

REVIEW ON PLASTIC WASTE MANAGEMENT

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ABSTRACT

Plastic has become the most common material used. It has become vital asset for humanity. It has its major application and been used widely in both water and food packaging industries. Plastic waste is not homogeneous so special attention has to be taken for managing plastic waste. Plastic continue to threaten the quality of our land, water and air. Unsafe disposal of plastic in rural areas is becoming prevalent and will come at massive cost to the rural ecology and economy. Some kinds of plastic do not decompose at all; others could take up to 450 years to breakdown. The paper discusses prospects of plastic waste management. It is concluded that the existing rate of effect on environment will continue unless long term remedial measures are adopted in our country.

Keywords: Shredder, Extruder, Bakelite

INTRODUCTION

Plastics are a part of our daily lives. Plastics have made significant contribution in almost every field of human activity till the date such as in agriculture, transportation, medical, heat insulation, packaging, manufacturing of household and electric products and so on. Unfortunately, these plastics are composed of major toxic pollutants, it has the potential to cause great harm to environment in the form of air, water and land pollution. Hence it creates negative impact on the natural environment and creates problems for plants, wildlife and even on human beings. The garden city of India Bangalore generates around 350MT to 400MT of plastic per day (1). Plastic is estimated to occupy 20% of the 4000 tonnes of municipal solid waste generated. The BBMP struggles to manage plastic pollution despite a blanket ban enforced since 2016. According to the Karnataka State Plastic Association, plastic consumption in the city is approximately 16 kg per person every month (2). Among those multi-layered plastics were found in 61% which cannot be recycled, means these are occupying on the land and water bodies of the city causing major problems of plastic pollution (3). Coming India, in 1990–1991, India produced 0.363 MT of plastics polymer, but within a decade, and 13 incredible 890% increase leads to total plastics production to 3.2 MT (2000–2001). 14 Plastics production in India further rises to 4.77 MT in 2005–2006 (4), and as on 2018 it as increased to 9MT and from that only 60% was recycled and rest 40% are been responsible for plastic pollution (5). Hence from these data one can say that plastic pollution is increasing year by year hence it is must to recycle those to avoid future problems regarding plastic pollution.

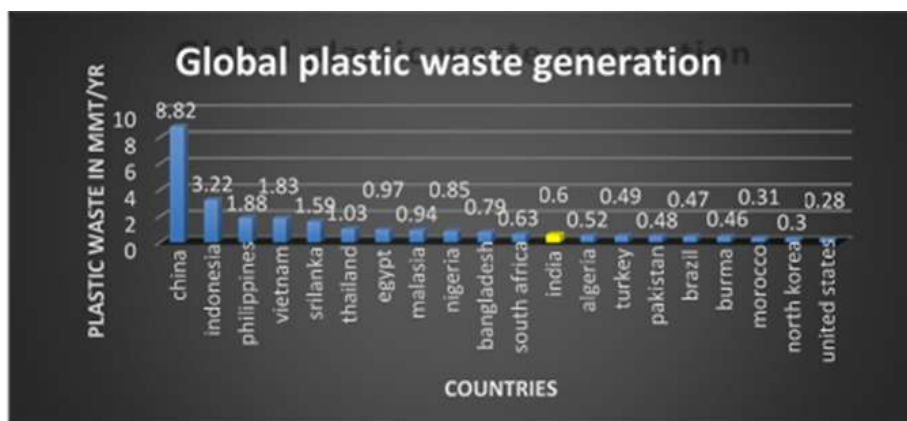


Fig.1. Global plastic waste generation.

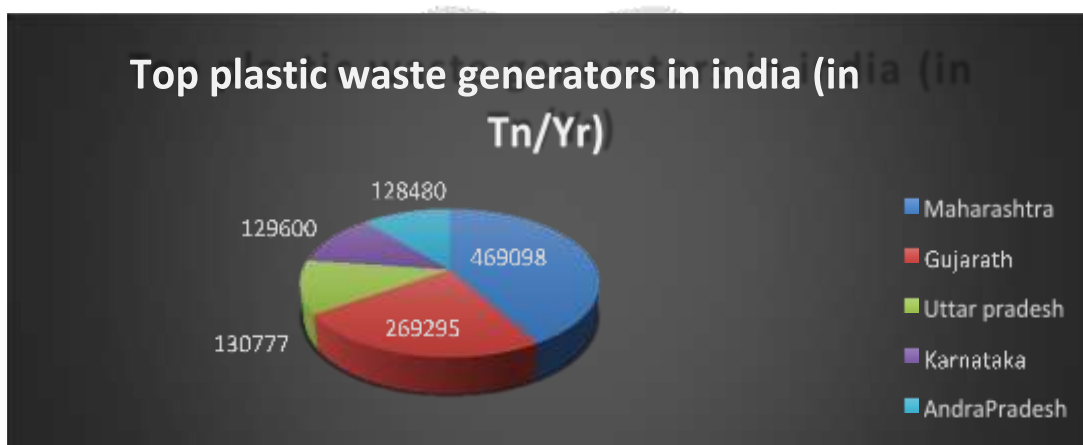


Fig.2. Plastic waste generation in India.

In the graph the plastic waste generation is shown graphically. Plastics were found in 61% which cannot be recycled, means these are occupying on the land and water bodies of the city causing major problems of plastic pollution (3). Coming India, in 1990–1991, India produced 0.363 MT of plastics polymer, but within a decade, 89% increase leads to total plastics production to 3.2 MT (2000–2001). 14 Plastics production in India further rises to 4.77 MT in 2005–2006 (4), and as on 2018 it as increased to 9MT and from that only 60% was recycled and rest 40% are been responsible for plastic pollution (5). Hence from these data one can say that plastic pollution is increasing year by year hence it is must to recycle those to avoid future problems regarding plastic pollution.

HISTORY

The first plastic i.e., cellulose nitride also called has celluloid was developed in 1869, in 1909 phenol-formaldehydes (Bakelite) were developed. The volume of these were subsequently developed such as cellulose acetate and poly vinyl chloride were relatively small and were made into semi durable items and were used in electrical equipment and insulation. The “plastic age” was considered to be begun in late 1940’s; at that time high volume production of low density began. In 1954, Giulio Natta discovered polypropylene and it started to manufacturing in 1957. Now usage of plastic grown up rapidly, these plastics are occupied the most of the Applications in daily life.

TYPES OF PLASTIC AND THEIR MAJOR APPLICATIONS

Various types of plastic and their applications are as follows:

Thermoplastics: These types of plastics become soft when heated, when cooled they solidify and retain shape of mould.

Thermosetting plastics: These are types of plastic which once set cannot be remoulded/softened by applying a heat.

Some common plastics with their applications are as follows:

Polyamides (PA) or (nylons) – fibres, toothbrush bristles, tubing, fishing line and low strength machine parts such as engine parts or gun frames.

Polycarbonate (PC) - compact discs, eyeglasses, riot shields, security windows, traffic lights and lenses.

Polyester (PES) – fibres and textiles.

Polyethylene (PE) – a wide range of inexpensive uses including supermarket bags and plastic bottles.

Polypropylene (PP) – bottle caps, drinking straws, yogurt containers, appliances, car fenders (bumpers) and plastic pressure pipe systems.

Polystyrene (PS) – foam peanuts, food containers, plastic tableware, disposable cups, plates, cutlery, compact-disc (CD) and cassette boxes.

Polyurethanes (PU) – cushioning foams, thermal insulation foams, surface coatings and printing rollers: currently the sixth or seventh most commonly-used plastic, for instance the most commonly used plastic in cars.

High impact polystyrene (HIPS) – refrigerator liners, food packaging and vending cups.

Polyvinyl chloride (PVC) – plumbing pipes and guttering, electrical wire/cable insulation, shower curtains, window frames and flooring.

Polyvinylidene chloride (PVDC) – food packaging, such as: Saran.

Acrylonitrile butadiene styrene (ABS) – electronic equipment cases (e.g. computer monitors, printers, keyboards) and drainage pipe.

ISSUES

- Plastics continue to threaten the quality of our land, water and air. Unsafe disposal of plastics in rural areas is becoming prevalent and will come at massive costs to the rural ecology and economy.
- Some kinds of plastic do not decompose at all; others could take up to 450 years to break down, leaving a vexing problem to address.
- Their non-biodegradability threatens permanent effects on the rural ecology: plastics have been severely contaminating land and water bodies as they attract and sustain other pollutants.
- They regularly block drainage channels: both natural channels like streams and small water bodies, and artificial channels like UGDs and open drains. Choked drains are breeding grounds for disease-causing pathogens and cause waterlogging.
- Their current disposal methods reinforce environmental harm: for their disposal, plastics are either burned indiscriminately in landfills or used as fuel cakes; both practices release toxic pollutants into the immediate environment and have the potential to cause grave illnesses.
- Plastic waste dumping into oceans is threatening to the marine life.

OBJECTIVE

1. **Chemical and Thermal Recycling:** Chemical recycling uses advanced technical processes that convert plastic materials into smaller constituent molecules which can then be used as feedstock for the production of petrochemicals and plastics. Thermal processes involve heating plastics under controlled temperatures with/without catalysts. Depending on the conditions created for these treatments. Now a days extracting of fuel from plastics is more trending and has high demand. Hydrocracking, thermochemical, and catalytic conversion are the most widely used methods for fuel production from plastics (6).

2. **Mechanical Recycling:** This category includes the variety of mechanical processes performed on plastic waste, before it is introduced in manufacturing processes. It is primarily performed on simpler, single polymer plastics like polyethylene. There are several types of mechanical processes, and they typically involve the following steps: cutting/shredding. In this method plastic in the form of bottles, keyboards, etc... can be made into pieces by using single edge or multi edge blade and can be recycled by melting them to plastic stage and reused according to required applications (9).
3. **Energy Recovery:** The various methods under this category burn plastic to produce energy in the form of heat, steam and electricity. Experts believe that these processes should only be performed if other recovery processes fail. Plastics like polyethylene and polypropylene have a higher calorific (6).
4. **Re-extrusion:** This category of management systems involves the introduction of clean scrap of single types of plastics that can be re-entered into manufacturing processes to produce similar materials. This is typically difficult because scrap plastic, particularly in rural India, is not segregated by type and is not clean enough to re-enter manufacturing as it is. One of the methods involves making plastic reinforced bricks by cutting, heating from 0 to 100c, extruding and remoulding it (8). This produces low cost bricks with special properties like corrosion resistance, good thermal insulation, light weight, etc...

CONCLUSION

Plastics are integral part of society due to its extreme versatility and durability, light weight, excellent thermal and electrical insulations, even though plastic has major application in day today life major drawback is managing of plastic waste. Increasing in global demand for plastic causing environmental pollution. Various techniques are used in India to mitigate plastic waste. It makes rising sense environmentally as well as economically and current trends demonstrate a considerable increase in the rate of recovery and recycling of plastic wastes.

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