

# A Review on Plastic Waste Management Technology

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**Abstract:** Plastic have been used widely in both water and food packaging due to their natural properties such as inertness and low bulk densities, which make them suitable mover material and little risk to contaminants. In Indian cities and villages people use the plastic in buying vegetables as a carry bag, drinking bottles, use of plastic furniture in home, plastic object in kitchen and many more uses. After usage of plastic it will become part waste garbage and create pollution due to presence of toxic chemicals and it will be spread disease. In current scenario consumption of plastic waste increase day by day and it is very difficult to manage plastic waste. However, only 5% to 25% plastic wastes being recycle. The paper discusses prospects of plastic waste management technology. It mainly includes recycling landfill, incineration.

**Keywords:** plastic, packaging, recycling, plastic waste management.

## 1. Introduction

Plastic have made significant contribution in almost every field of human activity today agricultural, medical, transportation, piping, electrical and heat insulation, packaging, manufacturing of household and electronic goods, furniture and other many more uses. Packaging is one of the most important applications of plastic. In fact, about 40% of plastic materials worldwide are used in packaging application. This has been possible due to the following attributes of plastic materials

1. Light weight and hygienic inert and chemical resistance.
2. Light weight and non-breakability.
3. Excellent barrier properties enhancing shell life.
4. Superior impact resistance
5. Sterilizable and resistance to bacterial and other microbial growth.
6. Transporting as well as opacity.
7. Lower fuel consumption and product loss during transportation.

Plastic are banned for series of health, safety and environmental problems. Non biodegradability of plastic is attributed towards causing waste management problems and chocking of the drains in urban cities. In essence, plastic form a considerable portion 5%-15% of the municipal solid waste by weight, which equals to 20%-30% volumetric proportion. These statistical reveal that beneath the wide use of plastic products, people should be alarmed about the challenges of pollution.

So the solution of waste management problem lies in segregation of dry and wet solid waste at the source for which an effective mass awareness campaign is very important. The dumping waste plastic in open areas is still the most commonly used disposal methods for municipal solid waste in developing countries. The recycling of plastic waste is getting carried out. The recycling ensures that the unwanted and discarded plastic waste does not remain in road side nor it is carried to the landfill.

## 2. Various types of plastic and their application

The various types of plastic and their major application are as follows.

### 1) Thermoplastic

This type of plastic become soft when heated, they can be molded or shaped with pressure when in plastic state when cooled, and they solidify and retain the shape. Some common thermoplastic with their properties are as follows,

### B. Polystyrene (PS)

Due to its properties such as glassy surface, clear to opaque, rigid, hard etc. It is generally used for making containers, cups, and electrical equipment like switch plates circuit boards etc.

### C. Polyethylene

Due to its properties such as transparency, chemical and heat resistance. It is used in the packaging of mineral water, soft drinks etc.

### D. Polypropylene (PP)

Some common properties of polypropylene are low density, chemical resistance, high melting point, low cost, environmental stress resistance. Generally, it is used for making bottles, sheets, furniture, toys, fan etc.

### E. Polyvinyl chloride (PVC)

Due to its properties such as versatility, energy saving, adaptability to changing time and environment, fire resistance. It is used in the industries such as building and construction agricultural transport etc.

### F. Low density polyethylene

Characteristic properties of LDPE are easy process ability,

low density, low melting range, Good chemical resistance and mainly it is used for milk packaging, wire and cable insulation.

#### G. High density polyethylene

Some common properties of HDPE are strength, chemical resistance, melting point, and used for making molded products.

#### H. Thermosets

These are non-recyclable material which set ones cannot be remolded (siddiqui et. al. 2013) even on application of heat. Ex. Phenol, melamine, urea, formaldehyde etc.

#### Sources of waste plastic

The main source of plastic wastes is industrial, commercial, municipal waste.

1. *Municipal waste:* Due to the increase in population there is constantly use or need of plastic for day to day work. Hence, a large proportion of plastic waste is found within municipal solid waste. However, this plastic waste collected from residential areas, parks and waste dumps before they enter the municipal solid waste.
2. *Industrial waste:* A major proportion of this waste comes in the form of wrapping of polyethylene film that has been used as a protection. Few industries also provides useful supplies of waste plastic such as electrical and electronics industries may provide cable sheets, switch box etc. the automotive industries may provide seat coverings, battery containers, fan blades etc.
3. *Commercial waste:* It contains a considerable amount of packaging material made of PE which is obtained from hotels and restaurants, workshop and wholesalers.

### 3. Hazardous effects of plastic

#### 1) Polluting substances

There is a different type of plastics as some of them are non-toxic and some are toxic. For example, polypropylene and polyethylene are inert materials but they are not completely stable under heat, mechanical pressure and light. PVC is a plastic contain number of hazardous substances such as chlorine which gets released in the form of HCL on heating and it may produce serious impact on the environment.

#### 2) Air pollution

Plastic recycling process leads to cause air pollution in case of incomplete combustion (Wienah, 2007) a large quantity of polluting substances are released but even the incomplete combustion of polyvinyl chloride, polypropylene. The release of carbon dioxide is a measure contributor to global warming is also released on burning of plastic.

#### 3) Some other problems are,

1. Death of animals may occur due to their consumption by animals.
2. Death of marine species due to the plastic waste.
3. Plastic waste also affects the soil fertility.

### 4. Plastic waste management

Plastic waste management techniques are required for proper management of plastic waste in a way which environment friendly and it may also help for proper utilization of plastic material. The solution of these problem lies in 3R namely reduces, reuse, and recycle.

#### 1) Conventional technology for plastic waste management

#### B. Recycling of plastic

Recycling of plastic must be carried out in such a manner that it minimizes the pollution level. Plastic recycling technology has been divided into four types.

- a) Primary: Recycling includes processing of waste into a product with features similar to the original product.
- b) Secondary: Recycling includes processing of waste plastic into product dissimilar features to the original product.
- c) Tertiary: In tertiary recycling process the basic chemicals and fuels are produced from plastic waste.
- d) Quaternary: In quaternary recycling process the energy content of the scrap plastic by burning. This process not use in India.

#### C. Steps involved in recycling process

- Selection: To select the waste which are suitable for recycling?
- Segregation: The plastic waste need to be segregated as per the codes.
- Processing: After selection and segregation, the pre consumer waste shall be recycled directly. The post-consumer waste shall be washed, shredded, extruded and granulated.

#### 1) Land filling

This is a traditional approach to waste management. In this technique, waste is left for decomposition in ground pits, but the space for constructing landfills is getting limited day by day. Landfill site which is properly managed has the advantage of restricted environmental harm rather than the impact of collection and transportation.

#### 2) Incineration

In this process, waste is burnt, but this may release hazardous materials into the atmosphere. For example, combustion of PVC generally hazardous substance such as dioxin and release of co<sub>2</sub>. This method of plastic waste management is usually discarded because many a times the treatment cost of the gases in comes out to be more than energy recovered.

### 5. Recent technology for plastic waste management

The recent technology for plastic waste management are listed below,

1. *Polymer blended Bitumen road:* The process of road lying using waste plastic is designed and the techniques are being implemented successfully for the construction of flexible roads at various places in India.

2. *Plastic waste in cement kiln*: Plastic waste generated from different cities and town is a part of municipal solid waste. It is a matter of concern that disposal of plastic waste is causing many problem such as leaching impact on land and ground water, choking of drains, making land infertile, burning causing environmental hazardous.
3. *Plasma pyrolysis technology*: Plasma pyrolysis is a technology which put together the thermochemical properties of plasma with the pyrolysis process (Panda et.al 2010). The extreme and versatile heat generation ability of plasma pyrolysis technology enables it to dispose of all type of plastic waste.
4. *Use of plastic waste and alternative fuel and raw material*: The co-processing of plastic waste results in replacement of primary fuel and raw material for industries like cement, production of lime/steel and power station.

### 6. Conclusion

Plastic waste management has assumed great significance in present day context. The various technologies used for a management of plastic waste. Recycling is one such technology for waste management of plastic product. It makes rising sense

environmentally as well as economically and current trends demonstrate a considerably increasing in the rate of recovery and recycling of plastic waste. The recycling of waste plastics is an efficient way to improve the environmental performance of the polymer industries for reducing this problem we can look towards some other alternatives such as biodegradable plastics, which can be made from agricultural/animal resources like starch, soya protein, cellulose, collagen and casein (Deshmukh et.al.2015).

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