Indian Centre for Plastics in the Environment

Eco-Echoes

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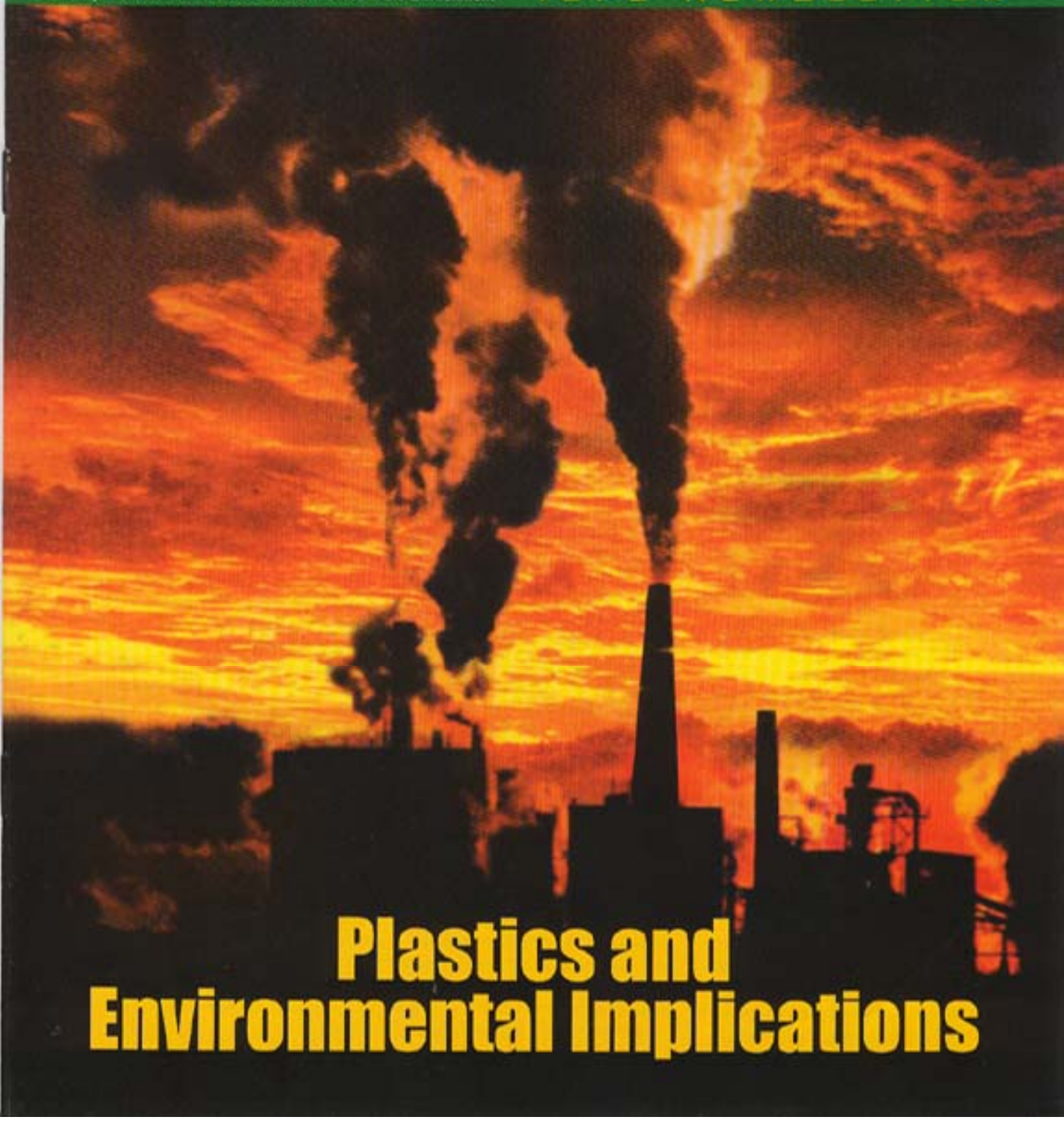
ICPE NEWSLETTER



Plastics and Environmental Implications

In this Issue

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Are the materials used in athletic shoes environmentally harmful?

Margaret Southgate, Hamilton, New Zealand

The ingredient that gives some athletic shoes their cushioning support is sulphur hexafluoride, known as SF6. It's a popular man-made gas with a uniquely buoyant chemical structure. Unfortunately, SF6 is also an unusually persistent global warming gas that is more damaging to the atmosphere (molecule by molecule) than carbon dioxide.

Nike's "Air" technology previously used 288 tons of SF6 a year, accounting for one percent of worldwide production before they began to phase out SF6 use in the mid 1990s. According to a spokesperson from the Nike Environmental Action Team, upon the company's discovery in 1992 that SF6 was environmentally damaging, they began investigating alternative materials and started to replace SF6 air bags with nitrogen bags. In October 2001, Nike partnered with the Center for Energy & Climate Solutions and the World Wildlife Fund, making a commitment to complete the phase out of SF6 by June 2003. "We're still on an aggressive plan to transition SF6 to more environmentally friendly substances, and most of the transition has happened, but we've run into complications in some of our newer and more technical products in terms of finding a suitable substitute," according to Veda Manager, director of global issues management at Nike. He says the company's new goal is to end SF6 use by 2006.

There are other environmental issues with shoes, when you consider the resources and energy that go into making our feet comfortable. Perhaps in exchange for its overuse of SF6, Nike is making an attempt to reduce running shoe waste. They now will take back their shoes, as well as other brands, grind them up and reuse them in athletic surfaces. Granulated rubber from the shoe outsole can be turned into artificial soccer, football, and baseball field surface, and weight room flooring. Granulated foam from shoe midsoles can become synthetic basketball courts, tennis courts, and playground surfacing tiles. And fabric from the shoe uppers can be used for padding under hardwood basketball floors. Since 1993, Nike has recycled 13 million pairs of shoes.

Plastics and Environmental Implications

Shri. T.K. Bandopadhyay, Technical Manager, ICPE

Man's first attempt at making a fire was in 12000 BC, marking the beginning of civilization.

As civilization progressed, so did the needs of the human race. Civilization brought about industrialization. Great inventions changed the world and improved our lifestyle. These inventions have made a vast difference between the way of life as a human being and that of an animal. Infact industrialization has been rapid, since the middle of the 19th century.

The environmental effects of many inventions were far reaching. The development of industries has created an enormous impact on the environment to such an extent, that it has become a concern to the very existence of civilization.

If we analyze different reasons for environmental pollution, we note that the following are the major ones: -

- Air pollution due to various types of gaseous emissions and Suspended Particulate Matter (SPM)
- Water & soil pollution due to various types of effluents and disposal of other waste materials
- Global warming due to industrial emissions, especially carbon dioxide
- Depletion of the ozone layer resulting in penetration of harmful UV rays on the earth's surface.

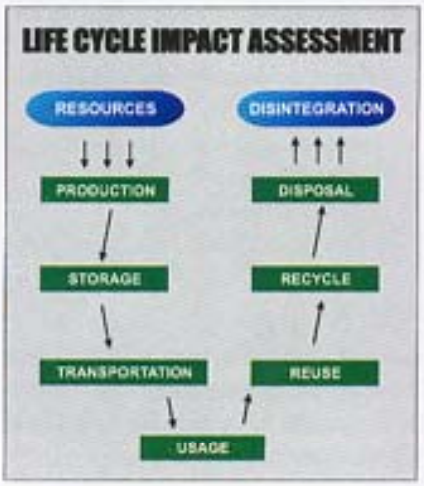
MAJOR REASONS OF ENVIRONMENTAL POLLUTION

AIR POLLUTION
WATER POLLUTION
SOIL POLLUTION
GLOBAL WARMING
DEPLETION OF OZONE LAYER

Role of plastics in each of these environmental issues:

Let's begin by analyzing what plastics materials are made up of. The carbon atom is the backbone of the chemical compounds that constitute all living things. Carbon atoms link to form a molecular structure chain. This occurs naturally in life process of plants, that have this structure in the form of cellulose. And it is this cellulose which led to the invention of plastics. In 1862, Alexander Parkes in Britain modified cellulose nitrate with camphor to produce the first man-made plastic material. Since then, various types of plastics have been invented involving many chemicals - organic as well as inorganic. Present annual consumption of plastics in the world is more than 130 million tonnes, which has almost doubled in the last 30 years. Of the various types of plastics and plastic commodities, it is Low Density Polyethylene (LDPE), Linear Low Density Polyethylene (LLDPE), High Density Polyethylene (HDPE), Polypropylene (PP), Polyvinyl Chloride (PVC) and Polystyrene (PS) which account for about 80% of the weight. We will try to analyse the impact that these plastics have had on environmental management. While analysing the impact/effect of material on the environment, one should consider the Life Cycle Assessment (LCA) which cover the following aspects: -

1. Production
2. Storage
3. Transportation/Delivery
4. Usage/reusage
5. Disposal, upto final disintegration



Life Cycle Assessment is an important environmental management tool to gauge the impact of a product on the environment from its manufacturing stage to its final disposal/ disintegration. However, LCA requires basic research to build up the data over a period of time. Some international organizations are conducting LCIA (Life Cycle Impact Assessment) for many products. LCIA about plastics products will be an important tool to compare plastics with other products in terms of the pollution they cause.

Till such time LCIA studies are released and those results accepted by different countries, we can assess the issue of environmental pollution as per existing norms and rules.

AIR POLLUTION

Air Pollution is of grave concern, mainly in the highly populated/ industrial areas. A chart showing the major air pollutants and types of industries responsible for such pollution is given in the table. A report published states that Delhi - one of the most polluted cities in the world, is plagued by environmental degradation. More than 2/3rd of Delhi's air pollution is due to the emissions by vehicles. Air pollution in Delhi area due to vehicle emission has since come down after strict implementation of CNG as a fuel in the public transport system. Among the other causes, are emissions from industries. The industries which have been identified under this by Central Pollution Control Board (CPCB) are :-

- Thermal Power Plants
- Brick Kilns
- Potteries
- Steel rolling plants and
- Induction furnaces.

(Plastics processing has been kept under non-polluting (Green) category).

Let us study the type of emissions possible from Plastic industries, which are hazardous, during the Life Cycle Assessment steps: -

Step 1: During production of commodity plastics raw materials, mainly four chemicals are involved which attract the attention of critics. These are: -

- Ethylene
- Propylene
- Chlorine/Vinyl Chloride Monomer (VCM)
- Benzene

Critical characteristics and safety limits, TLV (Threshold Limit Value), IDLH (Immediately Dangerous to Life or Health) limit etc. are available.

The manufacturers of these commodity plastics, which are essentially in the organized sector, constantly monitor the TLV of various chemicals and modern technologies

AIR POLLUTANTS AND THEIR EFFECTS ON ENVIRONMENT

POLLUTANT	TYPE OF INDUSTRY/ SOURCE RESPONSIBLE	EFFECTS ON ENVIRONMENT
Suspended Particulate Matter (SPM)	Fuel burning, stacks of boilers, dust storm, volcanic eruptions, explosions, cement, mining	Deposition of leaves and hence reduced photo-synthesis, respiratory diseases and pulmonary tuberculosis and bronchial asthma.
Sulphur Dioxide (SO_2)	Fuel burning, sulphuric acid, inappropriate incineration of city's solid wastes, chemical industries, smelting, refinery.	Acid rains, leaf burn, chlorophyll destruction, corrosion of stones and monuments, damage of testicles, irritation to membranes and lachrymal, reduced visibility, asthma.
Oxide of Nitrogen (NOx)	Petroleum operations, industrial and automobile combustion, lightning.	Irritation to mucous membranes, chlorotic mot premature needle drops, rymation.
Carbon Monoxide (CO)	Incomplete combustion of fuels and hydrocarbons in industry and automobiles.	Asphyxiating gas in enclosed places, head-ache, loss of visual acuity, loss of ability to accurately estimate time intervals, decrease in muscular co-ordination, loss of oxygen from blood, disruption of nitrogen fixation, free living bacteria and nitrogen fixers.

Plastics are not considered as sources of such pollution.

enable these industries to install systems, which ensure that the emissions do not exceed the permissible level.

Step 2: Emission during processing of these commodity plastics: -

Often polyethylene is considered an inert material. When processing in a poorly ventilated area, in absence of sufficient oxygen and at a temperature of more than 300°C, some amount of carbon monoxide is emitted. However, all conversion processes employ a lower temperature to the polymer. Extrusion Coating and Rotational Moulding are the two processes where the processing temperature reaches close to this limiting temperature. But both the techniques are generally performed on large production floors, which ensures presence of sufficient oxygen.

In burning situation, or when the flame is extinguished, some amount of carbon monoxide, acrolein and other aldehydes are produced. This situation is in general similar to that of wood and other cellulosic products.

PVC is the most controversial plastic material which attracts attention and criticism of the environmentalists lobby, and hence it is the most researched material all over the world. The topic is vast and requires elaborate discussion. The major issues concerning PVC are :-

Issue 1: PVC contains VCM - which is carcinogenic

However with improved technology, most manufacturers are today offering PVC containing Residual Vinyl Chloride Monomer (RVCM) of less than 5 ppm level - a safe limit for the environment. Some of the new plants can even boast of offering PVC with RVCM level of 1 ppm and below.

Issue 2: PVC evolves Chlorine and Hydrochloric acid (HCl) during processing, which are hazardous

If enough HCl is evolved from PVC during processing, then the product degrades which is indicated by yellowing, browning and ultimately blackening of the product.

In reality, HCl is not allowed to evolve from PVC during processing by the action of stabilizers which fix the HCl inside the compound itself, thus preventing loss of the basic property of the product.

Issue 3: PVC uses many heavy metals as stabilizers - which are hazardous

Yes, one of the earliest and most efficient stabilizers for PVC was lead and its salts. However the development of new stabilizers/ additives has started replacing many controversial stabilizers, though it is at a higher cost. For food contact applications, safe additives/stabilizers are already being used. Positive lists of various regulatory authorities of different countries indicate the type and level of all additives which can be used in all plastics, including PVC, in contact with drinking water, pharmaceutical and food items.

The Bureau of Indian Standards (BIS) has laid down these limits and any PVC product bearing the 'ISI' mark has to comply with these.

Issue 4: PVC evolves Dioxin during incineration

The American Society of Mechanical Engineers (ASME) has concluded in a recent study that there is no correlation between the amount and type of chlorine in the waste stream and the amount of dioxin emitted by waste incinerators. It is now widely believed, that incinerator design and operating conditions are the key to control dioxin.

Dioxin in atmosphere as per the draft report of US EPA:

- Dioxin level in atmosphere in 2000 has reduced by 1/3, as compared to that in the 70's.
- Production of plastics material has tripled during this period

This proves that dioxin and plastics are not correlated.

Issue 5: Fire situations in building emit toxic gases due to burning of PVC items

PVC is generally fire resistant. It does not catch fire by itself. Moreover in fire situation, especially gases emitted from other building materials can cause same or a more severe type of hazardous situation as done by PVC. Thus PVC cannot be singled out as the only reason for fatal injury to human lives during a fire.

PVC does not have any additional toxicity risks under fire situation. During fire situations, PVC, like all organic materials, releases gases which are toxic. Hydrochloric acid, a product released during PVC fire, is not a killer gas in the amounts normally released. A study report shows that it would require about 30minutes exposure to hydrogen chloride released from the PVC present in a typical room fire to inhale a lethal dose. Long before that, a person trapped in such a fire situation, would have died from the carbon monoxide released by all other organic materials (wood, clothes, etc.) in the room, or from the heat and flame exposure. While hydrogen chloride has a characteristic pungent odour to give signals of danger to the people, carbon monoxide, being odourless, does not give any indication of the impending danger.

Another fact is, when forced to burn, rate of burning of PVC is 90% lower than wood, which means, PVC under flaming conditions, consumes oxygen, releases heat and produces carbon monoxide and hydrochloric acid more slowly than wood and many other materials.

Plastics do not increase the SPM level in the atmosphere due to the nature of the process. Most of the powdery ingredients to be incorporated in plastics are either, processed in an enclosed place or in master batch form. Places where such master batches are made, are limited and are/can be properly controlled.

WATER AND SOIL POLLUTION

Plastics do not pollute water. In fact most plastics materials may be used in contact with food products. Potable water is stored and delivered through plastics. Plastics processing industries do not generally have scope of releasing any effluent except water itself, which is used as a cooling agent.

Printing inks used in plastics industry should be used according to laid down norms. Printing ink industries are developing solvent less printing inks which are safe for the environment. However, inks used in plastics constitute a very small percentage of overall printing inks usage.

Plastics raw materials manufacturing companies, which deal with various chemicals while manufacturing plastics, do follow the regulatory norms while discharging effluents. It is easier for the regulatory bodies also to have a check and control on this aspect, considering there are a limited number of raw material manufacturers.

DISPOSAL

There are options for disposal of plastics items. These are - Reuse, Recycle, and Disintegration through incineration and land filling.

Biodegradable and Photodegradable plastics have also been developed. In any of these options, plastics by themselves do not pose any problem. Civic awareness and strict control of methods of disposal are the keys to the treatment of plastic wastes required.

There is a general concern that plastic carry bags often choke the municipal drainage system. Here, it may be mentioned that, there are many other things, which may choke the drainage

system. There should be a social awareness that plastic items (any item for that matter) should be disposed of in a correct manner. If we want to live with the comfort of an urban life style and if we want to take advantage of technological developments in our lives, we must act responsibly towards the environment.

USAGE/REUSAGE

Most plastics materials are generally safe for use, when they come in contact with food items. But there are some plastic formulations, which are not suggested for such use. Some plastics need to use recommended additives for the end product to be used in contact with food. Here a general awareness and common code of practice is required to safeguard the interest of public health as well as to prevent the misuse of plastics. Bureau of Indian Standards has guidelines and standards in all these areas.

Plastics are used in Packaging, Building including furniture, Pipes, Cables, Electronic & Electrical, Automobiles and aviation, Medical including population control, Agriculture and water management, Appliances and household products and many other applications. Plastics always preserve the natural resources/energy and help to keep the environment clean. Reuse/Recycling of plastics is very much possible, for which detailed procedures are well developed.

GLOBAL WARMING

Global warming is a concern today as temperature on earth is increasing. However, plastics cannot be considered as the main cause of global warming. In fact plastics consume less energy for conversion compared to many other materials. Lesser consumption of energy means lesser requirement of electricity or other energy resources, most of which pollute the environment. Imbalance in carbon dioxide generation, a major cause of global warming, is caused due to many reasons. Imbalance caused due to plastics is negligible.

DEPLETION OF OZONE LAYER

There are certain chemicals, which have been identified as Ozone Depleting Substances (ODS's) that cause depletion of the ozone layer. CFC (Chloro Fluoro Carbon) is one of them. CFC-11 is used as a blowing agent in certain plastics to make up a foamy structure. Hydrocarbons, specifically cyclopentane, is reported to have replaced CFC-11 as a blowing agent. Other ODS substances are halons, Carbon Tetrachloride (CTC) and Methyl Chloroform (MCF). These do not find applications in the manufacture of commodity plastics.

STORAGE & TRANSPORTATION

Storage and Transportation of plastic products do not create environmental pollution. In fact transportation of various products in plastics containers/packages save enormous amounts of fuel, due to the very low density of plastics materials.

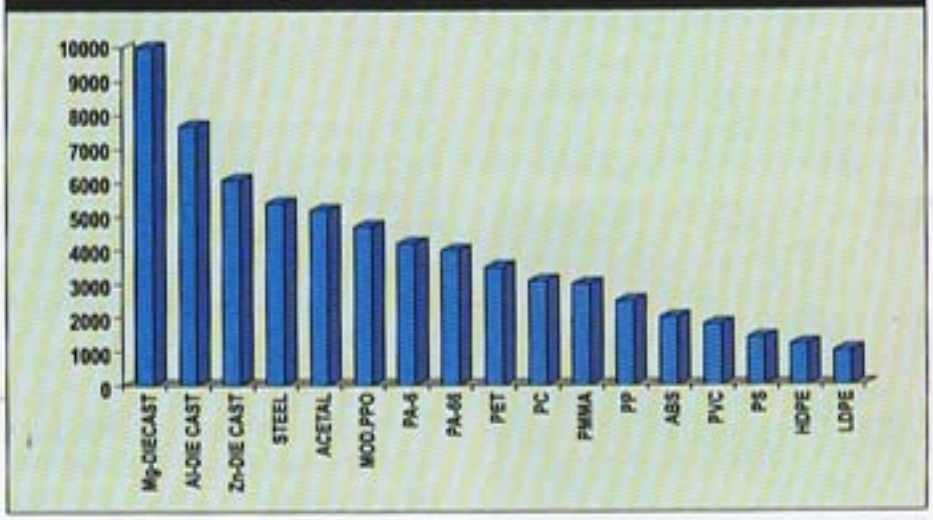
The positive contributions of plastics in maintaining the ecological balance are many. One MT of plastic product, replaces the wooden products derived out of 5 matured trees: considering that a tree requires at least 10 years to mature (which is longer in case of many other trees). We may analyze the benefit we derive by using plastics for manufacturing furniture/building materials, packaging materials etc. Afforestation is a prime factor for preserving the earth's environment. Plastic nursery bags prove helpful in the social forestry programme.

Geo textiles, plastic films help in restricting soil erosion and water seepage in canals and other areas. Plastics mulching also facilitates an increase in agricultural production. Plastics drip laterals are employed for water management, subsequently achieving a higher agricultural yield. Green Houses made of plastic film, also enable the production of agricultural products in places where it would otherwise be impossible.

CONCLUSION

It is clear that plastics protect the environment by conserving precious natural resources and energy. While policy makers in the Government have taken decisions to use plastics in various applications, more such decisions may be taken: to make use of plastics mandatory in areas where it replaces wood and other natural resources, and also helps prevent the use of many environmentally hazardous substances.

ENERGY REQUIREMENTS OF VARIOUS MATERIALS



ICPE Events

WEALTH FROM WASTE

In some select wards of the Mumbai Municipal Corporation, the concept of Dry Waste Management at source has been initiated. Certain NGO's in partnership with ICPE are involved in this endeavour.

Mr. K. G. Ramanathan, President, Governing Council, presided over a meeting held at the Indian Merchants' Chamber on November 24, 2003 to review the activities and discuss the future plans of the project. The statistical analysis of Dry Waste collection at source for 10 months (January – October 2003) in select areas of A, D, F (North) and S ward reveals that about 500 tonnes of dry waste was segregated, generating a value of over Rs. 19 lakhs and creating a livelihood for about 60 rag pickers – with earnings of Rs. 3,300 per month for each of them. This also showed that the plastic waste commanded a higher value than non-plastic waste.

"A/D/F – (North)/S" WARDS (58 RAG PICKERS / 10 months)		
	Weight (kg)	**Value (Rs)**
Plastics	182989 (36%)	1167138 (61%)
Non- Plastics	323707 (64%)	757375 (39%)
	5,06,696	**19,24,513**
AVERAGE INCOME Rs 3,318 per month, per rag picker		

Information on the basis of figures from January – October, 2003

AT PLASTINDIA

At the recently held meet of the PLASTINDIA FOUNDATION new members were elected onto the committee for the period 2003-2006.

Mr. Mahesh K. Shah
President

Mr. Arvind M. Mehta
Vice-President

Mr. Subhash K. Kadakia
Hon. Treasurer

Prior to being elected President of the Plastindia Foundation, Mr. Mahesh K. Shah was the Chairman of the Plastics Export Promotion Council (PLEXCONCIL) and the Vice-President of the Plastindia Foundation. He has also been associated with many institutions and organizations of national character.

Recently elected Vice-President, Mr. Arvind M. Mehta was the President of the All India Plastics Manufacturers' Association (AIPMA) and was also the Hon. Treasurer of the Plastindia Foundation from 2000-2003.

Mr. Subhash K. Kadakia was earlier the Chairman of Indian Plastics Institute (IPI).

Plastindia Foundation is the apex body of major Associations, Organisations and Institutions connected with plastics, with common objectives to promote the development of the plastics industry and to assist the growth of plastics and related materials and their products. The Foundation is dedicated to national progress through plastics.

Solid Waste Segregation Project at Vadodara

ICPE has co-ordinated with an NGO of Vadodara, Karelibaug Bhagini Samaj to replicate the Mumbai model of Dry Waste Management, for segregation of waste at source in Vadodara.

Plastics in the environment group of Indian Petrochemicals Corporation Limited (IPCL), Vadodara has joined the project by initiating a model project at the company township itself. The project, inaugurated on November 14, 2003, by honourable Mayor of Vadodara city, has received full co-operation of the Vadodara Municipality.

A combined effort of the NGO, corporate body, ICPE and the citizens is expected to create a cleaner environment in the area.

Pahal Paryavaran

Pahal Paryavaran, a group of social workers, in co-ordination with BMC, AIILSG, UNESCO, Aga Khan Trust and ICPE initiated a programme on social awareness for clean environment, in the Bhandup area of Mumbai.

This involved 5 areas under Bhandup, viz. Shastrinagar, Naradas Nagar, Rukmini Nagar, Janta Market and Mishra Nagar. School children from 5 schools in the area, each adopted one sub area to co-ordinate the task.

ICPE provided the technical assistance in training the teachers and officials of the BMC about segregation of wet and dry waste to the recyclers. ICPE also provided guidance to school children about the importance and usefulness of the bin culture in waste management. In addition, ICPE distributed waste bins to the citizens that adopted these areas. This helped raise adequate awareness among the local citizens.

ICPE at Pahal Paryavaran Programme

Debate on Plastics at Mumbai Intercollegiate Festival

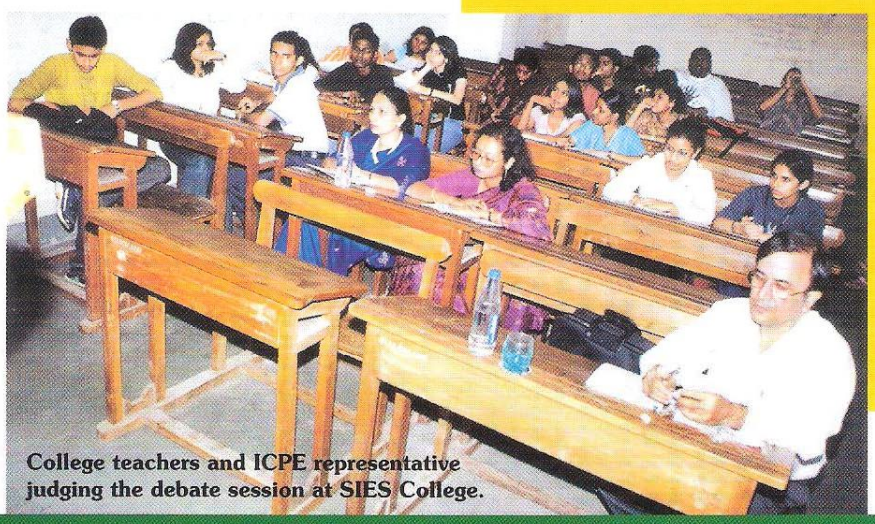
ICPE was invited to judge a debate on "Plastics are essential for our day to day life and are Environ friendly" at an intercollegiate festival, held at SIES College of Commerce and Economics, Mumbai on December 5, 2003.

Students from 18 colleges participated in the debate.

Students speaking for and against the topic, touched upon various aspects of plastics in the environment. Students speaking against, mentioned the myth of plastics as a source of dioxin, India lacking recycling facilities for plastics, plastics being non-biodegradable and that plastics also lead to cancer.

Those that spoke 'for' the topic brought up the importance of plastics in our everyday life and what an essential role they play. Students also realized that plastics was a cheaper substitute for wood or paper in a multiplicity of uses. The energy saving aspects of plastics were highlighted.

While summing up, the ICPE representative dispelled the myths that students had about plastics. ICPE also proposed to discuss the topic in detail with the college students at a further date, thereby making the coming generation aware of the benefits and importance of plastics in our lives.


College teachers and ICPE representative judging the debate session at SIES College.

ICPE gets tax exemption under 35 AC

The Government of India through the Ministry of Finance - Department of Revenue, has given a unique recognition to the sustained effort of ICPE in acting as a nodal agency for R&D and technical projects, communication and information on plastics and the environment and sponsoring/ facilitating pilot projects on Plastics Waste Management, by according ICPE a 100% Income Tax Exemption status under Section 35 AC, which is available essentially to R&D centers.

Under this recognition, any donation/contribution to ICPE will be 100% IT exempted. This act of the Ministry of Finance will greatly facilitate contributors/donors to take part more actively in ICPE's initiatives and activities.

ICPE Activities

- INTELPACK 2003 – Participated in the 8th International Packaging Exhibition, together with FOODTEK '03 and Pharma Tek, at the NSE complex in Mumbai during December 4 – 7, 2003.
- PLASTO 2003 – 3rd National Plastics Exhibition at Pune during December 18 – 21, 2003.
- ICPE supported Numaish Exhibition at Hyderabad by supplying technical literature for distribution and audio visual CD's to screen at the event for the visitors.
- On educating various associations and groups about recycling of plastics and waste segregation, ICPE commissioned a film through R&PM. This 5-minute film shows the process of waste segregation and plastics recycling. Mass dissemination of this film will help ICPE to spread their message to a larger audience.

ICPE conducted a full day awareness programme at the Bombay Scottish school on October 8, 2003 to address the issue of "Plastics and Its Usefulness in the Environment". The school authorities have requested ICPE to extend the programme for the students in the higher classes too. ICPE will move ahead by scheduling more such programmes for the school in the future.

- ICPE has received a heart warming response of over 3000 entries for their national art contest "It's My World". The topic of the contest was 'Wealth in Waste. Don't Litter. Recycle It.' Children from as far as Mizoram, Nagaland, Manipur, Meghalaya, Assam, Jammu & Kashmir and Tamil Nadu in the age group 9–13 years pictorially depicted how they would like to keep their environment clean and make the world a better place to live in. The prizes include a multi-media computer system along with other consolation prizes.

ICPE launched its nation wide advertising campaign to highlight the positive aspects of plastics and its importance in everyday life. The ads highlighted the use of plastics in the Jaipur foot, on the cricket field and in the latest technology. The advertisements were rendered in 6 languages, English, Hindi, Tamil, Telugu, Malayalam and Gujarati. The advertising campaign designed by R&PM, is scheduled to extend over a period of four months.

Vellore Showcases 'Garbage to Gold' Development Model

Garbage is their business. But they don't want to pile it up. Nor do they want to cart it away to a dump.

This Tamil Nadu district believes that garbage needs to be treated as soon as it is generated, and turned into 'gold' - an organic, chemical-free manure sold at as high a price as Rs. 10 per kg.

Incidentally, Vellore has been declared the cleanest district in the country by the total sanitation programme of the Indian Government. Mohandoss, the district's chief administrator and collector, said that Vellore was once a place where there was no water and no trees, and now it is a changed landscape.

At present, Vellore has 10 villages, two town panchayats and five municipality wards covered by the total sanitation and integrated projects programmes. In a year, the authorities plan to extend this to the whole district. The district, about 150 km west of Chennai, has achieved the aim of "total sanitation" with help from the state government and supported by NGOs like the Exnora International and its green arm here, the Exnora Green Cross. It has also received funding and support from the Central Government's National Afforestation and total sanitation programmes.

The visiting media were also shown the "Vellore model of development", which according to additional principal information officer T.G. Nallamuthu is "a composite model with the possibility of being implemented throughout the country, in villages and towns, institutions and hospitals".

On show were waste management, composting and integrated development projects in the Vellore Institute of Technology, a temple, the Narayani Peedam zero waste scheme in Malaikodi, the Gandhinagar town panchayat and Vellore municipality's public funded projects. The projects involve at least 12,000 people and waste generated in the living and working environments of various communities, including farmers and shopkeepers, from the very poor to the affluent. The waste comes from kitchens, toilets, cattle, temples, hotels, shops and includes degradable and non-degradable plastics, metal and tyres: at least 70 tonnes of solid and liquid refuse, which have to be taken care of every single day for this big a population.

The Vellore Institute of Technology houses a nearly 7,000-strong student and teacher population. Led by Exnora, it has been engaged in bio-conversion of degradable waste in a shed on the campus. Interestingly, the 'bio-degrading engine' used by the institute is in the form of 27 cattleheads in its decomposting shed, which constantly munch away at the vegetable waste and convert them into cow dung in just 24 hours. From the dung comes biogas used to light up hostels. The institute also uses solar energy and is ready to teach everyone clean technology.

The Narayani Peedam is an example of a 21st century temple to the mother goddess 'Narayani', headed by a young 27-year-old known as 'Sakthi Amma'. With hundreds of devotees in India, Singapore, U.S., Canada, Britain and France, this young seer, in collaboration with the NGO, is piloting projects where elephant dung, cow dung, flowers, temple waste and banana leaves are all turned into organic manure within the precincts of the temple. This manure is then used to plant thousands of trees on the surrounding hills.

Meanwhile, in the village of Palavanchathu, 3,600 families have got together to collect, sort out and generate manure from garbage, providing employment to hundreds. The Vellore fish market also has a project to compost fish waste. The women of Selamantham village make excellent tea from the biogas that fuels their homes.

(Source: www.newkerala.com)

Chain Reaction

A single resident of D Road, Churchgate, succeeded in transforming the area, says Suman Sudha Mishra.

Residents of 'D' Road, Churchgate in Mumbai, were unaware about the concept or utility of vermiculture until 1997. It was Madhu Bhatia, a resident of Vishnu Mahal, who experimented with the technique at her own house and spread the word. She had attended a few lectures on vermiculture, which inspired her to do the same in her locality.

She began the experimentation in her kitchen. She started dumping vegetable peels in a tub full of mud. Vermicast (eggs of the worms) was then added to it and the compost was ready in a month. Madhu then, visited the residents of her building who responded immediately as the results were there before their eyes. The residents co-operated, and initially Vermiculture was introduced in the flowerbed within the building premises.

They noticed a remarkable change, when the first half of the flowerbed where composting had taken place, bred no mosquitoes, which indicated that the soil was healthy. On the other hand where composting was yet to be done, there were a lot of mosquitoes that indicated the soil needed nourishment, informed Sunayana Sadarangani, a resident of the building. The success within the building has now encouraged the residents to carry the work outside the building premises to the road.

(Source: The Times of India, December 20, 2003)

T(h)rash out your eco-friendly house like this

Computer key - boards, plastic waste, mud blocks and other products that are generally rejected by people have been used for the construction of this house, close to Vidyaranyapuram Police Station near the Brahmi Durga Temple.

Surprised? Need not be. Because, the Rain Water Club (RWC) of Bangalore, which began a revolution in the City by motivating people to take up rain water harvesting has now raised their voice against the increasing environment degradation due to increase in the number of buildings and the amount of waste generated in the city.

It has also devised a plan to help people who are concerned about the environment build eco- friendly houses, through which waste material is made use of in a better way

"The speed at which the city is growing and the number of buildings that have come up is a threat to the environment. Apart from this, if you take an average, a person in the city generated at least half a kilo of waste per day that is nearly 2,000 tonnes of waste every year. It includes hazardous substances like plastic and other products. Unless the situation is not dealt with properly, in future there can be serious implications on the environment," says Vishwanath, president of RWC. As a model of their plan they have already completed the construction of the first eco house at Vidyaranyapuram.

"I wanted a house, but at the same time I did not want it to be an addition to the urban chaos, I wanted it to be lighter on the earth. I came across Vishwanath and Chitra who were ready to take up the challenge, the result is a cost effective house which does not harm the environment for its existence," says Rajagopalan, a retired Professor of Oceanography in Indian Institute of Technology Chennai, who has allowed the couple to go ahead with their experiment.

For the first model, RWC has attempted to retain the first layer of soil which is crucial for the sustenance of the tiny insects and plants, "some elements in the first layer of soil are crucial for these minute living things like ants and other species of insects, it is also important in the context of plant life, we have preserved the first layer of soil and tried to replace it back in 'its original place, so that life continues like before without any problem," said Vishwanath.

"Attempt has also been done to map the biodiversity of this small plot, this is important because it is a micro attempt to retain the species found in the plot," he said. Mud bricks and stone slabs have been used more, while the use of cement and other RCC has been restricted. Plastic waste has been mixed with brick, "it helps absorb moisture and will provide a cool atmosphere to the people living in it."

The house saves at least 15-20 percent of construction charges on cement concrete and steel, even the labour input has been less compared to the RCC houses. Dependency on electricity has been reduced as the house has been constructed in such a way that there is lot of sunlight, while the solar power has been put into use.

Rainwater harvesting has also been done which is being utilised for storing drinking water as well as for other purposes.

Source The Vijay Times, Bangalore, January 28, 2004

A 'RUBBISH' FASHION STATEMENT

Redefining recycled material, "Conserve: Fashion that Cares" magically transforms plastic into bright, funky bags, files and even household items.

Managed by a husband and wife team, this duo, unlike most designers, are proud that their creations started from a dump. Turning waste plastic into a 'renewed' material known as handmade Recycled plastic through an environmentally friendly process, they have not only managed to do their 'green' duty, but also found employment for the urban poor.

Hand-made, their creations manage to retain the natural look, texture and color. Using only 10 per cent of the energy compared to the conventional recycling process, it does not involve any additional colours and dyes. And judging by the response the stall is getting, it seems like a trend that is catching on.

(Source: Extract from The Hindu, New Delhi, November 23, 2003)

Broken your bone? Try a polyethylene one

Collaboration between Japan Fine Ceramics Centre and a research team from Chubu University has succeeded in developing an artificial bone material whose properties resemble those of cortical bone. A composite material was made using a grade of HDPE that is employed as a biological material together with anatase-type titanium dioxide, using nanotechnology. The synthetic bone material achieves previously unachievable high strength and processability. It is made by uniformly dispersing and compounding 40-50 vol.% of nano-size titanium dioxide into molten HDPE, and then hot pressing.

ICPE News INTERNATIONAL

A place where plastic is fantastic

Leominster museum celebrates the ubiquitous synthetic substance The two most common questions asked to 81-year-old Keith Lauer, curator of the National Plastics Center & Museum and self-described Plastorian, are: `Where are the restrooms?' and `Why Leominster?'

Answer No. 1: They're on all four floors.

Answer No. 2: That's because Leominster bills itself as "The Pioneer Plastics City," part of an area of north-central Massachusetts that still boasts about 150 plastics-related firms and has produced thousands of plastic products ranging from early celluloid combs to latter-day pink flamingo yard ornaments.

So where else would you expect to find a former schoolhouse devoted entirely to plastics? Home to such attractions as the Plastics Hall of Fame, a trio of touring PlastiVans, the Plastics Reading Room, and a gaggle of plastic artifacts, the National Plastics Center & Museum is considered the foremost cultural attraction in this blue-collar city. Never mind that the 22-year-old nonprofit institution is hoping to break even this year after two money-losing years, or that it has only four full-time employees, or that it is open to the public only 20 hours each week. If you want to learn about the likes of Bakelite, Tupperware, or Teflon, this is where you want to be. They strive to be the place you'd go for any information about plastics says David Hahn, the museum's president.

Here, Plastic is Good. You do not hear from environmental groups such as Greenpeace lamenting pollution caused by plastics production. You are not presented with data from the US Environmental Protection Agency pointing out that only a small proportion of consumer plastics that become waste are recycled. Instead, plastic is advocated and promoted, just as you would expect from an institution that receives much of its financial support from the plastics industry and whose board of directors is made up entirely of plastics professionals.

For his part, Hahn does not think a positive image of plastics is a tough sell. He grew up in an era when plastics didn't have acceptance, but he thinks that's changed. The 62-year-old former plastics executive says that the perception of plastics has improved and it's been years since he has faced people saying that 'You pollute the environment.' Those days are behind.

If Plastic is Good here, there is another theme as well: Plastic is Everywhere. Although much of the mission is educational, 5,500 visitors, most of them in school groups, took part in in-house programs in fiscal 2003. Walk-ins, too, get the message that plastic is a contributor not only to the good life (check out the lightweight plastic shopping cart) but also to life itself (notice the plastic incubator).

If you're lucky, you might get to tour the museum with Plastorian Lauer, a man who seems to know everything about plastic and isn't afraid to pass the information along. The retired machine company executive will gladly tell you that the

first celluloid combs were made in Leominster in 1901 and will explain the workings of a circa 1935 injection molder from FosterGrant, and will take you piece by piece through a collection of antique celluloid artifacts that are housed in the museum but that belong to the Plastorian himself. Perhaps Lauer will even take you inside a locked storage closet packed with such items as a 1930s radio, a 1950s guitar, and a toy troll of indeterminate vintage.

Once there, he might show you what he considers to be the museum's Holy Grail, the leather-bound, handwritten notes from the 1890-1905 executive committee meetings of the Celluloid Company, founded by no less a figure than John Wesley Hyatt.

It was Hyatt who invented celluloid, the first true plastic, in the late 1860s, and who is therefore referred to as "The Grandfather of the Plastics Industry." Someone found it in a dumpster in New York City, says Lauer reverently running his hand over the book.

Hyatt is the centerpiece of the Plastics Hall of Fame, housed on the second floor. It is here that the men of plastic are immortalized. Where would we be without the contributions of, say, Earl Tupper (Tupperware), Roy Plunkett (Teflon), Raymond Boyer (Saran Wrap), or Stephanie Kwolek (Kevlar, from which bulletproof clothing is made).

Hyatt, meanwhile, used his newly developed celluloid to fill the demand for billiard balls. His contribution is further recognized here by the presence of the hydraulic press he used to create the balls. A visitor to this former Victorian elementary school might have the building to him or herself, but Hahn talks of plans for a spiffy new automotive display and a renewed environmental exhibit dealing with energy conservation, health, and safety. Recognizing the fact that Leominster isn't Boston or New York but suggesting that, while the Pioneer Plastics City may be a fitting site for this museum, it's not what the travel industry likes to call a destination city. Still, the National Plastics Center & Museum remains a place that, like the businessman who offers unsolicited career advice to a baby-faced Dustin Hoffman in the 1967 movie "The Graduate," has only one word to say: plastics. The National Plastics Center & Museum is at 210 Lancaster St., Leominster. Call 978-537-9529 or visit www.plasticsmuseum.org. It is open to the public Wednesday through Saturday, 11 a.m. to 4 p.m. Admission prices range from $3 to $5.

Pushing Materials - *Richard Butler*

Man's ability to adapt or create materials to improve our lives and the world around us is not new. The development of leather and bronze are early examples of man tailoring a material to a particular application. However, this process of making materials for a specific purpose really boomed in the 20th century. The development of synthetic polymers led to an explosion of new materials for a variety of needs. Part of this drive for innovation has always come from the military but for the past hundred years the aerospace and automotive industries have also helped. Their quest for lighter, stronger or heat-resistant materials has brought about some impressive advances, which are easy to overlook as you cook with your Teflon-coated aluminium frying pan. From the space shuttle to Formula One, the push for the best possible material is fierce and finding everyday civilian uses can be harder. One of the key consumer areas that try to utilize the best of modern materials is sports. The sporting goods market in the US was worth around $70 billion in 2003, and grows at around 2% per year. The Sporting Goods Manufacturing Association estimates that the global market is worth around $150 billion per year, making it an attractive market to compete in. Apart from being financially lucrative, there are other reasons for chemicals companies to get involved with sports. First, it is an area that makes constant demands for better equipment; with consumers and professional athletes demanding every advantage they can get. As well as this, though, are the marketing opportunities presented by being associated with sporting heroes.

FIRST CONTACT

Sports are often the first consumer use of high-tech materials or, at least, the first in which the consumer is aware of the product. Lycra for instance, was initially developed to replace heavy perishable rubber materials used in corsets. 'The product soon developed and went into products such as swimwear, which had traditionally been made from heavy fabrics, and changed the shape of swimwear,"

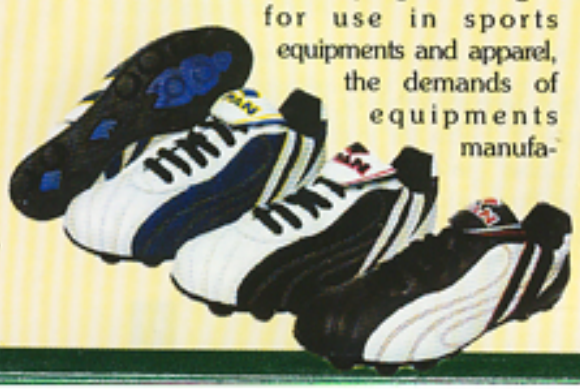
says Keith Milne of Invista, the textiles and Interiors business recently spun off by DuPont. From there, Lycra has become synonymous with garments such as cycling shorts and along with other Invista products, such as Teflon and Colmax, can be found in the strips of most of the world's best football players. Lycra is now used in everything from non-wrinkle suits to hosiery. It is also likely that the first time most members of the public will encounter carbon fibre is when they buy an expensive tennis racket.

Meanwhile, DuPont has found uses for a variety of its engineering polymers in sporting applications. The company's Hytrel polyester is used in everything from running shoes to wrist protectors for snowboarding. Several of DuPont's other engineering polymers, including glass-reinforced nylons and acetal resins have also found sporting applications from bicycle sprockets to ice skates.

Sporting goods are categorized into equipment, which covers items such as tennis rackets, apparel, footwear and recreational transport. Each of these areas offers rich scope for the introduction of advanced materials. "There are three main reasons for the use of high-tech polymers in sports," says Laurent Hanen of DuPont's engineering polymers division. "In sports you talk about safety — you need high-performance polymers for this. Also, sport is linked with fashion for colours, surface finishes and so forth. Finally, when you talk about sports you talk about better performance, you want to do better, you want your equipment to be lighter, and all these reasons demand you use high-performance materials."

DRIVING DEVELOPMENT

But as well as adapting technologies for use in sports equipments and apparel, the demands of equipments manufacturers are driving the development of the materials. For instance DuPont has collaborations with Adidas/Saloman and many of the other major sports manufacturers in Europe. Invista too also found that sports demand more from its products. In conjunction with a professor from Massachusetts Institute of Technology, the company developed clothing containing Lycra and some of its other fabrics to selectively compress muscles and focus the effort being produced into movement rather than vibration. "We develop all our products in a very high-tech way and sports is where that is most useful" says Keith Milne from Invista. Trek, bicycle manufacturer, has spent several years developing its own methods of creating carbon fibre. Its optimum compaction, low-void process was developed originally with expertise from the aerospace industry and NASA. This material is used to build a variety of high performance mountain and road bikes. Besides developing a mouldable carbon fibre that can be made into much more complex shapes than the traditional laying up process allowed, the company has also developed innovative ways of bonding carbon sections together.



Meanwhile, Trek and Nike have been collaborating on apparel, including the swiftsuit, originally designed by Nike for speed skating at the 2002 Winter Olympics, using various company fabrics. The whole body suit offers improved aerodynamics as well as compression technology and has been used by sprinters and cyclists. Windtunnel tests suggest that the suit allows a cyclist to cover 200km one minute faster than if they were wearing conventional cycling clothing. With the first 20 riders finishing the 2003 time trial stage in the Tour de France within six minutes of each other, a 15 second saving over the 47km route would be worth several positions.

At the consumer end of the sports market, BASF's collaboration with Adidas has led to the introduction of the ClimaCool range of running shoes. BASF's Elastogran division adapted its Elastollan thermoplastic polyurethane (TPU) elastomer to create a flexible breathable sports shoe. As well as its physical properties. Elastollan is used because it can be produced in a wide range of colours. Running shoes require bright colours, while tennis shoes tend to be more reserved. Both Nike and Adidas use TPU from BASF. In Nike's case, a TPU mesh covers the shoe, pulling the shoe tight across the foot and eliminating the need for laces or velcro, making life easier for runners and transitions faster for triathletes.

CHASING FASHIONS

The sports market is a valuable one with around 7% of DuPont's engineering polymers sales being in this area, and 15% of Invista's $2.5bn annual fibres turnover being sports related. However, as DuPont's Hanen notes the market is at the whim of fashion. "A few years ago you saw these microscooters everywhere," says Hanen "Now they have all disappeared." Both BASF and DuPont had developed polymers to create bright, colourful and durable wheels for a market that vanished almost as quickly as it appeared. "Much of our demand has come from the winter sports markets, for ski bindings and boots', explains Hanen. "Sometimes the market grows five or six percent, other years it drops by ten." The fickle nature of the market can act as a driver in itself, though. The need for attractive colours and finishes to match each year's trends has led DuPont to develop a powder-coating finish that works with several of its engineering polymers, giving a durable metallic finish. 'I would say that the customers push a lot of the research but we are trying to be more proactive' says Hanen. "We cannot be the leader at predicting trends, but we are the leader in providing for those trends."

Chemistry & Industry - 6 October 2003

American Plastics Council with Recycling Awareness & Volunteers Drive Helps Make Kids' Playgrounds with Plastic Waste a Reality

Partnership with Plastic Reprocessor, People & State's Environment Protection Agency

As the winner of the school prize for Massachusetts Recycles Day 1998 and to serve as 1999's kick-off event, the Laurel Lakes School of Fall River, MA was awarded a brand new playground made from 75% recycled plastics (more than 1.5 tons of recycled consumer milk jugs)! In order to compete for this playground, students, teachers and parents from school systems and communities throughout the state had to make formal pledges to recycle more as well as buy more recycled products.

In accepting the playground, comprised of a variety of entertaining, fitness and other functioning equipment, Principal Edward Foley of the Laurel Lakes School stated, "Everyone in our school system - our students, their teachers - and even the parents of the children who attend Laurel Lakes worked extremely hard to win this state-wide competition. It required a total effort by volunteers in our community to gather pledges and recycle more and buy more recycled products. The promise of a brand new playground for the winning school, plus a greater awareness by the school generation of the need to recycle were the driving forces. We're proud of this accomplishment."

"There is a misconception that recycled content products are difficult to find," said David Hendrickson, Coordinator for Massachusetts Recycles Day. "The recycled plastic playground by the American Plastics Council is the perfect showcase for the types of top-of-the-line products being manufactured from the recyclables we place at our curbside or drop-off at the recycling center."

The playground is both aesthetically and environmentally "pleasing" since the equipment will need virtually no maintenance due to recycled plastic lumber's resistance to weather variables. Additionally, the colors on the equipment are part of the material itself and will never require touch-up painting, helping to keep maintenance relatively simple. Use of this plastic lumber also means that children will never encounter splinters.

In order to promote recycling, the benefits of recycled plastic lumber and other Massachusetts Recycles Day activities, APC partnered with MassRecycles, Inc, the state recycling organization, the U.S. Environmental Protection Agency (EPA) and other non-profit associations in the State. APC also had a number of products made with recycled plastic on display, including office supplies, backpacks, fanny packs, fleecewear, and garden and landscape items.

The American Plastics Council publishes the Recycled Plastic Products Source Book, a guide for procurement and business officials containing over 1400 recycled plastic products. APC also has a free pocket-sized consumer's booklet entitled Shop Recycled! which contains over 240 products available in grocery and retail outlets around the country. Both guides can be ordered through APCs website.

Plastic bottles such as these are used to make the recycled playground the students at Laurel Lakes School are now enjoying.

Indian Centre for Plastics in the Environment

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