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FEBRUARY 2011

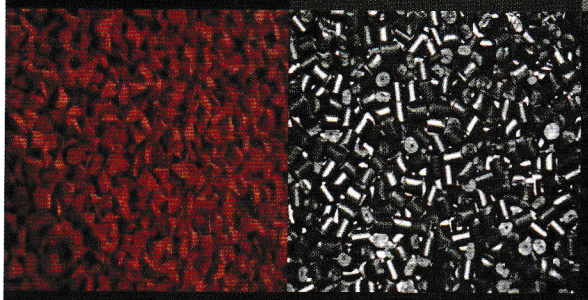
iPf PLASTICS INDIA

AN OFFICIAL ORGAN OF INDIAN PLASTICS FEDERATION

Log on to our Website : www.plasticfederation.org

SHRACHI RENU POLYMER

SHRACHI



Product Details

Colour Master Batch • White Master Batch
Calcium / Talc Filled PE Compounds
Additive Master Batch • Any other Plastic Compounds

User Industries

Woven Sacks (Raffia) • Films / Tarpaulines • Water Tanks
Non Woven Fabrics • Plastic Carry Bags

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PLASTICS INDIA

A journal for the growth and development of plastics trade & industry

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Editorial

The potential Indian market has motivated Indian entrepreneurs to acquire technical expertise, achieve high quality standards and build capacities in various facets of the booming plastic industry. Phenomenal developments in the plastic machinery sector coupled with matching developments in the petrochemical sector, both of which support the plastic processing sector, have facilitated the plastic processors to build capacities to service both the domestic market and the markets in the overseas.

The plastic processing sector comprises of over 30,000 units involved in producing a variety of items through injection moulding, blow moulding, extrusion and calendaring. The capacities built in most segments of this industry coupled with inherent capabilities has made us capable of servicing the overseas markets.

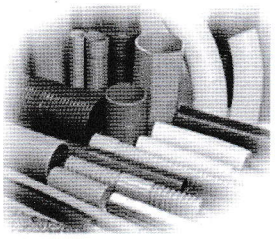
The economic reforms launched in India since 1991, have added further fillip to the Indian plastic industry. Joint ventures, foreign investments, easier access to technology from developed countries etc have opened up new vistas to further facilitate the growth of this industry.

Plastic industry is a huge industry and lots of people are directly or indirectly involved with this industry in the fields ranging from manufacturing to selling of plastic products. New employment opportunities are creating over time. A huge number of small industrialists are showing their interest to invest in this field.

The **plastic industry of India** has a big market potential and is gradually prospering. This potentiality of the market will surely actuate the entrepreneurs to invest in this industry. Entrepreneurs are trying to provide high quality plastic products, so that it becomes a booming industry.

The potentiality of plastic industry of India propels other associated industries to grow side by side. One of such growing industry is petrochemical industry. Both these industries are reciprocal to each other. The petrochemical industry facilitates the plastic industry to produce plastic products that will meet the domestic demand as well as that of the overseas market.

Pradip Nayyar
Editor



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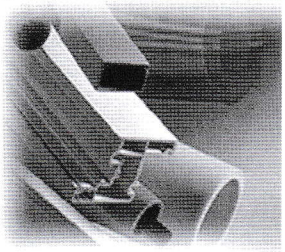
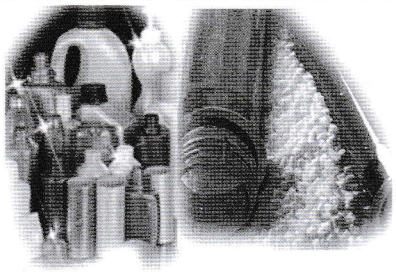
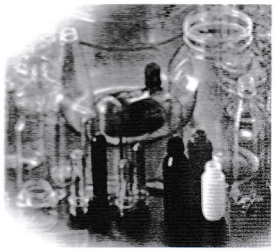






PRESIDENTIAL ADDRESS

Dear Members,

In this issue I wish to share my thoughts on the role of plastics as fillers in medical applications.

The medical sector is important for plastics. Fillers provide specific role in many medical products. Some of the areas where fillers are used and can provide better performance are summarized below:

Fillers are essential in plastics which must be sterilized. Glass fiber in particular is used because it can withstand sterilization and retain mechanical properties. Most medical plastics must be kept scrupulously clean and handled only in a clean room environment. Static charge built up on these parts will attract contaminants and therefore, it is critical that static charges are dissipated. Fillers perform this function because, unlike organic antistatic additives, they have no tendency to migrate and contaminate the surroundings. In the application of intravenous catheters, barium sulfate is added to polymers to make catheter inside the blood vessel visible to X ray.

Drug delivery patches and implantable or insertable medical devices are methods of releasing a therapeutic agent to a patient. They contain a therapeutic agent, a polymer and filler. Polymer plays a role of binder, and filler has platelet structure which controls the rate and delays drug release. Procedures that were previously possible only with surgery have become non Invasive because of highly engineered devices. The high precision of the devices now allows access to even smaller areas of the body. For designers of medical devices, the challenge is to create devices with improved feel while continually striving to reduce device size. Design and manufacturing techniques, as well as material modifications play a key role in advances in precision medical devices. An increased spectrum of material options is available through the use of polymer compounds incorporating performance enhancing fillers. Traditional polymer reinforcing fillers include glass, carbon, and other fibrous materials. However, in today's medical applications, with catheters and stint delivery balloons, extraordinarily thin walls and smooth surfaces are required. The traditional fillers are far too large in size to provide homogenous compounds suitable for extremely thin sections. This is an area where polymers play an important role.

No matter how long The Winter, Spring is sure to follow. With the celebration of Saraswati Puja we are all ready to welcome the Spring and Summer seasons as well as the festival of colours - HOLI.

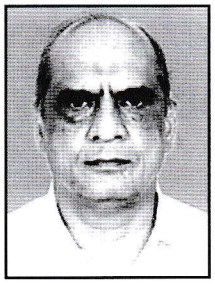
The Union Budget will be released in the Parliament on 28th Feb 2011. I am sure the Hon'ble Finance Minister will continue with the reforms and announce the dates for Implementation of the GST and DTC.

With Warm Regards,

Sourabh Khemani
President

From the Desk of

The Hony. Secretary



Dear Members

The Federation has decided to hold **Indplas'12** – An International Exhibition & Conference on Plastics in 2012. The Federation has already started working on it. A Core Committee consisting of Office Bearers, a few Past President and active members has been formed. Two meetings of the Core Committee have already been held during which discussions were held on stall rent, appointment of Agents, advertisement tariff in the Exhibitor's Directory, sponsorship category and rates were discussed. All founder members of Plastindia Foundation viz. AIPMA, GSPMA, OPPI, IPI, CIPET, PLEXCONCIL and All India Flat Tape Manufacturers Association, Andhra Pradesh Plastic Manufacturers Association and Tamil Nadu Plastic Manufacturers Association have agreed to be Support Sponsors of Indplas'12 without any financial obligations. They have also agreed to allow IPF to use their name and logo in all our publicity materials.

The Federation participated in Plastivision India 2011 Exhibition held in Mumbai from January 20 – 24, 2011. This exhibition has been organised by AIPMA. AGM Special Issue 2010, Brochures of Indplas'12 were distributed during Plastivision exhibition. An Indplas'12 promotional video film has been developed that was shown during Plastivision. The Federation was very successful in bringing awareness amongst exhibitors on Indplas'12.

This year also IPF has decided to send a delegation to Chinaplas 2011 Exhibition being held in Guangzhou, PR China from May 17 – 20, 2011. The Federation has nominated Shri Dipak Gathani to be the Convenor of Chinaplas 2011. Details of Chinaplas 2011 tour are being worked out and once the same is ready, members will be informed of the same. Members eager to participate in Chinaplas 2011 may keep in touch with Shri Dipak Gathani (M:98300 39614).

Members will be very glad to know that after trying for four years West Bengal Industrial Development Corp. Ltd. has allotted 1.02 acre land at Poly Park, in Sankrail, Dist. Howrah for development of IPF Knowledge Centre (Training & Testing Centre). The cost of purchase of the land Rs.17,08,500/- has already been paid to WBIDC. The centre will include besides testing facilities, hostel facilities, auditorium and class rooms etc.

With best wishes,

Ramawatar Poddar
Hony. Secretary

"High Density Polyethylene Eyeleted Tarpaulins as Sacks for Fruits & Vegetables"

– Ms Poorvi C. Desai, Sr. Manager,
Business Development – Polymers, Reliance Industries Limited

Agriculture in India

Agriculture is Indian economy's mainstay & it comprises 18.5% of the gross domestic product (GDP). In the last two years agriculture growth rate was 4% against growth rate of 2.5% during the 10thFive Year Plan.

The country is the leading producer of coconuts, mangoes, milk, bananas, dairy products, ginger, turmeric, cashew nuts, pulses and black pepper. It is also the second largest producer of rice, wheat, sugar, cotton, fruits & vegetables

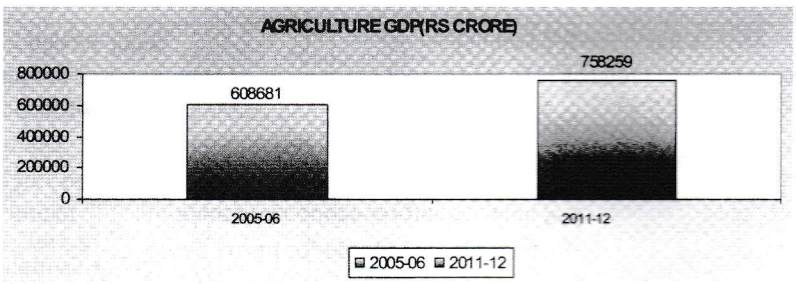
11th Plan aimed at doubling the annual growth rate in the agriculture sector to 4 percent

The most important area for investment in agriculture relates to the provision of water and its most efficient use. It is expected to add about 16 million hectares to the irrigated area during the 11th Five-Year Plan.

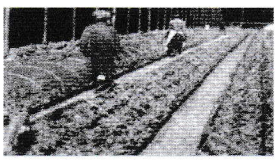
An assessment of the irrigation system in India indicates that efficiencies of surface water systems can be improved from the present level of 35 to 40 per cent to about 60 per cent and that of groundwater systems from 65 per cent to about 75 percent.

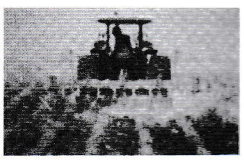
Moreover, about 84 per cent of the created irrigation potential has been utilised in India. Efficient use of crop water can increase the gross irrigated area.

Plastics in agriculture has been growing at a fast pace. Plastic products retain moisture levels in the soil by the use of plastic products such as linear low density polyethylene mulch film.



(Source : Reserve Bank of India, Planning Commission Targets)

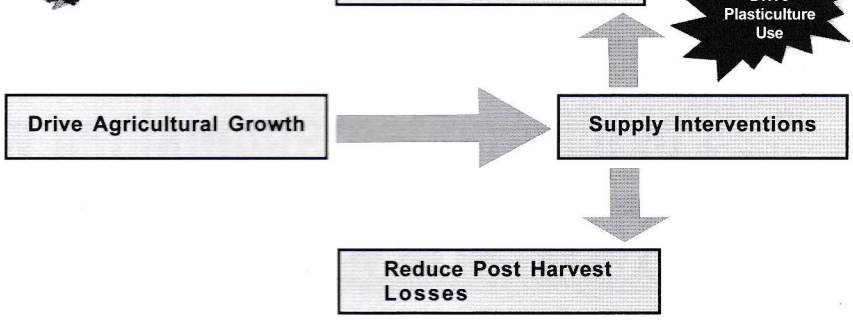




4.1% growth implies a Rs 1,50,000 crore increase In Agriculture GDP

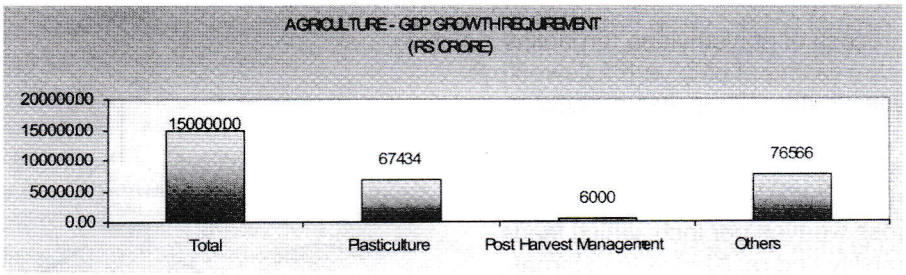
Where will this growth come from?

Driving agriculture growth requires concurrent demand and supply side interventions



Plastics in Agribusiness

Rapid adoption of plastic applications alone can help achieve 50% of the intended targets in Agriculture...



(Source : Reserve Bank of India, Planning Commission Targets)

HDPE Agrishade

Nets PE Greenhouse

LLDPE Drip Irrigation Pipes

LLDPE Mulch film

New Products to be Adopted in Plasticulture

- HDPE Eyeleted Tarpaulins as sacks for fruits & vegetables
- LDPE Reverse Printed Extrusion Coating on 2 sides of HDPE Woven Sacks

Plastics in Agribusiness

Plastics to a common man was earlier only a high density polyethylene bucket, but with its versatile nature, it has grown from a bucket to numerous plastic products in several sectors of the Industry including Agribusiness, etc.

Plastic products related to agriculture include LLDPE Mulch film, PVC pipes, HDPE Pipes, LLDPE Drip Irrigation Pipes, HDPE Agrishade Nets, PE Greenhouse etc would lead to higher productivity(yield) through efficient use of water, fertilizers

Plastics could be defined as most "Able" material to increase the productivity of fruits & vegetables for farmers leading to huge savings.

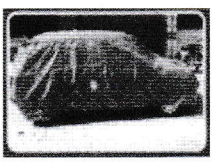
Plastic pipes in agriculture have resulted in huge savings for the farmers. Plastics have grown from films to agrishade nets, from tapes to agrishade nets and from monofilament to monofilament agrishade nets.

India being No.2 producer of fruits (50 million tonnes) & No.3 producer of vegetables (90 million tonnes) in the world, high potential exists for usage of plastic products in agriculture

Tarpaulin

Tarpaulin is a plastic product made up of woven high density polyethylene fabric laminated with LDPE, LLDPE or a blend of two. Tarpaulin, which is also known as "talpatri" brings in numerous enduses in agriculture and infrastructure sectors. Tarpaulins could be used in godowns. The demand of high density polyethylene tarpaulins revolves around both these sectors, a mirror reflection of the growth in both these sectors. Also, these tarpaulins could be used as a cover in the chemical industry, petrochemical industry and fertilizer industry.

Advantages of HDPE Tarpaulin



> It is light in weight
> Handling is easy
> Water proof, does not get wet or soaked
> Can be manufactured in desired colours
> Printing is much more attractive

Polyethylene Tarpaulins

Mildew and rot resistant, tough and long lasting. Polyethylene will help to keep things dry and protect

them from unfavourable weather conditions

1. Polyethylene tarpaulins are excellent for short term and long term use.
2. The design process of polyethylene tarpaulins consists, cross weaving of poly yarn followed by double-sided lamination. Thus, it is possible to make tight or loose tarpaulin designs according to the purpose for which tarpaulins are designed. A tight pattern can be recognized by the high number of cross weaves per inch, which leads to higher durability and resistance to external factors.
3. Polyethylene tarpaulins are resistant to weather variations. It is possible to get polyethylene tarpaulins that stand sturdy even during heavy rains without sagging. Polyethylene tarpaulins are resistant to scratches.

Manufacturing Process

LAMINATION

HDPE fabric is laminated with LDPE, LLDPE or a blend of the two. It could be a three-layer tarpaulin having one layer of woven fabric and two layers of LDPE/LLDPE coating, one each on either sides. Five layer tarpaulins consisting of two layers of woven fabric sandwiched between layers of LDPE/ LLDPE coating are also made.

SEALING

The laminated fabric, which is normally 48 inches wide, is cut into pieces according to desired size and sealed.

BORDER MAKING

A border is made and a rope is provided along the border to provide strength. Metallic loops are used to make eyelets along the border, through which the tightening ropes, are passed.

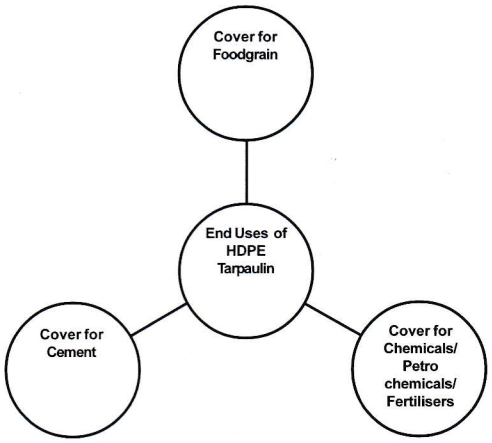
Machinery

A tape extruder, a lamination machine and eyeleting machines are used for manufacturing high density polyethylene tarpaulins. HDPE Tarpaulin is manufactured on a tape extruder. HDPE Agrishade Nets, HDPE Raschel bags and HDPE Woven Sacks for fertilizer packaging can be manufactured on this tape extruder.

India – High Density Polyethylene Tarpaulins

The consumption of High Density Polyethylene Tarpaulins in 2009-10 in India was 30,000 Tons.

End Uses of HDPE tarpaulin



Transportation

During the rainy season, HDPE tarpaulin is used for covering of trucks, which is a major market at present.

Storage

This is the second largest market which includes covers : for Godowns, cover for crops, Mandaps, temporary sheds and out-door open storage.

The applications of plastics which produce bigger width fabrics such as high density polyethylene tarpaulins are made up of a polymer, high density polyethylene. Extrusion of plastics which was initially perceived as films extends to extruded products such as high density polyethylene tarpaulins, both of these plastics products have a common function of protecting packed products from moisture and dust. Tape extrusion process gives an entrepreneur a flexibility to produce HDPE woven sacks, HDPE tarpaulins and many more products such as HDPE agrishade nets and HDPE Raschel bags on the same tape extruder. Plastics, a gain to the society by its waterproof characteristic has been a gain to the existing processors of woven sacks by an increase in a product mix, capacity utilization, average selling price and thus increase in net profitability.

Plastics for Entrepreneurs

High Density Polyethylene Eyeleted Tarpaulins as Sacks for Fruits & Vegetables for Entrepreneurs

Tarpaulin which is also known as talpatri, is a product which is used mainly in rainy season. It protects against rains during monsoons. Unfolding a

HDPE Tarpaulin with new enduses would unfold the demand of this product.

A new enduse of High Density Polyethylene Tarpaulin is that of High Density Polyethylene Tarpaulin as sacks for fruits & vegetables. Packaging material which offer ventilation to fruits and vegetables could be these sacks made up of high density polyethylene tarpaulin. More the ventilation, more the breathability. These high density polyethylene eyeleted tarpaulins as sacks which helps in keeping the fruits and vegetables fresh and prevents fruits and vegetables from getting rotten due to its waterproof characteristic.

This use poses another enduse of HDPE Woven sack & HDPE Tarpaulin manufacturers

HDPE Eyeleted Tarpaulins as sacks for packaging of fruits & vegetables with more number of eyelets for breathability

1 New Jute bag – 25 kgs(24 * 36 inches) – Rs12 & 50 kgs(30 * 50 inches) -Rs 18, Old Jute bag – 25 kg – Rs 3.5, 50 kg – Rs 6, PP Leno bag- 25 kg-Rs 4.5 & 50 kg -Rs 6.5, HDPE Eyeleted Tarpaulin as sack – 25 kg- Rs 7, 50 kg – Rs 14, but longer shelf life. These sacks can be reused for many times in comparison to PP Leno bags & Jute bags. 600 Denier, 7 mesh with filler of 15-20%. weight of HDPE Eyeleted tarpaulin as sack –25 kg - 65 gms, 50 kg -125 gms (Present Prevailing Prices, subject to changes)

2. Eyeleting machines are available locally. 28 number eyeleting machine of outer diameter 23 mm & inner diameter 11.5 mm are available with an automatic eyeleting machine price of Rs 1.5 lacs. Price of Aluminium eyelets – 144 nos – Rs 60. Eyelets at lower price also available. To include more number of eyelets for excellent breathability of fruits & vegetables

3. Potential – 364 KTA. India – Fruit production – 50 million tonnes, Vegetable production -90 million tonnes, weight of HDPE Eyeleted tarpaulin as sack –25 kg- 65 gms, 50 kg-125 gms

4. Existing material of packaging - Jute, PP Leno bags

5. Farmer procures HDPE Tarpaulin as sacks from shops in the Markets where other products related to agriculture are marketed such as HDPE Pipes etc. Price v/s longevity shared amongst farmers

6. Farmers pack fruits & vegetables in these sacks

7. These sacks from farmers are transported to wholesalers where auctioning of fruits & vegetables takes place

8. Wholesalers supply these sacks to retailers in APMC's

9. Resale value of these sacks gained by these retailers by supply of reused sacks to shops related to agriculture products

10. These reused sacks are marketed by these shops related to agriculture products to farmers based on the usage of number of times

Plastics with its waterproof characteristic prevents the fruits & vegetables from getting rotten during rainy season.

With only an additional investment in the eyeleting machines, would lead to a new product for the woven sack industry. Manufacturers of HDPE tarpaulins need no additional investment.

Accelerating the process of a market penetration of this new product would occur with an involvement of commission agents. Commission agents are people who know the local language, whom the farmers have faith in and who can communicate effectively the benefits of plastic products related to agribusiness to the farmers.

Plastics entered into agribusiness with woven sacks for foodgrains, leno bags for fruits & vegetables and today brings in an existing product with a new enduse. Fruits(rewards) which a common man gains by use of plastic products due to its longer shelf life contributing towards the cost economics has been a gain to entrepreneurs as well as farmers as well as common man

Branding of farm produce to distinguish a good quality produce with the help of 2 side lamination on a sack as high density polyethylene tarpaulin which could include the name of the farmer would lead to the delivery of good quality produce for wholesaler to retailer.

Conclusion

Plastics package, a package of fruits & vegetables in a package made up of HDPE Eyeleted tarpaulins as sacks acts as an excellent package with adequate breathability. Its waterproof characteristic prevents fruits & vegetables from getting rotten. HDPE eyeleted tarpaulins as sacks for containment of fruits and vegetables during storage and transportation stages. New products, new end uses in plastics catalyses the growth of the plastic processing industry.

DOSIGRAV - High Precision Gravimetric Blender and Mixer

DOSIGRAV (Gravimetric blender and mixer) is a highly accurate blending system offering the simultaneous and individual weighing of small quantities of raw materials and additives.

It has been specially designed to be operator friendly, accurate and reliable (Up to 10 years warranty) and is recognized by most of our customers as one of the best gravimetric blender available worldwide.

Its unique design makes it very easy to clean, to change materials or additives and to operate.

Patented microcontrolled variable flow-rate valves control input and output (mixing) of all materials and additives.

The DOSIGRAV system may be used as a central blending station located typically in a materials handling section outside of extrusion or injection area, keeping these areas clean, free of material and additives containers, fork lifts, etc.

This system makes free valuable space near the machines, allowing better and easier plant layouts.

Just one DOSIGRAV may feed several machines. The smart mixing control assures that there will be no segregation during conveying, independently from the conveying system.

Principle of Operation

The DOSIGRAV blending principle is based on a very accurate, individual and simultaneous weighing of small quantities of each component. The input and output of the material from each individual weighing unit relies on proprietary special variable flow rates valves. All system is patented.

Blending is not affected by variations in density, shape or compactness of materials and vibrations. The parts in contact with material are easily removable without the use of any tools, fast cleaning and material change. A modular design makes possible the use of identical parts for all components. Furthermore, a very simple control panel that can be installed up to 20 meters from the blending unit makes the operation extremely easy and intuitive.

Automation

Any automatic or manual raw material conveying system can easily integrate the DOSIGRAV. Specially in the case of automatic conveying systems, the DOSIGRAV becomes indispensable to assure a high productivity and reliability of the industrial process as the system does not need any human intervention to calibrate or check the operations. A dedicated multiprocessor controlled system performs automatically these functions.

The total weights of all components are continuously stored and displayed. If a preset value was introduced the blending process will stop and an alarm will be activated when this value is reached. A computer may be added to monitor and control the DOSIGRAV, to store every event and generate reports as desired.

Accuracy, Quality and Productivity

The DOSIGRAV system was designed to combine simple and robust mechanics, easy maintenance, high blending accuracy and easy operation. These purposes, usually difficult to achieve, were conciliated thanks to the blending philosophy and control system developed for the DOSIGRAV.

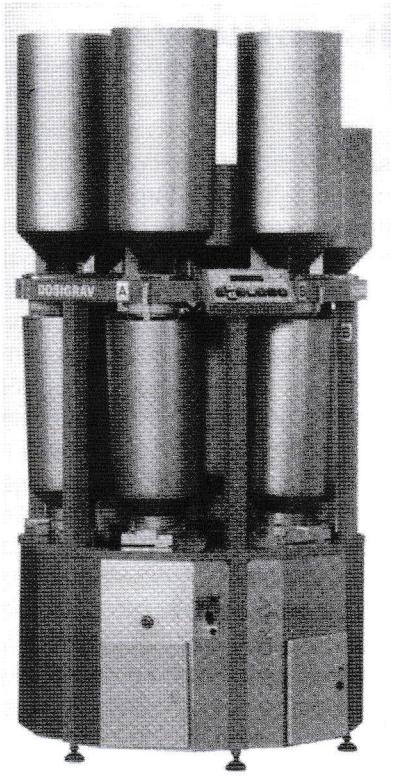
The DOSIGRAV ensures for each component and accuracy higher than 0,5% for itself. This is an unsurpassed extreme accuracy as we consider relative accuracies over each component and not, as usual, absolute values over the total blend weight.

Programming

Programming and visualization of the recipes are protected by hardware key. Therefore, the system assures to the client a total protection concerning the know-how involved in the formulation of the final products.

The operator calls the desired recipe by the code number.

Eventual programming errors or other irregular situations are detected and displayed. Programming, as well as all other operational commands, can be performed through a remote computer.



First Woven PP Pinch Bottom Bag worldwide

Starlinger has recently installed their first pp*starKON pinch bottomer – the world's first fully automated pinch bottom bag conversion line for the production of PP*STAR® poly woven pinch bottom bags.

The Starlinger PP*STAR® bag is the first pinch bottom bag made of woven polypropylene and reverse printed BOPP film. It is produced on the pp*starKON, the world's first automatic pinch bottom bag conversion line for polypropylene fabric, manufactured exclusively by Starlinger. Based on Starlinger's experience in the field of woven bag machinery, the pp*starKON unites flexibility, productivity and efficiency in the automated production process. It converts flat fabric into open-mouth pinch bottom bags with side gussets and staggered cut at the pinch top. A special glue, developed by Starlinger in cooperation with an adhesive specialist after years of research, is pre-applied on the pinch bottom and the pinch top. While the pinch bottom is sealed during the sack production process, the pinch top is closed during the filling process by reactivating the glue. This guarantees quick and clean sealing and secure closure against external agents.

The PP*STAR® woven pinch bottom bag can be used on common open-mouth filling lines; for the closing, modified regular pinch bag closing lines are perfectly suitable.

Optionally the pp*starKON can be equipped with a flush cut unit which prepares the PP*STAR® for the application of different easy-open or reclosable features.

A step change innovation with many advantages

The development of the PP*STAR® pinch bottom bag has opened new possibilities in dry petfood packaging, but it also meets the requirements of other applications such as fertilizer, seeds, flour, sugar or rice. It combines the advantages of pinch bottom bags and woven polypropylene: The bags are sift-proof, strong but lightweight, and offer excellent shelf display and visual appeal.

PP*STAR® bags can be supplied with different opening features. The bag length of PP*STAR® bags ranges from 500 to 1070 mm, the bag width lies between 250 and 480 mm.

PP*STAR® – a lightweight yet strong champion

PP*STAR® is an exceptionally lightweight form of packaging made of a BOPP-fabric composite. The fabric is woven from extruded and stretched polypropylene tapes and bonded by a BOPP film with high quality reverse printing. An average woven bag with a specific weight of 110 g/m² measures around 600 x 400 x 130 mm and weighs only 95 g. The BOPP-fabric composite is the ideal base for high-strength, lightweight packaging that is tear-resistant and at the same time appealing to the eye. And, being made entirely of polypropylene, the PP*STAR® bag is a desired mono-material packaging solution – hygienic and 100% recyclable.

The Starlinger pp*starKON pinch bottomer is available for viewing in Starlinger's show room in Weissenbach, Austria, during the Starlinger Open House which is held parallel to the K trade fair in Düsseldorf.

Source : Plastics News

Strong recovery anticipated for Japan's plastics processing machinery sector

Although shipments of processing machinery from Japanese vendors are still well short of their peak levels, 2010 seems likely to signal a welcome return to growth, with injection machine shipments forecast to grow by 39% year after having collapsed in 2009. Exports of injection molding machinery are also growing faster than shipments to domestic processors in Japan, but even in key markets such as china, demand is falling short of peak levels despite the over all machine market continuing to grow there.

Part of this is due to increased use of locally produced machines for less demanding applications. On a more regional Scale, Japanese machine suppliers continue to face competition from other Asian and global suppliers on account of the high value of the Japanese yen.

In terms of markets, next-generation environmentally friendly vehicles, LEDs, flat-screen TVs, and portable electronic devices are among key ones expected to drive growth for high-end Japanese plastics processing machines. Geographically speaking, developing domestic markets accompanying rising income levels in Asian countries are expected to drive local demand for products such as appliances and automobiles, and this should also lead to rising demand for high-end machinery.

The Assn. of Japan Plastics Machinery reports that the marker for injection machines in Japan is transforming in that machine builders are tailoring their offerings to suit specific applications. In doing so, they are selecting the appropriate drive mechanism, be it all-electric, hydraulic, or hybrid (including servodriven hydraulic pump). The Association reports that the processing sector is revisiting the advantage of direct clamping. With the energy savings that can be derived from using servodriven pumps, increasing numbers of users are adopting this type of machine. Demand for specialized machines for insert, outsert, and multimaterial molding is also growing as processors strive to add value to their work.

The outlook is not as positive for extruder shipments from Japanese vendors, with only a slight recovery forcast this year, although the outlook for 2011 is somewhat better. Strill, film and sheet extrusion line manufacturers continue to invest in R&D in search of downgauging and better uniformity. One area of active development is solar sheet and film, where the capability to produce cast sheet and film with light transmission and dispersion properties, as well as weatherability, commands a premium, and extrusion line builders are achieving this through advanced technology integration in the extruder, die, sizing rolls, and takeoff.

Areas where blown film lines may come into play include solar cell and fuel cell components, while Japanese OEM's may also benefit from local production of high- performance films in China. The move away from dry lamination processes that employ solvents containing Volatile organic compounds (VOCs) is also expected to boost demand for lamination equipment in Japan. Meanwhile in China, overinvestment in BOPP production lines in recent years seems likely to have a negative impact on investment in the short term. One positive note is the fast-growing flat-screen TV markets, Which is driving demand for high-performance sheet lines in south Korea, Taiwan, and China.

A lower-level recovery is also anticipated for blowmolding machinery shipments. Development in this sector is headed by machine builders' efforts to cater to a wider variety of materials, including biodegradable PLA, as well as PE, PP, and PET.

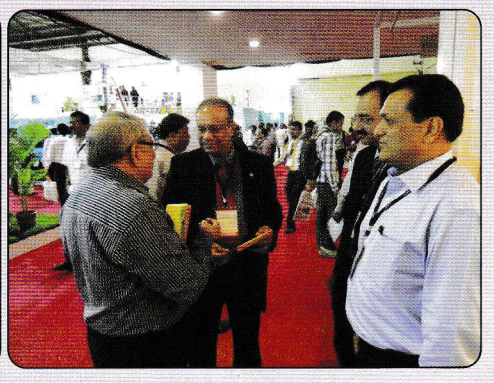
Bright market spots include automotive in Brazil and in the U.S., where more stringent EPA regulations slated for 2012 are set to drive demand for multilayer extrusion blowmolding machinery. Demand for stretch-blow machinery is forecast to grow in North and Latin America and Asia.

Japanese exhibitors will be participating in a special Japanese exhibitors willl be participating in a special Japanese pavilion at the K show in October (Stand 14C37).

Contd. to Page - 23

GLIMPSES

IPF Participation at PLASTIVISION INDIA 2011 at Mumbai



IPF participated in the 8th Plastivision India 2011 Exhibition organised by The All India Plastics Manufacturers' Association at Mumbai Exhibition Centre, Mumbai from January 20 - 24, 2011. There were more than 1000 exhibitors from different segments spread over more than 50000 sq. mt. of space in 5 AC Halls and 2 Hangers. The exhibition also focused on environmental issues with displays on plastic usages, solid waste management system, drip and green house irrigation and recycling of plastics. IPF took this opportunity to build awareness on our forthcoming Indplas'12 exhibition. Brochures where distributed to various exhibitor stalls. A film on Indplas'12 developed for the purpose was also shown at the exhibition. An advertisement on Indplas'12 was also published in Plastivision India 2011 exhibitor's directory. CDs of AIPD 2009 and AGM Special Issues were also sold from the IPF stall. The Federation fulfilled its objectives of participating in the exhibition.

Chemplast Sanmar Endowment Lecture

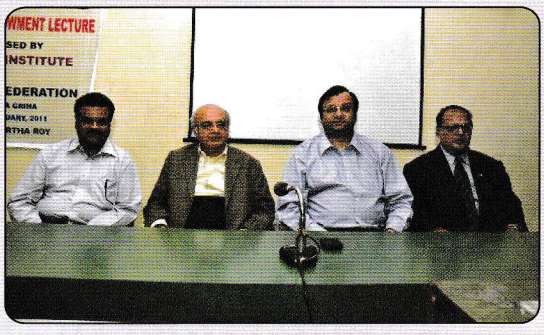
JOINTLY ORGANISED BY

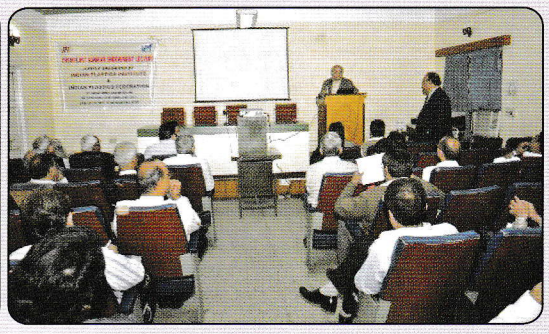
Indian Plastics Federation and IPI-Kolkata Chapter, on 5th February 2011

on

PVC & Plastic Piping systems: Past, Present and Future

The Lecture meeting was organised in the auditorium of **KOLKATA INFORMATION CENTER** and was attended by over 60 participants. The Speaker Shri Siddhartha Roy gave a 90 minutes presentation and travelled down the memory lane. He dispelled the fear in the minds of the people at large stating that due to wrong propaganda PVC is misunderstood as a harmful polymer. He showcased the sectors in which PVC is widely used and also gave an overview on its uses in the 21st Century. The lecture was rich in content and was widely appreciated by all participants.





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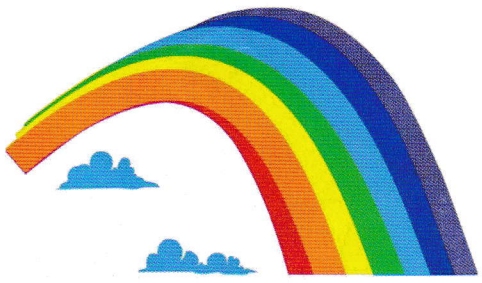

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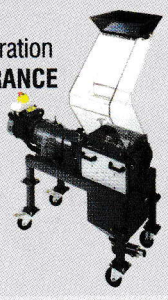

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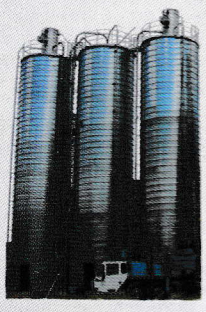

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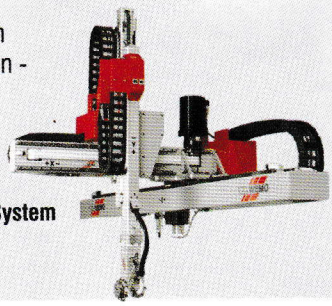

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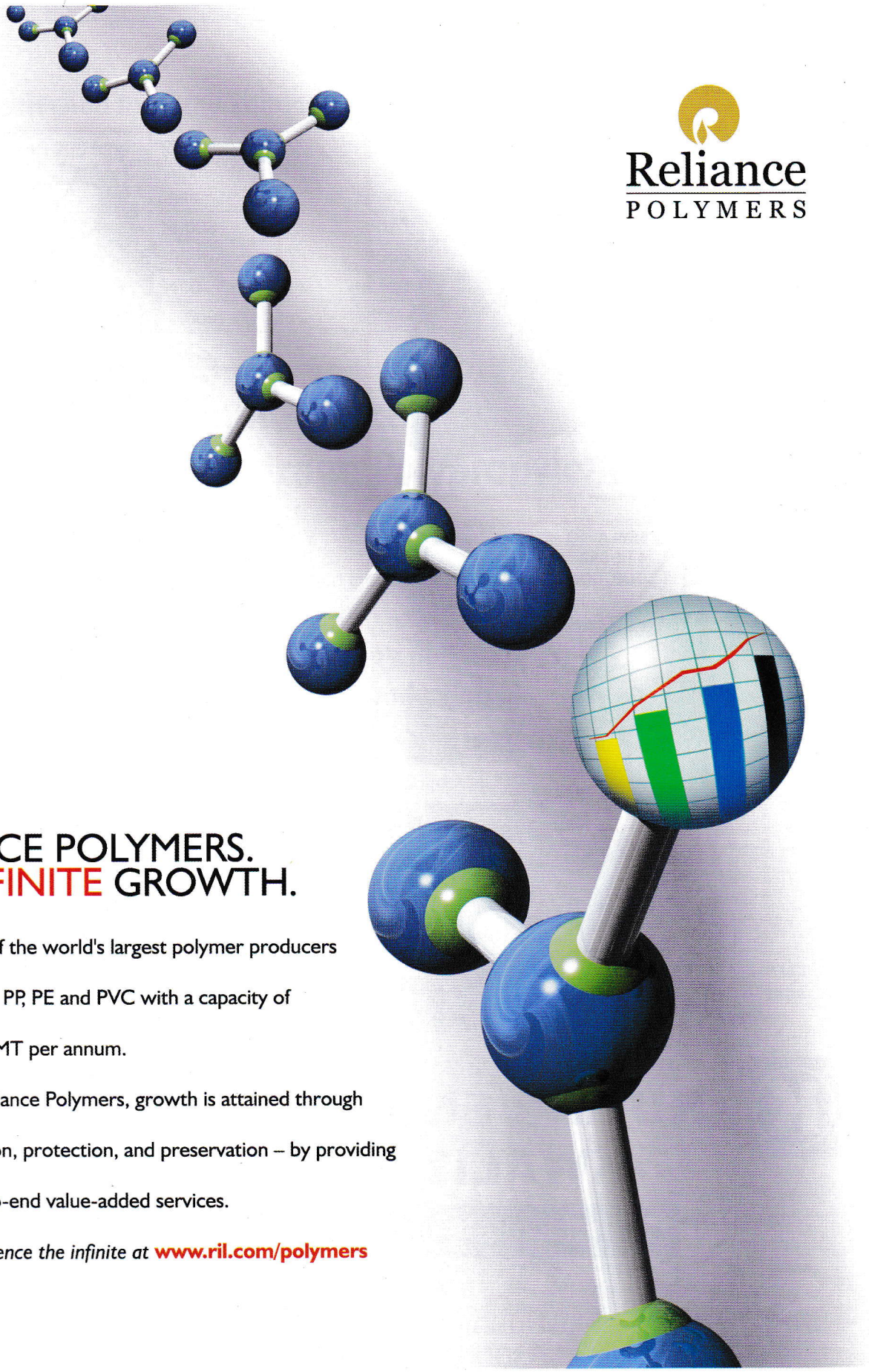

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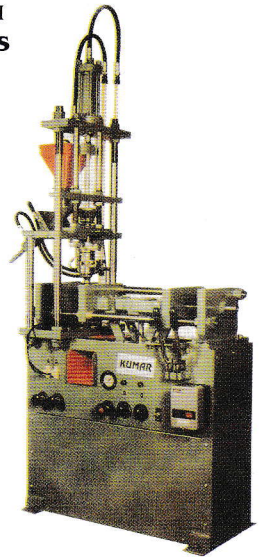
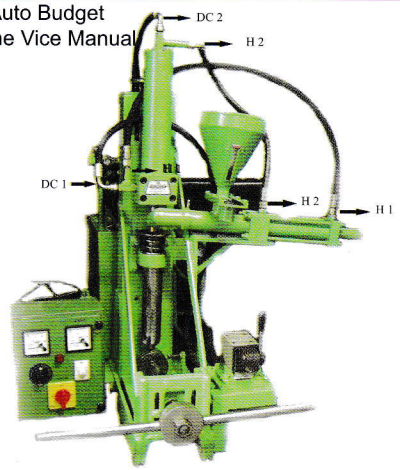
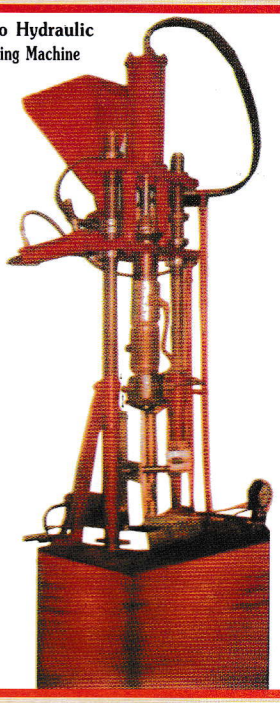


Semi Auto Budget
Machine Vice Manual



SEMI AUTO
4 TIE BAR
INJECTION MOULDING MACHINE

Semi Auto Hydraulic
Blow Moulding Machine



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Japanese injection machine shipments

Year	Less than 200 tons, units	200 tons or more	Total shipments units	% of previous year	Domestic production, units	% of previous year	Export production, units	% of previous year
2008	10,286	3722	14,008	80%	5073	84%	8935	78%
2009	4438	1617	6055	43%	1956	39%	4099	46%
2010	6300	2100	8400	139%	2500	128%	5900	144%
2011	7900	2600	10,500	125%	3000	120%	7500	127%

LyondellBasell Expands Process and Product Performance of Spherizone Polypropylene Technology Plant in Italy

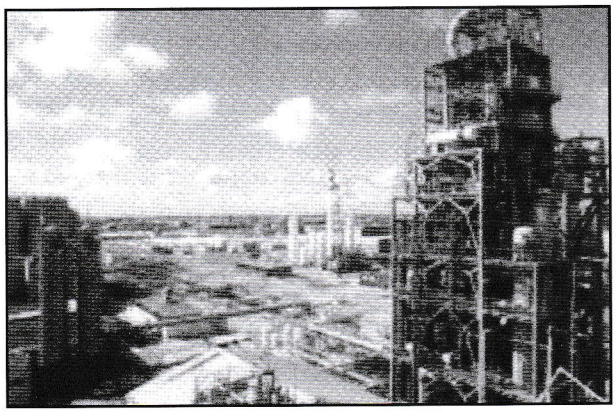
With growing customer requirements for high-performance, specialty polypropylene (PP) products, LyondellBasell announced today that it plans to extend production and technology capabilities at its Spherizone PP process technology plant in Brindisi, Italy.

Scheduled for completion in 2012, an upgraded process design and capacity expansion will include the use of additional co-monomers such as hexene to manufacture products with the properties required by pipe, sophisticated film and healthcare applications. Plant capacity is expected to be increased by 50 KT, extending total capacity to 235 KT per year.

According to Anton de Vries, LyondellBasell's senior vice president, Olefins and Polyolefins, Europe, Asia and International, "This project will enable LyondellBasell to better support the growing demand for higher-value, specialty PP grades."

Next generation in specialty PP production

LyondellBasell's Spherizone process manufactures PP with selectively adjusted, multi-modal molecular weight distribution through the use of a multizone reactor. "The Spherizone technology is the industry-leading process for the production of high-quality, high-performance PP resins," said de Vries. "Based on this success, we believe this upgraded process design represents the next generation in specialty PP production."



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For pipe, the new grades should offer improved expanded creep characteristics and excellent processability compared to current grades. In specialty film and injection-molded applications, the products should address customer needs for improved toughness, flexibility and higher melt strength.

"This performance can help converters reduce wall-thickness, which can reduce raw material and energy costs as well as waste, ultimately reducing environmental impact," said Paul Turner, LyondellBasell's vice president, polypropylene, Europe.

Source : Plastics News

Stronger, lighter, cheaper ... naturally

Design engineers have an expanding suite of natural fibers available for compounding into base resins. These not only "green up" products due to their renewable nature, but also can lower weight and boost physical properties, often at a lower coast than inorganic alternatives.

In a series of papers given at the society of plastics Engineers (SPE) Global Plastics Environmental Conference (GPEC) held earlier this year in Orlando, presenters promoted everything from corn cobs and wheat straw to sunflower hulls as functional fillers that not only displace petroleum or natural-gas-based plastics, but can also increase a compound's performance.

A paper by Michael Fuqua, Venkata chevali, and chad Ulven of North Dakota State University (Fargo, ND) detailed how corn cobs mixed into recycled high-density polyethylene (HDPE) Yielded improvements in thermal stability and mold tolerances. The paper also showed how the addition of chemical compartibilizers to aid bonding between the resin and the natural filler resulted in "significant" improvements in mechanical properties. The research led the team to conclude that corn-cob-filled recycled HDPE has some strong advantages over neat polymers or traditionally filled compounds.

Key to the compounds is the fact that biomass derived from natural fibers features what the researches call a "backbone" of crystalline straight-chain polymer cellulose. In contrast, biomass's other components, including hemicel-lulose, starch, lignin, and protein represent amorphous polymers that have less inherent strength than cellulose.

They researchers concluded that because of the chemical structure, the development of the chemical structure, the development of functional lignocellu-losic fillers would require high-cellulose-content biomass.

Hydrophobic polymer meets hydrophillc biomass

To create a robust compound, the NDSU researchers also had to overcome the fact that HDPE is inherently hydrophobic while biomass is hydrophilic. They found that maleic anhydride grafted polyethylene (MAPE) could act as a surface modifier of biomass fillers to help join the fillers and the HDPE in a robust matrix. MAPE essentially acted as a compatibilizer, interacting with the cellulose polymer chains that make up the backbone of lignocelluloisc biomass.

As part of their research, the NDSU team created samples loaded 20% by weight with the corn-cob filler, in addition to the MAPE. That was melt-blended with HDPE in a Leistritz co-ratating twin-screw extruder. Team members concluded that because of the inherent polarity differences between lignocellulosic fibers and HDPE, interfacial bonding is required or there would be limited chemical interaction and surface voids could form.

Sunflower power

Jeremy Dworshak, a material engineer at custom molder Steinwall Inc. (coon Rapids, MN), delivered a paper on his company's work with NDSU and John Deere to create a biocomposite mixing sunflower hull fibers with polypropylene (PP). In developing the compound, plaques were molded for use in standardized mechanical and physical testing, along with the production of components for full-scale testing.

John Deere wanted lower overall cost and improved properties for the part, a handle with two insert-molded screw threads, which had been molded of an unreinforced copolymer PP supplied by Matrixx Group Inc. Sunflower hull fibers were chosen on the basis of cellulose content and cost (see table), with around 45% cellulose: better than corn cobs (40%) but below flax fibers (70%).

The researchers concluded that these biocomposites could be processed at approximately the same parameters as the neat polymer. Moisture absorption did increase with the addition of fibers, and for the highest peak load in tensile pullout, a grade compatibilized with maleic anhydride did best.

Source : Plastics News

Air bubbles in injection moulding

In the field of injection moulded components in glass fibre reinforced PA 66 without the addition of self-extinguishing additives, some plastics converters have noted the appearance of swelling near the gate, after thermal drying and coating. This article analyzes the causes giving rise to this defect.

* * *

First of all, a distinction has to be made between surface blisters of variable size, voids, and detachment within the thickness of the product wall. In the case discussed here, the defect consists of a detachment of the layers of material, and it appears only around the gate. These are factors that enable most of the causes for surface swelling to be excluded.

A swelling restricted to the coating surface and located at different points could be due to problems regarding the coating operation, and/or to reduced adherence, and the compatibility between the surface and the primer or coating. Randomly-distributed internal bubbles can be caused by air trapped during the injection process, while internal voids in the vicinity of points with highest wall thicknesses may depend on insufficient compaction.

When the product includes metal inserts, as in the case of electric plugs, the material flow may terminate before the displaced air has been completely expelled, and in this case the air remains trapped. Some relatively unstable additives, such as self-extinguishing compounds, can deteriorate easily, generating high-temperature liquid or gaseous compounds which, in the case of gas formation, may spread through the molten plastic, giving rise to bubbles distributed randomly throughout the part.

In the case that we are considering here, the blister does not have a regular surface conformation, and it is always situated near the gate. It could be described as a detachment of one surface from another, rather than entrapped air or gas.

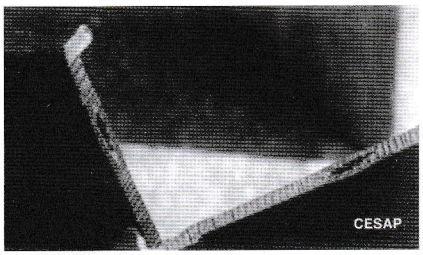
* * *

The detachment between the two surfaces that generates an internal blister is probably due to the material deteriorating as a result of a small amount of material near the gate having remained at a high temperature for a prolonged time. The processes of deterioration are also caused by excessive shear forces, which often occur near the gate when speed profiles are not correct and cause non-uniform temperatures in the molten plastic.

Material deterioration takes the form of layers of molten plastic with different characteristics within the part thickness. During the injection phase, excessive shear forces occur near the gate and on the outer layers, which are exposed to high strain. Later, when the part has cooled throughout the wall thickness, areas of stress still remain present, locked into the material, which does not show any signs of detachment or swelling.

Subsequent thermal treatments, such as kiln drying after coating, induce the releases of strain within the material, which therefore affects the inner layers, causing detachment and blistering.

Therefore, in conclusion, we can say that the blister (or the detachment of the two surfaces) is probably due to the process factors involved in real moulding conditions (as opposed to the theoretical conditions determined during process design) which cause deterioration. In addition, it is advisable to use speed profiles that reduce internal strain near the gate as much as possible. Likewise, a careful monitoring of uniform melt temperature is recommended.



Source : Macplas International

MONTHLY CIRCULAR OF THE FEDERATION

CIRCULAR NO. 37/2011 :

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 BHARAT KUMAR SUNDARLAL THAKKAR** 8/1, Rupchand Roy Street Kolkata - 700 007
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c)	Proposed by	:	M/s Rajda Sales (Cal) Pvt. Ltd.
d)	Seconded by	:	M/s Stretch Plast
e)	Name of representatives	:	1) Mr. Rishi Bharat Ondhia (Thakkar) 2) Mr. Bharat Kr. Ondhia (Thakkar)
f)	Items dealt in	:	Dealer of Chemicals

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

CIRCULAR NO. 38/2011 :

Sub: Consumer Price Index Number for Industrial Workers for Kolkata for the months of January to November 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
November, 2010	906	4294

CIRCULAR NO. 39/2011

MINISTRY OF ENVIRONMENT AND FORESTS

NOTIFICATION

New Delhi, the 4th February, 2011

S.O. 249(E).— Whereas the draft rules, namely, the Plastics (Manufacture, Usage and Waste Management) Rules, 2009 were published by the Government of India in the Ministry of Environment and Forests vide number S.O. 2400(E), dated the 17th September, 2009 in the Gazette of India, Extraordinary of the same date inviting objections and suggestions from all persons likely to be affected thereby, before the expiry of a period of sixty days from the date on which copies of the Gazette containing the said notification were made available to the public;

AND WHEREAS copies of the said Gazette were made available to the public on the 17th day of September, 2009;

AND WHEREAS the objections and suggestions received within the said period from the public in respect of the said draft rules have been duly considered by the Central Government.

NOW, THEREFORE, in exercise of the powers conferred by sections 3, 6, and 25 of the Environment (Protection) Act, 1986 (29 of 1986), and in supersession of the Recycled Plastics Manufacture and Usage Rules, 1999, except as respects things done or omitted to be done before such supersession, the Central Government hereby makes the following Rules, namely:-

1. Short title and commencement .-

(1) These rules may be called the Plastic Waste (Management and Handling) Rules, 2011.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. Application.-

The provisions of rules 5 and 8 shall not apply to the manufacture of carry bags exclusively for export purposes, by export oriented manufacturing units, against an order for export received by the owner or occupier of the concerned manufacturing unit. This exemption does not apply to any surplus or rejects, left over and the like.

400 GI/2011—3

3. **Definitions.**- In these rules, unless the context otherwise requires .-

(a) **"Act"** means the Environment (Protection) Act, 1986 (29 of 1986);

(b) **"Carry bags"** mean all plastic bags used to carry commodities, including self carrying features;

(c) **"Commodities"** mean articles; including but not limited to vegetables, fruits, pharmaceuticals, food grains and the like;

(d) **"Compostable plastics"** mean plastic that undergoes degradation by biological processes during composting to yield CO_2, water, inorganic compounds and biomass at a rate consistent with other known compostable materials and does not leave visible, distinguishable or toxic residue;

(e) **"Consent"** means the consent to establish and operate from the concerned State Pollution Control Board or Pollution Control Committee granted under the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974), and the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981);

(f) **"Disintegration"** means the physical breakdown of a material into very small fragments;

(g) **"Extended producer's responsibility (EPR)"** means the responsibility of a producer or manufacturer of plastic carry bags and multilayered plastic pouches or packages for the environmentally sound management of the product until the end of its life. This responsibility also applies to all manufactures using such packaging;

(h) **"Food-stuffs"** mean ready to eat food products, fast food, processed or cooked food in liquid, powder, solid or semi-solid form;

(i) **"Manufacturer"** means any producer who manufactures plastic carry bags, multilayered packaging, pouches and the like or uses such materials in packaging of a product;

(j) **"Municipal authority"** means Municipal Corporation, Municipality, Nagar Palika, Nagar Nigam, Nagar Panchayat, Municipal Council including notified area committee (NAC) or any other local body constituted under the relevant statutes and, where the management and handling of municipal solid waste is entrusted to such agency;

(k) **"Multilayered plastics"** mean any material having a combination of more than one layer of packaging material such as paper, paper board, polymeric materials, metalised layers or aluminium foil, either in the form of a laminate or co-extruded structure;

(l) **"Plastic"** means material which contains as an essential ingredient a high polymer and which at some stage in its processing into finished products can be shaped by flow;

(m)**"Plastic waste"** means any plastic product such as carry bags, pouches or multilayered packaging, which have been discarded after use or after their intended life is over;

(n) **"Registration"** means registration of units manufacturing or recycling carry bags made of virgin or recycled plastics with the concerned State Pollution Control Board or Pollution Control Committee, as the case may be;

(o) **"Virgin plastic"** means plastic material which has not been subjected to use earlier and has also not been blended with scrap or waste;

(p) **"Waste management"** means the scientific reduction, re-use, recovery, recycling, composting or disposal of plastic waste;

(q) **"Waste pickers"** mean individuals or groups of individuals engaged in the collection of plastic waste.

4. Prescribed Authority.-

The prescribed Authority means the Authority-

(a) for enforcement of the provisions of these rules related to authorization, manufacture, recycling and disposal shall be State Pollution Control Board and Pollution Control Committee in respect of Union territory;

(b) for enforcement of the provisions of these rules relating to the use, collection, segregation, transportation and disposal of post consumer plastic waste shall be the concerned municipal authority.

5. **Conditions.**- During the course of manufacture, stocking, distribution, sale and use of carry bags and sachets, the following conditions shall be fulfilled, namely:-

(a) carry bags shall either be white or made using only those pigments and colourants which are in conformity with Indian Standard : IS 9833:1981 titled as List of pigments and colourants for use in plastics in contact with foodstuffs, pharmaceuticals and drinking water, as amended from time to time;

(b) no person shall use carry bags made of recycled plastics or compostable plastics for storing, carrying, dispensing or packaging food stuffs;

(c) no person shall manufacture, stock, distribute or sell any carry bag made of virgin or recycled or compostable plastic, which is less than 40 microns in thickness;

(d) sachets using plastic material shall not be used for storing, packing or selling gutkha, tobacco and pan masala;

(e) recycled carry bags shall conform to the Indian Standard: IS 14534:1998 titled as Guidelines for Recycling of Plastics, as amended from time to time;

(f) carry bags made from compostable plastics shall conform to the Indian Standard: IS/ISO 17088:2008 titled as Specifications for Compostable Plastics, as amended from time to time.

6. **Plastic Waste Management.-**

The plastic waste management shall be as under:-

(a) recycling, recovery or disposal of plastic waste shall be carried out as per the rules, regulations and standards stipulated by the Central Government from time to time;

(b) recycling of plastics shall be carried out in accordance with the Indian Standard : IS 14534:1998 titled as Guidelines for Recycling of Plastics, as amended from time to time;

(c) the municipal authority shall be responsible for setting up, operationalisation and co-ordination of the waste management system and for performing the associated functions, namely:- (i) to ensure safe collection, storage, segregation, transportation, processing and disposal of plastic waste; (ii) to ensure that no damage is caused to

the environment during this process; (iii) to ensure setting up of collection centres for plastic waste involving manufacturers; (iv) to ensure its channelisation to recyclers; (v) to create awareness among all stakeholders about their responsibilities; (vi) to engage agencies or groups working in waste management including waste pickers, and (vii) to ensure that open burning of plastic waste is not permitted;

(d) for setting up plastic waste collection centres, the municipal authority may ask the manufacturers, either collectively or individually in line with the principle of Extended Producer's Responsibility (EPR) to provide the required finance to establish such collection centre;

(e) recyclers shall ensure that recycling facilities are in accordance with the Indian Standard: IS 14534:1998 titled as Guidelines for Recycling of Plastics and in compliance with the rules under the Environment (Protection) Act, 1986, as amended from time to time;

(f) the concerned municipal authority shall ensure that the residues generated from recycling processes are disposed of in compliance with Schedule II (Management of Municipal Solid Wastes) and Schedule III (Specifications for Landfill Sites) of the Municipal Solid Wastes (Management and Handling) Rules, 2000 made under the Environment (Protection) Act, 1986, as amended from time to time;

(g) the municipal authority shall incorporate the said rules in the Municipal bye laws of all the Urban Local Bodies;

(h) the municipal authority shall encourage the use of plastic waste by adopting suitable technology such as in road construction, co-incineration etc. The municipal authority or the operator intending to use such technology shall ensure the compliance with the prescribed standards including pollution norms prescribed by the competent authority in this regard.

7. **Protocols for Compostable Plastic Materials.** - Determination of the degree of degradability and degree of disintegration of plastic material shall be as per the protocols of the Indian Standards listed in the Annexure to these rules.

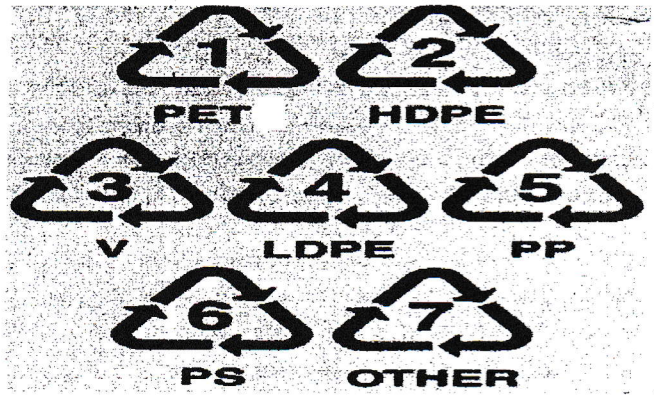
8. Marking or Labelling.-

(a) each plastic carry bag and multilayered packaging shall have the following information printed in English or in local language, namely:-

(i) name, registration number of the manufacturer and thickness in case of carry bag;

(ii) name and registration number of the manufacturer in case of multilayered packaging.

(b) each recycled carry bag shall bear a label or a mark "recycled" as shown below and shall conform to the Indian Standard: IS 14534: 1998 titled as Guidelines for Recycling of Plastics, as amended from time to time;



NOTE: PET-Polyethylene terephthalate, HDPE-High density polyethylene, V-Vinyl (PVC), LDPE- Low density polyethylene, PP-Polypropylene, PS-Polystyrene and Other means all other resins and multi-materials like ABS (Acrylonitrile butadiene styrene), PPO (Polyphenylene oxide), PC (Polycarbonate), PBT (Polybutylene terephalate) etc.

(c) each carry bag made from compostable plastics shall bear a label "compostable" and shall conform to the Indian Standard : IS/ISO 17088:2008 titled as Specifications for Compostable Plastics;

(d) retailers shall ensure that plastic carry bags and multilayered packaging sold by them are properly labelled, as per stipulations under these rules.

9. Registration of Manufacturers and Recyclers.-

(a) any person manufacturing or proposing to manufacture carry bags and multilayered plastics shall apply to the State Pollution Control Board (SPCB) or Pollution Control Committee (PCC) of the Union territory concerned for the grant of registration or for the renewal of registration for the manufacturing unit using Form 1 appended to these rules;

(b) any person recycling or proposing to recycle carry bags or multilayered plastics or any plastic waste shall apply to the SPCB or PCC for grant of registration or renewal of registration for the recycling unit using Form 2 appended to these rules;

(c) no person shall manufacture carry bags or recycle plastic bags or multilayered plastics unless without obtaining the registration certificate from the SPCB or PCC, as the case may be, prior to the commencement of production;

(d) the SPCB and PCC shall not issue or renew a registration for manufacturing or recycling units unless the unit possesses a valid consent under the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974) and the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981) and certificate of registration issued by the District Industries Centre or any other government agency authorised in this regard;

(e) every State Pollution Control Board or Pollution Control Committee shall take a decision on the grant of registration within ninety days of receipt of an application that is complete in all respects;

(f) the registration granted under this rule shall be valid for a period of three years, unless revoked, suspended or cancelled; and registration shall not be revoked, suspended or cancelled without providing the manufacturer an opportunity for a hearing;

(g) every application for renewal of registration shall be made at least ninety days before the expiry of the validity of the registration certificate.

10. Explicit pricing of carry bags.-

No carry bags shall be made available free of cost by retailers to consumers. The concerned municipal authority may by notification determine the minimum price for carry bags depending upon their quality and size which covers their material and waste management costs in order to encourage their re-use so as to minimize plastic waste generation.

11. State Level Advisory Body.-

(1) There shall be a State Level Advisory Body to monitor the implementation of these Rules.

(2) The State Level Advisory Body shall consist of the following persons, namely:-

(a) the Secretary, Department of Urban Development	- Chairman
(b) one expert from State Department of Environment	- Member
(c) one expert from State Pollution Control Board or Pollution Control Committee	- Member
(d) one expert from Urban Local Body	- Member
(e) one expert from Non-Governmental Organisation	- Member
(f) one expert from the field of Industry	- Member and
(g) one expert from the field of academic institution	- Member

(3) The State Level Advisory Body shall meet at least once in a year and may invite experts, if it considers necessary.

12. Annual Reports.-

(1) each State Pollution Control Board or Pollution Control Committee shall prepare and submit the annual report to the Central Pollution Control Board on the implementation of these rules by the 30th day of September of each year;

(2) the Central Pollution Control Board shall prepare a consolidated annual report on the use and management of plastic waste and forward it to the central government along with its recommendations before the 30th day of December each year.

[F. No. 17-2/2001-HSMD]

RAJIV GAUBA, Jt. Secy.

ANNEXURE

[See rule 7]

1.	IS/ISO 14851: 1999 Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium-Method by measuring the oxygen demand in a closed Respirometer
2.	IS/ISO 14852: 1999 Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium-Method by analysis of evolved carbon dioxide
3.	IS/ISO 14853: 2005 Plastics- Determination of the ultimate anaerobic biodegradation of plastic materials in an aqueous system-Method by measurement of biogas production
4.	IS/ISO 14855-1: 2005 Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions-Method by analysis of evolved carbon dioxide (Part-1 General method)
5.	IS/ISO 14855-2: 2007 Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions-Method by analysis of evolved carbon dioxide (Part-2: Gravimetric measurement of carbon dioxide evolved in a laboratory- scale test)
6.	IS/ISO 15985: 2004 Plastics- Determination of the ultimate anaerobic biodegradation and disintegration under high-solids anaerobic digestion conditions- Methods by analysis of released biogas
7.	IS/ISO 16929: 2002 Plastics- Determination of degree of disintegration of plastic materials under defined composting conditions in a pilot - scale test
8.	IS/ISO 17556: 2003 Plastics- Determination of ultimate aerobic biodegradability in soil by measuring the oxygen demand in a Respirometer or the amount of carbon dioxide evolved
9.	IS/ISO 20200:2004 Plastics- Determination of degree of disintegration of plastic materials under simulated composting conditions in a laboratory - scale test

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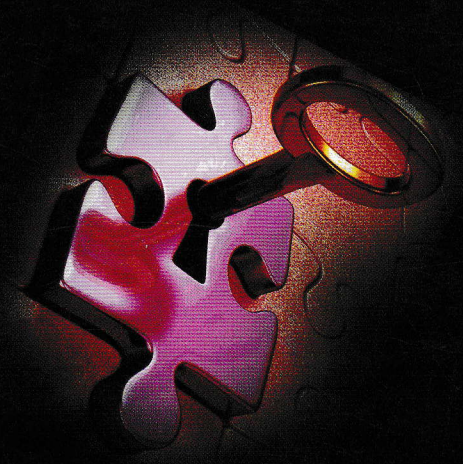

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