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AN OFFICIAL ORGAN OF INDIAN PLASTICS FEDERATION

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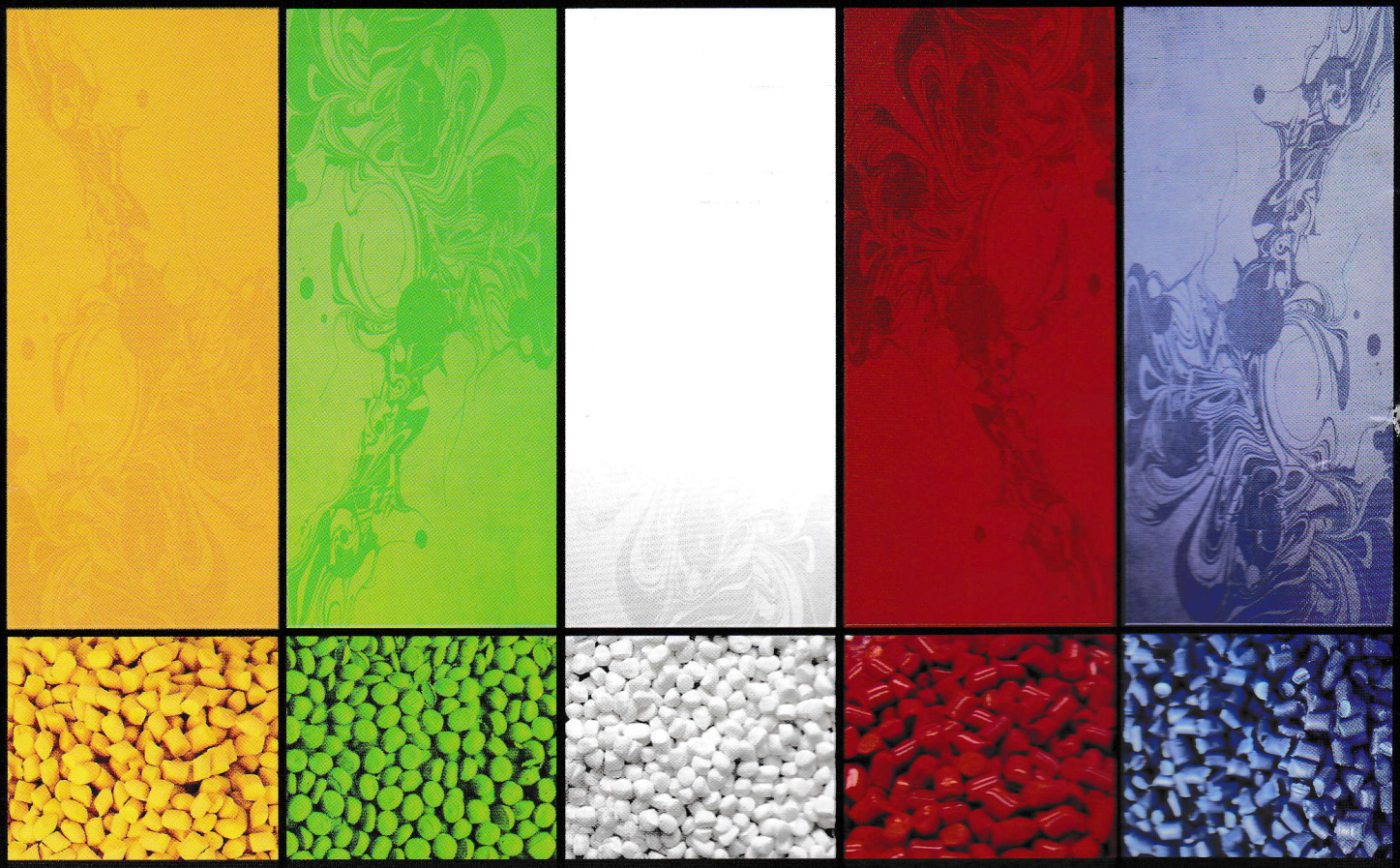

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Editorial

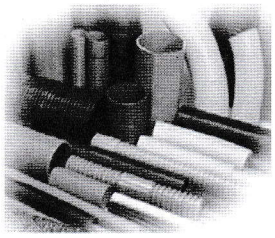
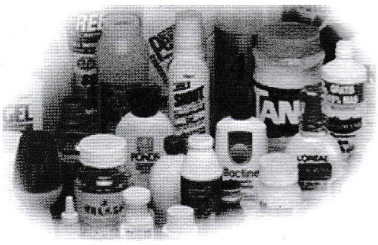
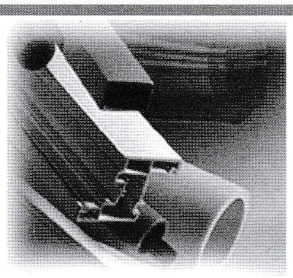
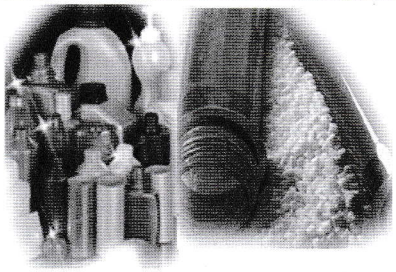
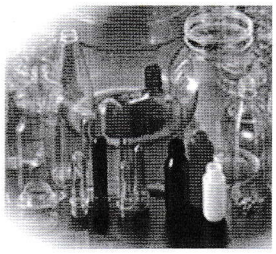
Changing face of the injection moulding industry in Europe

Injection moulding industry in Europe is changing, as per Applied Market Information Ltd. (AMI), based on its databases of injection moulders for France, the UK and Spain and Portugal.

For France and the UK there has been a notable drop in the number of businesses operating. Over 300 UK companies listed in the last edition of AMI's guide to the injection moulding industry in the United Kingdom have either closed down or gone out of business, while in France 279 businesses have gone. This has resulted in a net decline of 14% in the number of sites listed for France and a 21% decline for the UK. In Spain and Portugal, nearly 200 companies to have gone since the previous edition of AMI's guide. In addition to the impact of the recession which led to an increase in bankruptcies or voluntary liquidations, the industry has also been affected by the retirement of owners unable to sell on their business and by plant rationalization among the larger groups. The relocation of capacity to lower cost locations in Central and Eastern Europe also continues to occur, while other operators have just withdrawn from injection moulding preferring to contract out their injection moulding requirements or have refocused their activities on tooling, assembly or finishing operations or moved into non-plastic activities. The sectors which AMI has found to be most affected by these trends were suppliers to the automotive industry, particularly of small and medium sized components. Similarly small and medium sized electronic and appliance manufacturing has declined significantly in these countries and with it the moulding sector to supply it.

Contraction of injection moulding activity in these countries is also illustrated by the decline in polymer demand during the recession. Hitting a peak of nearly 3 mln tons of thermoplastics injection moulded in these countries in 2007, over half a mln tons of volume was lost in the two year period from 2007-2009. The UK injection moulding sector was the worst affected with a 21% decline in polymer demand from injection moulders over these two years. Moulders in the UK are now processing only around 600,000 tpa of polymer compared with 840,000 tons about 10 years earlier. The impact of the recession came on top of a process of declining foreign investment more attracted to the euro zone or the growing markets of Eastern Europe and significant reductions in automotive, electronics, household appliances and consumer goods manufacturing, much of it relocated to other countries.

Pradip Nayyar
Editor

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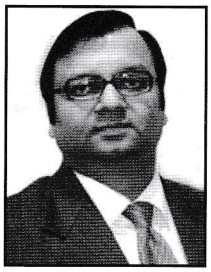


Dear Members,

Since we have decided to hold our AGM in September 2011 this is my penultimate message to you as the President of this August body.

In this issue I share some of my thoughts on Biopolymers.

The chronic limitations of biopolymers include their susceptibility to degradation and loss of properties during processing and reprocessing. Also, bio-based polymers and blends have less flexibility in polymer design, such as copolymers. In many applications, biopolymers require additives that do not inhibit compostability. Additive manufacturers have been working to develop solutions to enhance the physical properties and aesthetics of PLA, thus imparting enhanced functionality and the potential for PLA to be considered for a much broader range of applications,. Few of the developments include:

Biopolymers are often used as a blend of two immiscible polymers, e.g. a stiff, brittle biopolymer (PLA) with an elastic component. These blends need compatibilization to produce a stable polymer blend. It is possible to manufacture PLA with higher molecular weight, broader molecular weight distribution and higher degree of branching than regular PLA. Such chain-extended PLA has higher melt strength and therefore can be processed with greater stability. They can enable branching PLA which results in higher molecular weight and lower density foams with closed cell structures.

Biopolymers have also been developed that can withstand elevated temperatures during transport, storage and use. Its introduction extends the use of PLA to applications beyond chilled foods and beverages. Strong toughening modifier improves PLA by enhancing its processibility, durability, impact strength and flexibility.

PLA is being modified to become more useful. Its modifier is targeted at PLA food-contact applications, adding toughness, ductility and durability to extruded and thermoformed packaging. Metal release additive reportedly makes PLA processing more consistent, enhances its flow properties, and widens its processing window. Master batches have been developed that address all of PLA's main problems: poor impact strength, metal release, and melt strength. A clear impact modifier master batch for use with poly lactic acid (PLA) bioplastics provides substantial increases in impact strength while sustaining the excellent clarity of the base resin.

The increase in use of biodegradable resins offers a new generation of materials, with new properties compared with traditional plastics. The main advantage of these materials is that they can be organically recycled through composting. These new additives enhance the physical properties and aesthetics of PLA, impart enhanced functionality and increase the potential for PLA to be considered for a much broader range of applications.

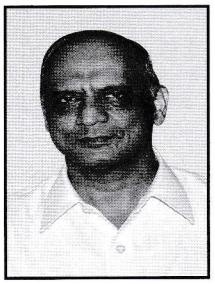
Hope the above information is useful to all of you.

With warm regards

Sourabh Khemani
President

From the Desk of

The Hony. Secretary



Dear Members

In my last message to you I had informed that work on the Registration of the Lease Deed on our plot of land at Sankrail, Dist. Howrah is in progress. Members will be pleased to know that Registration of the lease deed has been completed. Land filling and construction of the boundary wall work is held up because of the monsoon. Once the rail subsides work on the plot will commence.

On 20th July 2011 IPF jointly with IPI (KC) organised a technical session on "Extrusion – Versatile Polymer Processing Method and its Applications". The presentation was made by Reliance Industries Ltd. in our conference hall.

On 10th August 2011 IPF jointly with IPI (KC) organised a Technical Lecture on "Composites for Industrial Applications". The speaker was Dr. N. R. Bose. IPF has planned to hold another workshop on 24th August 2011 on "Opportunities In Plastics Extrusions." The presentation will be made by Neptune Plastic Industries. The Federation has also planned to hold a Technical Lecture on 'M & SSE Awareness" at Rotary Sadan on 6th September 2011 at 2.0 pm at Rotary Sadan. Dr. Manas Rajan Bhunia, Hon'ble Minister of Micro & Small Scale Enterprises & Textiles, Govt. of West Bengal has kindly consented to be the Chief Guest on the occasion. Members are welcomed to join the Technical Lecture.

The Federation has decided to hold its 52nd Annual General Meeting at Indian Chamber of Commerce, 4 India Exchange Place, Kolkata – 700 001 on 20th September 2011. Kolkata Launch function of Indplas'12 – International Exhibition on Plastics scheduled to be held from October 5 – 8, 2012 will also be held on the same day at the same venue. Members are requested to participate both in the Indplas'12 Launch Function and Annual General Meeting.

With best wishes

Ramawatar Poddar
Executive Secretary

Plastic heart gives dad Matthew Green new lease of life

Mr Green says he is excited about playing in the garden with his son

A 40-year-old father who was dying from heart failure is set to leave hospital after receiving an artificial heart.

Matthew Green is ready to go home and await a transplant after surgeons at Papworth Hospital in Cambridgeshire replaced his heart with an implant.

His new plastic heart is powered by a portable driver in a backpack, which he said had "revolutionised" his life.

It is thought to be the first time a UK patient has been able to go home with an entirely artificial heart.

Around 900 similar operations have been carried out around the world.

Mr Green said: "It's going to revolutionise my life. Before I couldn't walk anywhere. I could hardly climb a flight of stairs and now I've been up and I've been walking out and getting back to a normal life.

"I went out for a pub lunch over the weekend and that just felt fantastic, to be with normal people again."

Consultant cardiothoracic surgeon Mr Steven Tsui said without the device Mr Green, from London, might not have survived the wait for a heart transplant operation.

"At any point in time there may be as many as 30 people waiting for a heart transplant on our waiting list at Papworth, with one third waiting over a year," he said.

'Excellent recovery'

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The BBC's David Shukman explains how the artificial heart works

"Matthew's condition was deteriorating rapidly and we discussed with him the possibility of receiving this device, because without it, he may not have survived the wait until a suitable donor heart could be found for him."

He said for the first time a patient was walking the streets of Britain without a human heart.

Mr Green, who is married and has a son, had been suffering from Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC), a heart muscle disease that results in arrhythmia, heart failure and occasionally sudden death.

His health had declined over recent years, meaning the only option available to him was a heart transplant.

Earlier, he thanked the Papworth staff for making "it possible for me to return home to my family".

"Two years ago I was cycling nine miles to work and nine miles back every day, but by the time I was admitted to hospital I was struggling to walk even a few yards," he said.

"I am really excited about going home and just being able to do the everyday things that I haven't been able to do for such a long time, such as playing in the garden with my son and cooking a meal for my family."

The SynCardia temporary Total Artificial Heart Mr Green received is used as a bridge-to-transplant for patients dying from end-stage biventricular heart failure, where both sides of the heart are failing.

The device works in the same way as a heart transplant in that it replaces both failing ventricles and the heart valves they contain, thus relieving the symptoms and effects of severe heart failure. However, it is not suitable for long-term use.

Mr Tsui, director of the transplant service at Papworth, said the operation on 9 June "went extremely well".

"Matthew has made an excellent recovery," he said.

"I expect him to go home very soon, being able to do a lot more than before the operation - with a vastly improved quality of life - until we can find a suitable donor heart for him to have a heart transplant."

Mr Green will leave Papworth with a backpack containing a 13.5lb (6kg) portable driver to power his new heart.

Papworth Hospital carries out 2,000 major heart operations a year - more than any other hospital in the UK. Its first heart transplant, in 1979, was a UK first and the hospital has been using mechanical devices to support patients with end-stage heart failure since the 1980s.

The Total Artificial Heart is a modern version of the Jarvik-7 artificial heart of the 1980s. In November, 1986, a patient received a Jarvik heart and was supported for two days before receiving a transplant.

It is understood that other patients with mechanical hearts have been sent home before, but never with both ventricles replaced.

Health Secretary Andrew Lansley said: "The NHS has a long and proud track record of innovation that has driven major improvements in patient care in the past.

"The success of this procedure at Papworth Hospital is an excellent example of how the NHS can continue to provide the best treatment and outcomes for its patients in the future."

Professor Peter Weissberg, medical director at the British Heart Foundation, said that for some patients, with severe heart failure, transplantation is their only hope of long-term survival, but donor hearts are not always available.

He added: "Patients with mechanical hearts must remain permanently linked to a power supply via tubes that pass through the skin, which is a potential source of infection.

"With this artificial heart, the power supply is small enough to fit in a shoulder bag so patients can walk around and go home."

News from BBC: Plastic heart gives dad Matthew Green new lease of life

FORTHCOMING EVENTS OF IPF

Sl. No.	Date	Time	Programme	Venue
1	17/08/11	4.30 PM	Technical Lecture on **'Composites for Industrial Applications'** by Dr. N. R. Bose	IPF Conference Room
2	24/08/11	4.00 pm	Technical Lecture on **'Opportunitites in Plastics Extrusion'** Focus - Paper 1 - Manufacture of Mosquito Nets Paper 2 - Drip Irrigation Systems Presentation by 'Neptune Plastics Industres'	IPF Conference Room
3	6/9/2011	2.00 - 6.00 pm	'M & SSE Awareness Seminar' Chief Guest Dr M K Bhuniya Minister in Charge : Micro & Small Scale Enterprises & Textiles, GoWB	Rotary Sadan
4	Early September		**UNVEILING OF FOUNDATION STONE AT IPF-KC** Chief Guest - Shri Partho Chatterjee, Hon'ble Minister for Commerce & Industries, Govt. of W.B. (confirmation awaited)	Poly Park
5	14/09/11	4.00 pm	Presentation on **'Plastics Waste Management'** by Dr. A. S. Bhattacharyya	IPF Conference Room
6	20/09/11	10.00 am - 6.00 pm	**Indplas'12 Launch Functiion and 52nd AGM of IPF**	ICC Auditorium
7	28/09/2011	9.30 a.m.	**"India Petrochem Summit"** organised by Indian Chamber of Commerce & supported by IPF	The Park Hotel
8	9 - 11 November 2011	10.00 am - 5.00 p.m.	**"Poly India 2011 - An International Exhibition & Conference"** on Advanced Applications of Polymers & Plastics organised by FICCI & supported by IPF	Hitex, Hyderabad

Essential Compounding Chemicals used with PVC Resin

Mr. Siddhartha Roy
Royplastech

The essential ingredients in a PVC formulation are:

- PVC Resin
  Suspension Grade
  Paste Grade
  Copolymer
- Primary Plasticiser
- Secondary Plasticiser
- Stabilisers
  Heat Stabilisers
  Light Stabilisers
- Lubricants
- Fillers
- Pigments
- Special Additives

PVC Resin

There are 4 types of PVC Resin grouped by polymerization method.

1. Suspension Grade PVC
2. Emulsion Grade PVC
3. Bulk Polymerised PVC
4. Copolymer PVC

Suspension Grade PVC

The most widely prevalent type, Suspension grade PVC is made by polymerizing droplets of Vinyl Chloride monomer suspended in water. When Polymerisation is complete, the slurry is centrifuged and the PVC cake is gently dried by special heating systems so as not to subject the unstabilised resin to heat degradation. Particle size of the resin ranges from 50-250 microns and have porous popcorn like structures which readily absorbs Plasticisers.

The structure of the PVC particles can be modified by selecting suitable suspending agents and Polymerisation Catalyst. Less porous types are extensively used for the high volume Rigid or Unplasticised PVC applications like PVC Pipes, Windows, Sidings, Ductings. Suspension grades of a coarser particle size and very porous structures absorb large quantities of Plasticiser forming a dryblend at temperatures as low as 80°C.The more porous types are used in Plasticised applications like Cables, Footwear, Soft Calendered Sheeting and Films etc.

Emulsion Grade PVC

Emulsion Polymerised PVC is what Paste Grade Resin is and this is almost exclusively used for Plastisols. Paste grade resin is a very fine particle size PVC produced by spray drying an Emulsion of PVC in Water very much like how milk powder is produced. Paste grade resin needs much more energy to produce and is considerably costlier than Suspension resin.

The paste grade resin carries the emulsifying chemicals and catalysts with it. It is therefore less pure than Suspension Polymerized or Bulk Polymerized PVC. The Electrical properties of Paste grade resin plastisols are therefore much poorer than Suspension Resin Compounds. Clarity is poorer than Suspension or Bulk PVC.

Paste grade resin is compact in structure, and does not absorb much Plasticiser at room temperatures. Temperatures in excess of 160-180°C are needed to drive the plasticer into the Resin during curing.

Paste grade Resin is extensively used for Cushion Vinyl Floorings of wide widths. Different layers of specially formulated pastes are coated either on a suitable substrate (Direct Coating) or on Release Paper (Transfer coating). The layers are fused continuously in long ovens and rolled up after release paper is stripped off.

The rolled good flooring can have a tough semitransparent wear layer over printed and foamed layers which are sitting on top of highly filled base coats to build up the thickness. Many extremely attractive and rich effects are possible and these represent the higher end of Vinyl Flooring.

Bulk Polymerised PVC

Bulk Polymerisation gives the purest form of PVC resin as no emulsifying or suspending agents are used. They are mainly used in transparent applications. They are mainly made available in the lower K value groups, as Unplasticised PVC Foils for Blister Packaging and other Calendered/Extruded Transparent films are best processed from lower K Value grades. Refinements in Suspension resin technology has edged out Bulk PVC in the recent past.

Copolymer PVC

Vinyl Chloride is copolymerized with

comonomers like Vinyl acetate give a range of resins with unique properties. PVAc or Copolymer of Vinyl Chloride and Vinyl acetate is the most important. The good solubility in solvents of PVAc makes it the prime choice for Vinyl Printing Inks and solvent cements. There is a very special application of PVAc in Floor tiling and it is the resin of choice for Vinyl Asbestos tiles. The Resin is actually a binder rather than the main ingredient. With Copolymer Resin it is possible to manufacture floor tiles with Fillers like Asbestos and Calcium Carbonate accounting for as much as 84% with the Copolymer and other compounding additives as low as 16%. Such high levels are not possible with Suspension resin as its melt viscosity is much higher and cannot coat and encapsulate such high levels of inert filler.

Special callendering trains are required for Vinyl asbestos tiles. However with Asbestos falling out favour, such products have slowly died out.

K Value

PVC Resins are classified by their K-Value, an indicator of the molecular weight and degree of polymerization.

- K70-75 are high K value resins which gives best mechanical properties but are more difficult to process. They need more plasticizer for same softness. High performance Cable insulations in Suspension resin and tough coatings for Conveyor belts, Industrial Flooring and similar high end applications in Paste grade are some popular application. It is the costliest.
- K65-68 are medium K value resin which are the most popular. They have a good balance of Mechanical properties and processibility. UPVC (Unplasticised or Rigid PVC) is made from the less porous grades while Plasticised Applications are best made from the more porous grades. There is a lot of grade choice as they cater to the Majority of PVC applications. Because of its sheer volume this family of PVC resins are priced the lowest.
- K58-60 are low K-value ranges. Mechanical properties are lowest, but processing is easiest. Many difficult to process applications like injection moulding, blow moulding and Clear Calendered packaging film are made from the lower K value ranges. Prices are higher than Medium K Value Resins.
- K50-55 are special resins which are tailor made for some demanding applications. Interesting ones are Battery Separator Resins and Blending resins used along withPaste Grade resin to reduce costs. Processing is easiest.
- As PVC is 56% Chlorine, it is one of the few Polymers which are self extinguishing, as Chlorine is a strong Flame inhibitor.

Primary Plasticisers

Plasticisers make the hard PVC resin softer. Primary plasticizers have good compatibility with PVC resin and can be absorbed in large quantities. In special cases as much as 140-150 PHR of Primary plasticiser can be gelated into PVC for super soft products. Nearly all Plasticisers are liquids and have to be absorbed in Suspension resin in heated mixers. High Speed mixers (which generate frictional heat while mixing) are the most popular types of dryblending equipment. Heated Ribbon blenders and Sigma mixers are only used when very high Plasticiser levels are required.

There is a vast array of Primary plasticizers for PVC. This discussion will be limited to the most popular, the Phthalate Esters. Phthalic acid is reacted with various alchohols to manufacture a family of Phthalate plasticizers of which Di Octyl Pthalate (DOP) is the most popular. Other important Primary Plasticisers are DOA & DOS (for low temperature applications), Trimellitates (for high temperature applications and Polymeric Plasticisers (High permanence).

The number of Carbon atoms in the Alcohol decides the gradation of Properties

Purity is very important in Plasticisers. Presence of unreacted Acid or alcohol even in small quantities reduces efficiency of the plasticizer. Impure Plasticisers have a bad odour. Electrical properties are adversely affected by impurities. For totally smell free DOP, double distillation is used, increasing costs.

Blends of such plasticizers can also be used but complicates manufacturing. However, in some case, small amounts of DBP have been used to promote Processing. DBP tends to evaporate out slowly with use, thereby stiffening the product, i.e. its permanency is low.

The higher Carbon atoms Phthalates have better permanence. They do not volatilize easily at high temperatures. If a Plasticiser volatilizes the product becomes harder and brittle. Fusing and gelation take longer with DNP & DIDP.

Phthalate Plasticisers are not fire resistant. They are the main reason why Flexible PVC products are much more flammable than Unplasticised (Rigid) PVC.

There are flame resistant Plasticisers, mainly Phosphates but they have to be imported.

There are many more families of Plasticisers for special properties, (Low Temperature, High Permanence, Non Migrating, Continuous High Temperature, Smoke resistance etc.).

Alcohol	Carbon atoms	Plasticiser Name	Gelation Rate	Main Usages
Butyl	4	Di Butyl Phthalate (DBP)	Fastest	Fast Fusing, Cheaper
Octyl	8	Di Octyl Phthalate (DOP)	Standard	Most Popular
Iso Octyl	8	Di Iso Octyl Phthalate (DIOP)	Standard	Slightly Cheaper than DOP
Nonyl	9	Di Nonyl Phthalate (DNP)	Slower	Non Toxic applications. Costlier
Iso Decyl	10	Di Iso Decyl Phthalate (DIDP)	Slowest	Best Heat ageing. Costliest.

One important concept has to be understood: **Plasticising Efficiency**. The Plasticising efficiency of DOP (the most popular) is set as 1. The Plasticising efficiency of any other plasticizer is expressed as a ratio with DOP for producing a moulding of same softness. For example if 50 PHR of DOP yields a Shore hardness of 77, and 55 PHR of another plasticizer gives the same hardness, the Plasticizing efficiency of the plasticizer is 50/55 x 100 or 0.91 (91%). For example for the Phthalates discussed above, the Plasticising efficiencies are:

Plasticiser Name	Plasticising Efficiency
Di Buty Phthalate (DBP)	1.05
Di Octyl Phthalate (DOP)	1.0
Di Iso Octyl Phthalate (DIOP)	1.0
Di Nonyl Phthalate (DNP)	0.98
Di Iso Decyl Phthalate (DIDP)	0.95

This concept is very important for the next group discussed.

Secondary Plasticisers

Secondary Plasticisers and extenders have limited compatibility. Their main purpose is to decrease costs. Some properties like fire retandance are improved.

The most common Secondary Plasticisers are the Chlorinated Paraffins. Waxes or Paraffin oils are chlorinated, Chlorine level varying from 40-60%. Chlorinated Paraffin Waxes (CPW) are very viscous and rarely used nowadays. Chlorinated Paraffin Oils (CPO) is much more popular as the Viscosity and Plasticising efficiency is better than CPW. The higher the Chlorine Content the better the Plasticising Efficiency, but Viscosity is higher. Addition of CPO adversely affects Gelation rates. Cost increases as Chlorine levels increase.

Special Paraffin Oil cuts are also used as extenders but are overshadowed by their Chlorinated derivatives.

Another important parameter is Compatibility. This determines how much Secondary Plasticisers PVC can hold. If addition levels exceed the Compatibility limit, the secondary Plasticiser will ooze out on the surface of the product during use. Secondary Plasticisers are rarely used as sole Plasticiser except in Semi Rigid applications. Primary Plasticisers have to be included in the recipe for Secondary Plasticisers to be of any use.

Secondary Plasticiser	Chlorination Level	Plasticising Efficiency	Compatability Limits, % of DOP	
			Shore A 75-90	Shore A 70-60
CPWax	40%	0.40 - 0.50	35%	30%
CPWax	56% (near solid)	0.50 - 0.55	40%	35%
CPOil	**42%**	**0.75**	**50-80%**	**40-70%**
CPOil	56%	0.8	60-100%	50-60%

The compatibility of Secondary Plasticisers is influenced by Filler levels. High filler levels improve compatibility and it is not unknown that in highly filled applications, Primary Plasticisers are eliminated, though this is not a safe practice.

There is another group of Secondary Plasticisers which are actually costlier than DOP. These are Epoxidised Vegetable oils. They will be discussed in the next section as they are added to boost heat stability and processing.

Stabilisers

The PVC molecule is unstable to heat and light. Heating PVC causes breakage of the Polymer chains, liberating Hydrochloric Acid gas. The HCl catalyses more degradation and the degradation can become explosive, releasing large quantities of corrosive HCl and other toxic gases. Exposure to Ultraviolet Radiation also breaks up Polymer chains, but is much slower than Heat degradation.

Heat Stabilisers

To process PVC it has to be stabilised against the action of Heat required at processing temperatures. A majority of Stabilisers contain metal elements which react with HCl and inhibit further degradation. They are Metal Salts, Soaps or Complexes. Stabilisation of PVC is a vast

Type	Form	PHR used	Clarity	Toxicity	Odour	Cost / Kg
Ba - Cd	Liquid	1.5 - 2.5	Clear	V. Toxic	Slight	~ Rs 200
Ba - Zn	Liquid	2 - 3	Clear	Toxic	Slight	~ Rs 190
Cd - Zn	Liquid	2 - 3	Clear	Toxic	Slight	~ Rs 220
Ca - Zn	Liquid	3 - 4	Clear	Non Toxic	Negl.	~ Rs 250
Leads	Powder	2 - 4	Opaque	Toxic	None	~ Rs 100
Tins	Liquid	0.5 - 1	Crystal	T & Non	Strong	~ Rs 350

Stabiliser application areas

Type	Heat Stabiity	Main Applications	Not recommended For
Leads	Very Good, esp long term.	Cables, Pipes & Fittings, Sleeves, Profiles, Cheapest.	Clear Application. Can be toxic
Tins	Best	Transparent tubings and sheeting, High quality Pipes, Medical	Causes sulphide staining with Leads. Costliest Stabilizer
Cd - Zn	Moderate	ROHS Cables, Non Toxic	For high heat history.
Ba - Cd	Good	Leather Cloth, Calendered Products, Footwear.	Non Toxic applications
Cd - Zn	Moderate	Foamed Leather Cloth	For high heat history.
Metalic Stearates	Low	Costabilisers with lubricating action	Sole Stabilizer.

subject and these are the second most important ingredient after Plasticisers in a Flexible PVC formulation. Some of the most important families are:

Light Stabilisers

Many of the Mixed Metal Stabilisers also protect PVC from UV radiation attack. Among the Lead Stabilisers, DBLPhosphite has some UV resistance properties. However their light stabilization effect may need to be boosted in application subject to outdoor exposure to harsh conditions.

Such light stabilisers are complex chemicals like HALS and are very expensive (Rs. 3000-5000/kg). While they are effective at very low dosages (0.1-0.3 PHR) they are only used if absolutely necessary due to their high cost.

An important group is the Epoxidised Vegetable Oils mentioned under Secondary Plasticisers. These boost the Heat and Light stabilizing effect of many Stabilisers. Commonly referred as the Synergistic effect, they are frequently used in combination with Mixed metals for best results. The most popular are Epoxidised Groundnut Oil and Epoxidised Soya Bean Oil.

Lubricants

Lubricants prevent hot PVC from sticking to metal surfaces while processing. They are a must with suspension resin compounds but have a much lesser role in Plastisol. Stearic Acid, Waxes including High Molecular waxes and many complex esters are commonly used. Dosage are low, 0.1-0.3 PHR.

Lubricants and their correct selection plays a vital role in processing. Too little and the melt is sticky, hangs up inside processing surface and starts degrading. Too much, and the melt slips on the extruder screw, reducing production rate. Overlubrication inhibits gelation and prevents full physical properties to develop..

Metallic Soaps Like Lead Stearate, Calcium Stearate etc have stabilizing as well as lubricating action. Nearly all of the Mixed Metal and Tin Stabilisers are non lubricating.

Lubricants can be Internal (Lubricating the movement of melt molecules, improving processability) and External (Lubricationg melt flow over metal processing surfaces). The Lubrication system has to have a balance of both.

Fillers

Fillers are inert inorganic powders whose major role is to reduce costs. Additions of fillers, especially in high dosages, adversely affect most desirable properties, and therefore are rightly viewed as cheapening agents. But some properties like Electrical strength and stiffness can improve.

Reinforcing fillers like Glass Fibre, Carbon Fibre will not be discussed here. They are much more expensive than PVC resin and not widely used in PVC formulations.

Non Reinforcing Fillers are a wide ranging group. For PVC the most important is Calcium Carbonate. There are two types of Calcium Carbonate which are widely used:

Ground Calcium Carbonate

Good quality Limestone (Whiting) mined from the quarries is pulverized into powder of a particle size suitable for addition in plastics. This is by far the cheapest type of filler, with transportation costs sometimes exceeding the product price. Purity of ground calcium Carbonate depends solely on the quality of the Limestone source as there is no chemical refining process to remove impurities, especially abrasive silicate and other rocky materials.

Ground Calcium Carbonate is extensively used by Leather Cloth Manufacturers who coat a PVC Paste on to substrates like Textiles, Paper etc, which is then cured continuously in an oven. The abrasive contaminants can be handled by the knife coating process. The abrasive nature of Ground Calcium Carbonate prevents its widespread use with Suspension Resin as the abrasion on extruders and Injection Moulding machines would be prohibitive. Coated fabrics made with the much costlier Paste grade resin is able to compete with Laminated products made from Suspension Resin because of the cheap filler used.

Not all Ground Calcium Carbonate is of low quality. Premium Champagne whiting from special Limestone quarries can be more expensive than PCC and is used in high end Electrical and Pipe applications. These are imported.

The surface quality is badly affected by ground Calcium Carbonate, but in Leather Cloth industry normally a thin high quality top coat which hides these defects. Its effect on Plastisols for Dip mouldings could be evaluated.

Precipitated Calcium Carbonate

Limestone is dissolved and impurities filtered out. After further chemical purification to remove Iron and Magnesium, the solution is carbonated with CO_2. Very pure Calcium Carbonate is precipitated and this is filtered and dried.. There are several grades depending on purity and particle size. Prices vary according to grade. Precipitated Calcium Carbonate (PCC) is the most widely used filler in PVC. PCC, by the way, is the main ingredient in toothpaste which accounts for much more tonnage that PVC Fillers. There are therefore many manufacturers in India.

Both Ground and Precipitated $CaCO_3$ absorb expensive Plasticisers, taking away some portion meant for flexibilising PVC. Thus more DOP has to be added to compensate, thus partly offsetting cost advantage. This can be significant especially as doses go up. Viscosity also increases.

To reduce the Oil (DOP) absorption Precipitated Calcium Carbonate is coated with Stearic Acid / Calcium Stearate. DOP absorption is reduced considerably and processing and gloss improves. These are premium fillers and are termed Activated PCC.

Recently, better quality GCC are being offered by several manufacturers and are replacing the costlier PCC in lower end PVC applications like Agri Pipes, SWR etc.

Other mineral fillers are Talc, Dolomite, Wolastonite and Asbestos. Asbestos was widely used in Vinyl Floor tiling but its carcinogenic nature has prevented its use nowadays.

While Calcium Carbonate seems to be the most attractive cost reducing agent, care has to be taken in optimizing its addition level and grade selection for best results. The concept of Volume cost will be taken up in the last section.

Pigments

Pigments again are a vast subject. They can be broadly classified as:

- Inorganic Pigments
- Organic Pigments
- Carbon Blacks.

Inorganic pigments are oxides and salts of metals as well as complex minerals. The most important is Titanium Dioxide which is the chief whitening pigment used in Plastics.

Important Inorganic Pigment groups

- Ultramarine : Blues and Violets
- Chromes : Yellows, Orange, Brown
- Cadmiums : Reds, Orange, Yellow
- Iron Oxide : Brow, Black. Iron oxide tends to catalyse decomposition of PVC so must be used wit care if at all.

Inorganic pigments are heat stable, cheaper but does not have the colour strength and brightnes when compared to organic pigments.

Important Organic Pigment Groups

- Phthalocyanines : Blue, Green
- Chromophthals : Red, Orange
- Azos : Wide range of colours, but carcinogenic.
- Lakes and Toners : Oil soluble dyes leach out with the plasticizer in PVC. However when deposited and reacted with inorganic carriers, they for Lakes which are widely used in Plastics

Masterbatches

The modern trend is to depend on masterbatch suppliers to provide the technology of obtaining the right shade in the product. Developing colours in-house starting with pigments is a complex job. Maintaining shades requires very accurate weighments of multiple pigments. Though it is the cheapest route, the conveniences of masterbatches make it the preferred colouring route.

A masterbatch is a colour matched pigment mixture dispersed and encapsulated in a Polymer carrier which is compatible with the Polymer being processed.

Special Additives

There are a wide variety of special additives which can be added to improve performance of the moulding. These will be discussed in detail at a later time, but the most interesting are listed:

Flow Promoters

Special Acrylic Polymers aids in the processing of PVC by reducing the melt viscosity. They are mainly used in Rigid PVC applications which are difficult to process like Pipe Fittings, Calendered and Extruded Sheet and thick wall Pipes. They have limited effectiveness in Plasticised PVC, but are used in some applications where Plasticiser level is low.

Impact Modifiers

A family of Acrylic and MBS copolymers, they act like rubber and improve resistance to shock loads in Rigid PVC products. CPE (Chlorinated Polyethylene) is widely used as an Impact modifier in PVC Pipe.

Fire Retardants and Smoke Suppressants

The classic route of imparting Fire and flame retardancy to Plastics is well established. Most polymers can be burnt quite easily. By introducing a Halogenated compound and then adding Sb_2O_3 the polymer gets protected from burning. The Halogen reacts with the Antimony trioxide emitting a thick cloud of non burning gas which envelopes the burning part like a blanket. Oxygen supply is cut off and the flame extinguishes.

- Fortunately PVC already is 56% Chlorine, a Halogen. Thus costly (and Toxic) Brominated compounds need not be added as is the case with other polymers. Addition of Sb_2O_3 need not be as high as in other polymers
- ATH is a chemical which contains water of crystallization. It can be added as filler. When a flame strikes the product, ATH releases steam which acts as a fire extinguisher and counteracts the flame.
- There are many other proprietary Flame retardant and Smoke suppressing additives, most of which are imported.

Foaming Agents

- Foaming Agents are chemicals which decompose at gelling temperatures giving off inert gases like Nitrogen or Carbon Dioxide. The gases are trapped on the thick melt and generate a foamed structure.
- This is a useful way of increasing the bulk or volume of the moulding and lowering the density considerably. They are extensively used in the Leather cloth industry and another well known application is microcellular shoe soles.
- Many novel embossed an raised effects are obtained in spread coated Vinyl Rolled good flooring by printing patterns with PVC Plastisols containing blowing agents. On curing the printed portions foam up and give novel patterns.

Fungicides and Biocides

- Protects the non plastic components like Plasticisers from mould growth. This is especially important in wet and humid environments like Bathrooms. PVC Shower curtains often need such protection.

Volume Cost

Volume cost and its implications are not properly understood by many entrepreneurs. 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.

If cost calculations are done on Per Kilo basis, many times the reduction in cost by adding fillers is calculated as a percentage of original formulation cost. The savings may be translated into a price reduction, especially in competitive situations to maintain market share. 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.

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

In your Floor tile formulation, the filler loading is very high. Many problems could be solved by reducing the filler loading.

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. 80.00		1.4	Rs. 112.00	
DOP	Rs. 100.00	125.00%	0.98	Rs. 98.00	87.50%
Flow Promoter	Rs. 250.00	312.50%	1.05	Rs. 262.50	234.38%
Stabiliser	Rs.120.00	150.00%	2.3	Rs. 276.00	246.43%
Filler	Rs. 16.00	20.00%	2.7	Rs. 43.20	38.57%
Ti02	Rs. 120.00	150.00%	5.6	Rs. 672.00	600.00%

However this may be thought to be the last resort as costs would go up. If viewed from a volume cost angle, the increase in actual cost is not that high. If rejections and scrap generation drastically reduce, reducing Fillers may prove cost effective

In the following example, a 20% reduction in filler would appear to increase the cost on a per Kg. basis by about 9.5%. On the basis of Volume cost, the increase is actually 5.6%. If reduction of wastage and rejects improves by about 5%, the proposed reduction in Filler would be cost efficient.

Formula 1			
	Recipe Kgs	Cost Rs/Kg	Litres
PVC	30	Rs. 2,400.00	21.43
DOP	7.5	Rs. 750.00	7.65
Flow Promoter	0.25	Rs. 62.50	0.24
Stabiliser	1	Rs. 120.00	0.43
Filler	100	Rs. 1,600.00	37.04
Ti02	3.5	Rs. 420.00	0.63
Total	142.25	Rs. 5,352.50	67.42
		Cost/Kg	Rs/Litre
		Rs. 37.63	**Rs. 79.39**

Formula 2			
	Recipe Kgs	Cost Rs/Kg	Litres
PVC	30	Rs. 2,400.00	21.43
DOP	7.5	Rs. 750.00	7.65
CPW	0.25	Rs. 62.50	0.24
Stabiliser	1	Rs. 120.00	0.43
Filler	80	Rs. 1,280.00	29.63
Ti02	3.5	Rs. 420.00	0.63
Total	122.25	Rs. 5,032.50	60.01
		Cost/Kg	Rs/Litre
		Rs. 41.17	**Rs. 83.86**
	Increase	**-9.40%**	**-5.63%**

Contd. to Page - 23

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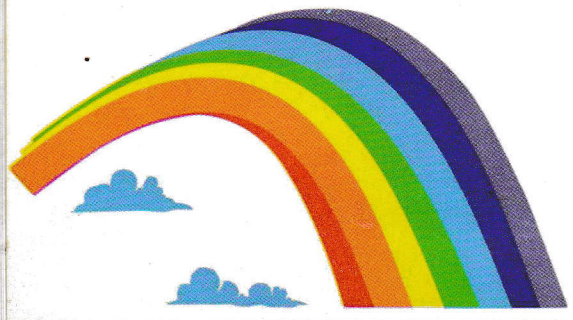

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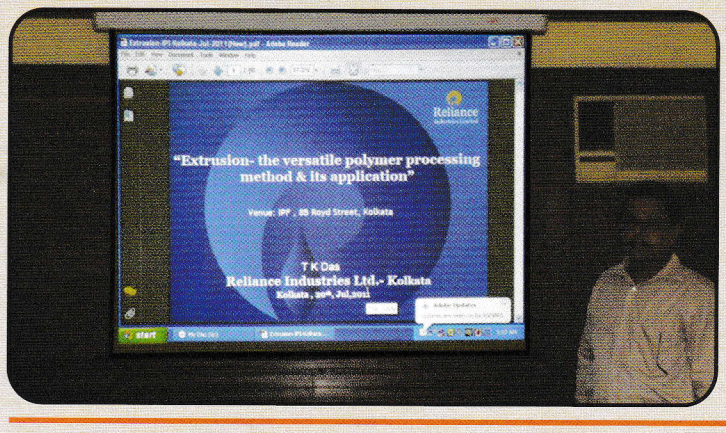
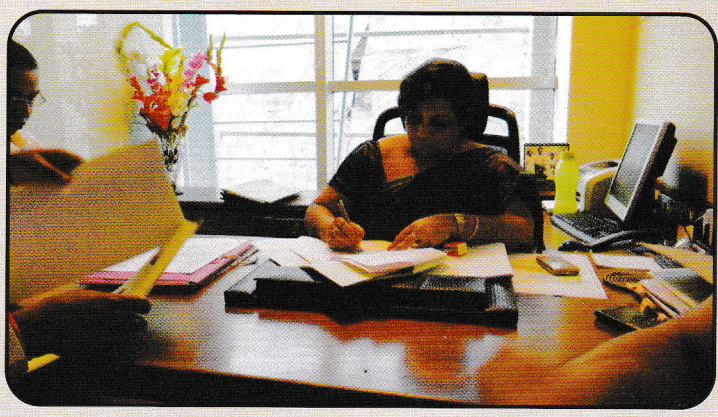
xproindia ENDOWMENT LECTURE

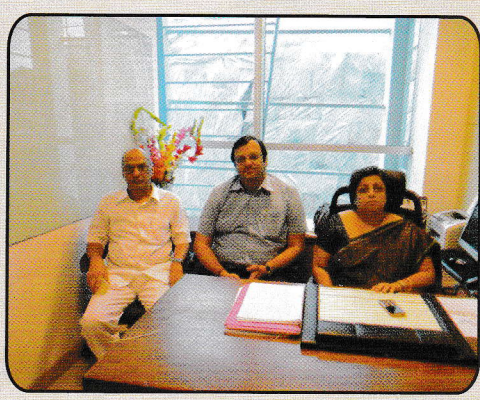
Indian Plastics Federation jointly with Indian Plastics Insitute (Kolkata Chapter) organised a *xproindia* Endowment Lecture on "Extrusion - Versatile Polymer Processing Method and its Applications" on 20th July 2011 at IPF Conference Hall. Mr. T. K. Das, General Manager, Reliance Industries Ltd., Kolkata spoke on the subject matter. The lecture was very informative. A large number of members attended the lecture.



LAND REGISTRATION

Land on which IPF Knowledge Centre will be developed at Poly Park, Sankrail in Dist. Howrah was registered on 25th July 2011 in the chamber of Ms Meenakshi Mukherjee, Deputy Manager, Land & Law, WBIDC. Shri Sourabh Khemani, President - IPF signed the lease deed on behalf of IPF in the presence of Shri Ramawatar Poddar, Hony. Secretary of the Federation.



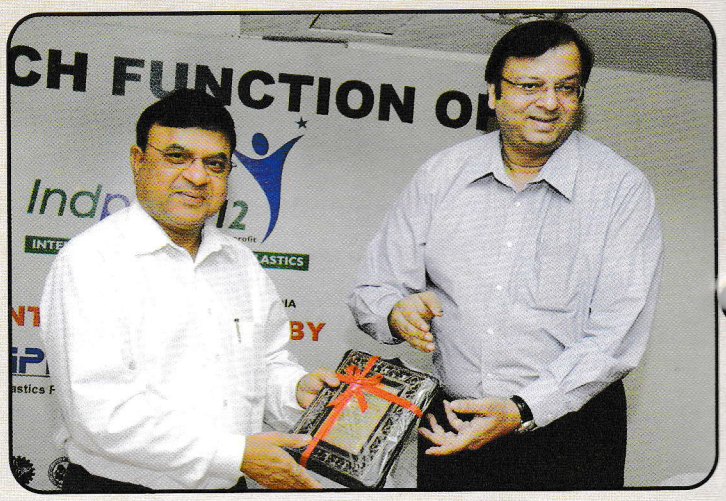


LAUNCH FUNCTION OF INDPLAS' 12 AT AHMEDABAD

Indplas '12 - 6th International Plastics Exhibition, jointly organized by Indian Plastics Federation(IPF) and Plastindia Foundation and supported by all Founder Members of Plastindia and other leading plastics Associations from India, was launched at Ahmedabad at a well attended function on Saturday, 30th july '11 at Hotel Nalanda.Thanks to support of GSPMA,the function was well received and attended.

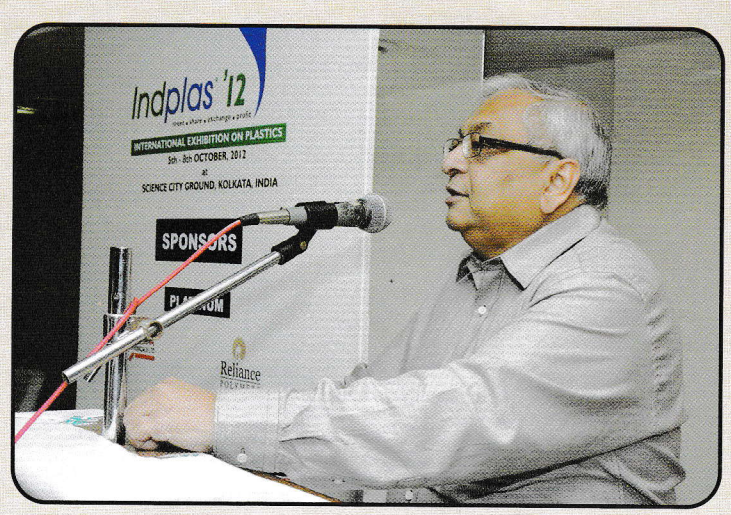
Shri Sourabh Khemani welcomed the Chief Guest Shri Mahendra N . Patel, Chairman, Mamta group with Flowers and Memento from IPF. He also welcomed Guest of Honour Shri Mahavirji Khatang, President of GSPMA with Flowers and Memento. President briefly touched activities of IPF and need for Plastic Industry from Gujrat to participate in Indplas '12 to be held at Kolkata from 5th to 8th Oct '12. He also emphasised on ready market for processed goods in eastern part of India.

In his address, Chairman of Indplas' 12 Exhibition Organizing Committee and IPF Knowledge Centre - Shri Amar Seth covered in details the need of IPF—KC and what all is planned including training, Testing centre with CAT/CAM, Renewable energy section, Display section and Demo-- Mixed-Plastic Scrap Reprocessing unit to start with. He also invited inputs from members present since the KC is still at conceptulising stage. He also mentioned that KC will be on a one acre plot of land already in possession of IPF to be implemented in stages. This is a Rs 25 cr project when fully operational.

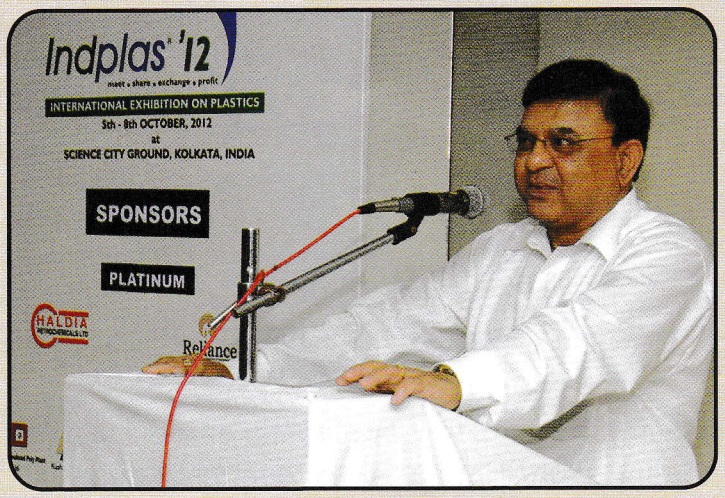


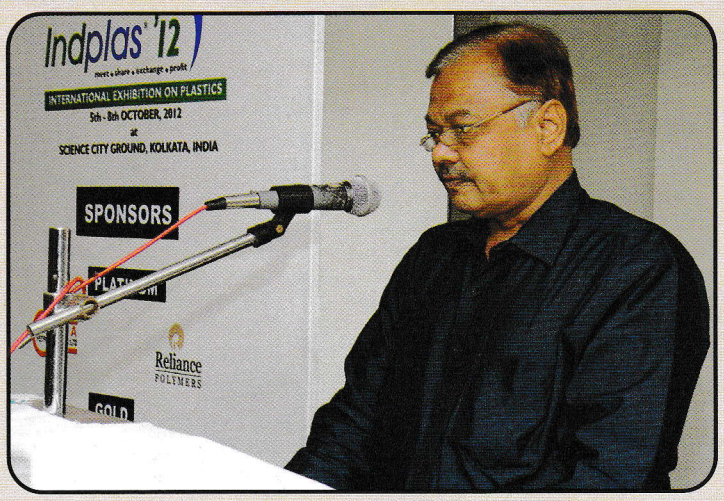
Shri Seth then briefed the august gathering about Indplas' 12. All modern facilities with AC hangers will be provided to exhibitors. He recalled that 237 satisfied exhibitors of Indplas' 06 had assured their participation, having concluded a large volume of business during Indplas' 06. With eastern market growing fast and easy availability of raw material coming from Haldia Petrochemicals Ltd. and upcoming plant of Brahamputra Complex*(Promoted by GAIL) in Assam, there is ample oppourtunities for Machine and Ancillary equipment manufacturers from West to market in East. Indplas' 12 expect around 600 exhibitors from all over India including International exhibitors from China and Taiwan and certain European countries. Indplas' 12 promotional film was screened to give more details of the exhibition.

In his address Shri Mahavir Khatang, conveyed his good wishes and full hearted support of GSPMA for Indplas' 12. According to him, Indplas '12 is not a competitive exhibition with GSPMA's PLEXPO but is the need for eastern zone and an oppourtunity for Gujrat parties to expand their business in East by participating In Indplas' 12.



Shri Seth mentioned that substantial surplus of Indplas' 12 will be earmarked for IPF - KC. IPF has announced various sponsorship schemes. He also announced that Haldia Petrochemicals Ltd. and Reliance Industries Ltd. have consented to be PLATINUM Sponsor. He invited Support Sponsorship from Gujrat Plastics Industry. It was also announced that all sponsors and Donors names shall be permanently displayed at IPF KC. Promptly Shri Shyam Tibrewal of Mayur Wovens, Shri Jigish Doshi of Visakha Poly Fabs and Shri Amritbhai Patel of Doll Plast conveyed their consent to be support sponsor of Indplas' 12 by donating Rs 1.11 lac each.





In his address, Chief Guest shri Mahendra N Patel , congratulated IPF for this dream project of IPF - Knowledge centre. He mentioned that he has understood what are the plans of IPF and has assured his full cooperation and guidance in setting up renewable energy section .He also mentioned that GSPMA should also take up similar programme in Gujrat since Knowledge centre in various parts of the country will boost plastic industry growth. As a machine manufacturer he also agreed that Eastern Zone has a good market potential since majority of Machine mfgs and Ancillary Equipment mfgs are in Western India. He conveyed his good wishes for success of Indplas' 12.

Shri R A Lohia, Past President of IPF Welcomed and thanked Shri Kamlesh Gohil, Chairman of KMD group for extending their logistic support to IPF in organizing this function.

Shri Vajubhai Vaghasia, Marketing Consultant for Indplas' 12 in western part of India, thanked both shri Mahendrabhai and shri Mahavirji for their gracious presence. He also thanked all those who attended the Launch function. He once again requested the Gujrat plastic Industry to participate in Indplas' 12 and get full mileage of growth. Programme ended over sumptuous Dinner with discussion.

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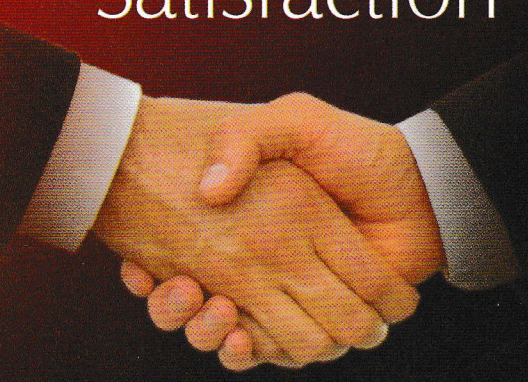

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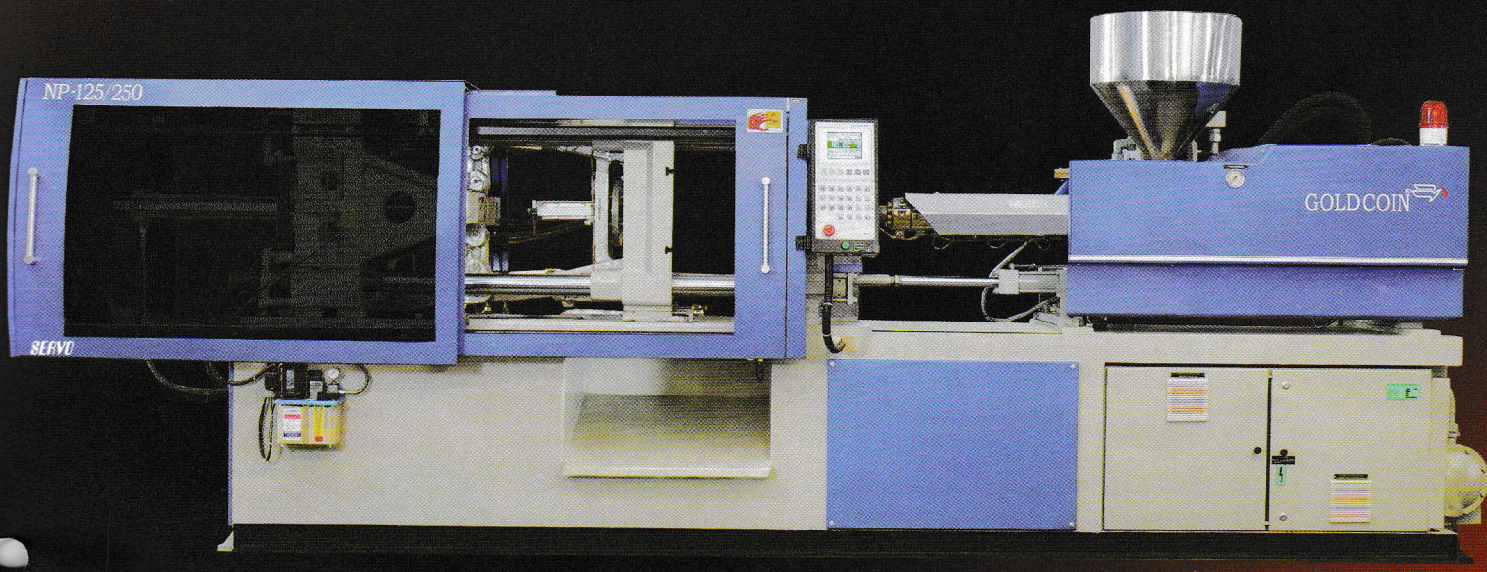

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Business Opportunities in Micro Irrigation System in India

Plastic Trend in Agriculture ...

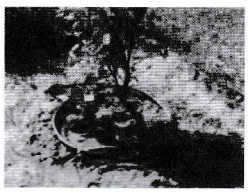
Mr. Prabhu N. Chakrawal
Officer – PADC
Indian Oil Corporation Ltd,
Panipat, Haryana

Introduction

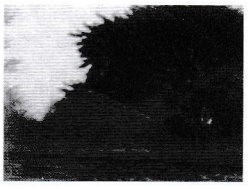
Micro irrigation is an approach to irrigation that keeps the water demand to a minimum through spray, mist, sprinkle or drip. The water discharge patterns differ because emission devices are designed for specific applications due to agronomic or horticultural requirements.

a) Drip Irrigation: It is the slow and regular application of water directly to the root zone of plants through network of economically designed plastic pipes, mains, sub mains, laterals and low discharge emitters. Drip irrigation in particular offers farmers to increase their water efficiency up to 50 percent at the same time improving yields by 30 percent or more.

LLDPE drip laterals are placed along the rows of the crop on which emitters are connected directly to provide water to the roots.



b) Sprinkler Irrigation: The water is conveyed under pressure through aluminium or high density polyethylene pipes to the fields. The water is sprinkled over the crop through the rotating nozzles at a pressure of 3-4 kg / cm2. The riser and nozzles are installed on the lateral pipes.



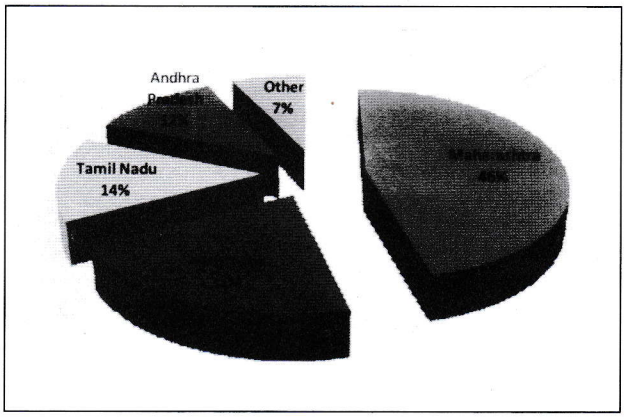
Potential of Micro Irrigation in India

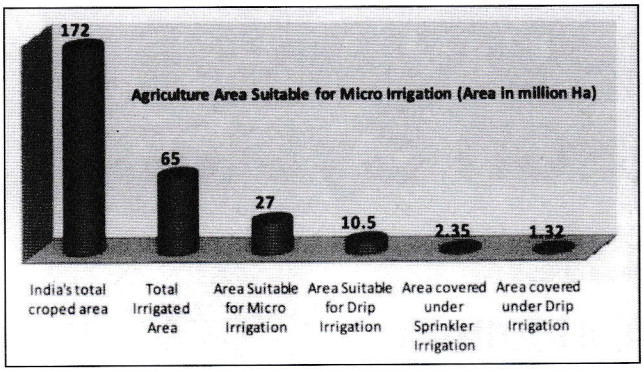
India is a large producer of agricultural products. Irrigation resources are limited and the water use efficiency as well as agricultural productivity is low. Micro Irrigation has become popular in India and it has been adopted on 3.6 million ha. India has 172 million ha of cultivated land (second largest in the world). Studies of comparative crop yield and water use for surface and conventional drip irrigation of different crops carried out at agricultural universities in India have consistently found water savings of 30-60% and yield increases of 20-40 % favoring drip irrigation over surface methods. There are some 100 private companies producing and marketing drip irrigation systems in India. According to 10th Horticultural plan, out of the total cultivated area of 172 million ha in the country, only 65 million hectare (37%) is irrigated. As per the estimates, the total cropped area suitable for micro irrigation (Drip + Sprinkler) in the country is to the tune of 27 million ha. The Indian Committee on Irrigation and Drainage estimates a potential for drip irrigation in India of 10.5 million hectares.

The Micro Irrigation System (MIS) market in India is valued at ₹17 bn in 2009 and is expected to grow rapidly in the future. The depleting water level and water scarcity has created a demand for Micro Irrigation System, which is expected to drive the market. Domestic and foreign participation has been continuously increasing as they compete for a izeable share of un-irrigated land in India with high profit opportunities.

Being India an agricultural country, yet abroad 15% of plastics go into the agriculture while we are using only 3% in Canal lining and drip irrigation. In Agricultural plastic uses are endless.

In India, adoption of micro irrigation is growing with annual average growth rate of 16-17%.





(Ref: Book: Micro Irrigation System in India 2010)

Government of India Assistance & Plans

Drip Irrigation in India is promoted under the Government sponsored scheme "CSSMI (Centrally Sponsored Scheme – Micro Irrigation)".

Central government is giving 40% subsidy and 10% subsidy is given by state government remaining 50% cost is borne by the beneficiary (farmers), a maximum area of five ha per beneficiary.

Additional subsidy is also given by some government bodies like NABARD, which vary from state to state.

Different State Governments were found to have supplemented the central subsidy fund with their own resources and improved the scope & coverage of the micro irrigation scheme.

Particulars	AP	Gujarat	MP	Karnataka	Orissa	Punjab
Total Assistance (% of total system cost)	70%	50%	70%	75%	70%	75%
% Shares – Central: State: Beneficiary	40: 30: 30	40: 10: 50	40: 30: 30	40: 35: 25	40: 30: 30	40: 35: 25

Since plenty of water resources are available in northern India, which has not attracted the farmers for adoption of micro irrigation. But farmers have started adopting micro irrigation in northern region too like Bundelkhan region, Himanchal Pradesh, in the border region of Haryana & Rajasthan and Punjab because of scarcity of water.

Government has allotted ₹10 bn for micro irrigation in the union budget 10-11.

The significant hike in the plan outlay for the agriculture and allied sector as compared to the previous fiscal is indicative of the Government's thrust towards increasing the production & productivity of the agricultural sector. The allocation of micro irrigation projects also augurs well for the overall agricultural growth going forward as this would help in reducing its dependence on monsoons.

(Ref: Union Budget 2010-11 – Impact Analysis)

In the 11th five year plan (2007-2012), the government has approved a rehabilitation package amounting to ₹16978 crores for the farmers in distress in 31 selected districts in the four States, namely, Andhra Pradesh, Karnataka, Kerala, and Maharashtra. The package comprises relief from the Prime Minister's Relief Fund, strengthening institutional credit support, irrigation development, promotion of micro irrigation, watershed development, extension services, enhancing seed replacement rate (SRR) and income augmentation through horticulture, livestock, and fishery in these districts.

(Ref: 11th Five year plan –Volume III- Gov. of India)

In Uttar Pradesh, Government is giving 100% subsidy on drip & sprinkler irrigation in Bundelkhand region and 75% in rest of the state. Bundelkhand region which contributes maximum area in pulses, the facility of micro irrigation system has been extended in a big way.

Under National Horticulture Mission, Haryana Government had proposed ₹1295 lakh budget for Micro Irrigation.

Haryana State Micro Irrigation Action Plan – 2009 -10

The Andhra Pradesh government has prepared a comprehensive action plan involving an outlay of ₹15,300 crore for execution of micro irrigation systems under the 31 lift irrigation projects in the state. Tenders for the projects, initially for an extent of 250,000 acres, will be finalised by September 2010. By 2014, it has been targeted to cover the entire area of 6.2 million acres, which would be irrigated by the 31 lift irrigation projects. The implementing agencies will maintain the micro irrigation systems for a period of five years.

(www.ibef.org : News: AP to take up Rs 15300 cr micro irrigation projects)

S.No.	Component	[illegible]		[illegible]	
		Phy.(ha)	Fin. (Rs. in lakhs)	Phy.(ha)	Fin. (Rs. in lakhs)
1	Drip Irrigation	3459	1066.40	120	71.85
2	Sprinkler irrigation	586	79.46	0.00	0.00
	Total	4045	1223.56	120	71.85

(Ref: Presentation: Haryana Agriculture Strategy, Dept of Agri. Haryana)

Bihar State has planned to bring an area of 200000 ha under drip and sprinkle irrigation systems covering 534 blocks in 38 districts involving a total project cost of ₹708 crores.

Subsidy by the Central & State Government in Bihar

General Farmers (Small/ Marginal/ SC/ ST/ Women): 70%

Maximum amount of subsidy to be paid to a farmer, as under -

Sprinkler Irrigation System: Max area of 5 ha and financial assistance of up to ` 50,000.00

Drip Irrigation and Micro Sprinklers: Max area of 4 ha or ₹200000.00

In case the farmer installs both sprinkler and drip irrigation systems at his farm the max amount of subsidy should be ₹250000.00 subject to area limits prescribed above.

New Entrepreneur Development, Indian Oil Corporation Ltd,

Product Application & Development Center (PADC)

Technical support is given by the PADC to the interested Entrepreneur for setting-up of MI system manufacturing unit from project startup stage to the implementation stage in the following areas:

a) Selection of Equipment

b) Processing of IOCL grades to get the right quality of end product

c) Development of cost effective recipe

d) Information on recent development & market trends.

Area Planned Under Different Sectors: (Drip Irrigation Systems) – Bihar State (Amount: Rs. In Lakhs)
(For the year 2009-12)

Drip Irrigation System	Area (Ha)	Cost per ha	Estimated Cost	Subsidy				Farmer's Share
				GOI Share (40%)	State Share (20%)	Additional State Share (10%)	Total	
Mango, Litchi, Guava	80000	0.35	28000	11200	5600	2800	19600	8400
Banana	8000	0.90	7200	2880	1440	720	5040	2160
Vegetables	10000	1.30	13000	5200	2600	1300	9100	3900
Sugarcane	1500	0.90	1350	540	270	135	945	405
Flower Culture	500	1.40	700	280	140	70	490	210
Total	100000		50250	20100	10050	5025	35175	15075

Area planned Under Sprinkler/Rain Gun/Rain Pot Irrigation System – Bihar State (Amount: Rs. In Lakhs)

Sprinkler/ rain pot/ rain gun	Area (Ha)	Estimated Cost per ha	Total Estimated Cost	Subsidy				Farmer's Share
				GOI Share (40%)	State Share (20%)	Additional State Share (10%)	Total	
Vegetables	4000	0.35	1400	560	280	140	980	420
Potato	10000	0.35	3500	1400	700	350	2450	1050
Sugarcane	1000	0.35	350	140	70	35	245	105
Agricultural crops	85000	0.18	15300	6120	3060	1530	10710	4590
Total	100000		20550	8220	4110	2055	14385	6165

(Reference: Presentation - State Action Plan for the year 2009-12, Department of Agriculture, Gov. of Bihar)

Micro Irrigation (MI) System Manufacturing Process: Drip Lateral is extruded from virgin LLDPE through a circular die

(die range 12 - 32 mm). This resin is incorporated with Carbon Black for UV resistance to yield Lateral having excellent physical and environmental stress crack resistant properties. Drippers, the core of the drip irrigation system, are small water emitters made of injection moulded HDPE material. Depending upon the design it emits water of different flow rate (0.5 to 12 litre / hr). Drippers are inserted inside the lateral tube during the extrusion in In-line drip laterals. In off-line laterals, drippers are inserted from outside. Sprinkler pipe is extruded from virgin HDPE resin through a circular die (die range 32 - 110 mm) and Carbon Black is incorporated into the resin for UV resistance. Water sprinkler systems are mounted on the sprinkler pipe depending on irrigation application.

Conclusion

The annual food grain requirement of India, works-out to be 450 million tons by the year 2050, in terms of average utilisable water resources, which was 6008 m3 in 1947 (presently 1250 m3) is expected to dwindle down to 760 m3 by 2050. Agriculture, a main stay in the India, has dependence of 65% of Indian population. Agricultural sector is the largest consumer of water. India, shares 17% of the global population with only 2.4% of land and 4% of the water resources. Efficient utilization of available water resources may become crucial for the country. The overall efficiency of the flood irrigation system range between 25 to 40%. To meet the food security, income and nutritional needs of the projected population in 2020 the food production in India will have to be almost doubled. Adoption of Micro irrigation, may help in saving significant amounts of water and increase the quality and quantity of agriculture produce. All these emphasize the need for water conservation and improvement in water-use efficiency system in agriculture through micro irrigation.

These lessons indicate that there is a high market potential of micro irrigation system in the country. This business involves low projects investments which make it possible for entrepreneurs to start manufacturing business of micro irrigation system in a small way.

IOCL Grades for Micro Irrigation System					
Application	Product	Grade	MFI (I2)	Density	Special Characteristics
Drip Laterals	LLDPE	010F18A	0.9	0.918	Good processability, Good mechanical properties, No slip and anti block.
	HDPE	003F46	0.30	0.946	Good Processability & low gel content.
	HDPE	004P41	0.38	0.941	Very good processability, excellent ESCR. Meets PE-63 requirements
Sprinkler System	HDPE	010DP45	1.0 (I5)	0.945	Bimodal grade with good processability.
	HDPE	004DP44	0.43 (I5)	0.944	Bimodal grade with very good processability, Meets PE-80 rating requirements.
Dripper	HDPE	180M50	18	0.950	Excellent gloss.

Mould Cooling today

By Mr. R.C. Batra German Advisor (Retd.)

The cooling period constitutes the major segment of a moulding cycle. Any measure of moulding cost reduction must be directed towards shortening the cooling time. However, it has not received the attention it deserves. All other factors involved in moulding, such as materials and their flowability, injection, holding and back pressure, injection and dosing speed, times for various operations etc., have been studied and investigated in detail for their effect on the product. Ways and means have been developed to monitor and control them. Cooling and its relevance to the quality of the moulding, however, did not ejoy the same attention. Neither the inlet and outlet temperatures of the coolant nor its pressure and flow as well as the surface temperature of the mould were measured, recorded and maintained constant. Cooling was solely regarded only as an unavoidable measure to bring the hot fluid plastics to solidification and all efforts were directed towards fast cooling regardless of consequent effect on quality of the moulding.

For a long time, the cooling design in the mould was confined to providing a few drilled holes in the mould blocks for circulation of a fluid coolant, mostly water. The main consideration for their size and placement was availability of space and avoidance of interference with the screw and ejector holes and not the shape of the moulding and sections of heat concentration. Consequently, the heat removal was unbalanced which resulted in uneven shrinkage, dimensional inconsistency, built-in stresses, warpage, inferior strength and non-uniform surface finish of the moulding. It also impeded filling of thinner sections. The curative action resorted to was mostly increasing the pressure and prolonging the cooling period. Later, refrigerated water was used to expedite cooling. Although it cut down the time, it introduced other problems like freezing-in of stresses, variation in dimension, surface defect and warpage. It proved a failure in tropical countries. The moulds sweated and often led to surface defects in the mouldings. The moulds too developed rust and pit marks.

Water, which is employed extensively as the cooling medium, has many drawbacks. the cooling medium, has many drawbacks. It is a bad conductor of heat. The fact has been realised at last and some means of creating turbulence in the flow have been introduced with positive results. Water also promotes rusting and corrosion. In addition, its calcium contents deposit on the inner surface of the cooling holes and form an insulating barrier which reduces the heat removal efficiency significantly. The rust and corrosion may lead to initiation of cracks from inside of the cooling channels, especially when the surface of the drilled holes is rough. The boiling temperature of water limits its application as coolant mainly to the moulds for commodity plastics with some exceptions.

It is only in the past three decades that efforts have been made to study the overall effects of cooling on the mouldings in some depth. Nonetheless, the progree has been slow, sporadic and unscientific. Though the mould

designers have realised the importance and effects of a good cooling layout, quite often it is difficult to incorporate and effective cooling layout because of the product desing based solely on the function and not on the peculiarities of the material.

It has also been recognised that the optimum mould temperature is different for different materials. Some polymers, especially the engineering and speciality plastics, call for elevated mould temperatures. Special gadgets, which supply the coolant at a set temperature, have replaced the old system of drawing water from a central cooling tower for all machines irrespective of the materials being processed.

Thin cores as well as thin sections of the main mould core have proved to be the Achilles heel. These defy effective cooling by means of coolant circulation. Drilling cooling holes is either not possible or likely to reduce their strength considerably and make them prone to damage. Fabricating these sections out of alloys having good heat conductivity has brought some relief as far as better dissipation of heat is concerned. They can be cooled indirectly by well-cooled surrounding mould plates or through holes drilled in their own lower, thicker bases. These alloys, mostly containing copper as the major ingredient, however, have lower tensile strength and wear resistance and consequently shorter service life than the rest of the core made of hardened steel. The better heat conductivity, however, can also prove disadvantageous - it may give rise to temperatures different than those of other mould components made of hardened steels with lower heat conductivity.

Invention of heat pipes has alleviated the difficulty of cooling thin cores to some extent. The hollow, slender thin-walled pipes, sealed on both ends, contain a fluid which evaporates at higher temperatures but regains its fluid state when cooled. This phenomenon is made use of by embedding the pipe in the core and immersing the other end in flowing cold water. The heat of the core turns the fluid content into a vapour which flows down to the colder end where the vapour is condensed to a fluid. The fluid rises up to the hot end through a gauze like fabric enclosed in the pipe.

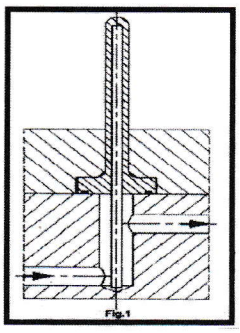


Fig. 1 illustrates the working principle. A heat pipe can be as slim as 3 mm. in diameter, so that it can be employed in majority of cases.

All cooling methods discussed so far, employ the coolant at constant temperature with uninterrupted flow. Consequently, the injected melt has to flow through a cold mould which offers resirtance to its flow and impedes the progress. The melt loses heat and becomes more viscous. Consequently, it takes higher pressure and longer time to fill the cavity. One way to circumvent the drawback is to employ alternating cooling i.e. to interrupt the circulation of the cooling medium during the injection phase and switch it on after complete mould filling. The simple measure has shown significant improvements. The operation requires a cooling device, synchronised with

core and cavity are required to have different temperatures to counteract warpage, camouflage sink marks or facilitate ejection. With the help of separate monitoring and heat recovery systems, which electronically monitor coolant circuit temperature and throttle the flow of the coolant, the temperature of the relevant mould component is raised to the set level. The temperature sensor can be conveniently placed at the exit point of the coolant. The system is economical in two ways. It saves energy as the heat from the melt itself is utilised to heat up the mould component and it obviates the necessity of an additional cooling/ heating gadget.

An ideal layout of the mould cooling, conforming to the shape of the product, remained an utopia until the invention of laser sintering. The unconventional solid free-form fabrication technologies, such as rapid prototyping, laser fusing, laminate tooling process etc. employing laser sintering, help to overcome the restrictions imposed by conventional machining methods on the form of cooling and enable incorporation of efficient conformal cooling system, which may be defined as a cooling figuration which essentially follows the contour of the top surface or deviates from it as thick/thin sections of the moulding may dictate for optimal thermal management.

The criteria, guiding the layout, are the heat conductivity of the mould material, its strength at the processing temperature, the temperature and pressure of the melt and the variations in wall thickness of the moulding. The objective is to remove the heat from the injected melt uniformly. It has been observed that conformal cooling may cut down the cycle by 30 to 60 percent depending upon the geometry of the product besides bestowing other advantages like dimensional consistency, absence of surface defects and reduction of internal stresses. A patented method of forming solid mould parts by laser sintering out of tool steels and light metal alloys called "Laser Cusing has perfected the process and is specialised in manufacture of mould inserts incorporating conformal cooling layout.

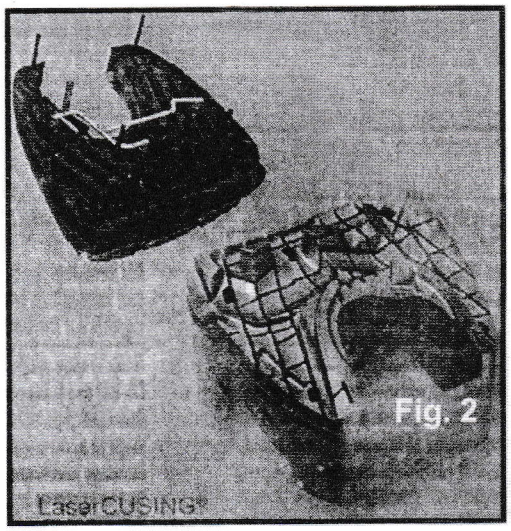


Fig. 2 illustrates one such layout in the mould core for the cover of a technical gadget.

A further development of the concept is the Pulse Cooling. It aims at varying the mould temperature at different stages of the moulding cy'cle by varying the flow as well as the temperature of the cooling medium. The gadget monitors the mould surface temperature constantly and cools intermittently, changes temperature of the cooling fluid and preheat or hold the mould at a

constant temperature during a particular segment of the moulding cycle. This makes the cooling process more suitable to the state of the melt at a given point. Obviously, the measure can be successful if it is applied to all circuits of the cooling network and each circuit is independent. In other words, the gadget must have a number of independent cooling lines which can be set, regulated and controlled individually. The present range of devices in the market offer 4 to 48 circuits. These complex operations are governed by microprocessors. Pulse cooling of moulds with conformal cooling layout proves economical in the long run in spite of the high investment cost. The main advantages are;

- Very short warm up time as only the mould surface is heated to the set temperature and not the whole mould block.
- Higher productivity by dint of shorter cooling period.
- Very low rejection rate because of consistency of parameters governing the component dimensions. Less in- built stresses hence less warpage.
- Very low water consumption.

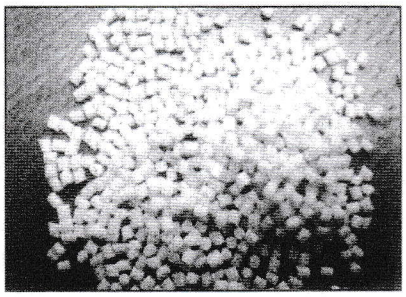
The latest method, especially forcooling thin parts, called Stemke Cooling System after the inventor, uses liquefied gas as the coolant. The working principle is similar to that of a refrigerator. The cooling machine performs several functions. Upon receiving temperature signal from the sensor built in the mould component to be cooled, it releases compressed gas which is pumped the hot spot through a hollow pipe placed in a hole inside the component where it evaporates, thereby extracting heat and creating sub zero temperatures. The gas returns to its source where it is compressed and liquefied. The coolant moves in a closed circuit. It resembles conventional fountain cooling with the difference that it can work effectively with bores as small as 0, 8 mm. and as deep as one meter. Consequently, it can be employed for cooling of very slender cores, ejector pins as well as for thin parts the main mould core. It may be added that mould components with such slender cavities are produced by means of laser fusion processes.

The principal advantage of this cooling system over other methods of heat dissipation by means of water, oil, heat pipes etc. is that the temperature of the mould component at the hot spot is monitored constantly by means of a thermocouple embedded in the core. It controls and directs injection of the coolant as an impulse. The coolant moves in a closed circuit which makes the system economical as well as environment friendly.

In case of multi-cavity moulds, the coolant is supplied to a manifold, analogous to that of hot runner systems. Housed in the mould, it distributes the liquid coolant to individual capillaries fixed on it and returns the gaseous coolant collectively to the cooling machine for regeneration and recirculation. The magnetic valves governing inlet and outlet of the coolant are placed outside the mould without making the latter bulky or complicated.

NATIONAL AND INTERNATIONAL PLASTICS NEWS

Rhodia polyamide Boosting China's Capacity



Rhodia Polyamide, one of French chemical giant Rhodia SA's six enterprises, plan to increase the capacity of its Shangai compounding plants by 40 per cent to stay ahead of the competition in Asia. Speaking to new providers in Shanghai, Frank Langanier, Asia-Pacific Zone Director, Rhodia Polyamide Engineering Plastics, said a capacity boost would help support the rapid growth in the presently under-supplied market, particularly in auto, home as well as electrical and electronics. About 40 per cent of Rhodia's global sales of engineering plastics are generated in Asia. Rhodia estimates that Asia will become the largest nylon 6/6 market by 2015 and China's share in that region will continue to grow.

Bayer MaterialScience Increases Presence in China

Bayer MaterialScience has announced plans to build five new downstream facilities in China by 2012 as part of an ongoing process to serve the booming manufacturing sector in the country.

More than 40 percent of Bayer MaterialScience polyurethanes business in China is currently achieved through supplying polyurethane systems to the construction, appliance and automotive sectors, in particular. The facilities comprise three polyurethanes system houses, a new polycarbonate sheet facility and a polycarbonate colour compounding and design centre. Each will be strategically located close to major customers in Shanghai, Qingdao, Chongqing and Guangzhou.

With these projects, Bayer MaterialScience will increase its downstream presence considerably in what has become the company's second largest market worldwide. Bayer MaterialScience will then have a network covering the main geographical areas of the country.

First High-pressure Pipe Extrusion Line For Russia

By placing the order for a complete extrustion line to produce high-pressure pipes of upto 1,600 mm in diameter, ZAO Tehstroi, Kazan, will not only virtually double its own production capacity, but also extend the overall range of pipes produced for the Russian market. At the beginning of 2011, the machine manufacturer Battenfeld-Cincinnati, Bad Oeynhausen/Vienna, will install the first extrusion line in Russia to manufacture HDPE high–pressure pipes with diameters ranging from 800 to 1,600 mm.

With this high-pressure pipe extrusion line, which will start operating at the beginning of 2011, Tehstroi is increasing its production capacity to about 45,000 and its market share in Russia to more than 20%.

The new line is designed as a coextrusion system for manufacturing pipes with a colour stripe. It consists of perfectly matched machine components, including material feeding, extruder, die and downstream equipment as well as a user-friendly machine control system. In addition to the 150 mm single-screw extruder, which ensures homogeneous, gentle melt processing unit, above all the die with its innovative internal pipe cooling system guarantees a high end product quality standard.

The PO 1600-120 VSIT is a lattice basket die with spiral mandrel specially developed for polyolefin processing. Inside the die, the Efficient Air Cooling (EAC) system provides effective cooling with a substantial reduction in energy costs through a sophisticated air exchange system. Apart from high output, EAC ensures optimal product quality through minimal wall thickness fluctuation and reduction of the sagging effect. With this line, Tehstroi will be able to meet the high quality standards required for high-pressure pipes with cost and energy-efficient production.

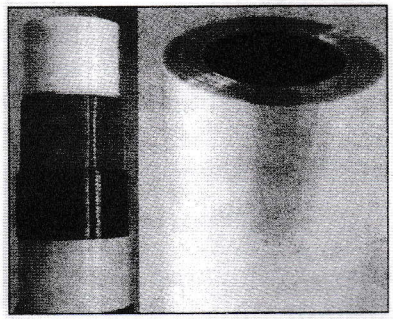
Saudi Petrochemical Exports Reach Eight-Month High

Saudi Arabia's petrochemical exports reached an eight-month high in November, mainly due to strong demand from China, India and other Asian countries, as per government statistics.

Saudi Arabia, holder of the world's largest oil reserves, exported 3.54 billion riyals worth ($944 million) of petrochemicals that month, the most since March of last year when the value of monthly shipments totalled 3.59 billion riyals, the Department of Statistics and Information noted.

Exports of petrochemicals, plastics and other non-oil products to Asian countries jumped by 9.8 per cent to 3.57 billion riyals in November, the biggest month-to-month increase since March, the data showed. Also, non-oil exports to the EU totalled 1.16 billion riyals, down 0.2 per cent from October.

Turbulent Q1-2011 For Asia's Polyolefin Markets

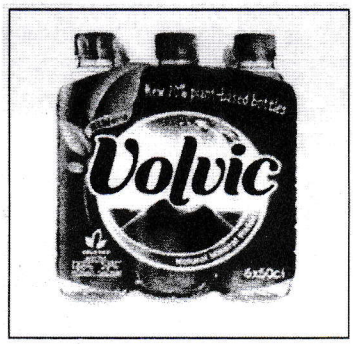


Asia's polyolefin markets are likely to remain turbulent in Q1-2011 despite recent price hikes, as feedstock costs are fluctuating and future demand remains uncertain, as per ICIS. Producers are also concerned about the rapid rise in crude oil and naphtha prices, which have put margins under pressure.

However, Polyethylene (PE) and polypropylene (PP) prices rose by $10-50/tonne recently in China, as traders returned to the market after the New Year holidays. High-Density Polyethylene (HDPE) film-grade prices were higher at $1,230-1,280/ tonne (cost & freight) China, linear low density PE (LLDPE) was at around $ 1,330-1,380/tonne CFR China, and Low-Density PE (LDPE) was at $ 1,680-1,740/tonne CFR China, Polypropylene (PP) injection-moulding grade prices gained by $10-20/tonne to close at $1,680-1,740/tonne CFR China, during the period.

Demand from converters exporting plastic products to the West is said to be good, due to the expectation of a recovery in orders from USA and Europe.

Volvic's Sugar-based PET Bottle Hits The UK

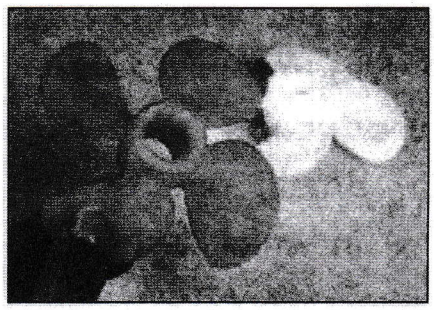


Danone-owned water brand Volvic has launched its 'greener bottle', made with 25 per cent recycled plastic and 20 per cent plant material.

The bottle has a 38 per cent lower packaging carbon footprint and 16 per cent lower lifecycle footprint than the previous Volvic bottle. The plant material, BioPET, is made from PET produced using some feedstocks manufactured from fermented and dehydrated sugarcane waste. The resulting bottle is 100 per cent recyclable, says the firm.

The biomaterial is made in India, using sugarcane molasses. Volvic is also reducing the weight to 15 g from 17 g, and the bottles that are already on sale in France & Germany, are manufactured at the company's own facilities in France. The firm claims, that this design is part of the plans to reduce the brand's global carbon footprint by 40 per cent in 2012.

Impregnating Plastics With CO_2

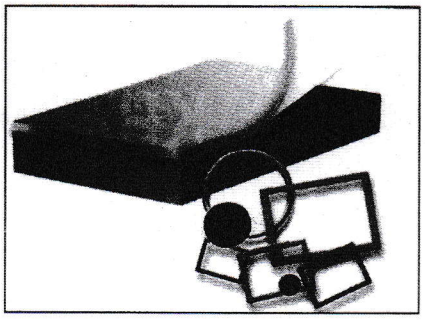


Researchers at the Fraunhofer Institute for Environmental Safety & Energy Technology, Oberhausen tested how CO_2 can be used to impregnate plastics.

At a temperature of 30.1° C and a pressure of 73.8 bar, CO_2 goes into a critical state that gives the gas solvent-like properties. In this state, it can be introduced into polymers, in which dyes, additives, medical compounds and other substances can be dissolved. At 170 bar, pigment in powder-form dissolves completely in the CO_2 and then diffuses with the gas into the plastic. The process is suitable for impregnating partially crystalline and amorphous polymers such as nylon, thermoplastic elastomers,

thermoplastic polyurethanes, polypropylene and polycarbonate; it cannot be applied to crystalline polymers. The process holds enormous potential as CO_2 is non-flammable and inexpensive.

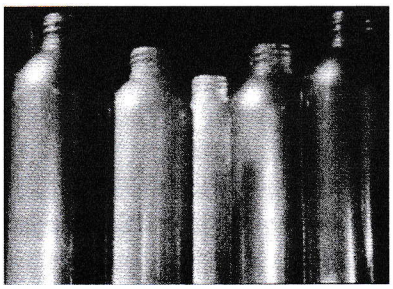
Soft Seal Foam Material For Mobile Applications



The High Performance foams Division of Rogers Corporation has launched a new PORON® ThinStik™ soft seal. This is a highly compressible product for ultra-thin gap filling, LCD gasketing and sealing needs in gaps as thin as 0.1 mm. Rogers' PORON foam is combined with a pressure-sensitive adhesive layer to enable higher compressibility than traditional laminated adhesive constructions. PORON ThinStik self-adhesive solution material contains fewer incompressible layers as it is manufactured through a unique, single-step process that combines the adhesive and foam. This process eliminates the additional, incompressible layers of adhesive and PET found in the conventional double-side tape, providing designers the benefits of more foam- space in a compressible package for the same thickness of final gaskets.

The PORON ThinStik is designed with specifications to ensure a reliable bonding surface to a variety of substrates, with high-quality optical clarity that is tolerant to high temperatures and chemical exposure. Compression force deflection (CFD) testing demonstrates that PORON ThinStik retains over 90 per cent of its original thickness under extreme conditions as compared to the conventional foam with a laminated adhesive.

Chrome-like Reflectivity Within a Polymer Material



It is now possible to create a visual appeal with Ampacet's UltraChrome, which follows the Formulax LiquidMetals Colors™ line of products. This luxurious mirror-like finish defies the traditional boundaries between polished aluminium, chrome and plastic material. UltraChrome is moulded into the parts to ensure piece-to-piece uniformity and a scratch-resistant finish. The moulded in finish retains its reflectivity and elegance because the UltraChrome masterbatch is dispersed throughout the parts without compromising on bond strength for laminated parts. As against secondary processes like vacuum metalising and painting, which are easily scratched and chipped, UltraChrome is immune to surface damage. It reduces production-to-market cycle time and lowers costs to a considerable extent since there is no need to outsource finishing or transport products to an off-sight facility for secondary processing. This single-step moulding process eliminates volatile organic compounds (VOC) and carbon emissions that occur during secondary painting operations. This premium reflective UltraChrome masterbatch is available in vibrant and high-end varieties that can be used with polyolefins and other engineered resins. This durable, recyclable, single-step moulding and decorating material takes plastics to a new level of visual presence.

New-Antimicrobial Bottle Plus Antimicrobial Label

With increased levels of interest in the health and hygiene area, M & H is pleased to announce its revolutionary new clinically-proven antimicrobial labels.

The antimicrobial additive helps stop the spread of infection and is clinically proven to be effective across a wide range of bacteria including MRSA, R, Coli, Salmonella and Listeria. It works by adding ionic silver which inhibits fungal growth and kills over 99.99% of bacteria within 24 hours, and is effective over the lifetime of the product. It is food-safe and has no effect on the product contents and is widely used in the NHS where it is accepted as one of the most effective antimicrobial additives. It can be used in the manufacture of bottles and jars and is available in SAN, PP, PET and HDPE.

EVENTS

TIPREX 2011

TIPREX 2011 will introduce the latest in cutting-edge processing solutions, technologies and products to ASEAN plastic and rubber sectors that are playing significant roles in elevating the manufacturing and industrial sectors to the next level.

31st August-3rd September, 2011
BITEC, Bangkok, Thailand

Asian-Pacific Int'l Plastics & Rubber Industry Exhibition

The exhibit area of the 12th Asian-Pacific Int'l Plastic & Rubber Industry Exhibition is 50000sq.m. And there will be 700 overseas and local famous companies exhibit their new products on the exhibition. Asian-Pacific Int'l Plastic & Rubber Industry Exhibition has successfully held 11 versions since 1997 at Shanghai, Guangzhou and Beijing. As a result, it has developed into the most important plastics and rubber exhibition in China. And this exhibition is the only which sponsored and supported by national authority organizations.

6th -9th September, 2011

China Shanghai New International Expo Centre, Shanghai, China

Interplas US

For almost 60 years, Interplas has successfully represented the plastic processing community in the UK. Through good years and difficult times, the show has remained the industry's core event.

27th -29th September, 2011
National Exhibition Centre, Birmingham, England, United Kingdom

Plastimagen 2011

Plastimagen Mexico is internationally recognized as the leading plastic exhibition in Mexico and Latin America.

4th -7th October, 2011
Centro Banamex, Mexico City

Fakuma

The FAKUMA international trade fair for plastics processing has lived up to its reputation as Europe's, if not the world's most important plastics trade fair of the year in 2009 at all levels. This applies especially to the field of injection moulding technology, and FAKUMA is plainly the world's number one event in this area. FAKUMA also plays a leading role where extrusion and thermoforming technologies are concerned.

18th -22nd October, 2011
Friedrichshafen Messegelande, Friedrichshafen, Germany

Plastex Ukraine

The 6th International Exhibition Plastex Ukraine 2011 will now run alongside the ProdPack Ukraine 2011, the leading packaging exhibition in the Ukraine. Plastex Ukraine happens alongside ProdPack and World Food Ukraine, which will boost both exhibitions.

25th -28th October, 2011
International Exhibition Centre (IEC), Kiev, Ukraine

M-Plas

As the point of convergence for key industry players in the plastics and rubber industries, M-PLAS 2011 is the ideal platform for updates on the latest industry news, innovations and developments. This 4-day exhibition will bring together leading international manufacturers and suppliers. Professionals will benefit from this state-of-the-art showcase and be able to explore the opportunities for better business.

9th -12th November, 2011
Kuala Lumpur Convention Centre, Malaysia

Equiplast

The plastics and rubber transformation industry will be showcasing all its potential at the event along with the most extensive array of products.

14th -18th November, 2011
Gran Via Exhibition Center, Barcelona, Spain

Plastex Uzbekistan

Plastex Uzbekistan is the meeting point of interested visitors-professionals with the world leaders of the polymeric market: producers of machines and equipment for plastic and polymer, raw and auxiliary materials, equipment for blow moulding and waste recycling as well as control and measuring equipment production, namely full specter of plastic and polymeric materials production services.

16th -18th November, 2011
Uzbekistan, Tashkent

Plastindia 2012

In tune with the previous versions of Plastindia Exhibitions, Plastindia 2012 would scale new heights and will be an event which will ensure that India is the place for global business in plastics.

1st -6th February, 2012
Pragati Maidan, New Delhi, India

PLASTEX 2011

PLASTEX 2011 is the leading international trade fair dedicated to the plastic machinery, components, raw materials and chemicals at the MENA region. The fair presents products and services, technologies and innovations, trends and tendencies for trade markets. It is an international meeting-place for worldwide suppliers and regional manufacturers.

24th -27th November, 2011
Cairo International Convention & Exhibition Centre (CICEC), Cairo, Egypt

NPE 2012

NPE 2012 is the next edition of the triennial NPE international plastics exposition.

1st -5th April, 2012
Orange Country Convention Center, Orlando, Florida, USA

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- Consumers specific Masterbatches.

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