Report ◆ Project Appraisal for Sanction of Term Loan & Working Capital Loan
E	Pre-Implementation Approvals	◆ Registration with Director of Industries & Eligibility Certificate from WBIDC ◆ Power Connection ◆ Water Supply Connection ◆ Approval of Factory Layout ◆ Construction of Building ◆ Consent to Operate from State Pollution Control Board ◆ Registration & Licensing under Factories Act ◆ Boiler Registration & Explosive License ◆ Fire License ◆ Central Excise Registration ◆ VAT Registration ◆ Service Tax Registration
F	Implementation	◆ Procurement & Installation of P&M ◆ Procurement of Raw Materials ◆ Recruitment of Manpower ◆ Commercial Production ◆ Apply for Incentives

MONTHLY CIRCULAR OF THE FEDERATION

CIRCULAR NO. 27/2010 :

Sub: Membership of the Federation

The Federation has received the following applications for membership of the Federation :

1.	a) Name & Address of the Applicant Firm	:	**M/S B. R. PLASTICS** 57/1, Ram Lochan Shire Street Belurmath Howrah – 711 202.
	b) Class of membership	:	**Life Manufacturer member**
	c) Proposed by	:	M/s Agrico Industries
	d) Seconded by	:	M/s Stretch Plast
	e) Name of representative	:	Mr. Raj Kumar Mundhra
	f) Items of manufacture	:	Manufacturer of PVC Compound
2.	a) Name & Address of the Applicant Firm	:	**M/S. GOLCHHA POLYMERS & CHEMICALS** 54/1, Canning Street 4th Floor, Room No. 3 Kolkata – 700 001.
	b) Class of membership	:	**Life Dealer member**
	c) Proposed by	:	M/s Agrico Industries
	d) Seconded by	:	M/s Stretch Plast
	e) Name of Representatives	:	1. Mr. Nawratan Golchha 2. Mr. Manoj Golchha
	f) Items dealt in	:	Dealer of Plastic Raw Materials and Chemicals
3.	a) Name & Address of the Applicant Firm	:	**M/S ROOS TEMPKOOL LTD.** BA – 182, 1st Floor Sector – 1, Salt Lake City Kolkata – 700 064.
	b) Class of membership	:	**Manufacturer member**
	c) Proposed by	:	M/s Rajda Sales (Cal) Pvt. Ltd.
	d) Seconded by	:	M/s Stretch Plast
	e) Name of representative	:	Mr. S. Datta
	f) Items of manufacture	:	Manufacturer of Ancillaries (Chilling Plant, Cooling Tower, Scrap Grinder, Dryer etc.)
4.	a) Name & Address of the Applicant Firm	:	**M/S LICO DICE** 35B/1B, Raja Naba Krishna Street Kolkata – 700 005.
	b) Class of membership	:	**Manufacturer member**
	c) Proposed by	:	M/s The Polydaa
	d) Seconded by	:	M/s Stretch Plast
	e) Name of representative	:	Mr. Tapas Ghara
	f) Items of manufacture	:	Manufacturer of Dies (Plastic Mould)
5.	a) Name & Address of the Applicant Firm	:	**M/S UNIVERSAL PIPES PVT. LTD.** ASIOC Industrrial Area Bamuni Maidan Guwahati – 781 021 (Assam).
	b) Class of membership	:	**Manufacturer member**
	c) Proposed by	:	Convenor – Assam & NE Chapter
	d) Seconded by	:	M/s Express Tin Containers (P) Ltd.
	e) Name of representative	:	Mr. Ramesh Pasari
	f) Items of manufacture	:	Manufacturer of PVC Pipes & Fittings

(Circulated in terms of Article 15 of the Articles of Association of the Federation)

CIRCULAR NO. 28/2010 :

Sub: Consumer Price Index Number for Industrial Workers for Kolkata for the months of January to August 2010

Month	Consumer Price Index	
	Base (1982 = 100)	Base (1960 = 100)
January, 2010	855	4053
February, 2010	850	4029
March, 2010	850	4029
April, 2010	860	4076
May, 2010	870	4124
June, 2010	881	4176
July, 2010	896	4247
August, 2010	896	4247

CIRCULAR NO. 29/2010 :

भारत सरकार
GOVERNMENT OF INDIA
केंद्रीय उत्पाद शुल्क, कोलकाता – I आयुक्तालय,
CENTRAL EXCISE KOLKATA - I COMMISSIONERATE
केंद्रीय उत्पाद शुल्क भवन : 180 शांतिपल्ली,, राजडांगा मेन रोड : कोलकाता–700107.
CENTRAL EXCISE BUILDING : 180 SHANTIPALLY, RAJDANGA MAIN ROAD : KOLKATA-700107

Public Notice No. 03 /2010 Dated : 11.10.2010

Subject :- Right to Information Act,2005 –name and other details of First Appellate Authority in respect of Kolkata – I Central Excise Commissionerate.

Attention of the trade, field formation and public in general is invited to the Right to Information Act, 2005. In accordance with the provision of Section 5 of the said Act and Central Board of Excise & Customs, New Delhi's order communicated vide F. No. 296 /115/2007-CX. 9 dated 12-11-07 **Shri B Sarkar , Joint Commissioner of Central Excise, Kolkata-I Commissionerate is designated as First Appellate Authority in respect of Kolkata – I, Appeal-I, Appeal-II & Appeal -IV Commissionerate with immediate effect:**

Authority: - Sub section (1) &(2) of Section 5 of the Right to Information Act'05. This is in supersession of the earlier Public Notices.

(A. K. Das) 11/X/10
Commissioner

CIRCULAR NO. 30/2010 :

एमएसएमई - विकास संस्थान
(पूर्व में, लघु उद्योग सेवा संस्थान)
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भारत सरकार
111 व 112,बी.टी. रोड,कोलकाता-700108
दूरभाष 2577-0595/0597/0598 (पीबीएक्स)
टेलीफैक्स 033-2577-5531(निदेशक)
ई-मेल dcdi-kolkatta@dcmsme.gov.in
वेबसाइट : www.msmedikolkata.gov.in
देखें वि आ(एमएसएमई) : www.dcmsme.gov.in

MSME–DEVELOPMENT INSTITUTE
(Formerly- Small Industries Service Institute)
Ministry of Micro, Small and Medium Enterprises
GOVERNMENT OF INDIA
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Phone: 2577-0595/0597/0598 (BPABX)
Tele-Fax : 033-2577-5531(DIRECTOR)
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No. 8604(17)/NMCP/CORE/G&C/2010-11 Dated: 03.11.10
04

To
Indian Plastic Federation
10, Royed Street,
Kolkata – 700 016.

Sub : Various Activities under NMCP for MSMEs – reg.

Sir,

We are pleased to inform you that the Ministry of Micro, Small & Medium Enterprises has launched the National Manufacturing Competitiveness Programme (NMCP) to improve the competitiveness of the MSME sector. Under this scheme, some of the salient activities and financial implications thereof, are highlighted which could be reimbursed from this Institute :

1. Marketing Assistance and Technology Up gradation in MSMEs :

A. Encourage MSMEs to explore new markets through their participation in State/District level exhibitions being organized by State/District Authorities/Associations. MSME manufacturing units will be reimbursed once in a year for the following items:

i) Pavilion/stall/space charges upto 6.0 sq. mtr. – 50% cost will be reimbursed
ii) To and fro actual fare by shortest distance/direct train (limited to AC II tier class) from the nearest railway station/bus fare to the place of exhibition for one person – 50% of fare will be reimbursed
iii) For SC/ST/Women/Physically Handicapped entrepreneurs the assistance will be up to 80% for items (i) & (ii) above
iv) The total reimbursement will be max. Rs.30000/- per unit for the SC/ST/Women/Physically Handicapped entrepreneurs, while for the other units the max. limit will be Rs. 20,000/- per unit.

B. Corporate Governance Practices: MSMEs will be encouraged to Corporate Governance Practices in their units. The GOI assistance will be in the form of one time reimbursement up to 50% of the total expenditure subject to max. Rs. 45,000/- per MSME unit.

C. ISO 18000/ 22000/ 27000 : MSME units will be encouraged to adopt ISO 18000/22000/27000 certification in their units. The reimbursements will be up to 75% of the expenditure subject to a maximum of Rs. 1.00 lakh in each case.

2. Technology & Quality up gradation support to MSMEs :

One of the major activity is to encourage MSMEs to acquire product certifications licenses from National/International bodies. The primary objective of this activity is to provide subsidy to MSME units towards the expenditure incurred by them for obtaining product certification licenses from National standardization bodies (like BIS, BEE etc.) or international product certification (CE, UL, ANSI, etc.). MSME manufacturing units will be provided subsidy to the extend of 75% of the actual expenditure, towards licensing of product to National (max. Rs.1.5 Lakh /per MSME)/International (max. Rs.2.0 Lakh /per MSME) standards.

Hence, the desirous MSMEs are requested to avail the above opportunity by adopting various activities, promoted by Govt of India under NMCP. For further details, www.dcmsme.gov.in may be visited or undersigned may please be contacted.

Yours faithfully,

(P. K. Das)
Asstt. Director(G&C/NMCP)
For Director

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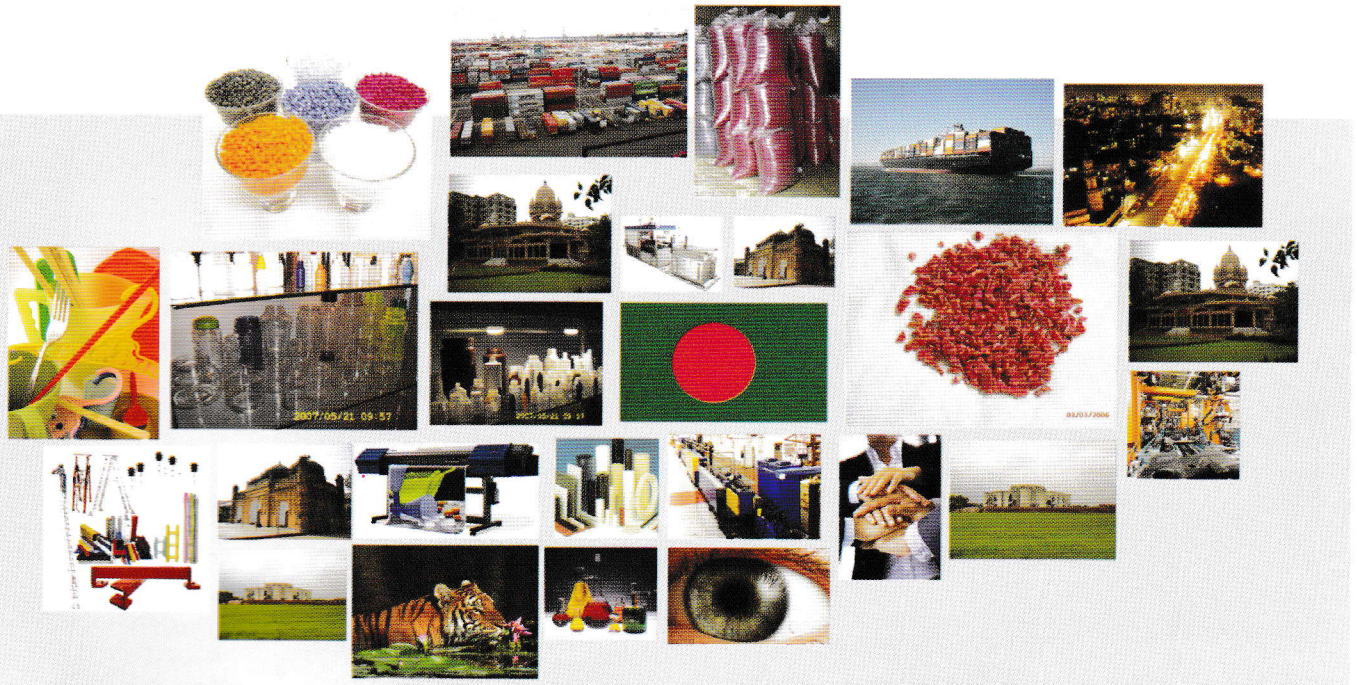

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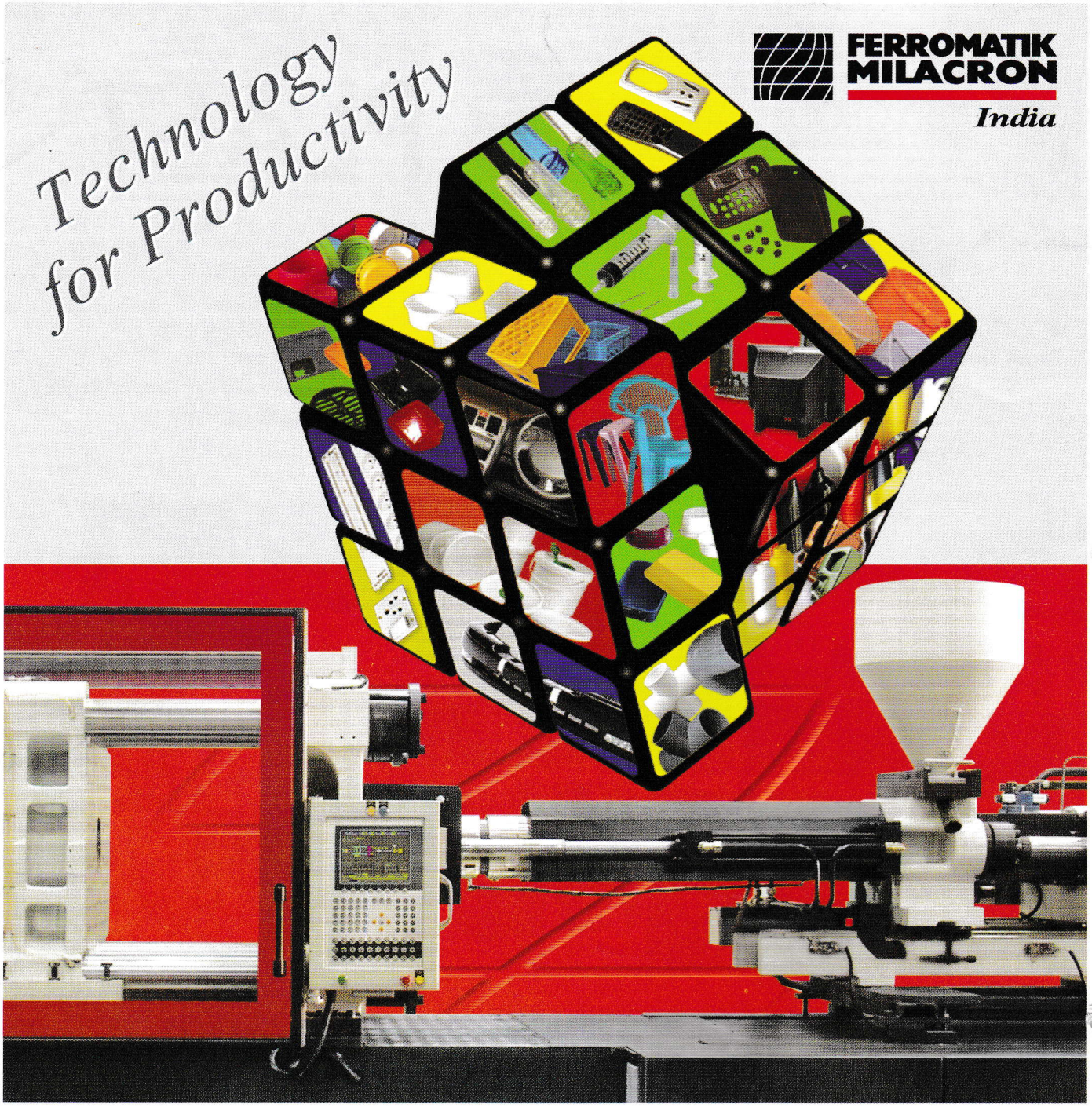
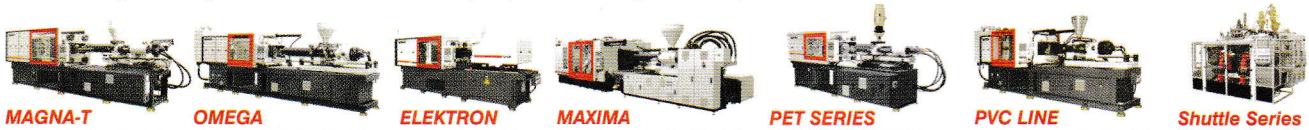


Ferromatik Milacron India *constantly strives to offer its customers Innovative solutions to keep them ahead in the race of competition. Product enhancement is a continuous process to help customer reduce Energy Consumption, increase Productivity leading to overall reduction in per piece Cost of Product.*



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OMEGA
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ELEKTRON
All Electric Machines 50 to 350 Ton

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