ICPE
INDIAN CENTRE FOR PLASTICS IN THE ENVIRONMENT

Envis Eco-Echoes

Management of Plastics, Polymer wastes and Biopolymers and impact of Plastics on the Eco-system

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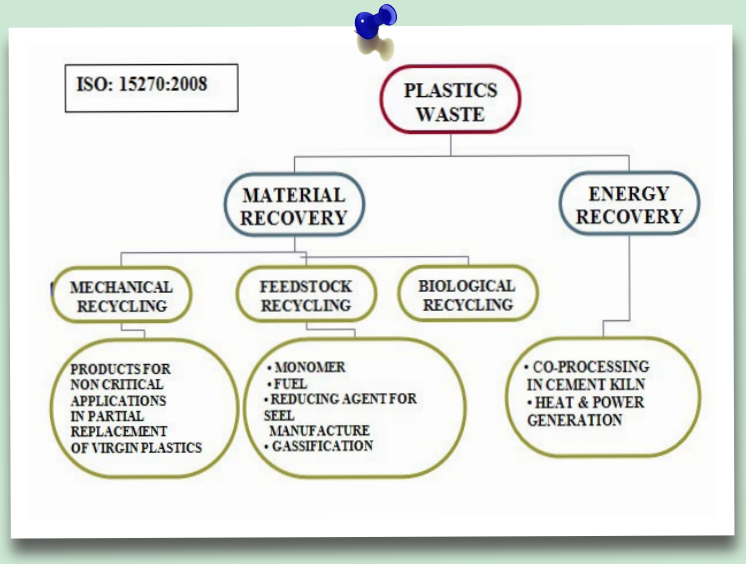
IN THIS ISSUE



Plastics and the Environment

Creating Fire artificially in the Stone Age was considered the beginning of civilization. Civilisation brought about industrialization. As the civilization progressed, so did the needs of human race. Great inventions changed the world and accordingly changed our life style also. Industrialisation was rapid since the beginning of 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 the civilisation.

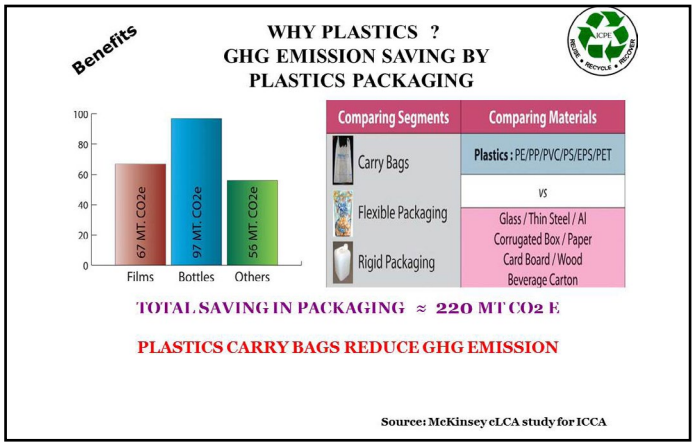
When we analyse different reasons for environmental pollution, we note that the following are the major ones –

- Air pollution due to various types of gaseous emissions Volatile Organic Compounds (VOCs), Hazardous Air Pollutants (HAPs) and Suspended Particulate Materials (SPM)
- Water and Soil pollution due to various types of effluents and disposals untreated from different industrial units / other operations
- Global Warming due to **CO_2 e** emissions from various industrial operations
- Depletion of ozone layer caused by emissions of certain types of emissions to the upper atmosphere

Air Pollution is considered the most serious concern, mainly in the highly populated / industrial areas. Emissions from vehicles and industries are among the major causes of air pollution. Production of plastics raw materials causes minimal effect on BOD and COD of water in comparison to alternative materials. For example, in comparison to paper industry, contribution to BOD and COD level by plastics are less than 10%.

Ozone layer in the upper atmosphere of Earth has the valuable ability to block most of the Sun's ultraviolet rays and other harmful radiations, preventing those to reach Earth's surface. Depletion of Ozone layer due to certain chemicals is a serious concern for the living beings. Attention has already been drawn and measures taken to restrict the use of such chemicals in the chemical industry. These chemicals do not find application in the manufacture of Commodity Plastics. There are certain chemicals which have been identified as Ozone Depleting Substances (ODS). They cause depletion of Ozone layer. CFC (Chloro Fluoro Carbon) is one of them. CFC-11 has been used as blowing agent in certain uses of plastics to give foamy structure. Hydrocarbons, specifically cyclopentane has replaced CFC-11 as blowing agent. Other ODS substances are Halons and Methyl Chloroform (MCF). These do not find applications in the manufacture of commodity plastics.

Global Warming phenomenon is considered the single most serious environmental issue, the world is facing today. Melting of glaciers in the poles has increased during the last 100 years at a level, which, if not resisted, would cause an environmental catastrophe in the entire world in the coming years, initially beginning with the areas near the sea sore.



Among the Top Ten Green House Gas Emission Saving Sectors - Four are Plastics

Under the United Nations Framework Convention on Climate Change (UNFCCC), the Intergovernmental Panel on Climate Change (IPCC), after going through scientific findings has concluded that significant reduction in the Green House Emissions is essential to slow down the rate of growth in atmospheric concentrations of CO_2. The IPCC analysis highlights that to achieve emissions reductions on the scale necessary, political intervention is must. Studies have been made to assess the impact of GHG emissions in two scenarios to 2030, a Business–as-Usual scenario that is, by allowing today's industrial activities to continue without imposing any restrictions or without any modifications in the process, and an "abetment scenario", by imposing necessary restrictions to achieve the target result. While world leaders are discussing on various measures to arrest the emissions of **CO_2 e**, a well researched carbon-Life Cycle Analysis (cLCA) conducted by McKinsey under the initiative of **International Council of Chemical Associations (ICCA)** and others, reveals that in 2005 the total GHG emission in the world was 46 G Tons **CO_2 e**. Due to the Chemical Industries there was about 11% savings in the **CO_2 e** emissions. Among the top 10 GHG emission savers, 4 are Plastics – Insulation, Packaging, Automobiles and Piping. These are the essential utilities we use in today's life. Plastics reduce

Plastics and the Environment

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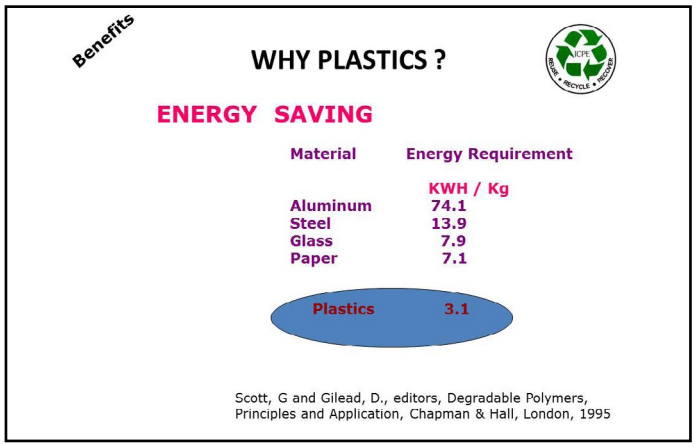
the GHG emissions which not visible by naked eye. Plastics consume least energy for conversion in to final product. Any process which requires less energy is always categorized as environment friendly.



Although plastics are employed in myriad applications where they actually conserve natural resources, there are some issues which have been surrounding the material ever since its growth rate increased. These issues mostly relate to the management of waste created by plastics products after its use, mostly in the packaging applications. Apart from the issue waste management, there are some other issues / controversies relating to health, safety and toxicities of certain types of plastics products. The major issues related to plastics could be listed as below:

- Plastics Waste – land area
- Plastics Waste – in the sea water
- Vinyl Chloride Monomer and manufacturing of PVC
- Use of Phthalate Plasticisers in PVC
- Use of Polycarbonate as Baby Feeding Bottle

Most prominent among the above is the issue of waste management. The plastics waste management relates mainly to the waste generated by packaging – the single largest application sector in plastics. The cause is mainly littering habit and inadequate infrastructure for waste management activity and absence proper recycling facilities preferably close to the place of generation of waste.

Over a period of last two to three decades, many countries have been able to address this particular issue in an appropriate manner and resolve the same to a great extent. However the issue of plastics waste in sea water is yet to be resolved to the satisfaction of all. According to the United Nation's Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP), land based sources account for 80% of marine pollution, rest being from the ships. Although there is conflicting figures on the volume of marine plastics waste pollution, however there is no denying that the problem is definitely serious. More and more attention and efforts are required to address the issue.

80% of Marine Pollution originates from land area

On residual Vinyl Chloride Monomer content in PVC, the controversies have been addressed fully with proper Standards – International as well as country specific, and its effective control through the testing facilities, which are available across the world. On the use of certain types of Phthalates, research work is still continuing for proving the safe use of controversial varieties Phthalates in PVC products for food and medical applications while at least four of five types have already been declared as safe for use. However for certain applications most Nations in the world have imposed restrictions in usage. These are toys and other materials which come in easy reach of children below 3 years of age. Many countries have imposed restrictions on use of Polycarbonate Baby Feeding Bottles due to the 'Bisphenol A' issue although the alleged 'migration' of the basic raw material to the product being packed, beyond the permissible level has not been exclusively proved. In the mean time, alternative plastic material - Polypropylene Random Copolymer is being developed for this application area. In any case, for food contact applications, adequate safety measures in terms of adhering to the National and International Standards are taken .It is clear that plastics protect the environment by conserving precious natural resources and energy. More awareness drives and improvements in developing infrastructure for handling waste especially for the flexible packaging waste is required.

Plastics Waste Management: Recycling & Recovery Options

Due to its multifaceted benefits, use of plastics in variety of applications has been increasing at a galloping rate all around the world, including in India. Plastics contribute various benefits to the modern world from providing safe and hygienic packaging materials for food and pharmaceutical products, to conserving Land, Water, Forests and Energy resources to practically in all areas of our life. The list below gives a quick overview of major application areas of plastics:

- Agriculture
- Healthcare / Medical
- Education
- Pipes for Water, Gas and Sewerage
- Building & Construction – Flooring / Doors & Windows / Drainage Pipes, Water Storage Tanks, Construction Linings etc
- Cables – Electrical and Telecommunication
- Electrical & Electronics Equipments
- Thermal Insulation
- Automobile, Aviation & Railways
- Packaging
- Household
- Furniture
- Toys & Others

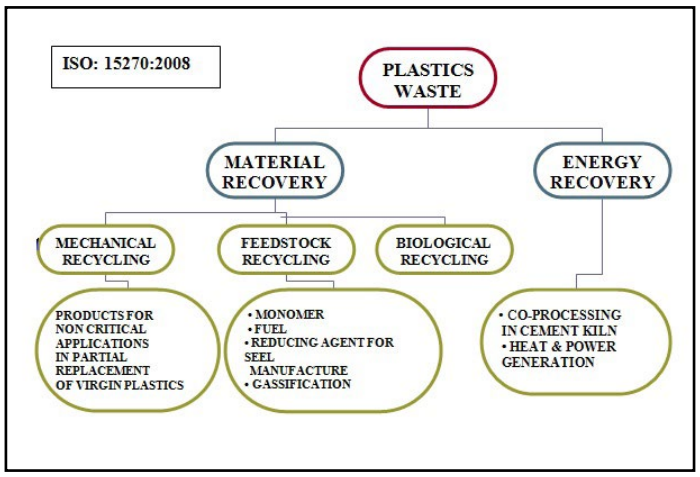
Some of these applications are for long time use and some for short term. Packaging is the single largest sector of applications of plastics which account for about 35% - 40% of consumption globally. Consumption pattern in India is similar. Flexible packaging applications are mostly for short term use. Management of waste created by the discarded used plastics items, especially the ones used for flexible packaging applications has become a challenging task, more so in the developing countries of the world.

Developed countries have established effective infrastructure for the management of plastics waste of all kinds by adopting proper collection system and different recycling technologies. However in the developing countries the general trend is to opt for selective collection of some types of plastics waste, which are easy to recycle by Mechanical Recycling Process (referred later) abandoning a large chunk of plastics waste, which are difficult for recycling.

These find their way to the landfill or simply remain in the surroundings, creating an environmental issue (chocking of drains or creating other health issues). New technologies and economics have come to play an important role in plastics recycling. When we talk about plastics recycling, it principally refers to 'Recovery', which is divided into 'Material Recycling' and 'Energy Recovery'.

Various options for plastics recycling / recovery have been described by the International Organisation for Standardisation (ISO) in its Standard: 15270:2008.

PLASTICS RECYCLING / RECOVERY OPTIONS



The choice between Mechanical Recycling, Feedstock Recycling or Energy Recovery will depend on the types of plastics waste and the relative ease / difficulty in total or partial segregation of different groups of plastics materials from each other or from other waste materials / contamination.

Brief Description of the options

Mechanical Recycling

- This is most preferred and widely used recycling process.
- Cost effective.
- This process converts the waste in to products for same or new areas of application. For example a milk packaging film waste is converted in to barsati film (water proofing purpose). A broken bucket is remoulded in to a bucket or mug etc. An automotive battery is converted in to briefcase. A PET bottle waste is recycled in to fibre for further conversion in to a carpet or a T-shirt.
- Recycled material is available at 50% – 60% cost of virgin material, at a lower property though.

Requirement:

Requirement for Mechanical recycling is Homogeneous input of same type of plastics waste. When different types of plastics are mixed together, specific segregation technique is employed to accumulate similar groups of plastics materials separately. Cleaning is an important part of the process. The process flow chart is as follows:

Sequence of operations

The mechanical recycling option generally comprises the following sequence of unit operations, some of which may occur simultaneously, that are carried out as part of the recyclate preparation and production process:

"Collection → Identification → Sorting → Grinding / Shredding with or without dust removing → Washing → Drying → Separating → Agglomerating → Extruding / Compounding → Palletizing

In some cases where the sorting process is able to group same type of plastic waste together, the "separating process" after washing and drying may not be necessary."

ISO 15270

Feedstock Recycling

This option is opted for converting plastics waste to different products:

1. Conversion to Monomer
2. Fuel
3. Reducing Agent in Blast furnace for production of iron
4. Gasification to constituent chemicals in reasonably purer form

1. Conversion to Monomer:

Some types of plastics waste have already been converted to its monomer for reusing the same as the base material for re- polymerization. At least 30 – 40% of PET waste has been re-polymerized to fresh raw material. This is a high technology process and is generally pursued by the basic plastics raw material manufacturers.

2. Fuel from plastics waste:

Waste generated out of mixed plastics, co-mingled plastics and plastics materials made out of a combination of different plastic materials are generally difficult for normal recycling (mechanical recycling) and are mostly abandoned in the waste stream as it is, and hence creates waste management problem.

Success has already been achieved in converting such plastics waste in to industrial fuel in an environmental friendly technology in some countries in the world including in India. This option has the benefit of using mixture of different types of plastics waste, mixed together, without segregation. Elaborate cleaning / washing is also not required. Industrial Fuel made out of the plastics waste is substitute of fossil fuel (LDO). This process is also used for Recycling of Electronic Waste, containing plastics.

Principles Involved

All plastics are polymers mostly containing carbon and hydrogen and few other elements like chlorine, nitrogen etc. Polymers are made up of small molecules, called monomers, which combine together and form large molecules, called polymers.

When this long chain of polymers breaks at certain points, or when lower molecular weight fractions are formed, this is termed as degradation of polymers. This is reverse of polymerization or de-Polymerisation. If such breaking of long polymeric chain or scission of bonds occurs randomly, it is called 'Random de-Polymerisation. Here the polymer degrades to lower molecular fragments. In the process of conversion of waste plastics into fuels, random de-Polymerisation is carried out in a specially designed reactor in the absence of oxygen and in the presence certain catalytic additives. The maximum reaction temperature is around 400°C.

This process can convert all types of hydrocarbon polymers including thermo plastics and thermosetting plastics, rubber products including used automobile tyre and synthetic fibre. Economic viability depends on the volume of operation and types & cost of inputs. Commercial scale plants are already running in some parts of the country. Pilot Plant is running successfully at a Colony in the heart of New Delhi since beginning of 2014. There is a growing feeling among the civic authorities for decentralizing the treatment processes of MSW closer to the waste generation area, if possible, so that the waste need not travel a long distance. Keeping that requirement in mind, Technologies are nowadays offered so that smaller batches of waste could be treated without causing any untoward environmental nuisance in the vicinity. The model project in New Delhi has been set up keeping this as a background. The plant is based on pyrolysis technology and runs in batch process. The batch capacity is 50 Kgs. The technology helps in converting all types of synthetic polymers into liquid hydrocarbon fuel and LPG rage gas at a temperature range of 150 - 450° C with the help of a unique pyro-cracking catalyst developed and patented by the technology provider. A special characteristic of the technology is that the volatile gases from the heated polymer react with the catalyst which is packed in a cartridge placed outside the reactor. This, as per the technology provider, ensures greater safety of the whole reaction process. The gas generated during the process burns with a blue flame and can be used for domestic cooking purpose. The residue after pyro-cracking is a mixture of carbonaceous material along with some percentage of inorganic debris. This residual material has sizable calorific value and could be used as solid fuel similar to coke. Any metal part which was embedded in the plastic waste product, would settle down at the bottom of the reactor to be collected separately at the end of the reaction.

The conversion rate depends on the type of plastic waste. Typical conversion rates are:

Liquid Fuel	25 – 80 %
LPG range Gas	15 – 50 %
Soil Fuel	5 – 25 %

Some amount of water vapour formed during the reaction process evaporates while collecting the fuel. Polyethylene and Polypropylene gives highest conversion rate to fuel while polyester gives low conversion. By mixing different types of plastics together, the optimum conversion could be achieved. No untoward VOC's are emitted in the surrounding environment. The hydrocarbon fuel is in the range of Light Diesel Oil

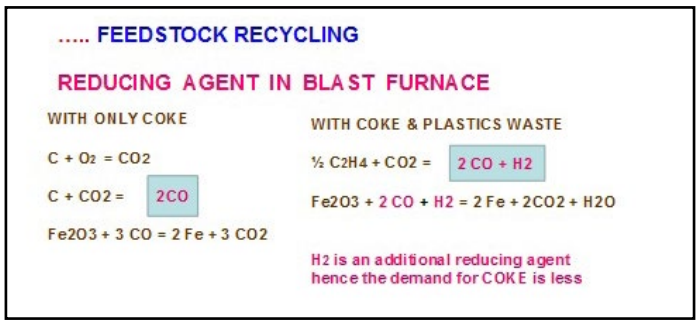
(LDO) and can be used in boilers, transformers, generators etc. Gross calorific value of the fuel is around 10, 500 cal/G.

Normally rigid plastics waste like bottles, jerry cans, broken buckets etc are mechanically recycled in plants located at industrial areas. The packaging films – mostly multi layered films and Thermocole (Expanded Polystyrene) materials which are abandoned by the mechanical recyclers, are put into such Waste to Fuel plant for scientific disposal. It is observed that average quantity of multilayered and other film waste and Thermocole waste generated in the colony is around 15 to 20 Kgs / per day, which is fully converted to fuel. At present no plastics waste (and no MSW) generated in this Colony, goes to the Landfill! Collection of waste can be extended to a wider area, even covering the nearby roadsides, so that larger capacity plants could be set up.

3. Reducing Agent in Blast furnace for production of iron

Successful examples are available for use of waste plastics as a reducing agent in the blast furnace for the manufacture of iron from its ore. Use of coke in the blast furnace provides only one type of reducing agent – Carbon Mono-oxide - (CO). In contrast, use of plastics waste provides one additional type of reducing agent – Hydrogen (H) apart from Carbon Mono-oxide. The process also reduces generation of 'ash'. A steel manufacturing facility having production capacity of 3 million tons per anum, can consume 600, 000 MTs of plastics waste. Japan is the leader in the world for implementing such process in various steel plants in their country.

The reaction involved is described here:



Energy Recovery

1. Co-Processing of plastics waste in Cement Kilns
2. Incineration for energy recovery / power generation

As the recovery option depends on many prevailing circumstances, Life Cycle Analysis (LCA) may be applied to decide, depending on the type and composition of the plastic wastes, which options are environmentally more favourable and sustainable.

1. Co-Processing in Cement Kilns

One of the most effective methods of recycling of plastics waste for recovery of energy is its use as an alternative fuel in cement kilns. The list below gives a comparison of the calorific values of different plastic materials as compared to coal.

Polyethylene	:	46 MJ/kg
Polypropylene	:	44 MJ/kg
Polyamide (Nylons):		32 MJ/kg
PET	:	22 MJ/kg
Coal	:	29 MJ/kg

The high temperature used in the cement kilns gives a scope for use of even some type of plastics waste contaminated with toxic chemicals like pesticides and some other hazardous materials without creating any increased emissions in the air or water. No segregation or cleaning is required for such type of disposal. Low-end plastics waste, which creates a waste management problem, may provide the vital energy to the cement industry.

Practically all types of plastic wastes can be used as an alternate fuel in cement kilns. Halogen containing plastics also can be used in kilns having suitable arrangements. It is observed that the emission levels of various gaseous substances including Dioxins and Furans, TOC, Heavy Metals, SPM, CO2, SO2 and NOx etc, either came down or remain within the acceptable norms. This is indicative that disposal / co-processing of all types of plastic wastes in cement kiln in Indian condition is an environmentally safe option.

There are about 170 cement kilns in the country, in different zones. Out of which about 150 Cement Kilns can use plastics waste as an alternative fuel. Even if each Cement Kiln replaces about 10% of coal with plastics waste (Germany replaces more

than 60% coal with plastics waste), more than half a million tons of plastics waste of the country could be disposed of scientifically and also saving close to one million ton of coal (for every Ton of coal about 0.6 MT of plastics waste is sufficient, because of higher calorific value of plastics). For using more quantities of plastics waste in the feed, certain modifications are required considering the light weight of plastics.

2. Incineration for Energy Recovery / Power Generation

After the selection of various types of plastic waste for mechanical recycling, there may still remain some types of plastic waste, heavily contaminated with various types of contaminants including different toxic chemicals or hazardous products. The best way of re-utilizing these wastes is to use the latent energy content of the plastics waste by co-processing in cement kilns or to incinerate them and recover the heat energy, instead of dumping them diffusely on landfills. This recovers their calorific values. The choice of incinerators is very important. Modern incineration technology has answers to tackle any incineration problem without polluting the environment and in many cases recovering the calorific value out of the waste being incinerated. Heavily contaminated plastics waste collected from different waste stream can be utilized for energy recovery by waste incineration plants. Cost of this system of recovery is considered highest among all the other alternatives. When considering incineration as an option, it is to be remembered that waste incineration plants are not operated with the aim of producing energy. The main purpose is and remains to reduce the volume of waste to a considerable degree by means of incineration in an environment friendly manner. Plastics waste contain calorific values equivalent to fuel. The list below gives the comparative energy values of different plastics vis-à-vis fuel oil and coal in Btu / pound.

Energy Values	
Material	**Btu/pound**
Plastics	
PET	10,900
HDPE	18,700
Other Plastic Containers	16,400
Other Plastics	17,900
Rubber & Leather	12,800
Newspaper	8,000
Corrugated Boxes (Paper)	7,000
Textiles	9,400
Wood	7,300
Average for MSW	5,900
Yard Wastes	2,900
Food Wastes	2,900
Heat Content of Common Fuels	
Fuel Oil	20,900
Wyoming Coal	9,600

There are 121 energy recovery facilities operating in the United States, with a designed capacity of nearly 97,000 tons of waste per day with the capacity to generate 2,700 MW of electricity (enough to power approximately 2 million homes), saving an equivalent of 30 million barrels of oil per year and preventing the release of 40 million tons of CO2 equivalents annually. At present more than 19 percent of the nation's MSW is processed by energy recovery facilities. A recent national survey found that 97 percent of opinion leaders support expansion of energy recovery in the United States and 89 percent would prefer remaining plastics to go to energy recovery facilities instead of landfills.

How do plastics contribute to waste-to-energy incineration?

Plastics are derived from petroleum or natural gas, giving them a stored energy value higher than any other material commonly found in the waste stream. In fact, one pound of plastics can generate twice the energy as Wyoming coal and almost as much energy as fuel oil. When plastics are processed in modern waste-to-energy facilities, they can help other waste combust more completely, leaving less ash for disposal in landfills.

- **Use of plastics waste in the construction of asphalt road:**

Use of plastics waste in the construction of asphalt road has been demonstrated by at least two to three technologies in the country in the past 3 – 4 years. There is scope of using some types of low-end plastics waste without elaborate cleaning, for improving the property of tar road by replacing bitumen to an extent of about 10 – 15 %. Such roads have been laid in different parts of the country. Tamil Nadu took initiative in encouraging the implementation of the technology developed by a Madurai Engineering College followed by Karnataka, which adopted a technology developed by CSRI Laboratory, Central Road Research Institute, Delhi. Later ICPE also took initiative in developing a technology for laying roads with plastics waste in some other parts of the country. MoEF has recognized the benefits of this process and encourages for its wide scale adoption. Flexible plastics packaging waste can be used in the process after suitable modifications.

Plastics Waste used in Road Construction

- PE / PP / PS / EPS
- Multilayered Plastics @ 15% of total Plastics Waste

For 1 KM long and 7 feet width Road, 1 MT of Plastics Waste is used with 9 MTs of Bitumen in the bottom layer. Road with seal coat requires extra Plastics Waste.

There is a saving of about Rs.20, 000/ per KM of 7 ft wide road. Quality of road also is improved.

Segregation / Collection and Transportation of Waste for converting it in to Wealth:

To make the whole process successful, at the first place it is important to segregate Waste in to 'Dry' and 'Wet' at the source of waste generation itself. This is the action which is taken by the waste generator – households / occupiers. Once this is done, the next step is collection of the waste, specifically the Dry Waste, for further segregation in to different types. This action can be accomplished appropriately by engaging waste separators, who segregates plastics, papers, metals, glass etc wastes separately so that the same could be forwarded to respective recycling industries for their conversion in to suitable products for use. Such practice of engaging manual workforce for segregating Dry Waste in to specific categories does exist in some parts of our country.

In Mumbai such model projects have been successfully being carried out with the initiatives of ICPE along with NGOs and fully supported by Brihanmumbai Municipal Corporation. In this model project, in select Mumbai Wards, about 80 (now 100) waste pickers have been engaged for collecting Dry Waste from the residential societies, shorting the waste in to different categories in the areas allotted by the Municipality Corporation and selling the shorted dry waste to Waste Dealers / Recyclers at market price. This help the waste pickers earn their livelihood and also Municipality Corporation to reduce the load in the landfills. Corporation also saves the cost of transporting the waste to far placed landfills.

Waste Management System at Brihanmumbai Municipal Corporation :

In Mumbai, constant effort is being made to separate the Dry and Wet waste at the source itself, so that the Dry wastes could be further segregated into different types of wastes and could be sent for recycling, resulting in lesser load to the landfill, sites.

There is an increasing activity among various Local Self Government Councils to treat the wet waste also through vermiculture or similar process, to generate compost which can be used as fertilizers. ICPE along with some NGO's have joined hands with BMC in some Wards of Mumbai to propagate the Proper Solid Waste Management culture among the citizens. The results are evident in at least some Wards of Mumbai.

Here is a brief description of the work being practised:

'A' – Ward (Cuffe Parade Area):

1. BMC has given a secured area and a shed for segregation of dry waste.
2. BMC has also provided 2 nos. 1 toner vans with drivers, free of cost, to move in the locality for 8 hours to collect dry wastes from households.
3. BMC / identified NGOs have issued Identity badges to the rag pickers.
4. Rag pickers accompany the BMC vans and collect dry wastes from door steps of the households/society buildings and bring those to the BMC allotted sheds for segregation.
5. The dry wastes are product-wise segregated into : paper, plastics, metal and others. Obviously, within each product, there are different categories e.g. in metal, there would be iron, aluminum foil etc. In plastics, there would be PE, PP films, polystyrene cups, HDPE solid items / caps etc.
6. These segregated dry wastes are stored in the secured sheds for disposal.
7. When sufficient quantity of waste is accumulated, waste dealers come to these sheds, weigh the scraps and pay the rag pickers / co-coordinator the cost of the waste, and collect the dry waste. Generally, this collection takes place once in a week. (In some places, where the sheds are not well secured, rag pickers dispose off their segregated wastes every alternate day, or even daily to the recycles / traders)
8. The wet wastes are collected by separate BMC vans from the household localities – directly to the landfills.

Plastics Waste Management: Recycling & Recovery Options

Continued.....

In some societies, local self government council or the societies themselves are collecting the wet wastes also for composting, resulting into zero garbage concept. However, this is not yet widely practised in all parts of the country as yet.


Ragpickers with Van


Waste at housing colonies


Waste being carried for loading into Municipality Van


Loading of Dry Waste in Municipality Vans


Municipality Van with Dry Waste on way to segregation area

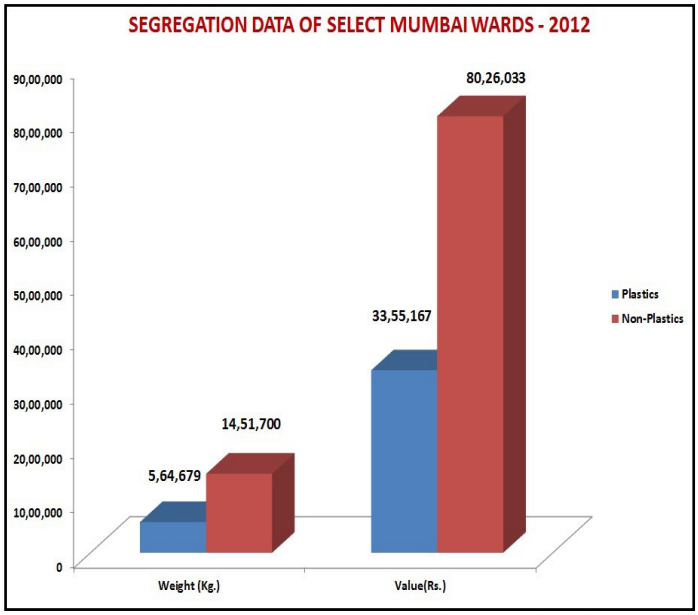

Segregation of Dry Waste

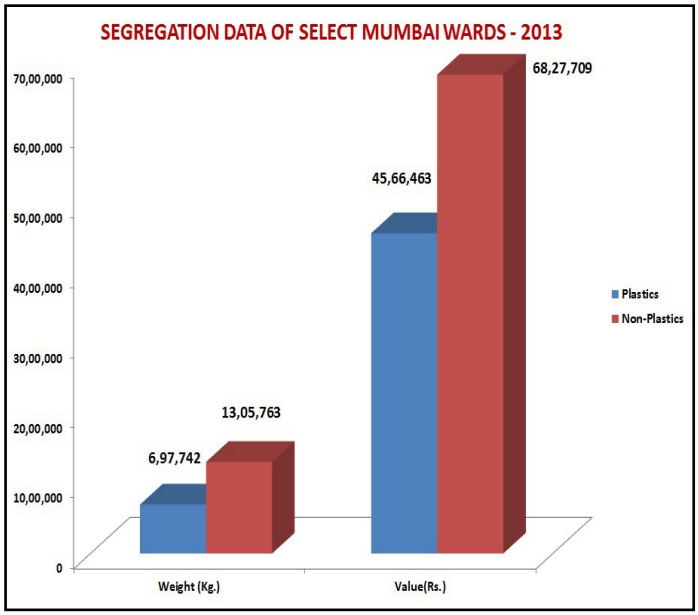

Another view of Dry WAste segregation


Packing Of Segregated Dry Waste

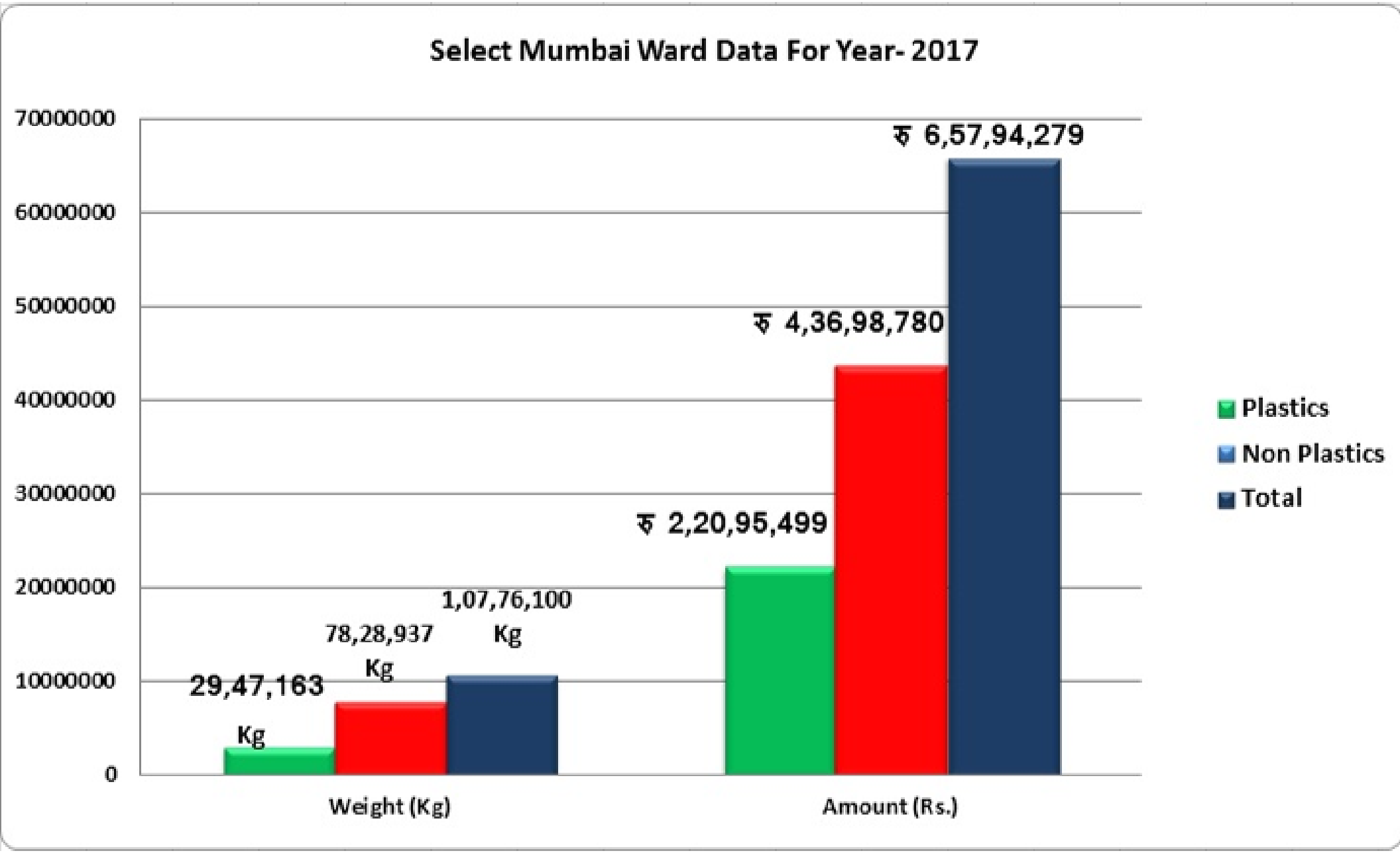

Storing of Segregated Dry Waste in a secured place


Segregated Dry Waste being weighed and sold to recyclers / traders





In 2013, about 100 waste pickers segregated more than 2000 MTs of Dry Waste consisting of about 40% as plastics waste, and earned sales revenue of more than Rs. 1.0 Crore, effectively earning about Rs. 9000/ per month per family, by selling the waste to recyclers. Civic Body and ICPE also shared some expenses. However, at the end 2000 MTs of Dry Waste did not land in the landfill. Such models are worth implementing in the whole country with appropriate modifications depending on local conditions.


Select Mumbai Ward Data For Year- 2017
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60000000
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78,28,937 Kg
1,07,76,100 Kg
₹ 2,20,95,499
₹ 4,36,98,780
₹ 6,57,94,279
Weight (Kg)
Amount (Rs.)
Plastics
Non Plastics
Total

The Model of Dry Waste Management of Cuff Parade ('A' Ward), Mumbai Partially Replicated at Matheran,

Matheran, a popular hill station located in the State of Maharashtra, is the smallest hill station of India with an area of about 7.25 sq. kms and local population of approx. 4,500. The annual number of tourists is approx 2,50,000. Around 63% of Matheran is Reserve Forest and the bungalow plots are largely forested. The climax forests support a variety of species of flora and are also home to a number of endangered species. This ecosystem is extremely sensitive and given the area and other factors, even small amounts of pressure on the ecology and environment have enormous pressure on it. The Supreme Court declared Matheran as eco-sensitive and the Ministry of Environment and Forests issued a draft notification on 6 February 2002 declaring Matheran and surrounding areas as eco-sensitive.

Course of Action:

One of the main problems of Matheran was the disposal of solid wastes, almost entirely comprising of PET bottles and laminates, which were thrown into the forests. ICPE took up the initiative of presenting a solution to their waste management problems and decided to provide help, assistance and expertise to Matheran. Members from ICPE addressed the Municipal Councilors on Solid Waste Management and Plastics and the Environment, which had a tremendous impact on them. The broad plan of action was then laid down - the representative of hotelier's association assured that all hotels would separate the plastic wastes, the Council would have separate bins for plastics and would conduct meetings with the local residents to garner their support and participation. The Council also agreed to set aside a plot where all the dry waste collected would be stored. ICPE took up the responsibility of taking it away from there. It was decided to approach the railways to transport the plastic waste to Neral in the freight trains that otherwise went back empty. It was found that Parle products sold the most at Matheran. Figures were obtained from Parle Bisleri and they quoted that the average number of PET bottles supplied to Matheran was 20,000-25,000 per month. The weight of empty bottles was stated as 1- 1 ½ tons every month. The weight of laminates was found to be approx 500 kgs per month.

A small committee was then formed to tackle the Solid Waste Management issues of Matheran – authorities from Matheran Bachao Samiti (MBS), ICPE, MCGM and Bisleri. A series of meetings were held in the Municipal Council office of Matheran to address the Councilors, hoteliers, shop owners and the local people.

ICPE made a visit to Matheran jointly with MBS, MCGM authorities and Bisleri in August 2002. It was seen that all the material that went up the hill (bottled water, packaged foodstuff etc.) was not brought down. Owing to the lack of sufficient number of garbage bins PET bottles, laminates and other dry wastes were littered along the railway tracks and all over the hill (market area, tourist points etc.).

Hoteliers dumped their dry wastes in their backyards.

During the meeting with the Councilors, a broad overview was given about ICPE and its segregation projects. The model Cuffe parade project was also described. Leaflets, giving details of the segregation process and the proper disposal of plastics, were distributed. MCGM authorities provided details of vermiculture and Advanced Locality Management (ALM).

It was then proposed that the Council Members make a visit to Mumbai to study the segregation projects and the SWM methods of MCGM for the proper implementation of the Waste Management Project at Matheran.

It was also proposed that awareness activities be conducted in the schools and among the local people for better understanding of the project.

Thus Matheran cleaning project started with the help of all involved.

A review was taken in October 2002, and it was then seen that there was a remarkable improvement in the dry waste management of Matheran. The roads and market area were found to be litter free. The civic sense of the local people had improved. Dry waste was collected by the Municipal Council from all over the hill and brought to a central location. The Council had taken up a contract for the collection and storage of dry waste.

However, a need was felt for a proper system of disposal of dry waste to be jointly worked out by the Municipal Council, hotel, association, shop owners and the local people with the initial help and guidance of ICPE. Some practical measures were taken for easy handling of the dry wastes, especially the PET bottles, which are light in weight but high in volume. M/s. Bisleri installed compactor Machines, which crushes the PET bottles to a thin layer of sheet.

M/s. Bisleri had organized their own collection system to take back crushed PET bottles to nearby centers for recycling.

ICPE organized other recyclers / traders to take back Plastics and other wastes, for recycling. Further efforts were made for handling the wet (biodegradable) wastes for converting those to compost through vermiculture process.

The larger hotels were advised to have their own vermiculture pits, whereas the smaller hotels could send their wet wastes to some common compost bins.

In November 2002, the Expert Committee on New and Proposed Eco Sensitive Zones constituted by the Ministry of Environment and Forests visited the Eco-Sensitive Zone of Matheran. After the visit, the Chairman of the Committee, Prof. (Dr.) H.Y. Mohan Ram, stated that the hill station of Matheran was clean and free of garbage.

He said that he had seen all the hill station in India, and no other hill station was as clean of garbage as Matheran.

ICPE and Industry Initiative at Matheran