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OCTOBER 2010

PLASTICS INDIA

AN OFFICIAL ORGAN OF INDIAN PLASTICS FEDERATION

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Editorial

Dear Members,

I am extremely grateful to all the members who have given me this opportunity to present the monthly issue of the upcoming year, once again. Therefore, today I would like to talk about the Commonwealth Games, the most talked about event.

Known as Delhi's famous Asiad village, this place once again hit the news with the preparations for the CWG 2010. It was in 1982 during the Asian Games that the village was set up for the athletes to stay and practice there and now in 2010, it has been recreated for the XIX Commonwealth Games. After having faced the axe of criticism, the Games village is now bustling with activities. Despite of receiving several sarcastic comments from various critics, the Commonwealth Games Village has finally received a positive certificate from the CWG chief himself. The Games Village is spread over an area of 63.5 hectares and has dedicated areas for residential complexes, dining halls, training area for the athletes and swimming pools. The village so far, has got positive feedback from the athletes and other dignitaries as top class facilities are being provided to them. Despite their hectic training sessions, the athletes are coming out in the village to rejuvenate in the special international zone which is a housing facilities like cafes, merchandise stores, restaurants, discotheques, games parlors and bars.

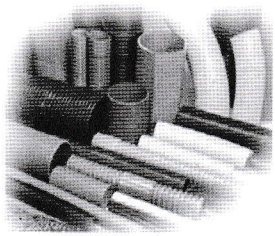
The initial total budget estimated by Indian Olympic Association in 2003 for hosting the Games was ₹ 1,620 crore but after escalation official total budget estimation in 2010 became ₹ 11,494 crore, which excludes non-sports-related infrastructure development in the city such as airports, city beautification and roads. Business Today magazine estimated that the Games cost Rs 300 billion. The 2010 Commonwealth Games are the most expensive Commonwealth Games ever. In preparation for an influx of English-speaking tourists for the Games, the Delhi government is implementing a program to teach English, and the necessary skills for serving tourists, to key workers–such as cab drivers, security workers, waiters, porters, and service staff. In the two years prior to the Games 2,000 drivers were taught English.

The CWG 2010 will prove to be a great source of income for a developing country like India. It will help in the development of tourism industry , world-wide t.v., exposure and many more. It will bring in more investment opportunities from world outside.

The village is in full swing with top-notch facilities for the foreign athletes and it is expected that they will have a great time staying in the village during the ongoing Commonwealth Games which will close on October 14, 2010.

Yours truly

Pradip Nayyar
Editor



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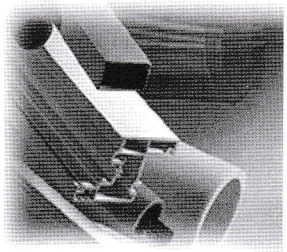
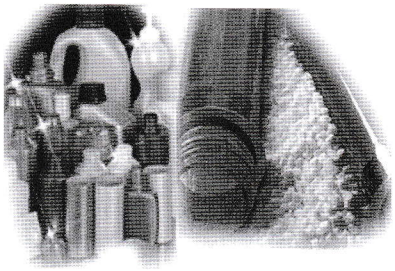
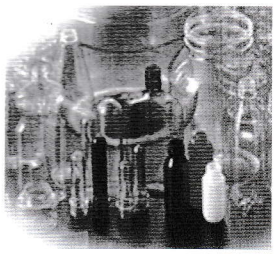
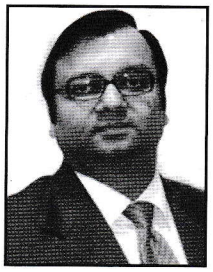






PRESIDENTIAL ADDRESS



Dear Members,

The 51st Annual General Meeting of the Federation concluded on 22nd September 2010 when most of the members of our team were re-elected to their respective categories. I would like to take this opportunity of conveying my sincere thanks to all members of our Federation for reposing their confidence in me and my team.

In the morning session, before the AGM, we had a Seminar on "**INNOVATIONS IN PLASTICS PROCESSING**", where Shri Ashok Goel, President of Plastindia Foundation, was the Chief Guest. The Seminar was well attended and both the papers presented by Speakers from Rajoo Engineers Ltd. and Ferromatik Milacron India Ltd. were well received by the members. Shri Ashok Goel released the **AGM Special Issue 2010** and also a **CD** on Plastic Waste Management titled **"A Step Forward"** .

In this issue, I would like to draw your attention to a new technology that uses plastics for substantially reducing counterfeiting and illegal imitations.

Holograms are commonly used today for a variety of ID and card applications to verify their authenticity. However, because they are only stamped on the surface of a card, their authenticity can be compromised. A new technology uses plastic-based holographic materials to more securely store information. These holographic materials can be directly laminated to a card, injection molded into a part, extruded into film, or cast into a very thin film. Because the materials can be processed in plastic, this new technology could serve as a next generation platform for a variety of ID badges or cards, including Driver's licences and passports, Employee badges, Credit cards, Identity cards for health insurance and secure access. Ensuring the security of bank cards and different forms of ID by this technology will provide a true step change in the level of security, making it virtually impossible to steal a person's identity or tamper with their cards in any way. Another unique aspect is that they are injection-moldable and can be shaped. Hence potential applications of this technology could be expanded well beyond cards such as to verify the authenticity of a variety of products like laptop computers, cell phones and other electronic devices, sunglasses and other consumer goods. Fingerprinting and biometric scans used today to fast track airport screening, could be accelerated and made more robust by storing these records on the Secure ID card as a high resolution holographic image. Using the entire volume of a plastic material to store holograms gives them a uniquely distinct appearance, which makes it virtually impossible to duplicate. This technology can store multiple holograms in a plastic card that allows for more robust security and personalized features. It is possible to store 3-D images of a person's face, record their fingerprints and even create unique animations within our holographic plastic materials. It is possible to control the visibility of what a person can see on the card. This will enable varying levels of security features that are needed for different applications, thus reducing counterfeiting and illegal imitations.

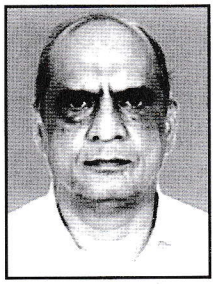
The festive season has already started in India and will first commence in West Bengal very soon. On the occasion of Durga Puja, I convey my heartfelt good wishes to all members of IPF.

Warm Regards.

Sourabh Khemani
President

From the Desk of

The Hony. Secretary



Dear Members,

At the very outset I would like to convey my thanks for reelecting me as Hony. Secretary of the Federation for another term at the recently concluded 51st Annual General Meeting held on 22nd September 2010 at the Indian Chamber of Commerce Auditorium, Kolkata.

Prior to the AGM a Seminar on "INNOVATIONS IN PLASTICS PROCESSING" was held at the same venue. The Seminar was jointly sponsored by M/s Rajoo Engineers Ltd. and M/s Ferromatik Milacron India Ltd. The speakers in the Seminar were Mr. Sunil Jain, President M/s Rajoo Engineers Ltd. who spoke on "Recent Developments in Extrusion Technology" and Shri Pradip Vanwani, Manager – Design & Development – M/s Ferromatik Milacron India Ltd. who spoke on "Injection Moulding Machine for PVC Pipe Fittings". The presentations made by the speakers were very informative and members appreciated their presentations. The Seminar was well attended and was a great success.

Launch Function of BANGLAPLAST 2011 was held at Hotel Hindusthan International, Kolkata on 30/09/2010. Dr. Omar Faruque, 1st Secretary Commercial, Bangladesh Dy. High Commission graced the occasion as Chief Guest. A few dignitaries from the Bangladesh Dy. High Commission also attended the launch function. The launch function was well attended with around 250 participants. IPF has extended its full support to this exhibition that will be held at Dacca in April, 2011. The main organizers of this exhibition is KMG Business Technology, Ahmedabad.

The festive season is round the corner and I offer my heartfelt good wishes to all members and their families for a Happy Durga Puja and Diwali. May the festive season be one of joy for all of you.

With best wishes,

Ramawatar Poddar
Hony. Secretary

LIST OF OFFICE-BEARERS & MEMBERS OF THE EXECUTIVE COMMITTEE OF THE FEDERATION FOR THE YEAR 2010-2011

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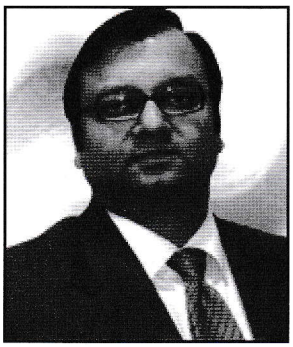
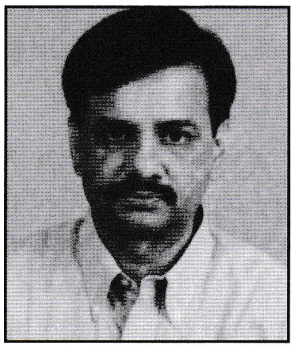
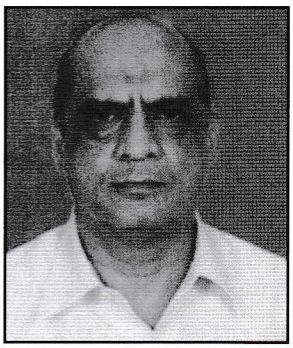


SOURABH KHEMANI
President



RAJESH MOHTA
Vice - President



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RAMESH KR. RATERIA
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ASHOK JAJODIA
Hony. Treasurer

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Shri Vijay Kr. Gupta (Nigainia)	:	M/s Ganapati Laminators & Packagers Pvt. Ltd.

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Shri Pankaj Sinha	-	M/s Dhunseri Petrochem & Tea Ltd.
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Shri M. Karuppasamy, GM	-	MSME Tool Room (CTR & TC), Kol
Shri N.N. Debnath, Director	-	SISI, Kolkata
Shri G. N. Bhattacharyya, GM	-	NSIC, Kolkata
Shri Alok Ray, Addl. Indl. Adviser	-	Regional Testing Centre (ER)
Shri A. K. Basak, Regional Chairman	-	Plexconcil (ER)

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Technical	:	**Shri Rohan Ghosh**
Finished Products	:	**Shri R. M. Maheshwari**
Woven Sacks	:	**Shri Sunil Agarwal**
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Membership Drive	:	**Shri Dipak Gathani**
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Pipe, Tubes & Profiles	:	**Shri Ashish Agarwal**

Adding Value to Polymers

Dr. Rajeev Basargekar
General Manager – Technical
Reliance Technology Group – Polymers
Reliance Industries Limited

1. Additives bring in a quantum change

The change brought about by additives can be seen from following examples:

- Current world record for pole-vault is much higher than the records some 15 years back. The material of construction of the poles used for pole vault has undergone changes from Bamboo to aluminum pole to carbon fibre epoxy and other reinforced plastics materials. The reinforcement used has led to a quantum increase in performance.
- Automotive interior trims used to fade, not now. Use of light fast pigments as well as UV stabilizers in the compound formulation have led to manufacture of parts passing in the stringent test of light fastness to artificial light.
- Crystal – water white transparent PC headlamps for cars remain water white for many years. The use of UV stabilizers has curtailed the yellowing tendency to keep the lamps water white transparent.
- Nylon gears can have low coefficient of friction. Use of lubricating additives like Molybdenum sulfide or graphite powders have led to reduction in coefficient of friction.
- PP consumed in world was about 47 million metric tons in 2009; all this consumption became possible due to incorporation of key ingredients. One can't think of processing or using PP without antioxidants.
- PVC degrades before melting, yet is melt-processed and ~ 20 % of plastics material used worldwide is PVC. Key ingredients like stabilizers, lubricants and plasticizers have led to pushing up degradation temperatures and / or lowering the melt temperature.
- Out of ~ 85 million metric tons of PE likely to be consumed in 2014, ~ 44 million will be for films. It would not have been possible unless slip and anti-block additives were used.
- Refrigerator doors close automatically when the distance between door and cabinet is low. Use of magnetic filler Barium Ferrite could make it possible.
- In 1976 there were about 11,000 cases of fires of television sets in USA & these reduced to less than 1200 in 1992. Awareness of combustibility of plastics & use of flame retardants have brought in the change.
- PP is a flammable plastics, DOT of India requires flame retardant batteries, yet cases for batteries are prepared with PP compounds. Use of flame retardants has made it possible to attain the desired flammability rating.
- We drink water transported by PVC pipes. Is it safe to drink it ? It is safe to drink with the appropriate choice of non-toxic stabilizers and lubricants.
- The flexible PVC coats on interiors of car can cause "fogging" of wind-shield, can it be avoided. It has been possible by use of non-migrating polymeric plasticizers in PVC formulations.

2. Additives contributing to versatility of plastics and adding value

Plastics are versatile with different characteristics:

- Rigid or Flexible
- Hard or soft
- Transparent or opaque
- Insulating or conducting
- Tough or comparatively brittle
- Flammable or non-flammable...

Additives have a role to impart the characteristics

In value engineering exercises value is defines as: Value = Function / cost

Additives can impart / enhance function and reduce cost

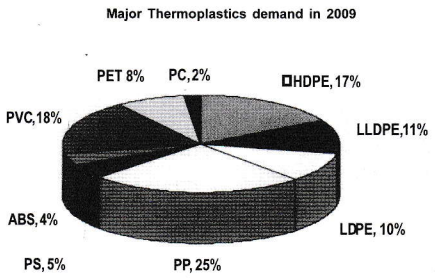
Value for polymers with additives is defined in an article by Mr. J. R. Shah as:

Value = P + 4p ; where P = Polymer and 4p are Protection, Preservation, Processibility and Performance.

By both the definitions additives can be seen to adding value to polymers.

3. Importance of Additive industry

Townsend report has indicated that the global additive industry is worth US $ 32 billion. The demand for major thermoplastics in 2009 as per CMAI report was 176 million metric tons and the break up is indicated in the figure below:



Even if a conservative proportion of 0.1 % of antioxidants in PP is considered the usage of antioxidant in PP alone would be about 44 kilo tons.

4. Types and roles of additives

A variety of additives are used in plastics, their names suggest the role played by them. The major additives in use are:

- Antioxidants
- Light stabilizers
- Metal deactivators
- PVC stabilizers
- Acid scavengers
- Lubricants
- Processing Aids
- Anti-blocking agents
- Slip additives
- Antifogging additive
- Antistatic additives
- Antimicrobials
- Flame retardants
- Blowing agents
- Cross-linking and controlled degradants for polyolefins (perox ides)
- Colourants
- Fluorescent whitening agents
- Fillers & reinforcements
- Coupling agents
- Nucleating and clarifying agents
- Scavengers ..O2, Ethylene.

More additives like additives promoting bio / oxidative degradability are getting added to the family of additives.

Additives have to be added responsibly. The following considerations have to be looked into:

- Why, what, how much, when & how to be added?
- Who is supposed to add?
- Are their any legal restrictions?
  - ..Lead Free PVC formulations
  - ..Phthalate free formulations
  - ..Food contact compliance

Additives added by the polymer manufacturers are limited, have to be known and extra have to be added by the processor. For compounding as well as recycling extra stabilizers have to be added.

Any plastics product becomes successful by meeting the end product requirements and when the product is processed in a cost effective manner.

Additives help to make the product successful by protecting the plastics in service life and during processing, by helping processing of the product & by enhancing the performance of plastics.

5. Protecting plastics in life and in processing

Plastics do not corrode like metals yet they degrade under "enemy action" of

- Heat + oxygen
- Metal ions with variable valancy + oxygen
- UV rays
- Shearing of melt during processing (mechanical action and/or heat) + oxygen

They have to be protected during service life as well as processing by using stabilizers. The major stabilizers used:

- Antioxidants : Primary (Service life) and Secondary (processing)
- Light stabilizers, metal deactivators, flame retardants, acid scavengers etc.

Many antioxidant, UV stabilizers, metal deactivator molecules available under different trade names from multinational and Indian companies.

5.1 Antioxidants

Polymer degradation gets manifested in yellowing, cracking, crazing, powder formation on surface and loss in strength and toughness. Polymer degrades by chain reaction of radical generation, reaction of radicals with oxygen, formation of hydroperoxides, which further generating radicals on chain as well as effecting chain fragmentation. Primary antioxidants generally protect polymers in service life and stabilize the radicals generated & render them inactive. Secondary antioxidants are generally processing stabilizers & react with hydroperoxides to render them ineffective. Hindered phenolic substances are most widely used primary antioxidants whereas phophites are useful as secondary antioxidants. Thioesters are useful as long term heat stabilizers, Hindered amines also form an important class of antioxidants and many of them perform more than one function like long term heat stabilizers, UV stabilizers etc.

The major polymers in which antioxidants are used, the cause of polymer degradation & share of usage of antioxidants are indicated in the table below:

Some important points to be kept in mind while using antioxidants & stabilizers are:

- Polymer manufacturers add antioxidants, sometime UV stabilizers in quantity good enough for one processing cycle.
- Recycling requires additional dosage of antioxidants
- Flame retardants have to be added by processors when required.
- PVC stabilizers are added by compounders and / or processors
- Compounding stage requires additional antioxidants.

Some selected trends in the development of antioxidants are as follows:

- Investigations on for preparing molecules with higher efficiency & also playing dual roles
- Special antioxidants for specific applications.

➢ Ciba projected Irgastab FS533 phenol-free stabilizer package for visbroken PP fibre grades. (2008 Additive conf. Germany)

Polymer	Cause of degradation	Approx % Share
PP	Removal of labile H on tail C atom to generatae redicals & oxygen reaction	40
PE	Shear, labile H at branch point	25
Styrenics	Double bond in rubber in HIPS, and in ABS	15
Engg.resins	Shear induced redicals and oxygen reaction	10
PVC	Double bond generation after dehydrochirination	5
Others	Various mechanisms	5
		100

Antioxidants include phenolics, phosphites, thioesters and others like amines.

- Natural antioxidants for plastic in medical applications

➢ Carotenoids (from carrots), Vitamin E, Curcumin (from turmeric) evaluated for UHMWPE in radiation cross linked hip-joints (2008 Additive conf. Germany)

5.2 Stabilization and Compounding of PVC

For all practical purpose PVC is an amorphous polymer, used in rigid as well as flexible form. Properties depend on formulations. Tg of PVC is ~ 80 deg C, above Tg molecular segmental motions become possible, also the possibility of thermal degradation (by dehydrochlorination) increases.

Unstabilized (especially rigid PVC) degrades before melting.

- For use of PVC in rigid form, degradation temperature pushed above melting temperature by usage of stabilizers (& lubricants)
- For Use of PVC in flexible form Tg as well as actual melting temperature is suppressed using plasticizer and also heat stability ensured by stabilizers.

A PVC compound contains a number of ingredients like Polymer, Stabilizers, Plasticizers, Extenders, Lubricants, Fillers, Pigments, Polymeric processing aids, Impact modifiers. Additionally for foamed structures blowing agents with kickers are also present

PVC stabilizers: • Function by absorption of HCl, reacting at pro-oxidative sites & reacting with hydroperoxides.

- Various types such as Organo-tin, mixed metal, lead and other co stabilizers like epoxidized oils, phosphites etc. used

PVC Plasticizers: Lower melting temperatures, lower Tg, lower rigidity, increase toughness and reduce hardness.

- Phthalates, Phosphates, Adipates, Trimellitates, polymeric plasticizers, chlorinated oils and waxes etc used.

European PVC heat stabilizer manufacturers have made a voluntary commitment, called Vinyl 2010, to reduce use of lead stabilizers 50% by 2010 and be lead-free by 2015. Use of lead stabilizers in the Asia-Pacific region is also expected to decline. The North America uses primarily tin-based stabilizers.

Lubricants: Lubricants are important in PVC, especially in rigid formulations since heat of shearing can lead to degradation.

- Internal lubricants, semi-compatible with PVC, help sliding of chains past each other- metal/organic stearate, steroid, GMS, GM etiolate etc.
- External lubricants: Not compatible with PVC, get squeezed out between metal surfaces & polymer melt to reduce friction & heat - paraffin & PE / PP waxes

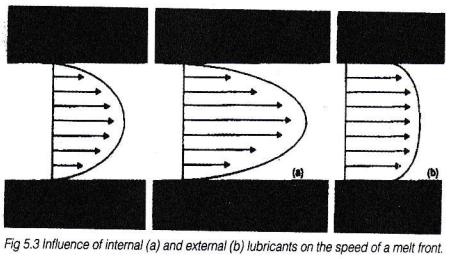


Fig 5.3 Influence of internal (a) and external (b) lubricants on the speed of a melt front.

Elongated velocity profile is indication of pseudoplasticity whereas the plug flow type profile is indication of slippage at walls.

Viscous heat generation = Viscosity X (Shear rate)2

Internal lubricants reduce viscosity to reduce heat generation and external lubricants introduce slip at walls to reduce friction.

Some aspects about PVC stabilization and compounding are:

- PVC can give Rigid to flexible, Hard to soft and opaque to Transparent and heavy to light products.
- For processing of PVC use of stabilizers and lubricants is mandatory (as compared to others)
- Variation in properties achieved through a variety of additives.
- Compounding of PVC is an operation by itself and has to be carried out in tune with end product – starting material for processing - and desired properties in end product.
- Compound can be scientifically evaluated by torque Rheometry and can be fine-tunes as per product and process needs and as per the input resin material.

Stabilizers, lubricants and other PVC additives are produced and / or marketed by companies like Sponsors of the endowment lecture – Jayvee Organics and Fine Organics - are making PVC processing possible in India.

5.3 Additives for PET

- PET bottles is an established market aiming for expansion in application spectrum.
  - Food, non-food, water, sports drinks, carbonated soft drinks, juices & juice drinks...
- Oxygen Barrier requirements met by multi-layer & mono-layer solutions with additives:
  - Combination of "Imperm", Nylon nanocomposite (Nanocor + Mitsubishi aromatic Nylon) for inner layers & BP's "Amsorb" oxygen scavenger

- Constar's "Oxbar" multilayer & "Diamond-Clear" for mono-layer / food contact layer.

- Protection from UV & diffused light:
  - Protection of colour, flavour, fragrance & nutritional value
  - Ciba's "SHELFPLUS UV1100, Milliken's ClearShield UV370 ...

- Flavour & odour control:
  - By acetaldehyde scavengers from ColorMatrix and PolyOne.

6. Additives helping processing of plastics

- Processing aids: These facilitate fast and efficient melt processing; are multi functional which can act as dispersants for fillers, flow promoters etc.

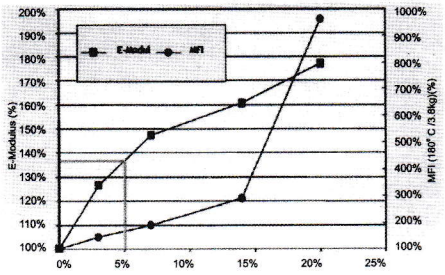
- Lubricants: Apart from PVC are also useful for polyolefins and engineering resins, act as internal or external lubricants depending on relative polarity with polymer.
  - Metal & organic Stearates, amide waxes, PE wax etc.

- Mould Release agents: External lubricants added to polymers can act as internal mould release agents.

- Slip additives: Reduce coefficient of friction by coming on surface- especially of films- are somewhat like external lubricants chemically. Erucamides, Oleamides

- Antiblocks: Prevent blocking of films, giving spacing effect between films ... silica. Combination of slip & antiblocks quite critical for films.

One of the newly introduced processing additives is "Valothene" introduced by PLASSTEKA based on invention of SwissGEL. Valothene is claimed to form mixtures with polyolefins for improved flowability as well as faster crystallization rates.Faster co-crystallization with polyolefins by forming a physical gel-like structure is supposed to be leading to lower cycle times in moulding and higher stiffness. For PE with inherent high impact the additive may be leading to advantages, however for PP the overall effect on impact-stiffness balance needs to be evaluated



and established, since the published data does not talk about toughness.

Increase in modulus and MFI by addition of "Valothene" in HDPE.

7. Additives enhancing the performance of plastics

Additives can modify properties of polymers to enhance the performance

Fillers

- Inert fillers as extenders, altering density, reducing shrinkage, improving hardness & surface quality, increasing heat deflection temperature and reducing cost

- Active fillers–improvements mentioned above + enhancement in strength

- Fillers widely used are CaCO3, dolomite, talc, clays, mica, wollastonite, silica, Barytes (BaSO4), Silicon carbide, MoS2 (Friction reduction), metal powders, ATH (Flame retardant also), C black, graphite powder (lubricating action), glass spheres (silane treated), organic fillers (in fibrous form) like saw dust, alpha cellulose, cotton, jute, sisal. Every filler adds to particular characteristics. For example Baryres can impart X-Ray opacity, talc can add to stiffness etc.

- Fillers added to thermoplastics in masterbatch form or compounds in which processing aids play important role.

Reinforcements

- Increase in tensile, shear & compressive strength, increase in HDT, increase in creep resistance, possibility of increase in toughness.

- Glass carbon, aramid, basalt, ceramic fibres, whickers

- For enhanced functionality proper coupling agent important. For glass fibres various types of silanes extensively used

- Long fibre reinforced plastics require extruders with special screw designs and mould designs.

Colourants

- Pigments for opaque coloration, dyes for transparent.

- Preferred as masterbatches.

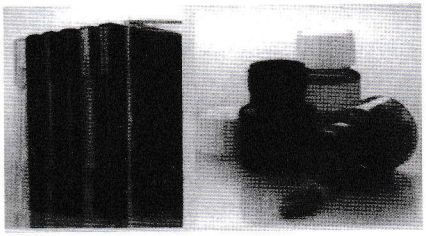
- Technology by itself as far as choice of colourants and making colour concentrates are concerned.

Others

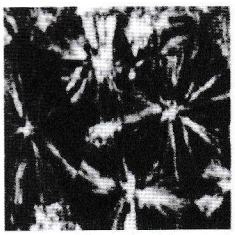
Antistatic agents (like GMS), Impact modifiers, Blowing agents, Optical Whiteners, Antifogging Agents other property modifiers.

Nucleators and Clarifiers

- To impart stiffness & transparency
- To raise the crystallization temperature & reduce cycle time
- Transparent PP has become possible due to clarifiers.
- Milliken, Adeka, Ciba, Rika working to introduce new products



Clarified PP Products



Spherulite sizes with and without clarifier in PP

Scratch resistance additives:

- Gaining importance due to demand of automotive plastics.

- Modified Siloxane based TEGOMER Antiscratch 100 from Evonik & Irgasurf 100 for Ciba claim to enhance scratch resistance

8. Additives for high volume

products

8.1 BOPP

- Globally > 200 BOPP producers in 52 countries with installed capacity of 6000 KTA
- In India currently 7 producers with installed capacity 343 KTA, additional 65KTA in pipeline.

Additive masterbatches recommended for BOPP are as below:

Masterbatches used for Manufacture of various types of BOPP Films

Sr. No.	Masterbatches	Additive content
1	Antiblock Marterbatch	Synthetic silica. inorganic and organic blocking agents
2	Slip Masterbatch	Erucamide, silicone based, high MW silicone based
3	Combined antistat Slip	Silica + Erucamide
4	Antistat masterbatch	GMS type
5	Combined antistat Slip	
6	Pealized Masterbatch	Synthetic CaCO3 - active conc~70%
7	White Masterbatch	TiO2 ~ 55 - 70 %
8	Modifier for Sythetic paper	Highly dispersed filler based on special polymers
9	Various Modifier masterbathches	High conc water clear hydrocarbon resins to impart stifness, reduce shrinkage, improve processability, improvement in barrier properties, twist retenction
10	Antifogg masterbathch	Containing antifogging agents with food contact approval
11	Optical brighteners	To eliminate yellow tinge
12	Processing aid marterbatch	Based on PPA & others to increase the output of satelite extruders used for skin layers

8.2 Raffia Tapes

Raffia tapes a major application for PE and PP

- In India mainly PE-Fertilizers, PP-Cement

Global demand in 2009 as per CMAI report was:

- PE Raffia: 1084 KTA
- PP Raffia: 7342 KTA

Indian Subcontinent demand in 2009 as per CMAI report was:

- PE Raffia ~ 250 KTA
- PP Raffia ~ 500 KTA

Additive masterbatches widely used:

- Antifibrrilating masterbatch for preventing fibrrilation during stretching, imparting white colour for white woven fabric reducing TiO2 demand, used in quantities to optimize cost while meeting end use requirements
- UV masterbatch also used with PP to meet the UV resistance for specified service life

8.3 Plastics Moulded Furniture

Chairs and table moulded from PP are widely used world over. Combinations of PP homopolymer and impact copolymer are used to attain desired characteristics of drop impact and creep resistance. The additives used are:

- Filler masterbatches for weight, stiffness, creep resistance
- Colour masterbatches
- Antistatic agents for comfort

9. Examples of plastics products in which additives play key role:

9.1 Repol MI3535 Compression moulding grade

SCACMI and ALCOVA have introduced high speed compression moulding machines which produce 1000 caps per minute for PET Carbonated soft drink bottles. The caps have to pass stringent product requirements of creep resistance (for gas retention), stiffness, impact strength & printability. The caps also have to pass the acid test of uninterrupted production. The production process involves cutting of molten pellets from extruder by rotary cutter and feeding them in 32 (or more) rotating cavities in which compression moulding gets completed in one rotation. The moulded caps are ejected mechanically with aid of compressed air and fed continuously to a conveyer belt. The process must take place continuously. Apart from choice of proper molecular architecture of PP impact copolymer grade faster surface solidification and smooth and fast ejection are a must and are provided by key additives nucleating agent and slip additive.

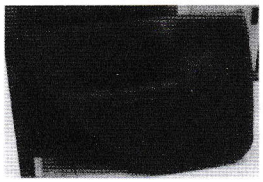
9.2 Active packaging of Bananas in Relene LLDPE films

To resist the over ripening of bananas during transport the bananas can be packed in LLDPE films containing ethylene scavengers which absorb the ethylene produced during ripening since ethylene plays a catalytic role in fruit ripening.

Bananas transported with & without active packaging.

9.3 Wood filled PP

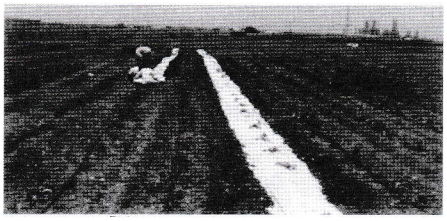
Wood filled PP is used for making extruded profiles as well as producing wood-stock sheets which are further matched mould thermoformed along with vinyl sheet or woven/non woven textile to prepare automobile parts like door-trims, back-panel shelf etc. Proper quality of wood flour, waxes as lubricating / dispersing agents play a key role.



Door trim prepared from wood -PP sheet laminated with fabric.

9.4 Mulch Films

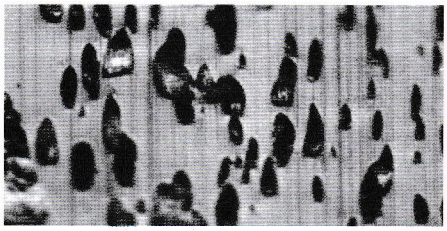
Mulch films are quite useful in agriculture of strawberries, groundnuts etc. Mulch films help in early production, higher yields, improved quality, reduced weed problem and reduced water evaporation. Slip/antiblock additives, UV stabilizers and insect repelling colourants are the important additives used in the film.



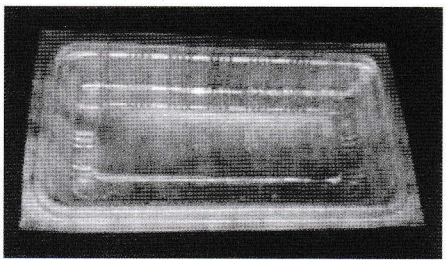
Laying of mulch film.

9.5 Foamed PP

Foamed PP products are relatively new and are in developing stage in India. Foamed PP requires special high melt strength grade of propylene and proper foaming + nucleating agent masterbatches for chemical foaming and CO_2 / Butane for physical blowing.



Cross section of foamed PP sheet



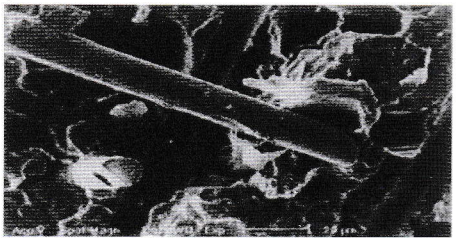
Thermoformed foamed PP product.

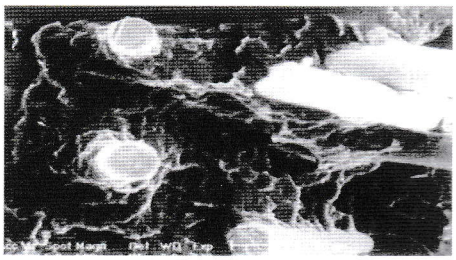
9.6 Glass filled plastics

Glass filled unsaturated polyester, vinyl ester and epoxy are quite popular to prepare FRP products by techniques like hand-lay-up, filament winding, SMC, resin transfer moulding etc. Proper choice of coupling agent can enhance the strength of the composite substantially. For unsaturated polyester and vinyl ester vinyl silane coupled fibres are effective whereas with epoxy aminopropyl silane are effective since these can form chemical bridges between glass and resin during the cross-linking (curing) stage.

In glass filled thermoplastics like Nylon, PBT and PP properly chosen coupling agent can lead to better physical adhesion between glass and the polymer leading to enhancement of strength by 10 to 25 % as compared to composites without coupling agents.

Without coupling agent



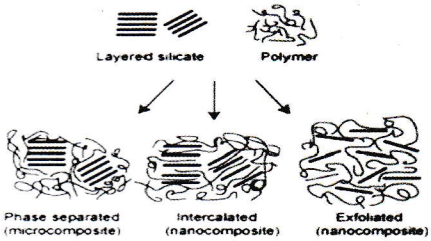


With coupling agent - better adhesion

9.7 Nano-Composites

Nano composites are supposed to be composites with filler dispersed to nanometer size scale and having very low filler content due to the high efficiency of dispersion. Nylon base nanocomposites are successfully used by Toyota and PP based nano composite was reported to be used in a GM vehicle,

For preparation of effective nanocomposite from layered clays, the layers need to be separated, the polymer needs to penetrate in the layers and polymer need to adhere with the filler surface. Thus the coupling agents between filler surface and polymer play a critical role in the success of a nano-composite.



Schematic representation of a nano-composite.

10. Epilogue

Additives have been playing key role in increasing the consumption of plastics and broadening the spectrum of applications of plastics and they play the role by altering material science in the bulk and on the surface of polymers.

Engineers and technologists have been playing with materials and energy to evolve processes and products and many technologies have become possible due to additives.

Polymer manufacturing, compounding and processing industries have been blossoming due to team work with Additives & masterbatch suppliers like:

BASF (with Ciba), Clariant, Great Lakes, Crompton, 3M, BASF, High Polymer Lab, Fine organics, Jayvee Organics, A. L. A. Chemicals, Rohm and Haas, Barlocher, Aryavart, Kaneka Corporation, Plastichemix, Plastiblends, SCJ, SJS, Alok, Rajiv....and many others in the business of additives.

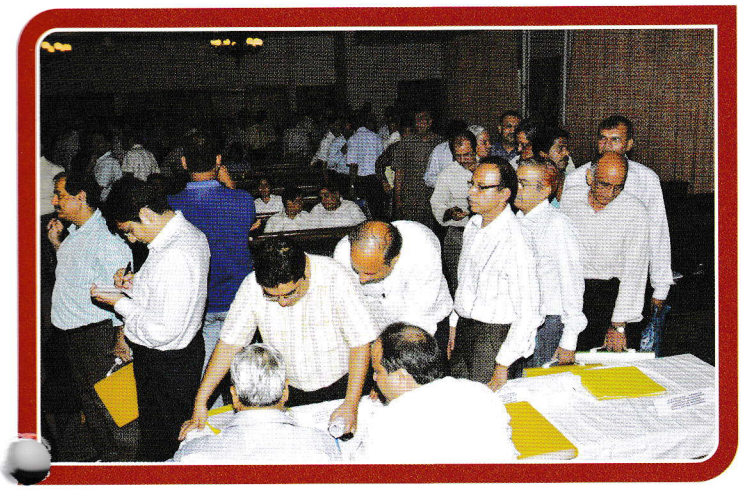
Teamwork of polymer manufacturers, processors and additive suppliers will help to scale greater heights in the field of plastics.

Contd. to Page - 19

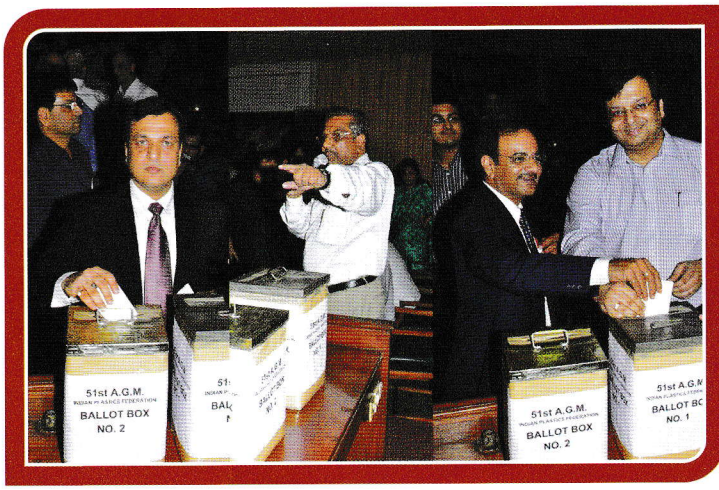
51ST ANNUAL GENERAL MEETING OF IPF HELD ON 22ND SEPTEMBER 2010

A view of the dais

A view of the Audience



Electoral process going on



Votes being cast in the Election

Vote counting in progress

A view of the elected Office-Bearers & Executive Committee members of IPF for the year 2010 - 2011

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- PVC STABILISERS – POWER ADDITIVES (INDIA) PVT. LTD.

FILLER : -

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- STEARIC ACID – SUNSHINE OLEOCHEM LTD.

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Compact Chiller
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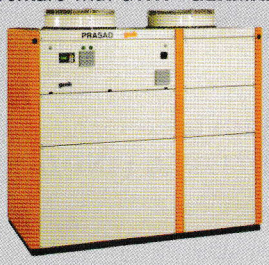

Air Chiller
Direct cooling air
chillers for
blown film plants

Mould Temperature Controller
Oil / Water based
with microprocessor
control

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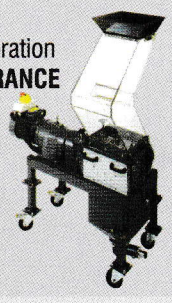
Granulator
Low speed,
Low noise



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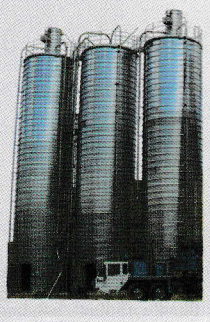
Technical Collaboration
with Ariostea - **ITALY**

Silo
Silo feeding system &
Material handling system
for PVC Resin



Rapid Technical Collaboration
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Polymer Conveyor Belt

WEMO Joint Venture with
Wemo Automation -
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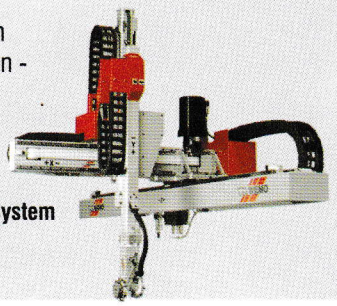
Robot System



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Economy Through Automation

Volume Cost & its importance in Plastic applications:

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What is Volume Cost?

The Volume Cost of a Raw Material input is the purchase cost of a unit volume of the material. It is extremely important to understand the Volume cost of Polymers and its additives as it plays a key role in their selection for a particular application.

Volume cost (Rs./Litre)= Purchase Cost (Rs./Kg.) x Density (Kg./Litre or gm/cc)

Let us examine the Volume costs of the major commodity Polymer families.

One of the first characteristic of a polymer that a designer looks at before specifying it as the material of construction is its price. These vary from time to time, sometimes wildly, but tend to maintain their proportion vis a vis other polymers. Here are the recent prices of the Commodity thermoplastics (Ball park figures for sure, I am not going into specific grades etc.).

While it would look that UPVC is by far the cheapest Polymer, the natural question is that why does it have such limited applications in, say moulded products? Assuming, just for arguments sake that UPVC was as easy to mould as the other Commodity Thermoplastics, why is it not used in such widespread applications like, say, buckets?

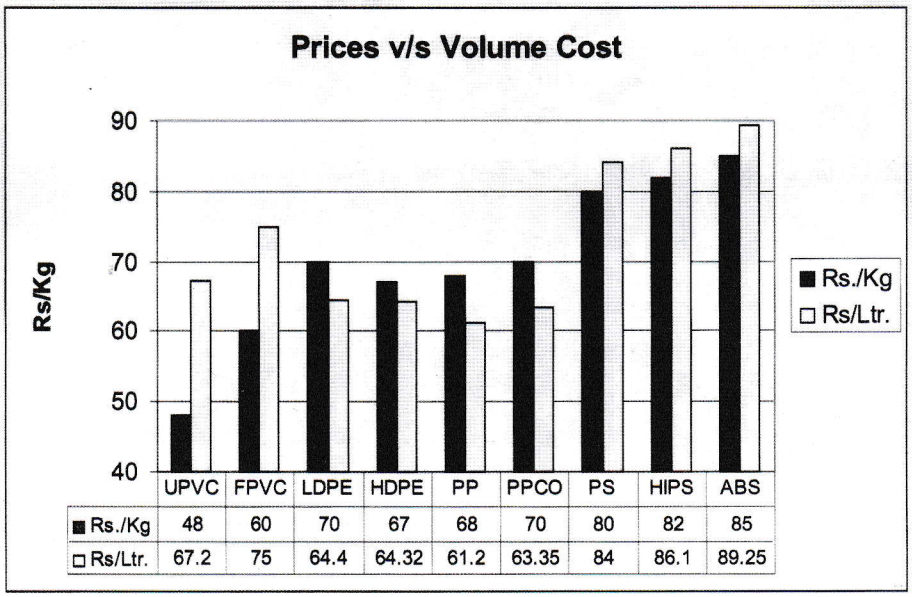
At this point we have to look at one of the very important properties of Polymers, which many a time is overlooked. Fortunately this is not a property which changes with time!

Polymer	Abbr.	Price Rs./Kg
Unplasticised PVC	UPVC	48
Plasticised PVC	FPVC	60
Low Density Polyethylene	LDPE	70
High Density Polyethylene	HDPE	67
Polypropylene Homopolymer	PP	68
Polypropylene Copolymer	PPCO	70
Polystyrene	PS	80
High Impact Polystyrene	HIPS	82
Acrylonitrile Butadiene Styrene	ABS	85

Polymer.	Density Kg/Ltr	Polymer	Density Kg/Ltr
UPVC	1.40	PS	1.05
FPVC	1.25	HIPS	1.05
LDPE	0.92	ABS	1.05
HDPE	0.96		
PP	0.90		
PPCO	0.905		

The Density of a polymer is measured from a fully gelled and fused sample and should not be confused with Bulk Density, which is the apparent density of the granules or powder that the Polymer is sold as and is measured prior to processing. Bulk density has more relevance to rate of flow through hopper throat of the processing machine, tendency to bridge/stick and other handling and storage considerations. Bulk density can change depending on particle size/shape, but Density of a Polymer is constant.

When the volume cost is plotted, a completely different picture appears. Polypropylene now becomes the cheapest



	UPVC	FPVC	LDPE	HDPE	PP	PPCO	PS	HIPS	ABS
■ Rs./Kg	48	60	70	67	68	70	80	82	85
□ Rs/Ltr.	67.2	75	64.4	64.32	61.2	63.35	84	86.1	89.25

As we have taken the example of the household bucket, it is interesting to note that they were first moulded in LDPE in the early 60s. As HDPE became available in the late 60s, its lower volume cost was one of the reasons why there was a whole scale shift by bucket manufacturers to HDPE. Of course the better stiffness and warm water resistance of HDPE were major factors for the shift, but the lower Volume Cost helped.

In the 90s, Polypropylene has also made inroads into the Bucket market, aided no doubt by its lower Volume cost, though its superior clarity, stiffness and temperature resistance were also factors. It is smart marketing which has positioned the clearer and stiffer PP Bucket as a premium product sold at higher prices than its HDPE cousin. As they say, "pricing depends on marketing policy while Costing depends on facts", and the fact is that the volume cost of the higher priced PP Bucket is lower than the HDPE one. That is to say that if PP and HDPE are injected into the same bucket mould volume, lesser amount of PP in Kgs would be required. It is a separate matter that the PP bucket mould would be different with perhaps a thinner wall to cash in on PP's higher rigidity, but the reality of better volume cost remains.

PVC was never in the picture because of its higher Volume cost. If its volume cost had been lower than the Polyolefins, ways and means would have been devised to mould it into buckets!

Perhaps this example is too simplified as there are many factors which have to be considered to select the correct plastic for a specific application, but the point I am getting at is that Volume cost is a less understood but extremely important factor. Factors affecting selection of plastics will be taken up in another article.

On the basis of volume cost I had formulated a directive to our Luggage designers when I was chief of R&D of VIP Industries. The directive was that any new Plastic Component will be designed with PP Copolymer unless the design intent cannot be met by the properties of PPCP. Only then is there a need to look at other higher volume cost polymers.

Importance of Volume Cost to the Plastics formulator

The consideration of volume cost is even more important when Polymers are compounded with additives. The density of the final product can change considerably especially when mineral fillers are added primarily to reduce costs.

Volume cost and its implications are not properly understood by many entrepreneurs, formulators and persons undertaking cost reduction/value engineering. It is vital to understand its implications before embarking on cost reduction exercises.

Plastic finished goods are rarely sold by weight. They are priced either per piece (Mouldings) or per unit length (Pipes, Cables, Tape). Thus the costing and pricing are for fixed Volumes. As the Plastic Raw materials are always purchased per unit weight, the tendency is to do cost calculations on a Per Kilo basis, and the finished product is priced accordingly to the weight per piece.

However, in the marketplace, competitive pressures often force the entrepreneur to offer discounts to protect market share. The discount is normally a percentage of the existing selling price, which, in the majority of cases is the realization on volume basis.

If cost calculations are done on Per Kilo basis, many times the reduction in cost by adding fillers/extenders is calculated as a percentage of original formulation cost. The savings may be translated into a price reduction based on this percentage. After some time the entrepreneur realizes that he is sustaining losses as the reduction in Volume cost was nowhere near the Per kg.cost reduction on which the discounts were based, especially when mineral fillers are the main cost reducing input. All Mineral fillers have a higher density than most plastics.

Rigid PVC Pipes is a prime example. The ease with which Calcium Carbonate can be loaded and processed by modern twin screw extruders has led to mindless loading of fillers in a desperate bid to reduce costs. The pitfalls are many as is illustrated by this example:

Volume Costs of PVC Formulations for PVC Pipes

Ingredient	Price Rs/Kg	Density Kg/Ltr.	0 PHR Filler PHR Kgs.	Cost Rs.	Volume Ltrs.	10 PHR Filler PHR Kgs.	Cost Rs.	Volume Ltrs.	20 PHR Filler PHR Kgs.	Cost Rs.	Volume Ltrs.
PVC Resin K67	48	1.38	100.0	Rs.4,800	72.46	100	Rs.4,800	72.46	100	Rs.4,800	72.46
TBLS	120	7.2	0.8	Rs.96	0.11	0.8	Rs.96	0.11	0.9	Rs.108	0.13
DBLS	140	4.5	0.5	Rs.70	0.11	0.5	Rs.70	0.11	0.6	Rs.84	0.13
Lead Stearate	100	2.1	0.4	Rs.40	0.19	0.4	Rs.40	0.19	0.5	Rs.50	0.24
Ca.Stearate	80	1.1	0.4	Rs.32	0.36	0.4	Rs.32	0.36	0.5	Rs.40	0.45
Filler	10	2.7	0.0	Rs.0	0.00	10	Rs.100	3.70	20	Rs.200	7.41
Lubricant	140	0.95	0.3	Rs.42	0.32	0.3	Rs.42	0.32	0.4	Rs.56	0.42
TiO2	130	5.6	0.6	Rs.78	0.11	0.6	Rs.78	0.11	0.6	Rs.78	0.11
Carbon Black	50	0.98	0.1	Rs.5	0.10	0.1	Rs.5	0.10	0.1	Rs.5	0.10
Totals			**103.1**	**Rs.5,163**	**73.77**	**113.1**	**Rs.5,263**	**77.47**	**123.6**	**Rs.5,421**	**81.45**
Formulation Cost				**Rs.50.08**	**Density**		**Rs.46.53**	**Density**		**Rs.43.86**	**Density**
Volume Costs				**Rs.69.99**	**1.398**		**Rs.67.94**	**1.460**		**Rs.66.55**	**1.517**

Ingredient	Price Rs/Kg	Density Kg/Ltr.	30 PHR Filler PHR Kgs.	Cost Rs.	Volume Ltrs.	40 PHR Filler PHR Kgs.	Cost Rs.	Volume Ltrs.	50 PHR Filler PHR Kgs.	Cost Rs.	Volume Ltrs.
PVC Resin K67	48	1.38	100.0	Rs.4,800	72.46	100	Rs.4,800	72.46	100	Rs.4,800	72.46
TBLS	120	7.2	0.9	Rs.108	0.13	1	Rs.120	0.14	1	Rs.120	0.14
DBLS	140	4.5	0.6	Rs.84	0.13	0.65	Rs.91	0.14	0.65	Rs.91	0.14
Lead Stearate	100	2.1	0.5	Rs.50	0.24	0.45	Rs.45	0.21	0.45	Rs.45	0.21
Calcium Stearate	80	1.1	0.5	Rs.40	0.45	0.55	Rs.44	0.50	0.55	Rs.44	0.50
Filler	10	2.7	30.0	Rs.300	11.11	40	Rs.400	14.81	50	Rs.500	18.52
Lubricant	140	0.95	0.4	Rs.56	0.42	0.5	Rs.70	0.53	0.5	Rs.70	0.53
TiO2	130	5.6	0.6	Rs.78	0.11	0.6	Rs.78	0.11	0.6	Rs.78	0.11
Carbon Black	50	0.98	0.1	Rs.5	0.10	0.1	Rs.5	0.10	0.1	Rs.5	0.10
Totals			**133.6**	**Rs.5,521**	**85.16**	**143.9**	**Rs.5,653**	**89.01**	**153.9**	**Rs.5,753**	**92.72**
Formulation Cost				**Rs.41.32**	**Density**		**Rs.39.30**	**Density**		**Rs.37.39**	**Density**
Volume Costs				**Rs.64.83**	**1.569**		**Rs.63.51**	**1.616**		**Rs.62.05**	**1.659**

Summary

	0 PHR	10 PHR	20 PHR	30 PHR	40 PHR	50 PHR
Formulation Cost Rs/Kg	Rs.50.08	Rs.46.53	Rs.43.86	Rs.41.32	Rs.39.30	Rs.37.39
Volume Cost Rs/Ltr.	Rs.69.99	Rs.67.94	Rs.66.55	Rs.64.83	Rs.63.51	Rs.62.05
% Reduction in Cost/Kg		7.08%	12.42%	17.48%	21.53%	25.33%
% Reduction in Cost/Ltr		2.94%	4.91%	7.37%	9.26%	11.35%

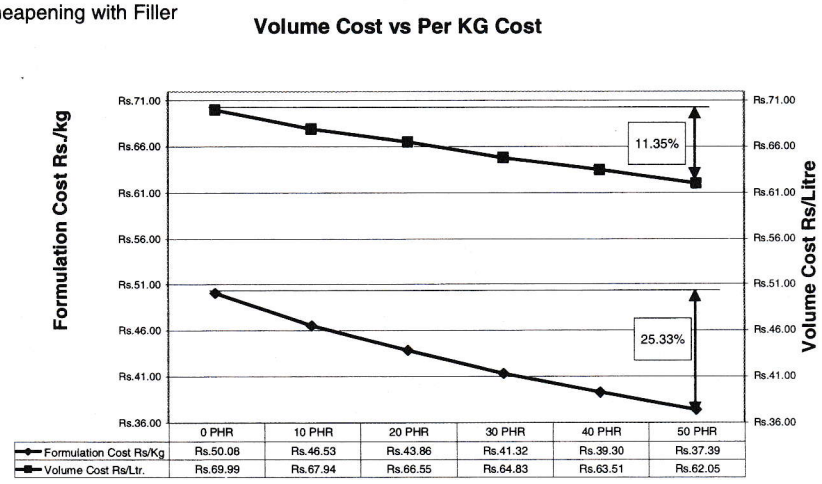
It is interesting to note that even though these are theoretical calculations, the predicted density is quite near the actually measured density with the difference being a few points in the third decimal place. Rarely do we find errors in the second decimal place. Assuming that the pipe is gelled fully and has no voids, the density figures predicted are quite close to actuals. There is some volatile loss, but in a Pipe formulation this is a low percentage.

The graphical representation shows the big difference in the reduction in cost when measured per kg & the volume cost by adding 50 PHR Calcium Carbonate (which I understand is not unusual in commercial grade PVC Water supply Pipe and in the non pressure applications like SWR) the expected cost reduction appears to be a healthy 25%. However, in actuality, the Volume cost has reduced only 11%. Such a high loading of filler not only ruins Pipe impact strength and pressure resistance, the wear and tear on costly twin screw equipment is severe. Thus it is not worth sacrificing so much of quality deterioration and machine life reduction for a mere 11% reduction in cost.

This should be understood by all PVC pipe manufacturers and other sectors which rely on dense mineral fillers primarily for cost reduction. Of course nobody makes pipes with 0PHR filler, around 8-10 PHR filler is the optimum level for good quality pipe conforming to BIS 4985, and also acceptable Screw Barrel life, and it is heartening to note that most of the quality conscious PVC Pipe manufacturers have persisted with such formulations and have been successful in the long run.

It is when higher loadings are resorted to for cost reduction that a vicious cycle starts. Let us say a manufacturer increases his Filler loading from 10 PHR to 40 PHR. Relying on formulation costing he expects a reduction of 15.5%. He reduces the

Cheapening with Filler



prices of his pipes by 15% from his BIS 4985 price. However his cost per length of pipe has gone down only by only 6.5% (the Volume Cost reduction). Soon he finds out that he is losing money, so what is the next step? More filler loading coupled with decreasing the wall thickness of the pipe, deteriorating quality even further. And the downward spiral in quality and shrinking returns continues.

This is a most dangerous trend. Many Polymer applications in India have faced declining demand due to loss in confidence of the consumers because of repeated failures of poor quality cheap products. Examples are too numerous, and is most saddening to persons and companies who have worked so hard in establishing such applications. In the Pipe field itself one can recall the hammering HDPE pipes took in the early eighties due to large scale failure of pipes made from scrap HDPE and sold to prestigious Government projects as prime grade pipes. While HDPE pipe market languished because of the bad name, PVC Pipes surged ahead. Even major companies like PIL were so badly affected that they had to close down the manufacture of their well established Hasti brand. It has taken two decades for HDPE pipes to claw back to good volumes, which involved consistent quality and development of new application areas like Drip and Sprinkler Irrigation, Gas piping, Large diameter sewerage pipes etc. as well as consolidation in the core water supply sector with good quality pipe with 2nd generation HDPE grades.

A dangerous fallout of mindless filler loadings is when markets change from pricing per piece or in the case of pipes, per unit length of specified thickness to pricing on a per kilo basis. Such a change encourages higher filler loadings and should be resisted by all discerning manufacturers. In plastics, heavier does not mean more "Mazboot". Physical properties are seriously compromised in PVC products made heavy by excessive filler additions.

With Polyolefins, the situation is different. Here Fillers like Talc and Calcium carbonate are added to improve stiffness to PP, or desired properties like antifibrilation in HDPE or PP Rafia Tape. Incorporation of Fillers in Polyolefins is an expensive process, requiring costly co-rotating Twin screw extruders. Compounding costs for filling Polyolefins can be as high as Rs. 10-15/ kg., while in PVC the increase in dryblending cost is negligible. Filled Polyolefins (10-40%) are costlier than the base polymer because compounding costs outweigh the lower filler cost. The volume costs go up sharply, but requirements of better stiffness in Auto Components, Moulded Furniture and other technical parts is the driving force for filler addition. It is only at filler levels of over 50%, as in filler masterbatches, that the cost per kilo dips below Polymer cost levels, but the volume cost will be adverse. Thus normally filler addition does not automatically lead to cost savings with Polyolefins as it does with PVC.

Glass Filled Polymers is a special case with the fillers price sometimes exceeding the Polymer prices. It should be obvious that Glass filling is done purely to improve mechanicals.

In Flexible PVC, considerations of Volume costs come into play. Large amounts of Plasticisers and extenders (Secondary Plasticisers) are used. The volume cost calculations are similar, though the contraction in volume in Flexible PVC compounds is a bit more because of volatile constituents in the liquid added.

Here is a simple example of a soft PVC compound stabilised with a mixed metal Stabiliser/ESO mix. It is interesting to note how the relative costs of the other ingredients change in relation to PVC Resin when viewed from the Volume cost angle.

Plasticisers like DOP which per kilo is much more expensive than resin has always been thought to be the reason why Plasticised PVC is costlier than RPVC. But DOP, for example, is not that costly from the Volume cost viewpoint. In fact when PVC prices had flared up, DOP was actually cheaper than Resin on a per liter basis!

Here again, an expected cost reduction by tripling the filler loading is considerably eroded on a Volume cost basis.

Secondary Plasticisers like the popular Chlorinated Paraffin family have a higher density than the primary plasticiser. Higher the chlorination, higher the density and lesser the

Volume Cost of Major Ingredients

Ingredient	Cost Rs/Kg	% of Resin Cost	Density Kg/Ltr	Volume Cost Rs/Ltr.	% of Resin Vol. Cost
PVC	Rs.50.00		1.4	Rs.70.00	
DOP	Rs.80.00	160.00%	0.98	Rs.78.40	112.00%
CP	Rs.50.00	62.50%	1.25	Rs.62.50	89.29%
Stabiliser	Rs.150.00	187.50%	1.05	Rs.157.50	225.00%
Filler	Rs.12.00	15.00%	2.7	Rs.32.40	46.29%

Formula 1

	Recipe Kgs	Cost Rs/ Kg	Litres
PVC	60	Rs.3,000.00	42.86
DOP	30	Rs.2,400.00	30.61
CP	15	Rs.750.00	12.00
Stabilise	2	Rs.300.00	1 9 0
Filler	01	Rs.120.00	3 70
Total	**117**	**Rs.6,570.00**	**91.08**
		Cost/Kg	Rs/ Litre
		Rs. 56.15	**Rs. 72.14**

Formula 2

	Recipe Kgs	Cost Rs/ Kg	Litres
PVC	60	Rs.3,000.00	42.86
DOP	30	Rs.2,400.00	30.61
CP	15	Rs.750.00	12.00
Stabiliser	2	Rs.300.00	1.90
Filler	30	Rs.360.00	11.11
Total	**137**	**Rs.6,810.00**	**98.49**
		Cost/Kg	Rs/ Litre
		Rs. 49.71	**Rs. 69.15**
Reduction		**11.48%**	**4.14%**

cheapening effect. Apart from Filler, CP is the favoured cost reduction tool. It takes considerable skill to balance the compatibility with the chlorination level of the CP selected with the addition PHR to achieve an effective cost reduction without compromising quality.

I hope those PVC processors tempted to take the high filler route pause and rethink their strategy. One of the reasons that so many PVC Pipe and profile extrusion firms have collapsed and closed shop is that they got caught in this vicious cycle higher filler loading-decreased wall thickness – product failures – compensation claims and were trapped with heavy losses.

There are other ways of reducing costs which do not impact quality and offer value for money. I hope PVC processors will explore and exhaust all these other routes before going up on filler levels. If so this article on Volume Costs would have served its purpose.

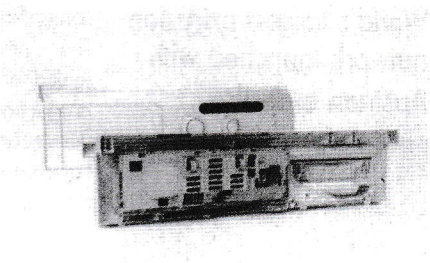
Glass fibre reinforced PP for automotive front end

The new front end of the Volkswagen Tiguan compact sport utility vehicle (SUV) has been produced using a short glass fibre reinforced polypropylene (PP) material. Traditionally, this kind of automotive components are made from metals or more costly engineering thermoplastics. In fact, the grade chosen for this new front end is *Hostacom™ G3 R05* from LyondellBasell.

Hostacom™ G3 R05 provides high impact strength, dimensional stability, rigidity and heat resistance required for this application, according to the officials from LyondellBasell. The company has modified the polymer matrix in order to achieve the required properties.

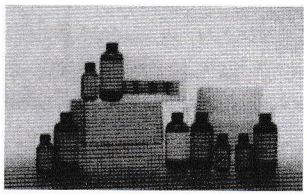
The *Hostacom™ G3 R05* includes glass fibre with uniform length and even fibre distribution. As a result, the front end is less prone to warpage and the material can also be used for injection-moulded parts with complex geometry, according to company officials.

Washing machine PCB made from PPE/PA-6 blend



Due to the recent changes to the International Electrotechnical Commission (IEC) 60335 standard for unattended household appliances, the Vestel Group has had to substitute the usage of halogenated flame-retardant polyamide (PA) - used for the injection moulding of PCB holders of its front-loading clothes washing machines- with a blend of polyphenylene ether and polyamide-6 (PPE/PA-6), ie, the *Noryl™ NH6020* supplied by SABIC Innovative Plastics. This material that is designed for high heat resistance and thin wall flame retardance performance offers a UL94 V0 rating at 0.8mm.

PolyOne launches breakthrough liquid colour solution



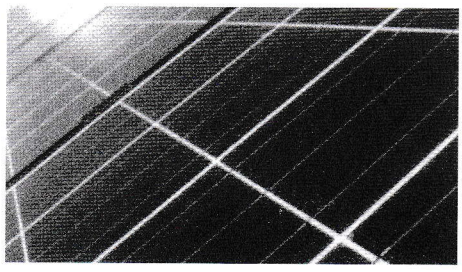
PolyOne Corporation has announced the introduction of *OnColor Complete™* liquid colour solutions, a revolutionary, eco-friendly liquid colourant system that helps converters and OEMs reduce costs, eliminate waste, and improve safety. By combining proprietary technology with state-of-the-art liquid colourants and refillable containers in a first-of-its-kind, closed-loop system, it helps manufacturers reduce operating costs and enhance employee safety, eliminate spillage and mess while simplifying material change outs and clean up.

Cost effective resins for solar photovoltaic panels

According to a report, in 2010, global cumulative installed photovoltaic (PV) capacity is expected to grow by at least 40 percent, with an estimated compounded annual growth rate of 20 per cent.

As the demand for solar power rises, SABIC Innovative Plastics is helping to drive the viability of this much sought-after energy source. Its *Noryl* and *Lexan EXL* resins offer customers ease in solar panel use with greater cost-efficiency and meet stringent global regulatory standards. Applications for SABIC Innovative Plastics' materials range from PV frames to junction boxes to connectors and the company continues to focus R&D efforts on new back sheet solutions.

SABIC Innovative Plastics' materials contribute to the expansion of solar energy through system innovation, particularly by replacing metal to consolidate parts, reduce maintenance and simplify installation.

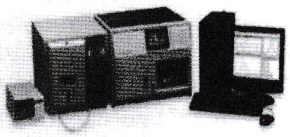


"SABIC Innovative Plastics is helping to make solar power more cost-effective, practical and affordable through our range of advanced, PV-focused materials. Our products can redefine the PV technology landscape to meet future demand. For the future, we see a fully integrated system – with one moulded part incorporating four functionalities, ie, frame, junction box, connectors and backsheets," said Andy Verheijden, Global Product Market Leader, Solar Energy, SABIC Innovative Plastics.

New micro-injection module from Arburg

The new micro-injection module from Arburg now offers an efficient solution for the manufacture of micro parts. The micro-injection module combines an 8 mm injection screw with a second screw for melting the material. One problem with minute shot weights of less than one gram is that in some cases, the material dwell time in the injection unit is very long. Furthermore, the displacement distance of the screw is extremely short because of the small injection volume. Unlike other alternatives in the market which use a combination of screw plasticising and piston injection, this micro-injection module operates using two screws which 'share' the preparation, dosing and injection of the material.

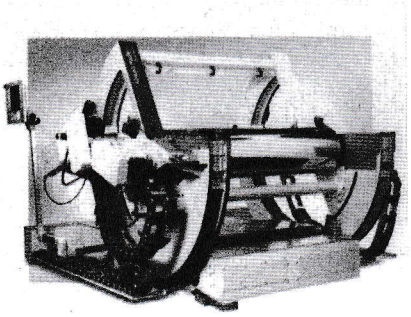
Gel permeation chromatography for tailored resins



The Viscotek *TDAmax* gel permeation chromatography (GPC) system from Malvern Instruments is useful for optimising polymerisation conditions. It incorporates refractive index and light scattering detectors with a viscometer. It provides direct absolute molecular weight measurement and precise intrinsic viscosity data, thus enabling comprehensive investigation of polymer properties, including structure, according to company officials.

KraussMaffei brings one-stop solution for optically clear sheets

KraussMaffei Berstorff GmbH offers customised solutions for optically clear sheets. The core component of the production line is the flexible polishing calendar - *PlanetCalander.*



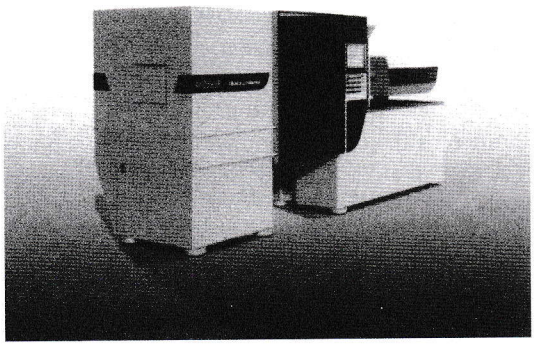
In the production of optical-clear films and sheets made from PC, PMMA, SAN, PETG, A-PET, PS or ABS, quality and perfectly clean material are of decisive importance. Since properties like high transparency, impact strength, resistance to scratches and UV light as well as favourable thermoforming properties are imerative for these applications, the sheets must be protected against dust by means of clean-room conditions and protective film lamination.

KraussMaffei Berstorff sheet production lines are material dependent designed for output rates of up to 1,200kg/hr.

New servo-electric series from Wittmann

Wittmann Battenfeld showcased its new *EcoPower* and *HM180 Aquamould* during the Plastpol trade fair recently in Kielce, Poland. The new *EcoPower* is compact, has a beltless injection unit and gives accurate clamping unit with direct drive. The braking energy of the drives, normally not utilised at all or recovered by an elaborate system, is utilised as effective energy within the machine by the *EcoPower*.

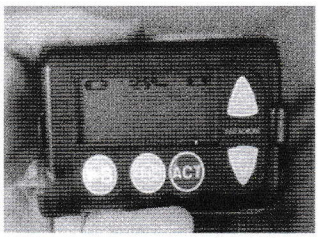
The series comes in a modular design and is pre-configured. The machine system consists of a basic platform that can be supplemented with extension packages according to individual needs. At the Plastpol, the high performance of the new servo-electric series was demonstrated by the production of an LSR O-ring on an *EcoPower 110/350* in a 128-cavity mould supplied by Rico. On an *HM 180/1330* with servo drive, the process known as *Aquamould* with project technology was shown.



A media cable was produced from PA with a mould supplied by IKV Aachen. With projectile technology, it is now possible to achieve smoother interior surfaces and to form specific cavity geometries as well. Residual wall thicknesses can be set regardless of the flow properties of the plastic material being processed, resulting in material savings and reduction in cycle times. Moreover, certain design barriers of the conventional *Aquamould* process can now be overcome.

Small, lightweight insulin pump

Insulet Corporation, an innovative American medical device company has developed the *OmniPod®* Insulin Management System in collaboration with the plastic converter Phillips Plastics Corporation. The partners have notably designed an advanced three-dimensional moulded interconnect device (3D-MID) as the *OmniPod™* chassis. This performing internal plastic component is injection moulded by Phillips Plastics Corporation using a two-shot moulding process. In the first shot, a non-plateable plastic is injection molded while the second shot applies a plateable plastic to the required areas.



Then the parts are metallised by *SelectConnect* Technology, which uses its patented *SelectConnect™* process to selectively plate injection moulded components with copper and nickel in order to produce 3D connections with multiple points of contact. Such a chassis allows the integration of electronic functions and provides reduced assembly time and cost reduction. This greatly enhances safety of the pump and increases the shelf-life of the product to a large extent as compared to the conventionally made insulin pumps, according to company officials.

Locking handle with plastic-metal hybrid structure

The German hybrid component manufacturer Peter Wahl GmbH & Co, has developed a new locking handle for the soft top in the luggage compartment of the new Mini Cooper convertible. The aim is to improve the look and feel of the previous locking handle that was made from several thermoplastic parts bolted to a metallic component. The handle design has been completely modified in order to obtain a plastic-metal structure. In fact the new locking handle is based on a metallic component overmoulded with a Polyamide-6 (PA-6) material in a single step process. Consequently, it provides weight saving and very good surface aesthetics and feel, thanks to the use of a specially modified PA-6 ie an *Akromid™* grade from Akro-Plastic.

Safe car control for the disabled

A collaborative project between Bozzio AG, Bern University, Dynamic Test Center and DSM has allowed designing and patenting an innovative user-friendly system allowing the disabled to drive cars with safety and confidence. This new system is available under the trade name *joysteer® X-by-wire* system. It is based on two joysticks that are mounted and coupled electronically to the vehicle steering mechanism and on precision gears made with polyamide-4,6 (PA-4,6) - ie a *Stanyl™* grade from DSM – that translate the driver's steering movements into vehicle control.

Innovative wind turbine for homeowners and professionals

As part of a three-year project, the French start-up company Nheolis SA has developed and patented an innovative wind turbine technology that is based on a new shape of blade. In fact, this innovation capitalises on Bernoulli's Principle, which governs the conservation of energy in fluid dynamics. As a result, the special semi-conical shape of its blades fully exploits the air flow kinetic energy for a superior energy production compared to traditional wind turbines with a similar rotor diameter. Each Nheolis wind turbine that is commercialised under the trade name *Nheowind™* is equipped with three semi-conically shaped blades that rotate around a horizontal axis and can be oriented along two deflection angles, leading to a much more efficient use of the air-flow kinetic energy. These blades are 2-metre long and 5 mm thick and they are made from glass fibre and polyester matrix.

The *Nheowind®* wind turbines are compact, robust and highly efficient, being able to function over a broad range of wind speeds, from 9 km/h to 162 km/h. Furthermore they are said to provide 2 to 3 times more electrical output than other turbines of similar diameter, according to company officials.

This innovation has also won Nheolis the 2009 Gold European Environmental Press (EEP) award.

Correct method and material to clean extruders without damage

Plastic processors often clean screws wrongly, causing serious and expensive damage. A common tool used as part of the cleaning procedure is an acetylene torch that unfortunately, affects the metallurgical properties of the base metal of the screw and closely machined screw tolerances.

During manufacturing of tool-steel screws, the base metal is heat treated to increase its hardness. If heat from an acetylene torch is used to remove plastic from the root of the screw, it will undo the annealing of the base metal, reduce the yield strength of the steel at that point and increase the likelihood that the screw will break because of torque.

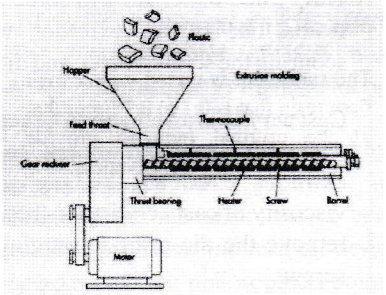
If the area where the torch was applied turns a permanent blue, it means heat has caused metallurgical changes to the base metal and reduced the wear resistance in that area of the screw. Occasionally, torching has caused delamination of the metal wear coating from the base metal of the screw.

Heat from an acetylene torch also causes the metal to expand on the side of the screw where it is applied, which in turn causes the screw to bend. Another big source of damage to screws during cleaning is using steel screw drivers, scrapers or pries bars to remove plastic.

Tools and cleaning materials for "pristine" cleaning of a screw and barrel are few and simple: high-heat gloves, safety glasses, a brass putty knife, brass wire brush, copper gauze, stearic acid flakes, an electric drill, cotton rags, a round brass wire brush about the ID of the barrel that is mounted on a rod as long as the barrel.

A more efficient alternative to blow torching is to purge and clean the screw immediately after use, while it is still evenly heated from production. In high-pressure applications like wire and cable and blown film, commercial purging compounds can be used. In low-pressure applications, a fractional-melt (0.35-MI) HDPE may be sufficient as a purging material instead.

For larger extruders, it may be more practical and economical to use a commercial purging compound for product changeovers, without pulling the screw. The first step in purging the screw is to close off the flow of the polymer being processed, by closing the slide gate at the bottom of the hopper. Screw speed needs to be reduced to 15-25 rpm and run at this speed until melt stops flowing from the end of the die.



All barrel zones should be set to about 200°C. Once the barrel zones have reached that temperature, purging can begin. Depending on the type of extrusion process, it may be necessary to remove the die or head tooling to reduce risk of over-pressurizing the end of the extruder.

The screw should be turning at 15 to 20 rpm. In a low-pressure die application, the die can remain on the extruder during purging until there is a complete change from the processing material to the purging material.

Once the die has been completely purged, stop the screw so that the die can be removed and the end of the screw exposed. Once the die is removed, the screw can be restarted and run at about 10 rpm to allow the remaining purge material to be pumped out.

Once the purging material has stopped extruding from the screw, the screw needs to be removed from the machine.

For an extruder with a screw cooling system, this apparatus of hoses, rotary union, and piping needs to be removed before the screw extractor mechanism can be attached to the extruder gearbox.

Using the screw extractor, the screw should now be pushed forward until 4 or 5 turns of the screw are exposed for cleaning.

Clean the purge material from the channels of the screw using the brass putty knife and brass wire brush.

When the purge material has been removed from the exposed portion of the screw, push another 4 to 5 turns of the screw forward using the screw extractor, and continue the cleaning process. The screw can eventually be pushed down most of the length of the barrel.

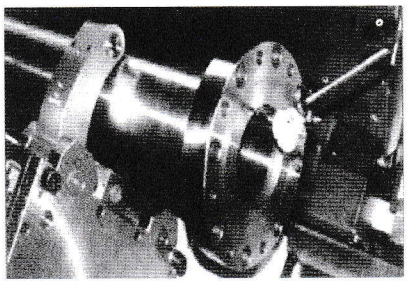
When the large amounts of purge or HDPE have been removed with the brass putty knife and wire brush, stearic acid flakes need to be sprinkled onto the root of the hot screw.

The copper gauze is to be used to remove any remaining residue. After the entire screw has been polished with copper gauze, a final clean-up to "pristine" condition needs to be done using a soft cotton rag to ensure that there is no contamination in the next production run.

Once the screw is completely cleaned, it can be set aside until the barrel has been cleaned, or placed on a screw rack. If the screw is stored, it should be sprayed and wiped down with light oil, such as WD-40 or PB Blaster to prevent rusting. Chrome-plated screws are less likely to rust during storage and don't need oiling.

Cleaning the barrel is much easier than cleaning the screw, but just as important. With barrel temperatures still set at 200°C, the barrel is ready to clean.

A wire brush is to be wrapped with copper gauze. Before inserting the brush and gauze assembly into the bore of the barrel, throw in a handful of stearic acid. Stearic acid can be sprinkled over the copper gauze before pushing the brush/gauze assembly into the barrel.



Once the brush/gauze assembly is inside the barrel, the electric drill is to be used to rotate it while moving it in and out until it moves easily. Additional stearic acid may be needed to be added before the bore is thoroughly cleaned.

When the brush/gauze assembly is removed from the barrel, push a bundle of cotton rags back and forth inside the length of the barrel to remove any purge or stearic acid residue.

When the rags have been passed back and forth several times and return totally clean, barrel cleaning is complete. The entire screw and barrel assembly are pristine and ready for the next production run.

Many purge materials are commercially available. It is the processor's job to identify the appropriate purge to use with the resin being processed.

Purge materials work by one of four mechanisms:

- Mechanical purge
- Abrasive mineral filled material • Chemical purge to break down resins and contaminants
- Hard resin filled with surfactants

Mechanical purges are stiff materials, normally polyethylene (PE) based, containing cleaning and release agents. Fractional melt flow high density polyethylene (HDPE) functions very well as a purge material over a wide temperature range.

Low viscosity abrasive mineral or glass filled materials will force most resins out of an extruder while scouring the screw, barrel, and die.

Cast acrylic is an abrasive purge, as it does not completely melt in the extruder. Due to the high melt viscosity of cast acrylic, it is better to remove the die prior to purging the screw.

Typical amounts required are 5 to 10 lbs/inch of screw diameter. Once cast acrylic is in the barrel, it has to be purged out or the screw pulled and mechanically cleaned.

The third purging material uses a surfactant that penetrates and loosens residue on the screw, barrel, and die, dispersing it in the melt.

The surfactant is mixed with a melt flow resin that is 0.1 to 0.3 times that of the original melt to provide maximum purging effectiveness.

The fourth material is a chemical purge that attacks the material left in the barrel. This may be through plastication of the resin in the barrel, lowering the viscosity and making it easier to force out of the barrel, or the additive may actually cause polymer depolymerization into lower-molecular-weight components.

Mechanical purging commonly uses a fractional melt flow HDPE. The stiff material pushes the resin being purged out in front of the HDPE.

Fractional melt flow HDPE is cheap, works well, and has a wide processing temperature range. After the resin being purged is out of the extruder, the barrel temperatures can be lowered and more HDPE added to remove the earlier purge material.

As the screw is being pulled from the extruder, any residual HDPE can be brushed off the screw with a brass wire brush.

Alternatively an electric or air-powered brass wire brush can be used in cleaning. Several commercially available materials are produced as purge compounds based on mechanical purging.

Does that part really contain bioplastics? The proof's in the isotopes

Bioplastics continue to get a lot of press, and are one of the fastest-growing segments of the plastics and packaging industries. More and more consumer packaged goods companies have announced campaigns to integrate bioplastics into their packaging to reduce their carbon footprint, and thus attract eco-conscious buyers. But how can processors be certain that the amount of bioplastic content that is promoted in a material actually exists in the resin?

Picarro Inc., a Sunnyvale, CA technology company, says it can help make that determination with its Combustion Module-Cavity Ring-Down Spectrometer (CM-CRDS) for stable carbon isotopic analysis. According to Picarro's CEO Mike Woelk, the CM-CRDS makes analysis push-button simple for companies to verify the bioplastics composition of polymers or finished materials throughout the supply chain, whether on the factory floor or at the distributor's warehouse.

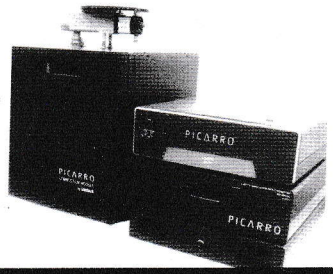
There are two massive cycles that are going on, explained Woelk in a telephone interview. Those are the carbon cycle and water cycle, and both CO_2 and H_2O are very dynamic molecules. "You can determine how CO_2 moves in the universe and where it originated—shale gas, coal, natural gas, all have a distinctive isotopic pattern. We measure it as a family of molecules based on the carbon that is in it," Woelk said.

Previously, this type of measurement required expensive and disruptive testing in specialized labs, but Picarro's solution gives both plastics consumers and suppliers a tool to ensure that bioplastics content claims can be verified in minutes without disrupting ongoing production.

To determine whether a material is bioplastic or "petroplastic," it is burned, and the composition of the CO_2 is measured to determined where it originated. "There are very distinct signatures for CO_2—soy, corn, rice, etc.," said Woelk. "We make it easy—shop ready—so that you can put a piece of plastic into the device and immediately determine the material's integrity throughout the supply chain."

Woelk agreed that there's a lot of hype surrounding bioplastic products, and added that the manufacturers of beverages, food products, and medical devices, "regardless of their philosophical point of view," want to support their consumers' buying preferences with respect to being eco-friendly. "How do you know the truth? That's what we provide and it's as simple as you can get," Woelk stated. "What we're talking about is analytical-grade results as good as any technology in the world can produce, and you don't need to be a scientist to do the work."

The CM-CRDS is a tabletop unit that performs a bulk specific isotope analysis and delivers isotopic carbon measurements of plastics and other packaging materials in roughly 10 minutes. It's designed to run up to 147 plastic samples consecutively without operator intervention, and with minimal training and setup time. Woelk noted that Picarro is in the very early stages of commercialization of its technology, even though it has been around for several years. "We've just gained commercial traction in the past two years," he said.



The CM-CRDS material analyzer helps companies determine whether packaging actually contains the bioplastic specified.

Picarro sees rapidly emerging trends as a result of the green movement, and along with these trends, the regulatory environment will evolve. "More regulations will evolve by hook or by crook," Woelk commented. "I think people think that these bioplastics markets are all big established markets, but they're not. It's a lot like the dotcom movement in the early days. There are very few companies that are making any money in the green space currently. And there are issues surrounding bioplastics, such as commingling bioplastics and petroplastics, which contaminates the resin stream. It will be important that manufacturers can produce scientific results to match the suppliers' claims."

Picarro Inc., www.picarro.com

applications and as a cling additive in stretch films. Both 6102FL and 6202FL are also used as the adhesive layer of surface-protective films.

Vistamaxx 3980FL has ethylene content of 9% and an MFR of 8. Designed as a cast-film grade, Johnson says its predominant use would be for seal-layer modification. Vistamaxx 3020FL has ethylene content of 11% and the highest molecular weight of the group, resulting in the lowest MFR (2). It's made to give blown film as much melt strength as possible. One potential application would be the core of a stretch hood.

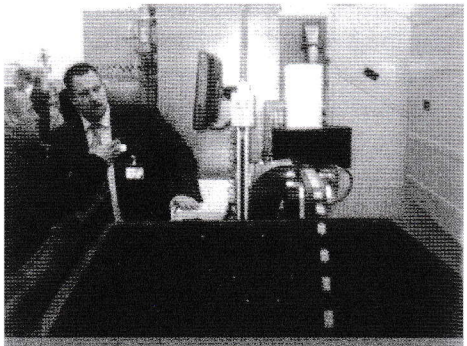
Currently Vistamaxx is made only at the ExxonMobil site in Baton Rouge, LA, but a new site with nameplate capacity of 300,000 tons/year for the production of specialty elastomers, including Vistamaxx, is set to open in 2011 in Singapore, which will expand the material's availability in response to strong market demand. "I can tell you that [Vistamaxx's growth rate] is one of the most significant growth rates that we've ever seen in launching a new polymer," Fitzpatrick says.

ExxonMobil Chemical
www.exxonmobilchemical.com

INJECTION MOLDING

'Major leap' into packaging market

Injection molding machine manufacturer Arburg placed packaging front and center at its March Technology Days open house, an annual event that this year drew about 4000 processors to the company's Lossburg, Germany headquarters. Arburg, best known for its Allrounder injection machines for consumer goods, E/E, and automotive applications, expects recent additions to its portfolio should make it a force in the packaging sector.



Closures flew as Arburg's Technology Days event also marked its "official entry" into the packaging market, one it's long served but now with greater emphasis.

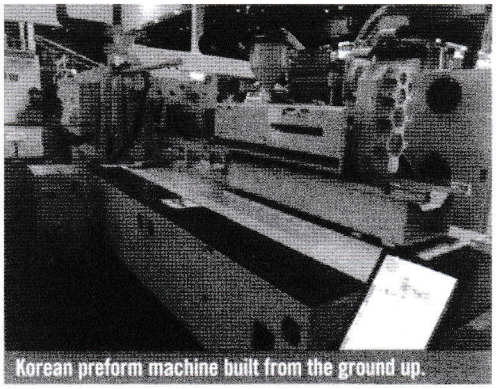
"With our Hidrive [hybrid drive] system, we've machines now able to run faster, which definitely should help us increase our presence in packaging," said Herbert Kraibühler, managing director, technology, of the company's renewed focus on packaging. He added, "These Technology Days are really our major leap into the packaging market."

The company's packaging forum within the open house included a molding cell based on an Allrounder 720 H (320 tonnes clamp force) running a 72-cavity closure mold (1.6g closures for still water) at 3-second cycles (mold from Austria's KTW). Other exhibits included molding cells for thin-walled packaging, inmold-labeled containers, and more.

Arburg, www.arburg.com

PET preform machine designed from ground up

Previously, Korean machine builder Dongshin Hydraulics Co. (Busan) offered an injection press that was essentially modified for molding PET preforms, but its latest offering is designed specifically for the task. The Pro PET 380 uses two accumulators and a servodrive pump, and a servomotor drives plasticating via a gearbox to help accelerate cycle time to 17 seconds for a 24-cavity tool molding 24g preforms. "Sure, we're slower than state-of-the-art machinery, but our 380-tonne double-toggle machine only costs $180,000," says Phillip Kim, executive VP at Dongshin. "The drive system we adopt also saves 50% on energy compared with hydraulic machines, and operation is at a quiet 74 dB."



Korean preform machine built from the ground up.

Dongshin Hydraulics Co., www.dongshin.net

AUXILIARY EQUIPMENT

Bulky, airy bottles palletized and wrapped

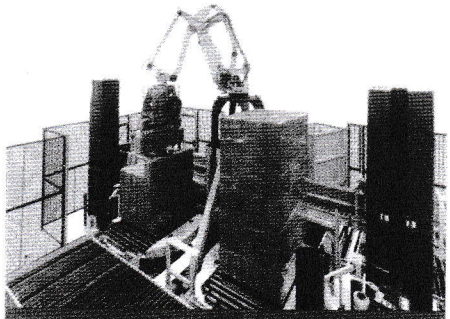
A new system that integrates palletizing and wrapping operations into one simplified, integrated cell offers greater efficiency for stretch-wrapping pallets.

Schneider Packaging Equipment Co. Inc. (Brewerton, NY), a manufacturer of case packers, tray packers, tissue wrapping, and bundling and robotic palletizing systems,

along with Lantech, a Louisville, KY-based packaging company, teamed up to offer the new Stack and Wrap Palletizing/ Stretch Wrapping Cell. This Cell combines two or more lines into a centralized automated palletizing stretch-wrapping station, and offers more efficient handling by building the unit load on the stretch wrapper, and stabilizing lightweight, unstable loads in a reduced floor space.

The palletizing system, engineered by Schneider, centers around a Fanuc robotic arm between two Lantech Q-600 stretch wrappers. Xpedx, a Lantech distributor, identified how the machines should interface and initiated the collaboration between the parties, says Schneider.

Terry Zarnowski, director of sales and marketing for Schneider Packaging, says the Stack and Wrap Palletizing system was designed to handle "highly unstable pallet loads with such products as blow-molded bottles, which are bulky but in which the converter is shipping nothing but air." Explains Zarnowski, "We came up with a solution that provides them



Schneider's stacking, wrapping, and palletizing system handles unstable loads with products like blowmolded bottles.

with the ability to build up full-height unit loads, and we can build and wrap the load together—build two layers, wrap it, build another two layers, wrap it, etc., and do that with minimal cost."

An automatic pallet dispenser and conveyor system delivers an empty pallet to each stretch wrapper, while product is delivered from two production lines to the palletizing cell. The robotic arm builds layers of product on each of the wrappers. Once a predetermined number of cases are loaded onto the first pallet, the first wrapper stabilizes the load layers by applying stretch film.

At this point, the robotic arm begins building a load on the second stretch wrapper. This process repeats as the wrapper and robotic arm alternate building and wrapping the load in predetermined increments until the load is complete and product is discharged to a conveyor transfer system. The system is designed to handle two different products simultaneously, thus allowing the system to maintain high throughput during wrapping.

WELCOME TO NEW MEMBERS OF THE FEDERATION

The following New Membership has been accepted by the Federation at its Executive Committee Meeting held on 8th October, 2010

M/s Navin Colour Corporation, Kolkata	:	Dealer Member
M/s Graphic Aids, Kolkata	:	Dealer Member
M/s Kalyani Plast, Konnagar	:	Life Dealer Member
M/s Peekay Agencies Pvt. Ltd., Kolkata	:	Distributor Member
M/s Millennium Footwear Pvt. Ltd. , Kolkata	:	Manufacturer Member
M/s Sri Swastic Industries, Kolkata	:	Manufacturer Member
M/s Prabhu Poly Pipes Pvt. Ltd., Kolkata	:	Manufacturer Member
M/s Essel Thermoware Pvt. Ltd. , Kolkata	:	Manufacturer Member

Lens-cleaning solution gets clear package as HDPE turns to PET

Global eye healthcare company Bausch + Lomb has made the switch from a white HDPE bottle to a transparent PET one for its renu fresh-brand of lens-cleaning solution. The brand owner tapped R&D/Leverage to help with the package's design, and turned to Amcor Rigid Plastics for injection stretch blow-molding of the packages. When contacted by MPW, Bausch + Lomb declined to reveal the names of its closure molder and label provider.

The package labels also have evolved, with clear, polyolefin pressure-sensitive labels replacing the previous white labels. Texture of the bottles' exteriors, realized via etching on the blow-molds' cavities, helps move them quickly through production lines and also enhances end-user ergonomics.

After blowmolding, the bottles are transported directly to a cleanroom, where they are packed and then shipped to Bausch + Lomb for filling. The PET bottles are topped with snap-on caps and are available in 2-, 4-, 8-, 12-, and 16-oz sizes.

A clear trend at Bausch + Lomb: HDPE to PET.

Amcor Rigid Plastics, www.amcor.com
R&D/Leverage, www.rdleverage.com
Bausch + Lomb, www.bausch.com

Monolayer PET jar cuts weight, filling time for tomato sauce

Predictive engineering software and a panel-less design have resulted in a polyethylene terephthalate jar for tomato sauce that is nearly 11% lighter than the existing PET jar and can be labeled and filled 25% faster. Created by Constar Inc. (Philadelphia, PA), the monolayer PET jar has been recognized with the 2009 Ameristar Award for Food Packaging. Designed for LiDestri Foods' 45-oz Francesco Rinaldi brand pasta sauces, the new jars are 8g lighter than their PET predecessor, having replaced their side grips and applied Constar's vertical compensation technology (VCT), which uses a rigid "ribbed" geometry to eliminate the need for vacuum panels and to improve stability. Ringing the shoulder of the jar is a circle of embossed tomatoes, part of an overall design that LiDestri says enhances the product's shelf appeal.

Constar marketing director Alex Fioravanti says that while PET containers have been previously used for hot filling, VCT technology speeds overall production. "PET containers with VCT have improved rigidity and symmetry," Fioravanti says, "which accelerate the labeling process. The round design facilitates high-speed label application when compared to more complex grip designs."

Constar's monolayer hot-fill PET jar cut 8g from a previous polyester design.

Constar's wide-mouth, hot-filled PET containers with VCT technology are available in stock and custom designs, with the option of incorporating DiamondClear oxygen-scavenging technology to allow shelf life up to 24 months. Last July, the U.S. Food & Drug Administration provided Constar with a food-contact notification for DiamondClear.

The Ameristar Awards will be formally presented to all winners at the Institute of Packaging Professionals' (IoPP) annual packaging summit (May 18; Hyatt Regency O'Hare; Rosemont, IL). In 2008, Constar won both Ameristar and WorldStar Awards for its monolayer PET wine bottle with Monoxbar oxygen-scavenging technology for French wine-maker Boisset Family Estates. The company has 13 U.S. and four European plants, and employs 1400.

Constar Inc., www.constar.net
LiDestri Foods Inc., www.lidestrifoods.com

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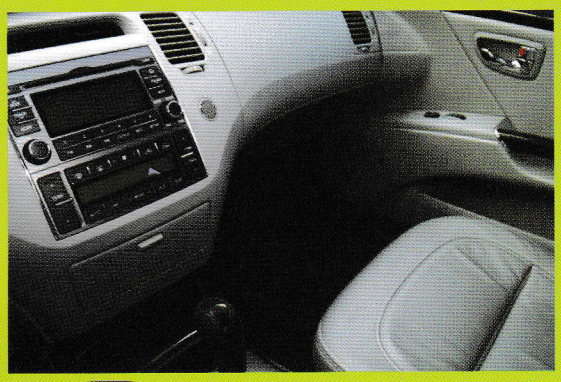

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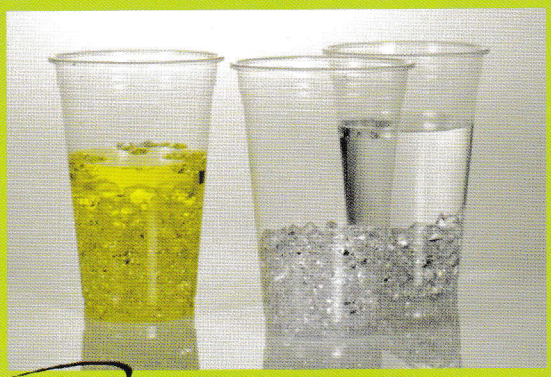

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