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MANAGEMENT OF PLASTICS, POLYMER WASTES AND BIO-POLYMERS AND IMPACT OF PLASTICS ON THE ECO-SYSTEM

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INDIAN CENTRE FOR PLASTICS IN THE ENVIRONMENT

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Trends in Plastics Packaging: The Ecological Aspects

Based on excerpts from the book 'Plastics for Food Packaging', brought out by Indian Institute of Packaging (IIP), as a project sponsored by Indian Centre for Plastics in the Environment (ICPE).

Packaging is one major field of application for plastic materials. Packaging may be defined as "a means of ensuring the safe delivery of a product to the **end consumer** in **sound condition** at the **minimum overall cost**".

Why Plastic Packaging?

Plastics, being synthetic materials, can be **tailor-made** to meet specific or combination of performance requirement of packages.

From packaging point of view, some of the distinct advantages that the plastic materials offer are:

- They are very **light in weight.**
- They are **non-toxic** and absolutely safe to use even in direct contact with food products, medicines, etc.
- They have **excellent barrier properties** towards oxygen, moisture and gases to achieve the anticipated shelf-life for products to be packed and also protect their flavours or aromas from loss through permeation.
- They are **resistant to most chemicals.**
- They **can be sterilized** by all the conventional methods.
- They can be processed to **any desired shapes and forms,** like
  - Flexible – film/pouch
  - Semi rigid – tube
  - Rigid – sheet/bottle/crate, etc.
- They **can be transparent and clear as glass,** e.g., PET, Polystyrene and Polycarbonate containers.
- They are sturdy and safe-in-use, because they **do not break easily** and even if they break, the broken pieces are not harmful as those of glass and metal.
- They **do not corrode** in humidity.
- They **do not promote any bacterial growth.**
- They result in effective **cost saving in the storage and**

transportation, because of lower volume and lesser secondary packaging.

- **Various methods for closures and dispensing** are available.
- Even the **smallest unit packs such as sachets** are possible, thereby providing an economical and safe pack to weaker sections of the society.
- They **can be made pilferproof,** tamper-evident and child resistant.
- They **require the lowest energy for conversion.**

Thus, **Plastics definitely score over all other packaging materials.** It is needless to mention that if they are used sensibly and judiciously, they should not pose any disposal and ecological problem.

Table 1 below gives the consumption of packaging materials.

At present, plastics account for about 12% of the total quantity of major packaging materials, which include paper and paperboard, jute/hessian, glass, metals (Tinplate, Steel & Aluminium). It is estimated that **by the year 2004-2005, plastics will account for about 15%** of the total packaging materials and obviously, expected to take some market share or applications of other conventional packaging materials, like glass and metals.

With the Government's liberalization policy and emphasis on exports, the demand for plastics packaging is bound to grow further. There is no doubt the plastics packaging is going to play a very significant role in the years to come. As a result, **India's per capita consumption which is around 4 kgs** at present, **compared to world average of about 20 kgs,** is expected to reach a per capita consumption level of **6 kgs by the year 2005-2006.**

Environment related issues

Important environmental issues, which directly impinge on packaging to varying degrees are:

- Solid Waste Disposal
- Ozone Depletion
- Air Pollution
- Water Pollution (in particular, ground water)
- Sea & Ocean Pollution
- Litter
- Depletion of Non-renewable Resources

Table 1
Consumption of Major Packaging Materials (in metric tonnes)

	1999-2000	2004-2005 (estimated)
Paper & Paperboard	16,00,000 (34%)	24,87,000 (40%)
Jute/Hessian	15,00,000 (32%)	15,00,000 (24%)
Glass	8,00,000 (17%)	10,20,000 (16%)
Plastics	5,92,062 (12%)	9,24,806 (15%)
Metals	2,48,000 (05%)	2,88,000 (05%)
	47,40,062 (100%)	62,19,806 (100%)
Wood (in million cu.m.)	7.8	7.8

According to the OECD (Organization for Economic Co-operation & Development) statistics, packaging accounts for:

- 20.8% **of all waste**
- 2.0% **of gaseous emission**
- 1.5% **of water consumption**
- 3.7% **of energy consumption**

However, in India, following are considered to be the major problems related to packaging, particularly, plastics packaging.

Indiscriminate Littering

Packaging in general and plastics packaging in particular, has become a matter of concern because of its **high-visibility** all around and **eye-catching** colours, which attract attention of the people.

As a result, by promulgating some rules, number of Municipal Corporations or States in the country have tried **to curb the use of thin plastic carry-bags,** which is identified as the main culprit for all our civic problems. Since in most of the places it has not been effectively implemented, the Central Government has now come out with a Notification – restricting manufacture, stock, distribution or sale of plastic carry-bags of less than 20 micron thickness.

Undoubtedly, in India waste is littered, instead of being disposed properly, to facilitate collection and recycling. Littering is, in fact, an **attitudinal problem of the people** rather than any problem with the plastics material.

A Major Source of Municipal Solid Waste (MSW)

It is true that packaging contributes to Municipal Solid Waste, but definitely, plastic does not make up a very large part. A study conducted by the National Environmental Engineering Research Institute (NEERI) for the Brihan Mumbai Municipal Corporation, which handles more than 5,500 metric tonne MSW per day, shows that **plastics waste is only 0.75%.**

Even in Europe and U.S.A. with per capita consumption of plastics at over 50 kgs per annum, plastics waste makes up only 8% of the total MSW. The rest is made up of organic materials (33%), paper & paperboard (30%), glass and metals (16%) and others (13%).

One must appreciate that plastics make a significant contribution by **reducing the weight and volume of materials** that are typically thrown away.

A study conducted by the "German Society for Research in the Packaging Market" shows that **if plastics packaging were replaced with other materials, the weight and volume of disposables would increase approximately by a factor of 4 and 2.5 respectively, along with twice the level of energy consumption and double the cost of packaging.**

Plastics are not Bio-degradable

In general, **all man-made products,** during manufacture, processing and disposal, **have an impact on the environment.** It is, therefore, necessary to understand, which of these products or packaging materials will impose the least burden on the environment.

Other materials, like tinplate, aluminium and glass are also not bio-degradable. The materials of composite containers, like plastic coated paper, cups also do not biodegrade easily. Bio-degradability cannot be sole criterion for selecting a packaging material, e.g., wood is a natural and bio-degradable material, but its use for packaging application is discouraged, because cutting timber or deforestation would cause more harm to the environment.

Plastics Packaging: Should it be Replaced ?

The widespread belief that **substitution of plastics with paper** is more favourable to the environment needs to be **supported by facts and a Life Cycle Analysis.**

The **manufacture of paper bags requires two-and-half times the energy** as compared to plastic bags of the same size and for comparable performance.

A stack of, say, **2000 paper grocery bags** will have a height of about **7.5 ft. compared to 7.5 inch height** of equal number of **plastics grocery bags,** which means that transportation and storage costs of empty paper grocery bags are also likely to be more.

It also **produces significantly higher air pollution.** There is a huge disparity in **waste water discharge** in manufacturing or recycling of paper.

As far as **bio-degradability** is concerned, the University of Arizona study shows that the newspapers buried in 1952 were legible. The same observation was made even with the telephone directories. In short, **bio-degradation in buried land-fills is a very slow process** (sometime more than 15 years).

Some may argue that **paper is manufactured from wood,** which comes from trees, and is **a renewable resource; while plastic is manufactured from mineral or petroleum oil,** which is **non-renewable.** Against this, the counter-argument would be that the **forests play an important role in protecting soil erosion** and more importantly, maintaining the right proportion of gases or **the gaseous balance in our atmosphere,** by absorbing carbon-dioxide and releasing oxygen.

From the available statistics, it is observed that **for making 1 metric tonne of paper, 17 trees are required** as raw material and in our hunger for wood, **44 million hectares of forests have already been felled** since our Independence, making this country a land with **one of the lowest areas under forest cover,** i.e., area under forest to total land area. Therefore, under these circumstances, it may not be a wise decision to substitute all plastics packaging with paper-based packaging.

Even compared with glass, for many applications, plastics packaging may be considered as more economical. A classic example is the light weight **stretched blow moulded PET bottles** for soft drinks or mineral water. A **truck can carry 60% more water with 80% less packaging,** as compared to glass bottles. This also results in fuel savings of almost 40%.

The ratio of product weight packed to the weight of package is the highest for plastics packaging, e.g., for packaging 500 grams coffee powder, the average weight of a

Glass Jar	= 500 grams
Tinplate Container	= 130 grams
Plastic Laminated Pouch	= 12 grams

One kg common salt is packed in a plastic pouch weighing only 5 grams where the ratio of product weight to package weight comes to 200:1.

Therefore, plastics packaging enables to get 'more out of less'.

Making Packaging Eco-friendly

It is not only product itself **but packaging too, which is required to be environment-friendly or eco-friendly.** However, environment-friendliness is **not in absolute terms, but in relative terms.** It means that among the alternative packages, the **one, which makes least harm to the environment,** will be considered as 'eco-friendly package'.

Present endeavour all over the world is to **use packaging media generating minimum solid waste, more easily reprocessable, recyclable or bio-degradable.** The aim is to:

- **Use more "Non-waste Technology", i.e., the technology which reduces waste to the barest minimum,** e.g., solvent-less lamination, and
- **"Manage" the packaging waste and not just dispose it off.** The proper and **effective waste management system** is expected to help in not only **improving our environment and eco-system,** but also in **helping resource and energy conservation. The long-term goal of the global waste management is to keep the landfill amount within 10%.**

In this respect, the industrialized countries have already taken a number of initiatives. Germany had introduced an **Ordinance on the Avoidance of Packaging Waste** in 1991, by which manufacturers and distributors had been obliged to take back used or post-consumer packages and adopted **"polluter pays"** principle. **European Union (EU)** had also issued **2 major directives** to its member countries in 1994 related to packaging, namely, **General Packaging Directive and Plastics Directive.** In all these, **major thrust is on 3 R's, i.e., Reduce, Reuse and Recycle.**

It is worth noting that no country in the world has yet completely banned plastics for packaging applications. Of course, some countries have restricted the use of particular type or some kinds of plastics packaging; but that is done purely on the basis of non-availability of local recycling facilities.

In the advanced countries, though bio-degradable plastics are available for decades, considering economy and long-term degradation process, its use has neither been made mandatory nor become very attractive. Other kinds of degradable plastics packaging materials including **Water Soluble Films,** which are available in India too, are also being **used in a very limited manner.**

For minimizing packaging solid waste, the present trend is to follow the priorities given below.

Avoidance or No Packaging

It means elimination of package or packaging materials, wherever possible. For example, a secondary pack made of EPS, i.e., expanded polystyrene used for packing a glass bottle (primary pack) is either eliminated by using a plastic bottle as primary pack or substituted by paper-based honey-comb board, where there is a restriction to use plastic forms.

Consumable Packaging

The idea is to eliminate completely the possibility of generating packaging waste, if not the package itself, e.g., instead of using the conventional metal drum, if suitable plastics/laminated bags are used for packaging of tar or asphalt, these can be consumed 100% at the time of using the product. In fact, it may improve bonding character of the product.

Reduction or Optimum Packaging

It means reducing or optimizing packaging materials at source. This is achieved **in terms of weight or volume** of packaging materials through an alternative material or improved design, but without sacrificing product quality. For example, the weight of a 200 litre drum can be drastically reduced by changing its packaging material from steel (weighing 20-22 kg) to HDPE (weighing 8.5-9.2 kg).

Table 2

Plastic Packaging	Original Weight/Thickness	Current Weight/Thickness	% Source Reduction
• PET Bottles			
1.5 litre	66 gram	42 gram	36%
2 litre	68 gram	51 gram	25%
• HM-HDPE Bag	47μ	25μ	47%
• Yogurt Cup	12 gram	25 gram	58%

It is worth noting that, of late, product packers have moved to plastics in order to achieve a decrease in packaging weight. This trend is likely to continue. One should appreciate that **'weight is cost'.**

Even without changing packaging material, improvements in resins/technology have enabled down-gauging to achieve source reduction in number of cases (Refer Table 2).

Change over from **rigid to flexible packaging** also ensures reduction at source. In general, **flexible packaging generates 60-90% less waste** than rigid containers.

Some of the **common approaches followed to reduce package weight are:**

- Changing design and construction/designing light-weight shapes
- Using materials with higher performance
- Marketing refill/recharge units
- Introducing product concentrates or re-designing/re-engineering
- Choosing a package type considering weight/volume ratio and total volume
- Limiting production tolerances
- Choosing processes that allow less material
- Light-weight packages without changing appearance

Reusable, Returnable or Refillable Packaging

Some types of packages are being returned for reuse or to refill the products number of times, e.g., plastic crates, containers (like large milk cans), pallets, etc., this is done primarily to avoid generation of solid waste.

To ensure return of the packages, if necessary, a 'deposit scheme' or any other suitable scheme may be introduced. Of course, at times, cost of collection, transportation back to the filling station, cleaning of used packages, etc., may not be economical.

Recycle Packaging

The **recyclability of a package** or the **use of recycled content** in the package is considered to be the most desirable alternative all over the world now from an environmental stand point.

In the first case, the package is designed or selected on the basis of **easy and economic recyclability character of the material,** e.g., mono-film or single packaging material (without lamination or coating) is preferred, compared to multi-layer or laminated/coated material, provided functional properties do not vary much. For the same reason, trend is to replace multi-layer film like **10µ PET/10µ Met-PET/100-200 g LD by a 35µ heat sealable BOPP for biscuit wrapping,** wherever possible. Similarly, if the **bottle is made of PP, its closure is also made of PP,** so that **segregation is not needed for different components** of the same package and the whole package can be sent to one recycling plant.

In the case of using **recycled packaging material/packages, the trend is to use the recycled material in the middle of the multi-layer container** (3-layer). The HDPE recycled bottles have been successfully used for packaging of motor oil, detergents, softeners, pesticides, etc., Examples of such containers are:

- **Motor Oil (5 litre) Container**
  Inner layer – Virgin HD (10%)
  Centre layer – Recycled HD (70% including 25% post-consumer waste recycle)
  Outer layer – Virgin HD (20%)
- **Detergent/Softener Bottle**
  Containing 25 to 30% recycled HD (target – 50%)

In fact, for making its package (of window-cleaner) more eco-friendly, a company has changed original **one-shot container,** first by a **refill pack (stand-up pouch)** primarily to reduce weight, and then by a co-extruded **reusable bottle** with structure like **HD/LLD/PE (reverse printed).**

Recoverable Packaging

If packages cannot be reused or recycled economically, one thinks of recovering it in some way or the other, otherwise it is considered as waste of raw material and energy.

Plastic wastes contribute to increasing calorific value of municipal solid waste for incineration, which is a useful source of energy, estimated to be from 8-9 GJ/T to 20 GJ/T. Moreover, compared to other common combustible materials, on an average, plastic produce more heat energy, e.g.,

Plastics	- 40 MJ/kg
Coal	- 30 MJ/kg
Wood	- 15 MJ/kg
Paper	- 15 MJ/kg
Textiles	- 13 MJ/kg

In Western Europe, plastic wastes provide 30% of energy generated in MSW recovery plants.

Other Ecological Considerations

If we consider reclaimable energy content of plastics, along with the energy required to process raw materials into finished goods or packages, it could be seen that the **energy (oil) consumption to make plastic bottles or plastic**

Table 3			
Package		Oil Consumption	Resource Saving
Number	Type		
1000	1 litre Glass Bottles	230 kgs	57%
1000	1 litre Plastic Bottles	100 kgs	
1000	Paper Bags	47 kgs	32%
1000	Plastic Bags	32 kgs	

bags is much less compared to that of glass bottles or paper bags for comparable use and performance levels. In other words, plastics help in resource saving, as highlighted here in Table 3.

From conservation of raw material resources point of view, it could also be seen that plastic packaging is better than other type of packaging, i.e., with the same quantity of packaging raw material, more number of packages can be produced from plastics, e.g., **number of bottles (1 litre capacity) produced per kg raw material:**

1 kg Raw Material	No. of Bottles
Glass	3
Tinplate	10
HDPE	11
PVC	25
PET	31

It has been observed that **to pack 1 tonne of foodstuffs in 1 kg package, we need only 32 kgs of PET, as compared to 350 kgs of glass, 100 kgs of tinplate, 90 kgs of HDPE and 40 kgs of PVC.**

Conclusion

Packaging represents one of the most significant material support to lifestyle, produced by the industrial society. It best expresses the way our society's material life is organized. Plastics being synthetic materials can be tailor-made to meet specific or performance requirements of packages.

Plastic has effectively replaced its other counterparts due to its lightweight, strength, moisture-resistance and durability. Plastic packaging also has storage, production and distribution advantages over other packaging mediums.

Due to increasing awareness, plastics have gained social importance as an environmental friendly material in terms of lesser energy consumption, low weight and volume of disposables, lesser pollution and conservation of natural resources.

Question & Answer in the Lok Sabha, Lower House of Indian Parliament, on Plastics and the Environment

Question raised by Hon'ble Member of Parliament, Dr. Rajesh Mishra on Production of Plastics:

Will the Minister of Environment and Forests be pleased to state:

a) whether the production and use of plastic is harmful to the environment and health;

b) if so, whether plastic bags make fertile land infertile; and

c) if so, the details of steps being taken by the Government to stop the production and use of plastic?

Answer by Hon'ble Minister of State in the Ministry of Environment and Forests (Shri Namo Narain Meena):

a) & b) Plastics (Polymers) are petroleum-products having long-chain of hydrocarbon. They are

chemically inert or neutral and used for the manufacture of a large number of consumer items and they can be recycled. Plastics by themselves are not harmful. Only the indiscriminate littering of plastics and environmentally unsound recycling practices has the potential to cause adverse impacts on environment and health.

c) To prohibit the use of recycled plastic in packaging of foodstuffs and to encourage proper waste collection the Government has brought out the Recycled Plastics Manufacture and Usage Rules, 1999 amended 2003. As per these rules, the use of recycled plastic bags is prohibited for storing, carrying, dispensing, or packaging of foodstuffs. Also these rules prohibit the manufacture, stocking, distribution or selling of carry bags made of virgin/recycled plastics, which are below 8 x 12 inches in size and 20 microns in thickness.

(Unstarred Question No. 79. Answered on 25.07.2005)

www.envis-icpe.com

Website hits for the months April - June 2005

Months		Hits
April	:	38,405
May	:	38,028
June	:	38,211

Plastic Bottle Collection has Doubled over the Past Two Years in the UK

10.5 per cent collection rate/2005 expected to be "a year of maturity".

The collection of plastic bottles has increased by 100% over the past two years, according to research funded by the Waste and Resources Action Programme (WRAP) and conducted by the plastics recovery organization *Recoup*. The survey showed that plastic bottle collections in the UK had risen to an estimated annual level of almost 48,500 tonnes at the end of 2005. Given that an estimated 460,000 tonnes of plastic bottles entered the UK household waste stream each year, the collection rate stood at 10.5%. The authors noted that, "while this is a significant increase on 2003, this rate remains relatively low compared to other major European countries and North America – indicating that there is clear potential for combined growth". The actual recycling rate was calculated as 7.9%.

While the recycling of plastic bottles was not a key driver for local authorities, recycling strategies were, because bottles were low weight items and current UK recycling targets were weight based. One reason behind this improvement was greater pressure for effective recycling programmes to be provided. An increase in government funding for plastics recycling had also made its mark and there was increased public recognition that plastic bottle recycling facilities could be provided cost effectively. Besides improved baling and handling infrastructure, other causes included strong public demand for these services, rising land fill tax on residual waste and increased confidence in markets for collected plastic bottles.

The authors forecast that the collection of plastic bottles would rise to around 52,000 tonnes per year by the end of 2006 through planned initiatives. The majority would continue to be collected through kerbside collection schemes. If a good performance was seen, by both kerbside and bring schemes, the collection of almost 130,000 tonnes of plastic bottles might be feasible, the survey found. Factors including the future collection of plastic bottles for recycling included placing greater emphasis on kerbside collection activities, which outperformed bring schemes by a ratio of 4:1. In addition, the authors suggested that UK baling and handling infrastructure should be reviewed and the potential to expand should be assessed where necessary.

As regards to kerbside collection schemes, the survey determined that these initiatives accounted for 68% of the plastic bottles collected at the end of 2004. Bring schemes were less important in terms of volumes collected with a 32% share. Local authorities had reportedly also indicated that kerbside collections would continue to grow between 2005 and 2007. At present, around 8.4m households in the UK participated in kerbside collection schemes for plastic bottles, meaning that 34% of households had access to these services. This also represented a 55% improvement compared to the state of affairs at the end of 2003. Between now and end of 2006, the provision of plastic bottle collection within kerbside schemes was set to exceed 10.9m households or 44% of the population.

The number of bring sites had risen to almost 4000. Local authority plans suggested a continued climb 'in bring facilities' over the next year as new sites and schemes are developed with approximately 5000 sites expected to be operational by the end of 2006. The report showed that 73% of all local authorities offered some collection facilities for plastic bottles. The reported cost of bring schemes for plastic bottles was estimated to stand at between £50 and £350 per tonne of bottles collected. The authors pointed out that it was difficult to separate out the cost of plastic bottle recycling through kerbside collection schemes, as they were typically collected together other waste fractions.

Amongst the major reasons cited for not including plastic bottles in collection schemes, the survey found that cost was a big factor. However, "53 of the local authorities that responded to the survey indicated that it costs them little or no extra to collect their plastic bottles for recycling compared to collecting them for land fill/other disposal routes demonstrating that plastic bottles recycling could be achieved cost effectively in well designed schemes" – the authors noted. Other reasons included a focus on the heavier materials, the use of kerbside sorting vehicles with limited compartments and a lack of local baling and handling facilities.

(Source: EUWID, Packaging Markets, No. 14, June 28, 2005)

EU Votes to Ban Phthalates being used in Children's Toys

The European Parliament has voted in favour of a permanent ban on the use of six phthalates in toys and child-care articles. Three phthalates – DEHP, DBP and BBP – are totally banned where their concentration exceeds 0.1% by mass of plasticised material. Three other phthalates – DINP, DNOP and DIDP – are banned for the same concentrations in toys and child-care articles which children could put in their mouths, whether or not they are intended for this use. The ban applies irrespective of the age categories.

The Parliament is also calling on the Commission to look at other types of material containing these phthalates, especially in the area of healthcare.

Expressing its disappointment, the European Plasticiser Industry said that it was concerned by the decision to ban the phthalates, saying that such stringent measures were unnecessary and ignored scientific risk assessments. Director of the European Council for Plasticisers and Intermediates (ECPI), David Cadogan said 'Banning a substance (DINP) which has been scientifically risk assessed as safe, thereby forcing manufacturers to use alternatives about which far less is known, does nothing to protect the health of children.' ECPI added that only one of the six phthalates, DINP, is generally used in toys and that industry had spent more than Euro Dollar 130m researching the health and environmental effects of phthalates.

The vote has been welcomed by Greenpeace, which has campaigned for a total ban on the use of phthalates in toys.

Phthalates and their Safety

The debate around phthalates and their safety goes back a number of years with the Greens leading the way. Some major milestones on the way to the ban are:

September 1997: A Greenpeace study claims that phthalates were identified in a number of PVC toys, and often comprised 10%-40% of the toy's weight. A number of phthalates were identified but DINP was found predominantly. The study raised concerns that DINP could leach out of toys that were chewed by children. Greenpeace claimed that when DINP was purchased for laboratory use, it was labelled with a number of hazards, including 'possible risk of irreversible effects'.

February 1998: The European Union decides to appoint a scientific committee to investigate the use of phthalate plasticisers in PVC toys. The European toy industry welcomes the move, saying that 'five generations of children throughout the world have played with and sucked toys made from pliable vinyl and there is no evidence that they have been adversely affected by it'.

November 1999: The European Commission decides to ban phthalate plasticisers in children's toys for children under the age of three, citing a 'serious and immediate health risk'. The decision is slammed by the ECPI.

December 1999: The ban on the use of six phthalates is finally endorsed by the emergencies committee of the European Commission. The ban was originally set for three months, but was continually endorsed on a rolling basis.

January 2001: ExxonMobil and the ECPI complete a five-year study which, they claimed, showed that DINP and DIDP posed no environmental concern.

March 2001: The European Commission extends its temporary rolling ban on phthalates for the fifth time. The Council of Ministers is divided as to whether to impose a total ban or wait until an accurate method of testing for the leaching of phthalates in saliva is developed.

2002: The rolling ban is extended.

2004: The ECPI expresses concern that the Commission will ban the use of phthalates in all toys and child-care articles for all ages.

June 2005: A study linking human exposure to phthalates and adverse changes in the genitals of baby boys was criticized by industry as scare mongering.

July 2005: European Parliament votes to ban manufacturers from using six phthalates in children's toys.

(Source: www.europeanchemicalnews.com)

Model Township with Zero Garbage

Plastics in the Environment Group (PEG) of Indian Petrochemicals Corporation Ltd. (IPCL), Baroda, being inspired by the ICPE and Brihanmumbai Municipal Corporation (BMC) initiated Surakhsha Garden Dry Waste Management Model of A-ward of Mumbai, had already initiated a Plastics Waste Segregation Project in IPCL's Baroda Township in 2003.

IPCL's Nagothane Township authorities adopted the idea and implemented a 'Zero Garbage Concept' in the Complex and Township with the guidance of NGO-Stree Mukti Sanghatana, also one of the partners to ICPE's Waste Management Activity in Mumbai Wards.

ICPE provided necessary support in disposing of the segregated dry waste to recyclers.

Stree Mukti Sanghatana also helped the Township in setting up composting pits to convert all wet (bio-degradable) waste into manure. Thus an integrated waste disposal system has been established and put in place.

It is heartening to note that the Nagothane Township of IPCL, housing more than 1000 families, has been able to implement a 'Zero Garbage Concept' within a very short period of time.

It has become a model township for others to emulate.

Fuel from Plastics Waste – Commercial Production Started

A team comprising Mr. T. K. Bandopadhyay, ICPE and Dr. Shashikant Sharma, R&D, IPCL, had visited the Inventor's laboratory in November 2004 and observed a demonstration of the process of manufacturing Fuel from Plastics Waste, in laboratory scale. The report was published in Eco-Echoes Issue 3 & 4.

The team again visited the unit in June 2005 to observe the unit's commercial operation in running condition and to interact with the inventors.

Salient points of discussions and observations:

- The unit has started its commercial production since April 2005 and within two months of operation, has attained more than 100% of its designed capacity – 5000 litres of fuel per day from 5 MTD of Plastics Waste.
- Present selling price is Rs. 18 per litre.
- Unit's 5000 litres production capacity is fully booked by local users.
- Local traders supply the input, low-end plastics waste, @ Rs. 3.0 to Rs. 3.5 per kg. Also some MNC's and large scale plastics/multi layer plastics laminate manufacturers have started supplying their factory waste to this unit, free of cost, presumably to get rid of the disposal problem of their waste in an environment-friendly manner and avoid criticism from the regulatory authorities. (Pepsi Co, Paper Products, Bhadrachalam Paper Mills are some of such industries).

The reactor which converts plastics waste into fuel

Low-end plastics waste awaiting conversion into value-added fuel

- The inventors are also negotiating with Maharashtra Government and other private/public organizations to set up similar facilities elsewhere.

Plastics for Food Packaging

In 2003, ICPE had published the milestone epochal book "Plastics for the Environment & Sustainable Development". The book had addressed the multifaceted issues and dimensions of plastics, their vital role in our environment and usefulness for both economic and sustainable development and was an example of unparalleled initiative in industrial communication in our country.

The second book in the series – "Plastics for Food Packaging" has now been brought out by Indian Institute of Packaging (IIP) as an outcome of a project sponsored by ICPE.

This book addresses the specific role of plastics in the food packaging applications and how plastics have

helped in the preservation, protection, distribution, safety and hygiene aspects of food items, keeping in view consumer convenience and environmental issues. Several experts of Indian Institute of Packaging have contributed to put this monograph together.

The scientific data and information provided in the monograph by the premier institute of the country in the field of packaging will broaden the knowledge horizon of the public at large and will be a reference for food industry, safety regulating authorities and policy makers in the country.

The book will be dedicated to the Nation in a formal launching function at Indian Institute of Packaging, Mumbai shortly.

PVC and the Basel Convention

Origin of the Convention

In the late 1980s, a tightening of environmental regulations in industrialized countries led to a dramatic rise in the cost of hazardous waste disposal. Searching for cheaper ways to get rid of the wastes, "toxic traders" began shipping hazardous waste to developing countries and to Eastern Europe. When this activity was revealed, international outrage led to the drafting and adoption of the Basel Convention.

Background

Initially there was concern that plastics wastes needed to be controlled by the Basel Convention. During the twelfth session of the Technical Working Group of the Basel Convention in February 1997 it was recognized that plastic wastes including chlorinated polymer and copolymers wastes do not have intrinsic hazard characteristics and that any hazardous effects that may arise are from the disposal of these wastes. At that meeting it was decided that non-halogenated polymer wastes and some fluorinated polymer wastes should be placed on the Annex IX – non hazardous (B3010). A consensus could not be reached on PVC wastes due to concerns of miss-management of these wastes. During the fourteenth session of the Technical Working Group, held in Pretoria, in November 1998, it was reviewed that PVC wastes and PVC coated cables have been placed on list C. This is simply a working list used by the Technical Working Group for considering the placement of wastes on either Annex VIII (list A) or Annex IX (list B) and has no other status.

Due to the divergent opinions on the hazardousness of PVC wastes and PVC coated cables and stated positions of some countries mean that it has not yet proved possible to achieve a consensus within the Technical Working Group. But at this stage no single country has informed the Basel Secretariat that it has included PVC wastes in its national definitions of hazardous waste. Nevertheless some consider they should be listed on Annex VIII-hazardous wastes.

One problem that had been identified refers specifically to the treatment of PVC wastes and PVC coated cables. It is agreed that burning could result in the production of dioxins and, in the absence of control, to their release to the environment. This has been given as a reason for proposing the placing PVC wastes and PVC coated cables on Annex VIII (list A). However, placement of a waste on lists contained in Annex VIII or IX cannot be due to its management practices, according to the principles of classification adopted in the Basel Convention, which are intrinsic characteristics.

The evaluation of the hazardousness of PVC wastes and PVC coated cables in terms of the Convention seems to be premature, at that time, with respect both to the completeness of the scientific information available and the Technical Working Group's own evaluation of the application of the hazard classes H10 to H13.

The Secretariat, in cooperation with other experts as necessary, was requested to prepare a view of the available and forthcoming scientific information and provide an independent summary report for Technical Working Group.

A proposal to re-examine the listing of PVC wastes and PVC coated cables should be reconsidered at a future meeting of the Technical Working Group only when the results of a review of the available and forthcoming scientific information are ready and the Technical Working Group's review of the H characteristics is concluded as far as these characteristics are necessary to conclude the classification.

During the sixth Conference of Parties in December 2002, the Technical Guidelines for the Identification and Environmentally Sound Management of Plastic Wastes and of their Disposal contained in document UNEP/CHW.6/21; was adopted. The secretariat was requested to disseminate them to Parties, non-governmental organizations and industry in all United Nations languages as appropriate; and invite Parties, non-governmental organizations and industry to use the technical guidelines. This guideline included the current available scientific information on PVC and PVC coated cables and Environmental Sound Management (ESM) practices.
http://www.basel.int/meetings/cop/cop6/cop6 21e.pdf

As requested by decision VI/37 on the work program of the Open-ended Working Group, the Secretariat has undertaken the task to continue collecting relevant and recent scientific information on PVC wastes and PVC coated cables in collaboration with Parties, industry, non-governmental organizations and other organizations. This information has been placed on the website of the Basel Convention. www.basel.int

Where are we now

At the seventh meeting of the Conference of Parties, held in October 2004, it was agreed to include the review of scientific information on the disposal of PVC wastes in the work program of the Open-ended Working Group of the period 2005-2006. Nevertheless, scrape plastic coated cables, including PVC coated cables were mirror listed on Annex VIII if destined for uncontrolled

burning and on Annex IX if ESM is applied.

Also the Secretariat was requested to prepare, based on comments received and made in all the meetings up to the seventh meeting of the Conference of the Parties, a paper analyzing the current situation for consideration by the Open-ended Working Group; and also requested the Open-ended Working Group to submit to the Conference of the Parties at its eighth meeting recommendations for a decision on the status of PVC wastes in the context of the Basel Convention.

An interim guideline for H013 was also adopted at the seventh meeting of the Conference of Parties. This guideline advised that the only practical examples of use for these H characteristics are limited to approaches using testing procedures based upon leachate of wastes. None of the Parties provided concrete information regarding approaches concerning other materials yielded after disposal. The document contains practical information on leachate tests which could be used by Parties to develop a national approach for H13. At this stage there is no harmonized approach that could be recommended.

Similarly, progress was reported for H10, H11 and H12.

The Convention is now ready to decide on the listing of PVC wastes.

(Source: European Council of Vinyl Manufacturers)

PVC industry strongly feels that PVC waste should join other plastics waste on Annex IX as long as they do not have Annex III (hazard) characteristics as currently defined in the Basel Convention.

Official representatives of various countries are required to place their view points to the Basel Convention Secretariat. Malaysian Government has already officially declared that as per Malaysian Government Regulations, PVC waste do not fall under the classification of Hazardous Waste. Representatives of Indian PVC industry also met the official representatives of Indian Government, Jt. Secretary, MOEF and Director, MOEF and put forward the views and facts before the Government officials substantiating that PVC waste should not be categorized as a hazardous waste.

Plastic Surgery for Roads

The evils of the plastic bag – the one less than 20 microns in thickness and thrown away after one use – need no reiteration. Ragpickers don't find it profitable to collect them, and the non-biodegradable monsters mostly lie around, playing havoc with the city's drainage and environment. In Mumbai, the plastic waste menace is a serious one – on an average, the city produces 40 tonnes of plastic waste daily of which only five tonnes are recycled through ragpickers.

But now there's solution in sight, and the city's roads will provide it. Only, the plastic won't be flung on the roads but into them.

Reusing plastic waste to pave roads is an experiment that's been successfully conducted in many other places such as Kalamasseri in Kerala, Kolkata and Bangalore. Not only does the road become a receptacle for plastic waste but also gives a better grip. The plastic also brings down the quantity of bitumen used by 10%.

Mumbai caught on to the idea two years ago, when the BMC's road department experimented on a few roads at Prabhadevi. Right now it is in the process of fine-tuning and has appointed an NGO, the **Indian Centre for Plastics in the Environment (ICPE),** to provide shredded plastics. **"We are working on the project along with ICPE,** but there's been a delay because they've been unable to set up a shredder so far," says Mr. J. T. Barbhaya, Deputy Municipal Commissioner in charge of roads.

Mr. T. K. Bandopadhyay, Technical Manager, ICPE, however, assures that the project will be underway in the next one month. "The cost will be negligible as the plastic will be provided by the civic solid waste department," he says.

View of the road

How does it work? The plastic waste is collected, shredded and added to the aggregate (metal) which is then heated to 170 degrees. At 140 degrees, the plastic melts (which takes about 30 seconds) and sticks to the metal. The burning does not emit pollutants, and the plastic waste not only binds the metal but also increases durability and longevity of the road. A win-win situation for all.

(Based on reported in Times of India, Mumbai, 13th June, 2005)

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