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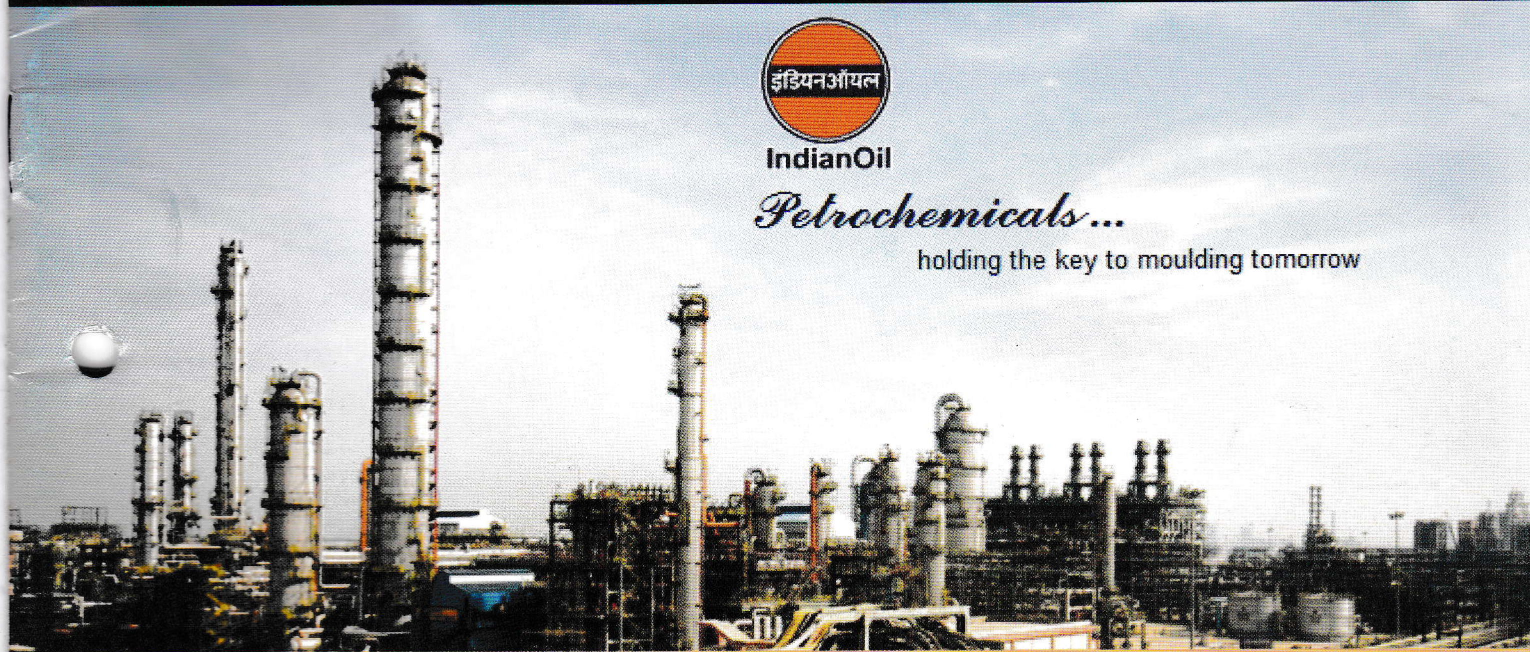

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Editorial

Dear Members,

Most of the basic materials from which we make the implements used in everyday life have been known from the earliest times. They include wood, stone, metals, glass, clay, ceramics, animal skins and vegetable fibres. But while some of these materials occur naturally, others, like metal and glass, are converted from raw materials by some form of chemical process.

Similarly, although plastics as we know them are essentially products of this century, plastics in their naturally occurring forms have also been used for thousands of years, ever since man first began to make bowls, utensils and bricks of clay, and waterproof his sailing vessels with asphalt.

The term "plastic", derived from the Greek word "plastikos" actually applies to any pliable substance that can be shaped or moulded, for example, wax, clay, asphalt and amber.

Most of the plastics we use today have been developed within the last 50 years or so. The majority of them are man-made and are usually described as synthetic products, or in other words, they are made by a process of building up from simple chemical substances.

Today's plastics are generally made by industrial chemists from various chemical compounds derived from lime, salt, water, petroleum or coal. Their special properties are light weight; high impact and tensile strengths; resistance to corrosion, salt water and most chemicals; suitability for use over a wide range of temperatures and for electrical insulation. Some plastics are not fully synthetic as they are produced simply by modifying natural materials. Examples are celluloid and cellulose acetate, both derived from cellulose (as in cotton wool) and plastics derived from casein, a complex protein which comes from cow's milk.

One of the very first experiments with synthetic plastics took place about 1835 when the French chemist, Regnault, caused a chemical called vinyl chloride to turn into white powder. This was the very earliest form of polyvinyl chloride, which we know as PVC, but it was not commercially developed for almost another century. There were many other plastics, the development of which was delayed for equally long periods. The main reason for this delay was that until well into the 20th century, it was impossible to obtain sufficient quantities of the necessary raw materials to make chemicals for the new products.

It was in 1862 that the first synthetic plastic material was introduced to the public. It was shown at the Great International Exhibition, London, by Alexander Parkes. The new product was then called "Parkesine" and had been made by mixing camphor (the chemical used in mothballs) with nitrocellulose (used in many modern lacquers for motor car bodies).

However the same discovery was made some years later by an American, John Hyatt who christened the new material "celluloid". His incentive was a prize from a billiard ball maker to find a substitute for ivory. What he discovered, celluloid, made lousy billiard balls, but great table tennis balls. He did not win the prize. Celluloid enabled the movie industry to boom, for it was the first material which could be imprinted with an image, and yet be flexible enough to feed through a movie projector. It had a serious drawback however, and that was its flammability, the reason many old theatres went up in flames. Along with other cellulose nitrates, celluloid was also used to make, denture plates, shirt collars and cuffs, and car windows.

Gradually, appreciation of the uses of the results of scientific research increased as did people's need for more goods, and of course more chemicals, steel and power to make them. Laboratories, regarded for so long as eccentric curiosities, were at last recognised as being useful to society. It was also realised that many new chemicals could be produced from what was merely waste residue from other industrial processes.

It was this change in people's attitudes towards science and manufacturing that really paved the way for the development of plastics on a commercial scale.

In 1909 came the next major advance with the introduction of phenol-formaldehyde, more commonly known as "Bakelite" after its discoverer, Dr. Leo Henrik Baekeland, a Belgian working in the United States.

The tempo of plastics development accelerated rapidly from this time onwards. Each decade saw the introduction of several new varieties of plastics:

1920-21, 1931-40, 1941-50, 1951-60

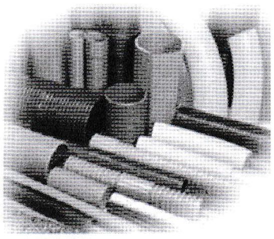
Since 1960 many new and more specialised plastics have been developed and the list continues to grow, until today there are many different "families" of plastics, each with numerous members.

urea-formaldehyde and the vinyls, eg polyvinyl chloride (PVC);

the acrylics, polyvinyl acetate (PVA), nylon, polystyrene, melamine formaldehyde; polyesters, polyethylené (polythene), silicones, epoxy, acrylonitrile butadiene, styrene (ABS); polyurethane, polypropylene.

The above collectivity is due to my visit to Haldia plant with IPF members. Where in the thoughts made me to ponder on how plastic is formed.

Pradip Nayyar
Editor



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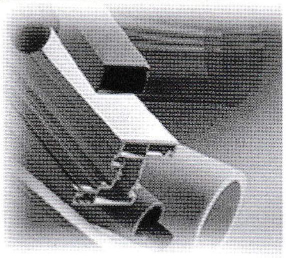

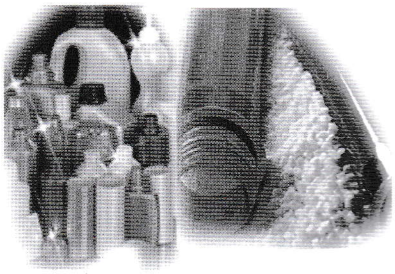

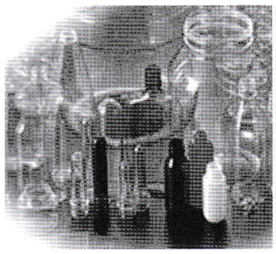

PRESIDENTIAL ADDRESS

Dear Members,

The Year 2010 has passed and I wish all members and their families a Very Happy and Prosperous New Year. May the coming year be one of Peace and Prosperity for all of you.

The New Year begins with hope for all of us when as usual we make promises to do better than what we had done in the past and then forget the same as months rolled by. I hope this time in The New Year 2011 that we have entered into will be a bit different for the Federation as we gear ourselves for holding our next International Exhibition on Plastics "INDPLAS'12" in October 2012. This is a promise we make with a hope that it will be kept.

In my last message to you I had shared my views on the problems of plastics waste disposal in particular as well as waste generated by plastics. In this issue I will deal with some of the recycling technologies that have evolved over the years to tackle this menace.

Post consumer plastics recycling technologies have evolved from traditional plastics processing and/or industrial scrap molding technologies. The challenge has been to modify these technologies to accept heterogeneous mixtures of plastic resins, normally incompatible with one another, and to tolerate contamination by various non-plastic materials. The recycling technologies available today can be divided into four broad categories:

- Separation that mechanically segregates distinct resins from a mixed plastic stream
- Mixed plastic that use the mixed plastic stream as is
- PET recycling for beverage bottles.
- Washing/upgrading for previously sorted plastics (e.g., HDPE dairy bottles)

Separation technologies : Separation technologies segregate high value (high volume) plastics from other plastics. The system first separates the mixed plastics from contaminants (paper, glass, metals, dirt, etc.). Once separated, the mixed plastics are chopped or granulated, followed by washing, separating by the sink/float process (difference in density) or hydrocycloning (centripetal acceleration separation by density), drying and pelletization. The pellets are cooled and dried, again producing an end product ready for shipment as feedstock to make new products. A typical mixed waste stream would have a polyolefin fraction of 60-80%, 15-30% heavier plastics (PVC, ABS, polystyrene, PET), and 5% aluminum, paper, and other inorganics. The recycling of PET, primarily from beverage bottles, has progressed faster than for the other plastics with most of the PET being recycled for fiber applications (such as carpets and textiles).

Superclean (Physical): Secondary Recycling : The recycle of PET bottles is normally done by sorting and washing the bottles, grinding into flakes, washing the flakes, removal of labels and caps, and drying the flakes. An optional step (which depends on the end use application) includes melting or extruding the flakes into PET pellets. The RPET produced this way is suitable for fibers and non-food contact bottle applications. If the flakes are intended for the manufacture of bottles utilized in food applications then the normal process would require an extra step in which volatile contaminants are removed while at the same time increasing the intrinsic viscosity of the flakes. In this case, the recycling process is referred as a "Superclean" process.

Feedstock (Chemical): Tertiary Recycling Involves chemical or thermal manipulation to process a stream of PET waste. The chemical structure of the PET break downs (known as depolymerization) and reverts back to the basic monomers or oligomers, which can then be purified and recombined to produce new PET resin.

The development (and further commercialization) of PET recycling process is highly dependent on the economics of such processes. Unfavorable economics, when compared to the production of virgin PET resins, as well as market conditions are often the determinant factors for the introduction of new PET recycling process. The issue of sufficient feedstock is also key to the success of any recycling venture. The recycler is concerned not only with the source of the material but must also consider the costs involved in bringing this material to the processing location. As the recycling business expands, the competition for feedstock intensifies. Several cases have been considered for the production of PET. These cases do not necessarily represent any one specific technology owner, but rather, represent "state-of-the-art" processes.

Mixed Plastics waste are being converted to make PlastikWOOD, saving trees and our Environment.

With warm regards once again,

Sourabh Khemani
President

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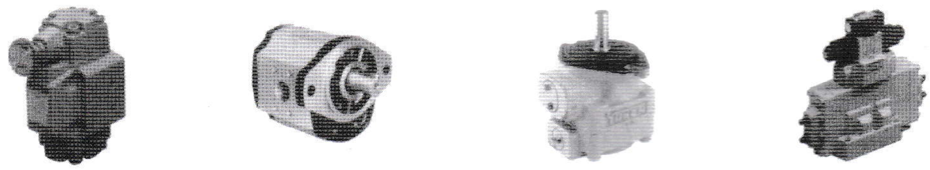

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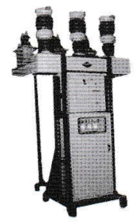

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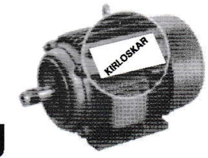

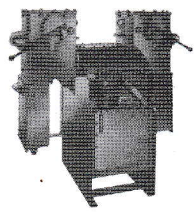

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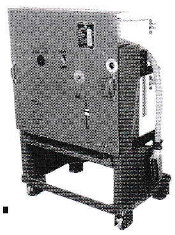

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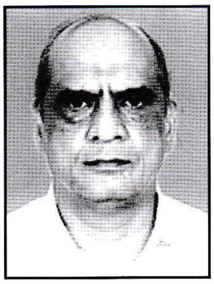


Dear Members

An eventful year 2010 has come to a close and a New Year 2011 has begun bringing with it new hopes and aspirations. On this occasion I on my personal behalf and on behalf of the Federation wish all members and their families a Very Happy and Prosperous New Year.

On 15th December 2010 IPF in association with IPI (Kolkata Chapter) organised a workshop on "Trouble Shooting in Plastic Processing" at Rotary Sadan. Over 100 persons participated in the workshop.

A visit to Haldia Petrochemicals Limited works at Haldia was organised for IPF members on 5th January 2011. On way to Haldia a visit to the Poly Park at Sankrail was also made and the IPF team was welcomed to the hospitality of M/s Pratap Synthetics Limited. After completion of the visit to Haldia works of HPL where lunch was organised by HPL, the team proceeded for CIPET Haldia Centre. Unfortunately due to a severe traffic jam the CIPET visit had to be called off and the team returned to Kolkata.

After a long wait your Federation has decided to hold an exhibition some time between 25th September 2012 and 14th October 2012. Shri Amar Seth has been nominated to be the Chairman of the 'Exhibition Organising Committee' of Indplas'12 in the last meeting of the Executive Committee held on 7th January 2011. An application has already been sent to The Director, Science City, requesting for booking of their exhibition ground. A provisional booking letter has been received from Science City.

With best wishes once again for a Happy and Prosperous New Year 2011.

Poddar

Ramawatar Poddar
Hony. Secretary

A major breakthrough in the arena of Non-conventional sources of energy!

Article By: Mrs.Laxmi
Research Scientist
Zadgaonakars' R&D Pvt. Ltd.

Waste Plastic Disposal: A Grave Problem

- **International status**

Waste plastic problem is an ever-increasing menace for global environment. Because of flexibility, durability and economy, a phenomenal rise is observed in the plastic consumer base. Throughout the world, research on waste plastic management is being carried out at war-footing. In developed countries, few waste plastic disposal / conversion methods have been implemented but are not efficient and economically feasible. Plastics being non biodegradable get accumulated in the environment. If this problem is not addressed properly, it will lead to mountains of waste plastic. Environment protection Agency U.K. projected that by the year 2007 the amount of waste plastic throw will be 65% more than that in year 2001. Practically it has excided the projection.

India has been a favored dumping ground for plastic wastes, mostly from industrialized countries like Canada, Denmark, Germany, UK, the Netherlands, Japan, France and the United States. According to the Government of India import data, more than 59,000 tons and 61,000 tons of plastic waste have found its way into India in the years 1999 and 2000 respectively. (Source: Statistics of Foreign Trade of India. March 2000 and March 2001. DGFT, Government of India).

More than 150 million tons of plastic is produced worldwide each year. Though plastics have opened the way for a plethora of new inventions and devices it has also ended up clogging the drains and becoming a health hazard.

India is the fourth highest Asian importer of plastic waste.

Country	No. of Shipments	Total (Metric Tons)
Hong Kong	586	1,71,37
Philippines	58	24,45
Indonesia	50	22,48
India	11	9,98
Malaysia	7	2,54
China	6	95
Taiwan	6	1,56
Thailand	6	1,23
Korea	6	1,09
Japan	5	51
Singapore	6	71
Total	**747**	**23,692**

- **Current status of technology in country**

Plastic waste contributes to the solid waste streams by about 8% - 15% by weight and twice that by Volume (GOI 1997). It was projected that annual post-consumer plastic waste will reach 3.6 million tons by the year 2006-2007. Practically it has excided the projection. At these alarming levels of waste generation, India needs to prepare a lot in recycling and disposing the waste. Several processes and means have been attempted to fight against the alarming levels of waste generation. However each process had its drawbacks and operational, economical & financial limitations for practical implementation.

A large proportion of sheeting materials and molded parts, etc is left out by rag pickers. The small bags /moldings are soiled and are difficult to identify. Also they have no value as recycle feed stocks. These un-utilized waste plastic remain uncollected and spread everywhere, littered in open drains or in garbage dumps, often resulting in choking of municipal sewers and storm water drains. This plastic Waste gradually goes on accumulating, thereby leading to:

- **Serious environmental problem**
- **Disposal problems**
- **Wastage and non utilization of high energy material**

In this direction, for the first time in the country, Prof. Mrs. Alka Umesh Zadgaonkar, Nagpur and her team have done significant work to dispose waste plastic material and thereby convert it into hydrocarbons.

Fuel / Energy Shortage

On the other hand, our country faces the critical problem of fuel and energy deficiency. The fast depletion of petroleum reserves in the world and frequent rise in prices of crude oil affect our economy adversely. India is not self sufficient in case of petroleum and crude oil. The national production capacity is capable of fulfilling not even 30% of the total fuel demand. The remaining whooping 70% is fulfilled by importing crude. Most of our precious foreign exchange is spent on importing crude.

Case Study:

Savings on Crude Oil

Crude Oil Consumption in India		115	MMTPA
Crude Imported	80%	92	MMTPA
Waste plastic generated in India (excluding almost equal amount of imported Waste dumped in India)	i.e.	10,000.00	MT/day
		3,650,000.00	MT/annum
Liquid Hydrocarbons obtained in the invented process	100% W/V	3,650,000.00	Kilo-liter/ annum
Quantity of crude that can be replaced by the output of the Zadgaonkars' Process (Assumption: Only the Waste Plastic generated in India is processed.)		10,950,000.00	Kilo-liter /annum
	i.e.	54,750,000.00	Barrels/annum
Average rate of crude oil		60 USD per Barrel	
Saving on Foreign Currency		3,285,000,000.00	USD
	i.e.	144,540,000,000.00	Indian Rupees

It is important to note that India generates just 2% of the Global waste.
Similarly India faces Power deficiency also.

Alternative Waste Disposal Methods

1. Land Filling

Waste Plastic materials are dumped for land-filling and they become "mummified" after decades. It is worth mentioning that the plastic is not a bio-degradable material hence this leads to the soil contamination and in long term serves as a cause of severe environmental hazard such as degradation of soil fertility, pollution of surface & subsoil water.

Besides the above drawbacks, the embodied energy present in the plastic is lost.

2. Incineration

It is possible to incinerate mixed plastics to recover energy. However it is not possible to do so in a controlled manner to reduce off-gas pollution i.e. dioxins & furans to desirable standards. Hence this method of plastic waste management is generally not preferred. The treatment cost of the gases is often more than the energy recovered.

3. Blast furnace

Waste plastic may be used in place of coke and pulverized coal after forming into particles of the required size and subsequently injected into the blast furnace. The injected plastic is broken down to form reducer gas (CO + H2), which rises through the raw material in the furnace and reacts with the iron ore. The injection of chlorine-contained plastics such as PVC in the blast furnace generates hydrogen chloride. The limestone used in the blast furnace to control the composition of the slag neutralizes the hydrogen chloride in the furnace and decrease its concentration. But substitution of coke with plastic is limited to approximately 40% wt only. (Ref: Shutov F. "Effective energy and gas emission saving using plastic waste recycling technologies", Expert group meeting, 2-3/ Dec /1999, Vienna international center, Vienna, Austria)

4. Gasification

Gasification is essentially thermal decomposition of organic matter under inert atmospheric conditions or in a limited supply of air. If the feed contains chlorinated compound like PVC then it is advisable to do gasification at lower temperature to remove chlorine then the temperature is raised to convert higher hydrocarbons. There are problems in controlling the combustion temperature and the quantity of unburned gases. (Reference US Patent Application No. 20030037714).

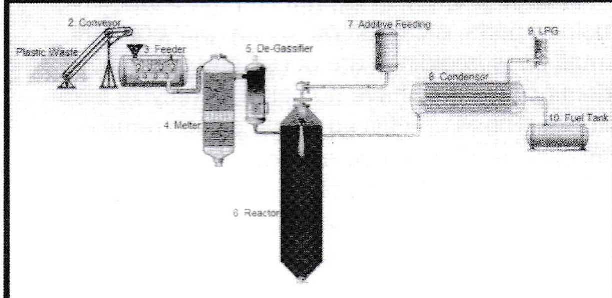
5. Recycling

Recycling is not the complete solution for disposal of the waste plastic. After third/fourth recycling the plastic is totally unfit for reuse and hence ultimately it ends up in Land filling. Some types of the plastics are not suitable for recycling. However, this method is only suitable for processing segregated plastic materials and is not suitable for assorted municipal waste plastic.

The problems associated with the recycling process are as follows:

- Many types of plastics are used hence it is difficult to segregate them for specific purpose.
- Plastics contain a wide range of fillers & additives.
- Many times plastic is associated with metal, Glass etc.
- Sorting of plastic is technically difficult as well as expensive.
- Recycling of plastic degrades the quality of the end product

The Invention: Zadgaonkars' Process



Zadgaonkars' Process

Conversion of Waste Plastic into Valueable Hydrocarbons

Introduction

• Principals involved

All plastics are polymers mostly containing carbon and hydrogen and few other elements like chlorine, nitrogen etc. polymers are made up of small molecules called as monomers which combine and form single large molecule called polymer.

When this long chain of monomers breaks at certain points or when lower molecular weight fractions are formed this is termed as degradation of polymer. This is reverse of polymerization. If such scission of bonds occurs randomly it is called as 'Random De-Polymerization'.

In the process of conversion of waste plastic into fuels random De-Polymerization is carried out in a specially designed Reactor in absence of oxygen & in the presence of and catalytic additive. The maximum reaction temperature is 350°C. There is Total conversion of waste plastic into value added fuel products.

Laboratory Scale/Bench Scale

Inventor Prof. Mrs. Alka Zadgaonkar started the basic research work for elimination of polymer waste in the year 1992. After eight years of rigorous research, in the year 1999. 300 gm of plastic waste was successfully converted into liquid hydrocarbons. The reaction parameters viz. temperature, pressure and time for a batch were extremely high in initial stages. Subsequently these parameters were brought down to feasible level by formulating improved catalytic additives.

Inventor was quite aware of the fact that many laboratory scale inventions miserably failed after scaling up. Considering this important fact, inventor decided to scale up the lab-scale unit by 100 times and thus 30 Kg bench scale apparatus was designed.

The Bench Scale Batch Process set-up :

The equipment was upgraded and designed with the controls, feed back and data generation devices for 30 kg of mixed waste plastic as batch feed, which could be conveniently operated in a laboratory setup. A number of experiments were carried out on this set up and the data generated was analyzed for further development. Assorted plastics and catalyst is heated to about 400 0C and distilled products are collected.

The Input Composition for Zadgaonkar's Process is as follows:

Type of Plastic	Percent Composition (by wt.)
PVC	3-5%
PET	5-8%
PP	15-20%
LDPE	20-25%
HDPE	15-20%
ABS, Nylon etc.	7-10%

Process Input Features:

Catalyst	0.01 to 0.03 wt% on feed
Temperature	300-400 0C
Pressure	Atmospheric
Batch cycle time	3-4 hrs

Output Yield Data

The major process parameters and product yields are given in Table below. The evolved vapors are condensed to collect gas and liquid products.

The product yields	Quantity (wt%)
Gas	10-20
Liquid hydrocarbons	60-80
Residue	7-10

Typical analysis of the gaseous product is given in the following table-

S.N.	Component	Quantity
1.	Methane	6.6 % wt
2.	Ethane+ethylene	10.6 "
3.	Propane	7.4 "
4.	Propylene	29.1 "
5.	Iso-butane	1.9 "
6.	n-Butane	0.9 "
7.	C4 (unsaturated)	25.6 "
8.	Iso C5-n-C5	0.1 "
9.	C5+higher	15.3 "
10.	Hydrogen	2.5 "
11.	CO/CO2	< 400 ppm

NB: The gas analysis was done after removal of chlorine as HCl

Typical analysis of the liquid product is given in the following table

Sr.No	Carbon number	Quantity (wt%)
1	Upto C10	61.0
2	C10 to C13	2.4
3	C13 to C16	8.5
4	C16 to C20	4.1
5	C20 to C23	7.6
6	C23 to C30	16.4

Certified Observations and Conclusions from Indian Oil Corporation (R&D Centre)

Following are the major observations and conclusions from the experiments by INDIAN OIL CORPORATION LIMITIED (RESEARCH & DEVELOPMENT CENTRE)-

- All the types of plastic waste including PVC & PET are converted into gases & liquid hydrocarbons.
- The catalyst enhances the conversion of waste plastic in to hydrocarbons thereby improving quality & quantity of hydrocarbon gas and liquid products. Negligible Conversion was observed in absence of invented catalytic additives
- Increase in the temperature and rate of heating increases the gas yield.
- Introduction of feed at higher temperature substantially reduces the process cycle time.
- Water from wet gas meter indicates presence of HCl in the gaseous fraction.
- Inorganic Chlorine is present in the gas and liquid products.
- PET bottles as a feed material – Analytical results of experiments using 100% PET bottles show that yield of liquid hydrocarbon is 60 wt%.

There was no formation of carboxylic group. This confirms that it is possible to convert the PET material in to liquid hydrocarbon under the catalytic conditions of the developed process.

- PVC as a feed material – Effect of catalytic conversion of pure PVC have been studied and the data shows the liquid yield of about 40 wt%. Further experiments were conducted for removal of chlorine from these products. Here de-chlorination step was incorporated prior to reaction step. It was observed that about 55% weight reduction after removal of Chlorine from the PVC.

Commercial Scale 5 MT Per Day Capacity Plant

Introduction

The lab-scale and the bench-scale units were of Batch Process type. Hence after successfully scaling up the technology, inventor decided to harness the advantages of a continuous process. The 5 MT commercial plant is successfully setup at:

K-13, Butibori MIDC Industrial Area, Wardha Road, Nagpur.

Implementation Map

The following table shows the roadmap of the targeted Schedule for construction and implementation of 5 MT per day capacity plant.

Project Implementation Schedule														
		Number of Months												
S.N.		Description	01	02	03	04	05	06	07	08	09	10	11	12
i.		Detail Engineering												
	a	Process	***************											
	b	Mechanical Engineering		*********************************										
	c	Piping				************************								
	d	Electrical				************************								
	e	Instrumentation					***********************							
	f	Civil & Architectural		***************************************										
ii.		Procurement		***										
iii.		Site Preparation & Construction			***									
iv.		Installation/ Erection								*******************				
v.		Trial Runs / Commissioning									*********************			

It is important to note that all the 5 steps indicated in the above chart have been completed by the 09th month i.e. 3 months in advance

The Process

The subject system is designed indigenously using modular concept for providing flexibility in operations and production. The process is flexible enough to design the end products on-line without changing the feed design. The process is designed for the Waste Plastic sourced from the Municipal Waste stream with a factor of variation at 5.0 % to 10.0 % for normal feed. The process is also suitable for a dedicated feed if required. The process modules, which house the equipment, components, process sensors piping & valves, are designed as follows –

SN	PARTICULARS	DESCRIPTION	VOLUME (IXbXh mt)
01	Feed	Sizing and Feeding	5.0 X 7.5 X 6.0
02	Melting	Removing metallic solids etc.	4.5 X 4.5 X 2.5
03	Reactor	Reacting additives and catalysts	4.5 X 4.5 X 2.5
04	Hydrogenation	Stabilizing the hydrocarbons	4.5 X 4.5 X 2.5
05	Final Product (liq. Hydrocarbon)	Collecting mixed hydrocarbons	5.0 X 7.5 X 6.0

The placement of sections is kept sequential for the convenience of plant operation, process flow and plant layout practices.

Plant Assembly

• Feed System

Feed system consists of sizing equipments for sizing hard, thick flexible and thin flexible materials, which normally constitutes the municipal waste stream. The system essentially consist sorters and sizing equipment like of Crusher, Cutter and Shredder. The various sizes and shapes of the material are sorted into categories suitable for Crushing, Cutting and Shredding. The sorted material is crushed or cut or shredded and graded in to uniform size for ease of handling and melting in the melting/preheating. This process of sizing and grading the waste is semi automatic. The graded feed is stored in a hopper before feeding to the process by a conveyor feeder. The sorted feedstock of known composition is stored separately for proportionate feeding for processing nonstandard feed design or processing special feed designs.

The dust and other fine waste collected from the cyclone filter are disposed through a vent with particle size monitoring system.

Section Specifications: Feeder

Materials of construction	M.S. & SS-316
Waste Plastic Sizing rate	250 kg/hr (consolidated)
Waste material feed rate	200 kg/hr
Pressure	0.0 kg/cm2
Temperature	10-45 OC

• Pre-melting / Feeder

The graded and air washed particles of Waste Plastic are then introduced into a Melting Vessel through a feeder. The feeder consists of a collecting hopper, driving motor, extruder barrel, screw conveyor, electric heater and control panel. The granular crushed/cut/shredded waste plastic melts and injected in the melting vessel.

• Melter

In melter vessel, the feed is heated to 2750C - 4100C. The extraneous impurities such as hard metal, clay, sand, glass etc. settles in the bottom of the melter, which will be removed on periodic basis. In future the heating required for the melting of waste plastic shall be provide by the gaseous fuel generated from the plant.

Section Specifications: Melter and De-chlorinator

Materials of construction	**SS-316 lined with Duran/Pyrex glass**
Feed rate	200 kg/hr
Vessel Pressure	0.0 –1.0 kg/cm2
Temperature vessel	275 °C
Pre-Melter Extruder	100 kg/cm2
Process Products	
Gaseous HCl, and other gasses (Hydrocarbons)	20 – 30 kg/hr
Molten Plastic Sludge	150-190 kg/hr
Metals and other extraneous impurities	3.0-5.0 kg/hr
Energy (Electrical Form)	4.0 kW
LPG	20.0-25.0 kg/hr
By product gas	10.0-15.0 kg/hr
Melting Vessel Size	2.0m X 0.6m dia
Material holding time	30 min

• De-chlorinator

The molten plastic sample will be drawn from the overflow end of melter vessel to De-chlorinator. Here the waste plastic is heated with catalytic additive which helps in removal of chlorine. The gaseous products from the molten plastic shall be subjected to separation of HCl gas. HCl gas is separated by absorption in a water column. The hydrocarbons free from HCl shall be used for heating purpose. The samples for analytical testing shall be drawn from the water column for checking the presence of HCl in the gases. The sample of molten plastic is taken out for analytical testing of chlorine content of the plastic, accordingly the quantity of scavenger is added to the reactor vessel, before subjecting to Depolymerisation

- **Reactor Section**

The reactor section of the plant consists of the reactor, which together with other equipment constitutes a continuous conversion of waste plastic in to hydrocarbons. The molten waste plastic free of chlorine, nitrogen and other organic impurities is fed in to the reactor and allowed to flow over a heated surface at 300 - 350 OC in the presence of the coal and patented additives. A small amount of Calcium Hydroxide is also added in this reactor if the molten plastic contains chlorine compounds.

The breaking of chemical bonds under the influence of heat is the result of overcoming bond dissociation energies. Organic substances such as polymers are highly heat sensitive due to the limited strength of the covalent bonds that make up their structures. Scission can occur either randomly or by a chain-end process, often referred to as an unzipping reaction. The reaction breaks complex hydrocarbons into simpler molecules in order to increase the quality and quantity of lighter, more desirable products and decrease the amount of residuals. All the reaction equipment and interconnecting transfer lines are heated. The heat is supplied in a number of individually controlled heating zones.

Section Specifications: Reactor Section

Materials of construction	SS-316/310	
Waste material feed rate	150-190 kg/hr	
Temperature	300-350 °C	
Reactor vessel	0.0 to 1.0 kg/cm2	
Pressure		
Pre-Reactor extruder	50-100 kg/cm2	
Process Products		
Gaseous Hydrocarbons	148-185 kg/hr	
Coke	12-16 kg/hr	
Calcium Chloride	5.0-7.0 kg/hr	
Others	4-5 kg/hr	
Energy Electrical	50-60 kW	
Melting Vessel Size	2.0m X 0.6m dia	
Material holding time	30 min	

- **Hydrogenation**

The gaseous unsaturated hydrocarbons are treated with the hydrogen under pressure at 20-25 kg/cm2 and 200-300 0C temperature in a small reactor.

- **Sectional Specifications: Hydrogenation**

Materials of construction	SS-316/310
Waste material feed rate	148-185 kg/hr
Vessel Pressure	20-25 kg/cm2
Temperature	200-300 ^{o}C
Process Products	
Gaseous Hydrocarbons	198-340 kg/hr
Energy LPG	20.0-25.0 kg/hr
Byproduct gas	10.0-15.0 kg/hr
Melting Vessel Size	160cm X 20cm dia
LHSV	5/hr

- **Final Product (Liquid Hydrocarbon Storage)**

The condensed fractions are collected here and the uncondensed gases are colleted and stored separately which can be used for heating requirements of the vessels.

Sectional Specifications: Liquid Hydrocarbon Storage

Materials of construction	SS-316
Feed rate	110-185 kg/hr
Pressure	0.0 kg/cm2
Temperature	30 ^{o}C

Contd. to Page - 21

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GLIMPSES

A visit to Haldia by IPF delegation

On 5th January 2010 an IPF delegation consisting of around 44 members visited the Poly Park at Sankrail. Shri K. K. Seksaria, Immediate Past President of IPF, received the delegates at the Poly Park and took members around the Poly Park complex. He showed members the plot where the Centre of Excellence (Training & Testing Centre) of IPF is proposed to be located. Shri J. C. Agarwal, Past President of IPF, and members of his organisation took the delegates to their unit at Poly Park. The delegates saw the production of woven sacks in his unit. A very good breakfast was hosted by M/s Pratap Synthetics Limited. After breakfast the delegates proceed towards Haldia Petrochemicals Limited works. Members were received by the Management team of HPL. A CD on HPL was shown to the delegates. After lunch that was hosted by Haldia Petrochemicals Ltd. members were taken around their works. The Management team of the works explained to members the operation of various units in the complex. Though the visit was for a very short time, it was very informative. Members felt proud on the success of HPL. IPF has sent a Thank you letter to HPL of the excellent arrangements and warm hospitality extended to the delegation. After HPL visit the delegates proceeded towards CIPET Haldia Centre. Unfortunately, the delegates were got stuck up in a traffic jam. The jam was so severe that the CIPET visit had to be called off. Due to the traffic jam in Haldia, the delegates arrived in Kolkata around 3 hours behind schedule. however they were very satisfied with the visit.

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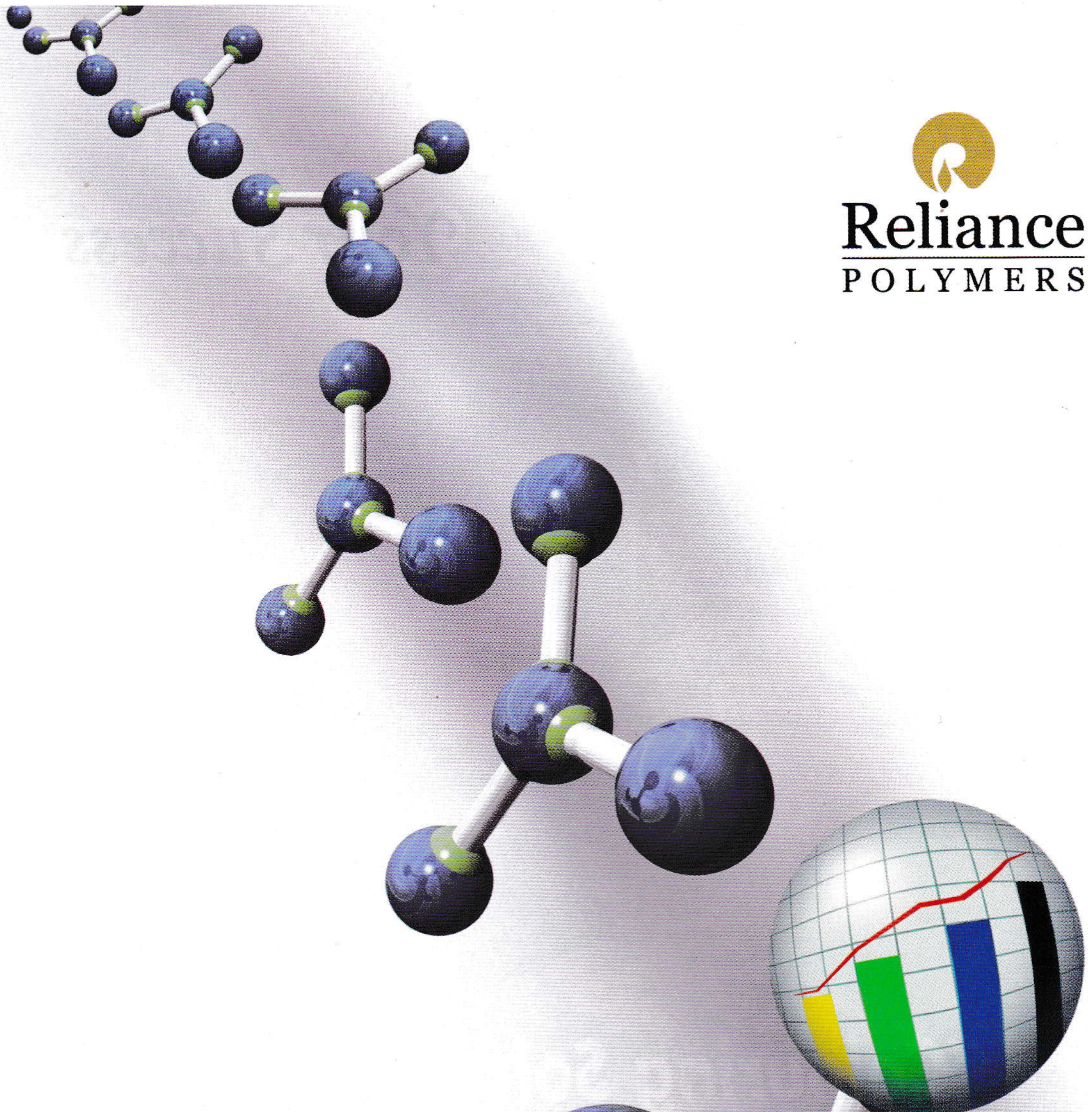

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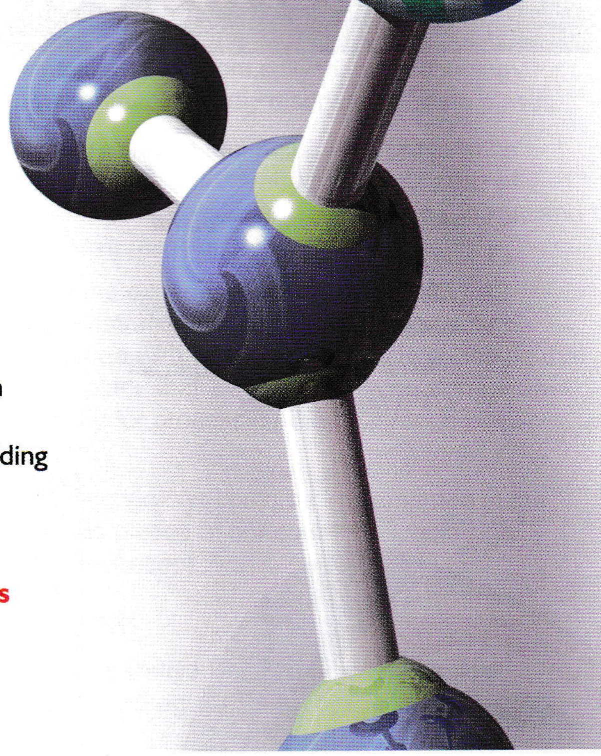

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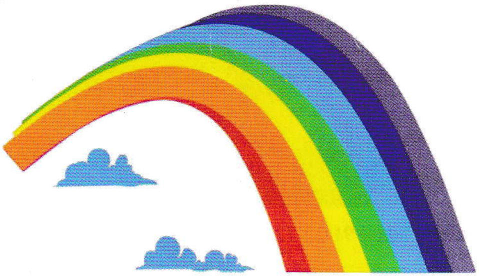

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Planned Control System

a) The COMPUTER CONTROL UNIT supervises the functioning of Smooth Operation of Plant

b) Safety Management

c) Co-ordination and Control

d) Intelligent monitoring and Energy Saving

The control system consists of a control station interface electronics, supervisory control and data acquisition software. 1 kVA, on line, Un-interrupted Power Supply (UPS), with 30 minutes backup. The control station shall be IBM compatible PCAT , P-IV, 40 GB hard disk, VGA colour monitor. The control station is loaded with DOS based Supervisory control and Data Acquisition (SCADA) software. The parameters, which are to be monitored/ controlled through computer, will be displayed on CRT and values of set point, auto/manual selection, direct/reverse action selection, engineering units can also e changed through the computer. The interface electronics consists of programmable logic controller (Allen Bradley) or Equivalent). The signal from the field will be accepted by interface electronics.

The input/output cards of the programmable logic controller carry out signal conditioning of the field signals and pass on the data to the CPU of the programmable logic controller. The PID algorithm, interlock logic sequencing etc is carried out by the PLC. The supervisory PC is loaded with DOS – based SCADA software which reads the data from PLC and displays it.

The SCADA software enables the operator to monitor and control the process enable/disable alarm action, change the loop set-points and effect the auto-manual and direct-reverse actions. All the parameters for the unit are provided with real-time trends. For Historical time trending, minimum/ maximum/average points values can be logged. There is practically no limitation on the number of tags that can be trended.

However, maximum history days are limited by the PC disk capacity. A versatile alarm management system is available through which multi-level alarms can be generated. As many as 300 alarm points can be made available as history. In addition to the above, the following advanced features are also provided through the software-

a) free format script driver reporting support

b) event/conditional reporting

c) alarm logging

d) operational diagnostics

e) access levels definition

f) calculations based on any of the I/O points

g) fault reporting which is on great help for the preventive Maintenance activity.

Salient Features

a) The product output product does not change either qualitatively or quantitatively irrespective of any input changes or proportions.

b) Batch Process has been successfully converted into Continuous Process.

c) Effects of feed variation collected from municipal waste have been studied and offers a complete solution for Waste Plastic disposal.

d) Improvement in product quality from variety of feed generated from municipal plastic waste has been achieved.

e) Optimisation of process parameters have been identified.

f) Generation of reliable design data for 500 MT Waste Plastic per day capacity plant using municipal plastic waste is ready.

Benefits to the Nation

- This Invention shall lead to the development of simple and economically viable technology for environment friendly disposal of waste plastic.
- The developed technology will prove to be beneficial to the country for the purpose of catering increasing demand of fuel / energy and will save millions of foreign exchange.
- With the experience gained from the demonstration plant, full-scale unit could be designed with confidence and it is expected that such plant shall be self-sustaining without any penalty for processing the hazardous plastic waste.
- This technology could be implemented in the various places of our country especially in PURA concept.

Test Reports

a. Comparative Data of various chemical properties of Regular Petrol and Fuels extracted from plastic

	Regular Gasoline	Fuel Extracted from Plastic Waste
Colour, Visual	Orange	Pale Yellow
Specific Gravity at 28°C	0.7423	0.7254
Specific Gravity at 15°C	0.7528	0.7365
Gross Calorific Value	11210	11262
Net Calorific Value	10460	10498
API gravity	56.46	60.65
Sulphur Content (present by mass max)	0.1	<0.002
Flash Point (Abel) °C	23.0	22.0
Pour Point °C	< -20°C	< -20°C
Cloud Point	< -20°C	< -20°C
Existent Gum, (gm/m3 max.)	40	36
Reactivity with SS	Nil	Nil
Reactivity with MS	Nil	Nil
Reactivity with CI	Nil	Nil
Reactivity with Al	Nil	Nil
Reactivity with Cu	Nil	Nil

Driving Test on Bajaj Pulsar (150cc)		
	Regular Gasoline	Fuel Extracted from Plastic Waste
Mileage	52.4	63.0
Time for 0-60 Km/Hr	22.5 Sec	18.1 Sec.
CO % at 400 RMP/ HC	2.8	2.3
(Permissible range up to 4.5)		

Note: Above mentioned tests were carried out by State Bank of India's Technical team

Note: In spite of the above mentioned facts, the fuel extracted from plastic waste will be utilized strictly as Non-Motorized fuel to start with.

IOC (R&D) Certified End Uses & Applications

The products obtained by this process have been tested at IOC (R&D)and end uses, are as follows:

End uses for liquid hydrocarbon:

a) D.G Sets for Generation of Electricity

b) Fuel for Agricultural pumps

c) Fuel for Boiler

d) Marine Fuel (Bunker fuel)

e) As input feed for Petroleum Refineries

f) Fuel oil etc.

End uses for Gas:

a) Any near by industries using LPG

b) For in-house consumption

For solid fuel:

a) Thermal power plants

b) Metallurgical Industries.

Polymer Scenario

India's largest polymer producer Reliance Industries has breathed new life into its plans, first announced in 2007, to build a cracker and down stream facilities in Jamnagar, in the south western Indian province of Gujarat. Plans for the Petrochemical complex, which is located in a special economic zone, were put on ice in the wake of the global financial downturn. The new complex will complement the site's second refinery, commissioned in 2009. Altogether, RIL is to invest some EUR 7.2 bn, roughly half of which (about EUR 2.9 bn) is earmarked for the cracker. Most of the investment costs will be carried by the company itself, RIL head Mukesh Ambani told India's "Mint" newspaper. The new cracker will be able to produce about 1.5m t/y of ethylene and propylene. Originally scheduled to start up by 2011 at the latest, the cracker could now be operational by 2014. The new complex also includes LDPE, PP, MEG and paraxylene lines (1.4m t/y). RIL's EBITDA currently stands at USD 7.4 bn, with sales of USD 44.6 bn. Petrochemical activities account for 28% of overall revenues, but make up almost 43% of Ebit. Reliance considers itself to be the world's fourth largest PP manufacturer, with capacity of 2.5m t/y (2008: 1.9m t/y), after Lyondell Basell, Sinopec and Total.

In Asia, LDPE film continues to trade at a premium when compared with other PE products such as LLDPE film and HDPE film. Most sources attribute the ongoing relative strength of the LDPE film market to comparatively tight supplies for this product, with players commenting that a large amount of new LLDPE and HDPE film capacity has been coming on-line for the past two years while relatively few additional LDPE film capacities have come on-line over the same period. According to data from ChemOrbis Price Wizard, import LDPE film has traded at an average premium of $201/ton over HDPE film on a CFR China, cash basis over the past ten weeks, with the premium showing a tendency to move higher over the past few weeks. From a ten-week low of $157/ton in early August, the LDPE/HDPE film premium rose to a ten-week high of $232/ton earlier in September before falling back to $228/ton last week. Looking at data for the entire year of 2010, the LDPE film/HDPE film premium in China has fluctuated between $150/ton to just over $250/ton for the entire period, with LDPE/HDPE film deltas of $100/ton or less having last been seen in the closing weeks of 2009. Over the same period, data from ChemOrbis Price Wizard show that the premium between LDPE film and LLDPE film has averaged $153/ton on a CFR China, cash basis, with the premium dipping to a ten-week low of $111/ton in early August, rising to a ten-week high of $177/ton earlier in September and then falling back to $173/ton last week. Looking back over data from the whole of 2010, LDPE film has maintained a premium of around $75-180/ton over LLDPE film, with premiums below the $75/ton mark last being observed in the closing weeks of 2009.

Russia sees investment in the petrochemicals industry rise up to US$3 billion a year as the industry recovers from the economic crisis, as reported in Reuters. Currently, Russia is the world's top oil producer with a 13% share of the global oil output, but it accounts for only 2% of petrochemical production. The country is looking to raise its share through a combination of protectionist measures and state funding. Energy Minister has said the government wants the petrochemical industry to become the fifth-largest sector in Russia in terms of its contribution to the gross domestic product. He promised more state guarantees on loans for petro-chemical companies. The country's largest bank, state-controlled Sberbank has issued a 26 bln rouble (US$841.4 mln) loan to petrochemical company Kazanorgsintez. Earlier this year, state development bank VEB has decided to provide US$1.4 bln long-term credit to a unit of petrochemicals company Sibur for construction of a polypropylene plant with an annual capacity of 500,000 tons in the Siberian city of Tobolsk.

Trading of petrochemicals in China may slow down from next week until the middle of October, as most market players will take a long holiday break, analysts and industry sources said on Tuesday. China would observe its annual Mid-Autumn Festival on 22-24 September and celebrate its week-long National Day holiday on 1-7 October. "Most traders and producers will go home for holiday celebrations and retreat from the markets from next week. The markets will become quiet," said Du Zhiqiang, a Shanghai-based analyst from Ping An Securities. Petrochemical plants that would continue to run for the duration of the holidays would have to secure feedstocks this week, he said. "Traders will buy some cargoes if prices are low and sell cargoes if prices are high at the moment," Du said. Buying sentiment this week got a boost from firming crude values and positive economic data out of China, said a trader. But actual trades would turn sluggish late next week, with normal activities only expected to resume in the middle of next month, when most market players return from the long holidays, industry sources said.

"More purchasing activities will happen after [the] holidays, so prices will likely start rising [then]," the trader said. The recent strong appreciation of the yuan should be beneficial in helping China secure imported petrochemical at a cheaper price, analysts said. The country is the biggest importer of petrochemicals in Asia. "Given that China imported more upstream products, such as crude, gas and fuels and chemical feedstock like polyethylene and polyproplyene, so China will spend less in buying them in the future. It's a good thing," said Lu Zhen, an analyst from Shanghai-based fund manager Galaxy Asset Management Co. But the country's exports may take a hit if the yuan continued to strengthen, which maybe the case in the months ahead, analysts said. On Tuesday, the Chinese yuan strengthened to 6.7378 against the dollar – its highest level achieved since the peg against US currency was suspended in July 2005 "It indeed will hurt exports," said Lu of Galaxy Asset Management.

State-owned Indian Oil Corp (IOC) is eager to set up a multi-billion dollar petrochemical plant in Oman. IOC seeks a commitment from Oman on supply of rich-gas (natural gas containing C2/C3 - ethane, propane, compounds). GAIL and Petronet LNG-India's largest importer of liquefied natural gas, have expressed interest in buying LNG from Oman on long-term contract. Oil and Natural Gas Corp (ONGC) and IOC are keen to join oil and gas exploration and production business in the Gulf nation. At the 6th Indo-Oman Joint Commission Meeting leaders of the countries expressed satisfaction at their growing ties in the hydrocarbon sector. The possibility of enhancing equity of Oman Oil company in the Bina-Oman Refineries Ltd. from the current 2% to 26% has been discussed.

Thailand's largest olefins maker-PTT Chemical Pcl, expects to operate its new 1 mln ton ethane cracker at 100% in 2010, from the current 50%. This is subject to the start up of the company's sixth gas separation plant of PTT, which is the main feedstock supply to the cracker, in Q4-2010 as per Reuters. Chances of a fourth quarter start up seem bright after a ruling allowed lifted suspension of the gas separation plant, after work on it was suspended a year ago by a court ruling in an environmental dispute at Map Ta Phut.

According to the data released by the Turkish Statistical Institute (TUIK), Turkey's plastics imports over July 2010 rose when compared to the same period of 2009. Total plastics imports for July 2010 reached 294,000 tons, moving up from 287,000 tons in July 2009. Despite the continuous increases in import prices over the last few months, as well as the volatile exchange rates, the country imported more plastics raw materials in July compared to the same month of 2009, although the figure was less than was imported in June 2010, which was a record month for this year, with 324,000 tons of imports. The news about Turkey's polymer imports in July 2010 is also fitting with the data released by the same institute, which showed Turkey's industrial production in July 2010 rose 8.6% compared to July 2009, while it was down 0.3% from the previous month. Within the figures, manufacturing production was up 9.1% annually.

SOCAR's Turkish petrochemical complex Petkim exported goods worth $234 million in the first half of 2010 compared to $347 million over 2009, the petrochemical complex told Trend. Petkim said that sales increased by 64 percent over the same period last year and amounted to $921 million. Production capacity of the enterprise in January-June were used by 95.4 percent, compared to 88 percent over the same period last year, the complex said. SOCAR participates in two major projects in Turkey. In particular, the company is co-owner of a large petrochemical complex Petkim. SOCAR also participates in the construction of a new refinery to provide the complex with raw.

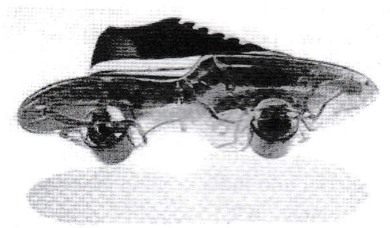
SOCAR and Turcas Petrol / Injaz Projects won a tender to sell 51 percent stake in chemical concern Petkim, offering $2.04 billion or it in 2008. Turkey imports 70-75 percent of the necessary chemical products. SOCAR / Turcas / Injaz's investments to the development of Petkim will reduce imports by 30 percent. Petkim Petrokimya Holding manufactures plastic packaging, fabric, PVC, detergents. It is the only Turkish producer of such products.

Finally, shutdowns at 3 of the 4 petrochemical plants in India are likely to keep the prices stable in Indian domestic market despite lower price level in the International market. GAIL, IOC and Haldia will have varied shutdown periods and this is likely to affect polyethylene supply. Polypropylene is still largely dependent on Reliance Industries Ltd and the anti dumping situation prevents inflow of material into India keeping prices high but stable. IOCL capacity is slowly ramping up though not at the anticipated pace and so far only about 6 to 7 grades of PP and PE prime grades have been offered.

With inputs from Team Polymer Business

NEWS AROUND THE WORLD

Heelys' Nano footboard merges shoe, skateboard



"Grinding" is getting a whole new definition for the plastics industry.

With its new Nano Inline Footboard, Heelys Inc. has unleashed a new piece of sports equipment. The injection molded hybrid of a skateboard, inline skate and scooter is made for all kinds of punishment — especially tricks in which the board slides across the edge of concrete steps or metal rails in a move called grinding.

"At the bottom of the board, there's an arch in the center for the grind plate," said Ryan Wills, innovation director for Dallas-based Heelys.

The Nano, which hit the market in August, opens a new product category for Heelys, which previously was known for shoes that integrated a polyurethane wheel at the base of the heel, allowing users to glide along smooth surfaces.

Wills said Heelys has been looking at ways to expand the company's product offering beyond its shoes. One issue Heelys users faced is that, with only one wheel, it was difficult to use the shoes over long distances and at high speeds. At the same time, though, Heelys wanted to maintain the "stealth aspect" of the shoe that becomes a skate.

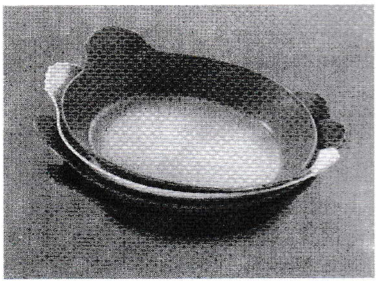
A full-sized skateboard is hard to pack or fit in a locker. With the Nano footboard, the company created a single small board just a bit larger than a user's shoe, with two in-line wheels. A Nano user just removes the wheel from one shoe, and clips onto the board using the same mechanism that held the wheel in place. An additional strap across the front of the foot keeps the board firmly attached for more extreme tricks.

Using it in combination with Heelys' shoe, riders can use their free foot to push off, brake and transition up or down steps, or they can just glide along on the heel.

Ticona develops thermoformable Vectra LCP

Ticona Engineering Polymers has added a new member to its series of flame-resistant liquid crystal polymers. The company said the material is the first LCP tailored for thermoforming.

"With high melt viscosity and melt strength, this new LCP is ideally suited for extrusion and thermoforming processes," said Edward Hallahan, marketing manager, high-performance polymers.



Vectra Trex 541 provides the following performance attributes, according to Ticona:

* High heat deflection temperature of 245°C;

* 20 percent improvement in impact performance versus standard 40 percent mineral-filled LCP;

* Higher melt viscosity – up to three times greater than standard 40 percent mineral-filled LCP.

Ticona developed Vectra Trex 541 for use by customers who extrude sheets and films that can be thermoformed to finished components. Suggested applications include:

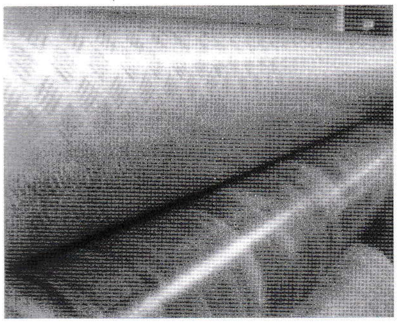
* Medical – for use in sterilizable trays and equipment;

* Aerospace – meeting flame, smoke and toxicity requirements for use in aircraft interior applications;

* Semiconductor – providing high stiffness and a low coefficient of thermal expansion for use in chip carriers.

Vectra Trex 541 extends application possibilities for LCPs in the kitchenware and food industries, says Ticona. It can be vacuum-formed into large-format sheets or cooking pans capable of heating up and cooling down rapidly.

Vinyl flooring recycling hits milestone



This month marks the first anniversary of the nationwide launch of Recofloor -- the United Kingdom's first vinyl flooring recycling scheme. It was founded by leading flooring manufacturers Altro Ltd. and Polyflor Ltd. to tackle growing volumes of waste sent to landfill.

In the past 12 months, the industry-led take-back initiative has collected and recycled 155 metric tons of uplifted vinyl and safety flooring and off-cuts. Around 175 metric tons is projected for the coming year, representing a 15 percent increase year on year.

Recofloor's 242 members across the United Kingdom and Ireland comprise flooring contractors, drop-off sites at flooring distributors and waste transfer stations, as well as construction projects at schools, hospitals and leading retail stores.

Recofloor project manager Jane Gardner of Axion Consulting, the scheme's agents, said: "Having created a free-standing industry scheme, the next challenge was to develop a sustainable, cost-effective and efficient collection system. This is now a reality with large volumes of flooring being diverted from landfill – benefiting the environment and reducing waste disposal costs for members."

Japan's New Weight-saver: Parts that Power Themselves

Fed up with the yards of cables wound around their products to power such parts as sensors and switches, Japanese carmakers are taking hybrid technology to the next level.

The goal is to develop components that need no external power sources and can transform small amounts of vibration, heat or light into the electricity they need to operate.

It's much the same principle of a mechanical watch that winds itself through the movement of a person's arm.

Research affiliates of Honda and Toyota are among the members of a new 21-company Japanese consortium aiming to pioneer such technology and promote it internationally.

Application in cars could eliminate the need for the lengthy cables needed to send power to the dozens of sensors mounted throughout a vehicle. That could save space and weight and help improve fuel efficiency.

Italian tire maker Pirelli SpA already uses the technology in its Cyber Tyre. A computer chip in the tire, which relays such information as air pressure and road conditions to the driver, is powered by drawing on the kinetic energy of the vibrating tire.

General Motors Co. and BMW are among the carmakers trying to convert engine or exhaust heat into energy for a car's electronics, according to the Japanese trade journal Nikkei Electronics.

The concept, known as energy harvesting, also could be applied to fields such as electronics. But widespread use is still limited by high costs and the added bulk of such gadgets.

Plastic Bottles to Dominate Medical Packaging

Plastic bottles will remain the most popular medical packaging in the United States over the next four years, with the market set to total $3.8 billion by 2014, according to Freedonia Group Inc.

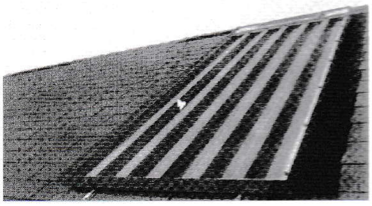
In its Pharmaceutical Packaging report, Freedonia says the plastic bottle market will grow 4.3 percent in the 2009-2014 period because of widespread use in packaging for oral drugs. The plastic bottle format will also dominate applications in over-the-counter medicines sold in tablet and capsule quantities of 50 or more.

However, the fastest growth in the US medical packaging market will come from prefillable syringes, as advantages in biotechnology will lead to more and more injectable therapies, says Freedonia.

The market for pharmaceutical closures – dominated by plastic flip-top vial closures and syringe tips – will total $3 billion in 2014.

The overall medical packaging market in the US will increase 5.3 percent to $18.5 billion in 2014.

Firms combine solar air collector with roof insulation



In close cooperation with Bayer MaterialScience AG, manufacturer Puren GmbH of Überlingen, Germany has developed the Bomatherm, a solar air collector and roof-insulation system. In this device, energy from solar radiation is intelligently combined with highly efficient thermal insulation, said an announcement from the two companies.

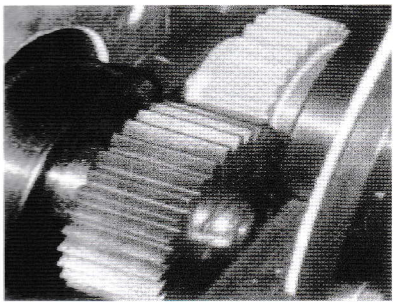
The air collector/roof- insulation system is laid like a roof and performs five functions at once: vapor barrier, thermal insulator, rainproof roof substructure, cladding and solar collector.

The development was made possible by a newly developed sheet technology based on BMS's polycarbonate and rigid polyurethane foam, the statement added.

"Its key benefit is its outstanding energy efficiency," explains Guenther Winnerl, head of marketing, polycarbonate sheets at Leverkusen-based BMS. "The solar collector, which is made of highly heat-resistant Makrolon sheet, produces usable energy in the form of hot air 'free of charge,' said Winnerl.

"Moreover, the insulation, which is based on polyurethane rigid foam, does not create thermal bridges, so only a negligible amount of heat energy escapes through the roof and the collector is optimally insulated against energy losses," said Christoph Schlott of Puren's project management.

Gear Wheels made from VICTREX® PEEK™ Polymers



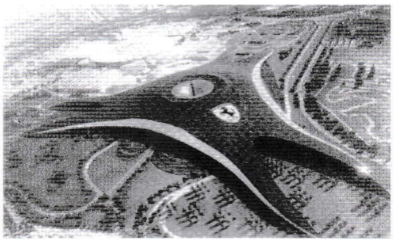
Since replacing existing metal gears with polymers has benefits such as weight/noise reduction and lower manufacturing costs by using injection molding, various industries have been investing more in R&D. Beginning with VICTREX® PEEK™, other polymer materials have been used as an alternative material to metal gears. However, industrial and especially automotive gear applications are required to meet a combination of demands such as variable loads, mechanical strength, friction and wear resistance, durability, resistance to lubricants and retention of strength over a wide range of service temperatures. Hence, the development of gear wheels is labor intensive and time consuming and requires ample resources.

Victrex plc a world leader in high performance materials including VICTREX PEEK polymers, VICOTE® Coatings and APTIV™ Films, has been strengthening R&D support on gear wheels for customers through optimization of material properties and actively supporting R&D, but to further enhance customer support, the company has announced the development of a second proprietary gear testing and analysis rig for polymer and metal gears.

The company has already been running the first gear test rig since 2005. The second rig, which has recently been commissioned, has further improved features compared to the first, and it will be used to support additional customer development and requirements for data on gear wheels.

The technical features of the second Victrex fully-instrumented gear test rig represent a significant advance over the original and include the capability to test gears over a much wider range of torques, rotational speeds, with dynamic variable loadings in a wide variety of lubricants over the range of typical service temperatures.

Metal roof held by BASF's Ultramid



Ultramid, the polyamide offered by global chemical company BASF, is responsible for the world's largest and most impressive standing-seam metal roof.

The first Ferrari theme park in the world is located in Abu Dhabi, on the island of Yas. The red-silver aluminum roof (over 200,000 square meters in size) of this unusual structure is secured in place with the aid of mounting brackets made of Ultramid.

Ferrari World Abu Dhabi is the largest indoor amusement park in the world and it will open to the public in October 2010. It is located immediately adjacent to the newly constructed Formula 1 racetrack in Abu Dhabi, and the roof mimics the lines of a Ferrari GT.

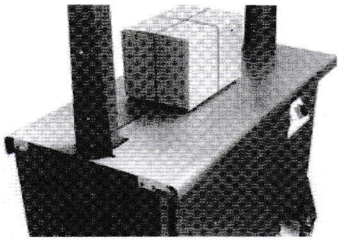
The roof of Ferrari World Abu Dhabi consists of individual aluminum panels that were formed directly from roll stock on-site, seamed during installation and fastened together with the aid of mounting brackets made of the very stiff Ultramid A3WG10, a glass fiber-reinforced polyamide 66 from BASF.

The patented ribbed, "thermoholder" plastic brackets replace their metal predecessors, optimize the sliding friction behavior at the head of the bracket and improve the insulating characteristics of the roof considerably, since they prevent the formation of heat bridges or–more important in hot Abu Dhabi– , cold bridges that compromise the building's insulation.

The two-part plastic fastener system that Interfalz developed in conjunction with BASF also incorporates an additional function: It secures the aluminum panels to the underlying insulating layer at a defined spacing. This is accomplished with the aid of an adapter plate welded to the "thermoholder" mounting bracket. It engages the head of an anchor that is also made of Ultramid: After the self-tapping Ultramid anchor is pressed into the insulating layer and screwed to the sub-structure, the mounting bracket is screwed to the head of the anchor.

Mosca launches entry-level RO-M machine

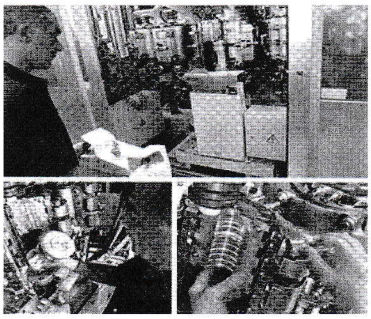
Mosca, a manufacturer and international supplier of plastic strapping and strapping equipment for industrial packaging, is looking to bring its entry-level RO-M machine to new markets by entering into a strategic partnership with distributors in the UK.



The machine incorporates an advanced sealing head and Mosca's direct drive technology to minimize the number of moving parts. By removing top-of-the-range extras the machine is extremely competitively priced, Mosca said.

The Mosca RO-M uses a standard arch size of 800x600mm and is compatible with two common PP strap widths, 5mm and 8mm, which can withstand tension of up to 25kg. The automatic machine is capable of achieving speeds of up to 35 cycles per minute.

Sidel launches the quick Bottle Switch



Sidel, one of the world's leaders in beverage packaging solutions, launches the Bottle Switch, the new Sidel-patented quick format changeover system.
The initial goal is to improve blow molder flexibility by reducing the mold changeover time in order to adapt to faster product changeover times on the filler: less than a minute to change a mold. This flexibility helps reduce machine downtime and therefore improves TCO. It is also a solution that helps customers avoid investing in storage silos or intermediate palletization.

The principle involves a simple, semi-automatic solution that places the required blowing station right in front of the operator. Easier unlocking of the mold support units ensures automatic opening. The operator just has to change the molds and removal/installation in the mold support units is done tool-free.

The results are an easy-to-use system with no tools, optimal ergonomics, increased safety and a 50% decrease in machine downtime. On an SBO 20 Universal2, for example, full format changeover is now 18 minutes "bottle to bottle" for a single operator, instead of 33 minutes for two operators with the previous system. This changeover consists in replacing the shells, body and mold base as well as the stretching thrusts.

This new system is proving highly attractive: about 15 Bottle Switch systems have already been sold. This new system is available in Options & Upgrades for all the most recent generations of SBO Universal blow molders and will be available by the end of 2010 for all SBO Series2 and Combi machines.

Getting hung up on being a Green Hero

EcoForce, which makes a range of household products from recycled materials, has been selected as one of Kevin McCloud's "Green Heroes" at the Grand Designs Live event taking place at the NEC in Birmingham in October.

The Green Heroes idea aims to highlight innovative and sustainable products made by UK based entrepreneurs. EcoForce, a family-run firm based in Welling borough, Northamptonshire, has already appeared as a Green Hero when Grand Designs Live took place in ExCel, London earlier this year.

The EcoForce range includes recycled clothes pegs, peg baskets and clothes lines, recycled sponges, scourers, cloths and dusters and recycled food bag grips. The range is available nationally at leading supermarkets.

Daniel Neumann, managing director of EcoForce, said: "Our ethos is to offer products that are effective, good value and recycled. It seems ludicrous that so many products are manufactured from virgin materials, at great cost to our environment, when in so many cases it is completely unnecessary.

"Recycled plastic saves oil and product miles, reduces landfill and uses 70% less energy than making virgin plastic. Our products are not just 10%, 20% or 30% recycled – they are all around the 90% mark and that's an important differential against other products.

"We are delighted that Kevin McCloud shares our same passion for the environment and has recognised EcoForce as being a shining example of a 'green hero.'

Space Radiation Hardens Polymers...

Space radiation might finally be good for something. The high-energy particles that degrade spacecraft and threaten astronauts' health could actually help make a new material useful for inflatable space habitats.

"Under space conditions, radiation is usually considered a damaging factor," said materials physicist Alexey Kondyurin of the University of Sydney in Australia. "But in our case, space radiation plays a positive role."

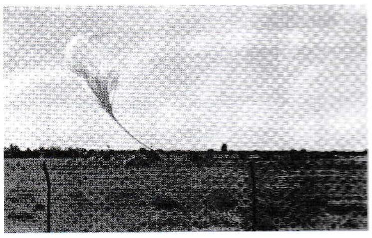
Kondyurin and colleagues developed a glue-like material that's goopy on the ground but hardens in space, and sent it 25 miles into the stratosphere tethered to a NASA balloon. Their results are published in a report online.

Ultimately, materials like Kondyurin's may be used to build inflatable structures in space. Lifting bulky buildings into orbit or transporting them whole to the moon or Mars is difficult and expensive. But materials that can blow up and self-harden (or "cure" in the language of materials scientists) could let future astronauts pack their houses on their backs.

Other groups have tested this idea with materials that harden in response to ultraviolet light. ILC Dover, a company that has built inflatable space habitat prototypes for NASA, has developed similar materials and promoted their use in solar sails, satellite antennae and sun shields for space telescopes.

In a project called BIG BLUE (Baseline Inflatable-wing Glider, Balloon-Launched Unmanned Experiment), University of Kentucky undergraduates built inflatable wings for a potential Mars plane and showed that they could harden at elevations of 89,000 feet.

But the University of Sydney group was the first to investigate the effects of the electrons, ions, X-rays and gamma-rays that constantly bombard — and usually damage — structures in space.



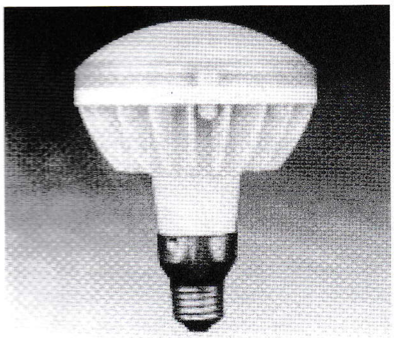
Kondyurin and his colleagues developed several prototype materials similar to epoxy and irradiated them in ion chambers and space plasma chambers in the lab. The materials were mostly made of carbon chains that slide across each other easily, producing a soft, gel-like material. But when smacked with highly energetic particles, the chains linked up to form a more rigid structure.

To see if the same thing happened in space, the team sent 20 samples to hitch a ride on a NASA-operated balloon that carried a gamma-ray telescope called TIGRE into the stratosphere over Australia. The launch was delayed for a month due to floods, but when the skies finally cleared on April 16, 2010, the balloon took off from Alice Springs, Australia.

The team was lucky to get flight time at all, Kondyurin said. A second balloon crashed and took out a car before smacking into the ground. The third flight was canceled.

The strips of material spent three days in the stratosphere, experiencing temperature swings between -105 and 90.5 degrees Fahrenheit and pressures barely above a vacuum level.

World's First All-Plastic LED Lamp for Outdoor Illumination



Iwasaki Electric Co., Ltd. and Teijin Limited announced the joint development of a completely plastic LED lamp that uses a high thermal conductivity resin, made by combining Teijin's RAHEAMA high thermal conductivity carbon material with polycarbonate resin, for the housing in place of aluminum. The new lamp, named LED EYELAMP, will be released by Iwasaki Electric by the end of this year, as the world's first LED lamp for outdoor illumination that uses plastic for the entire housing except for the bayonet cap.

The new lamp weighs just 300 grams, the same as a conventional self-ballasted mercury-vapor lamp. With only a tenth of the power consumption of a conventional mercury-vapor lamp, it is brighter and lasts 40,000 hours, roughly seven times longer than a conventional lamp. It also offers high design quality utilizing the unique texture of high thermal conductivity resin, which differs from the metal feeling. It still fits existing fixtures yet creates a new impression.

Lighting in outdoor signs and at work-sites mainly use self-ballasted mercury-vapor lamps, which do not require the ballast usually needed to turn them on. However, problems such as high power consumption remain. LED lamps feature low power consumption and long life, but since they generally use aluminum for heat dissipation, achieving adequate luminous flux usually results in excessive weight, while heat generated by the LED may affect electric circuit components.

To resolve these issues, Iwasaki Electric has utilized its many years of experience and knowledge as a lighting manufacturer in the development of a new type of LED lamp.

Renewable raw materials and plastics made of renewable raw materials

Under the aspect of sustainability, the plastics industry – like all other industries – is called on to conserve classic fossil resources and make increasing use of renewables – but only to the extent that they grow again naturally and that there is no possibility of competing with food production. On the other hand, the plastics industry must also make its contribution to protecting Nature and the environment, which means saving energy in production processes and handling waste materials responsibly. The high molecular weight and biodegradability of renewable raw materials provide particularly good conditions for this: biopolymers behave CO2-neutrally, not only as regards biological degradation but also in terms of thermal recycling of the waste materials and energy production.

In this respect, renewable raw materials are gaining increasing importance as feedstocks for plastics and as components in their production. Natural fibre composites are one example. A particular challenge here is to ensure not only ecological sustainability but also economic sustainability. This will necessitate further research to constantly improve product quality/functionality compared with conventional fossil-based materials and thus to increase production volumes. A further challenge is to cope with the inconsistent quality of renewable raw materials.

The most important raw materials are the two biopolymers*, starch and cellulose, as well as sugar (saccharose). The list also includes casein, chitin and chitosan, collagen (gelatine) and other proteins as well as natural resins and waxes, vegetable oils (linseed oil) and animal fats. Secondary products include polylactide (PLA) and copolymers as well as polyhydroxybutyric acid/ polyhydroxybutyrolactone (PHB) and other polyhydroxycarboxylic acids/polyhxdroxyalkanoates, which are produced from sugar or starch by fermentation to form lactic acid via dilactide, and subsequent polymerisation into PLA or from bacteria as storage materials (PHB). Classic biopolymers based on cellulose are the cellulose esters. Secondary products also include diols and dicarboxylic acids from biopolymers, which can be reacted with the relevant components, possibly from fossil sources, to produce polyesters, polyamides and polyurethanes.

Typical reinforcing fibres include flax, hemp, jute, kenaf, sisal and abaca as well as wood fibres from waste (WPC) from the wood and paper-processing industries, and reprocessed cotton.

It is only through the correct compounding that biopolymers are tailor-made for the relevant application. The main areas of application for biopolymers, often as blends with biodegradable plastics (also from fossil raw materials), are films, fibres, non-wovens, thermoplastics, adhesives and basic materials for dispersions. Target products include packaging and coatings for paper and board composites, sacks and bags for collecting biowaste, as well as catering products and products for horticulture and landscaping. Special areas of application in medical technology are surgical thread, hard and soft tissue implants and the encapsulation of active ingredients, for which PLA, PHB and their copolymers can be used. Their big advantage in such applications is that the mechanical properties and decomposition rate can be individually adjusted. Proteins, natural resins and waxes are frequently used for the manufacture of adhesives, paints and other surface coatings.

Natural fibre composites have gained major importance as lightweight construction materials and have been used for many years in the automotive industry, especially in car interiors for high-quality door structures and dashboards. They are also used for underbody protection and in driver's cabins in trucks. Like natural fibres and natural fibre composites, WPCs have gained an increasing foothold in the building industry, and their popularity is growing all the time.

The adjustability of the mechanical properties and decomposition rates of biopolymers illustrates that, with the right research, they can also be made suitable for the production of durable, high-quality plastics. Walkman and mobile phone housings made of biopolymers are already on the market.

There are currently two main challenges when it comes to stepping up the use of renewable raw materials. One is to make greater use of biological waste products such as lignin, and the other is to identify natural locations that do not compete with forestry and agriculture. These include marine plants of all kinds, which are noted for their rapid growth rates and serve as an effective carbon sink. The production of renewable raw materials such as cellulose and PHB through micro organisms also has considerable potential. It is possible either to produce biopolymers in a fermenter or to transfer the corresponding genes of the micro organisms to plants so that the biopolymers can be harvested in the traditional way. Here, genetically modified plants can be grown on set-aside agricultural land, so that there is no competition with crops and plants for the food sector.

Apart from conserving fossil resources and the CO2-neutral utilisation of biopolymers (from cradle to grave), renewable raw materials offer a major opportunity for the development of innovative products and processes and they also increase the reliability of feedstock supplies. There are thus good reasons for the plastics industry to look today at the enormous potential of renewable raw materials, and not to miss the boat in this expanding field.

*Biopolymers are natural high molecular-weight substances. Plastics based on biopolymers are often described as bioplastics. In contrast, biomaterials are materials that are used in contact with the biosystem, the human body.

The modification of plastic and rubber matrices with nano-scale particles can produce completely new properties with regard both to the mechanical and the functional characteristics of the matrix materials. These are derived from the special surface and interface properties of the nano particles. Nano technology is therefore regarded globally as an 'enabler' for innovative products and processes. It is seen as a key technology of the future and is expected to provide an innovation thrust in virtually every technical segment, particularly in production, automotive, energy and IC technology. On the other hand, nano technology still provides a number of major challenges for research and development, especially with regard to the production and compounding of nano particles, the specific improvement of the mechanical properties of matrix materials, and the generation of specific functions in connection with matrix materials with the aid of nano particles. Nano particles* can be spherical, cylindrical or platelet-shaped. Examples of nano-scale particles are SiO2, TiO2, ZnO2 nano particles, layered silicates (montmorillonite), and carbon nanotubes (Single and Multi Wall Carbon Nanotubes SWCNT, MWCNT) as well as organic and high molecular-weight particles. Nano particles are produced from macroscopic structures by plasma or laser ablation in the gas phase or from molecular structures in the liquid phase (sol phase). Key requirements here are the prevention of agglomeration of the produced nano particles and ensuring exfoliation of the layered silicates. This is often done by modifying the particle surface or replacing the cations of the layered silicates with voluminous organic cations. Compounding of the nano particles and the homogeneous dispersion of the particles (good distribution while retaining the nano-scale structure) is essential for obtaining a successful result in the composite with the polymer matrix. Nano-scale fillers act as heterogeneous nuclei in semi-crystalline plastics, and thus determine the morphology of the composites. The most common application for nano particles to date is as fillers in plastic matrices to improve the mechanical properties. The aim here is predominantly to achieve high stiffness and strength/hardness combined with high toughness and high heat resistance. The effect of carbon black and SiO2 in car tyres has been known for a long time. Other promising new openings for nano particles are to increase the heat stability of rubber in under-the-bonnet applications in the automotive industry. Further examples include reinforcement of the polymer matrix with carbon nanotubes (CNT) in sports goods (tennis racquets and golf clubs) and reinforcement of the matrix in carbon fibre composites. Materials of this kind can be used in all kinds of vehicles to reduce weight and thus save fuel through the substitution of metal materials. The use of CNTs as fillers results in composites with high electrical conductivity (for example, CNT-filled polyoxymethylene attains a maximum specific volume resistance of 30 Ω cm) combined with improved flow behaviour in the melt and higher temperature stability without any significant loss of mechanical properties. In addition, CNT-filled polymer matrices not only have good antistatic properties, they also afford improved thermal conductivity and can be made transparent. Metal oxide particles in surface coatings increase the scratch resistance, offer protection from wear and corrosion, and also create an anti-reflection effect and improved UV absorption. Magnetic nano particles in a polymer matrix can, through application of a magnetic alternating field and subsequent heating, lead to thermally activated crosslinkage. Exfoliated layered silicates as platelet-shaped nano particles in plastic matrices improve fire and flame protection and have a high barrier effect in plastic films. In this connection, mention should also be made of nano-porous, high molecular-weight foams, which have increased insulation capability and are of particular importance for lightweight construction. Nano-porous membranes (nano filters) can be used for water demineralisation and for the elimination of bacteria, viruses and toxins (heavy metal salts, dioxins) from contaminated water. Apart from that, special effects are to be expected from plastic modifications with nano-scale particles in terms of their functional properties. This is still a very special challenge for research and development. Polymers with metal oxide clusters as nano-scale fillers – organic-inorganic hybrid materials – are expected to display special optical, electrical and magnetic properties as are required for polymer electronics, storage media, photovoltaics, organic light-emitting diodes (OLEDs), displays and sensors. On the matter of the safety of nano particles, it has to be said that we are constantly surrounded by biogenic, natural and anthropogenic fine dust (aerosols). Nano particles that are permanently integrated into a matrix no longer exist as nano-scale particles that could adhere to aerosols. Also during use – e.g. through abrasion – it is to be expected that the nano particles remain permanently adhered to matrix fragments and are not released as nano particles. This must, however, be ensured for the respective product. During production, particular attention must be paid to the release of nano particles into the environment. For this reason, the nano particles are normally processed in a liquid medium and/or even in agglomerated form. To be able to estimate the hazard potential of nano particles, the stability and lifetime of the particles as nano particles and their behaviour in biological systems must be clarified. Relevant studies are being conducted on a broad basis, and they will help to minimise potential health and ecological hazards that emanate from products containing nano-scale particles. *Nano particles have, at least in one dimension, an expansion of lower than 100 nm, i.e. less than 1/10 000 nm or smaller than 1/1000th of the diameter of a human

MONTHLY CIRCULAR OF THE FEDERATION

CIRCULAR NO. 35/2011 :

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 A. N. HUSSUNALLY & CO.**
28, Strand Road
Kolkata - 700 001
   b) Class of membership : **Dealer member**
   c) Proposed by : M/s Con-Hyde (India) Pvt. Ltd.
   d) Seconded by : M/s National Moulding Co. Ltd.
   e) Name of representative : Mr. Hunaid Hasani
   f) Items dealt in : Dealer of Hydraulic Components/Clamps

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

CIRCULAR NO. 36/2011 :

Sub: Consumer Price Index Number for Industrial Workers for Kolkata for the months of January to October 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
September, 2010	901	4271
October, 2010	906	4294

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