Available online at www.pharmaresearchlibrary.com/ijcps **ISSN: 2321-3132**

Review Article

International Journal of Chemistry and Pharmaceutical Sciences

IJCPS, 2013: Vol.1(8), 532-535

www.pharmaresearchlibrary.com/ijcps

Plastic Waste Management in Municipalities

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Available Online 27 December 2013

Abstract

Solid waste management is one of the most challenging issues in municipalities, which are facing a serious pollution problem due to the generation of huge quantities of solid waste. Various studies reveal that about 90% of Municipality Solid Wast (MSW) is disposed of unscientifically in open dumps and landfills, creating problems to public health and the environment. In this study, an attempt has been made to provide a comprehensive review of the characteristics, disposal and treatment technologies of MSW practiced in India.

Key words: Solid waste management, Municipality Solid Wast (MSW), dumps and landfills

Introduction

"Plastics are non-biodegradable, synthetic polymers derived primarily from petro-fossil feedstock and made-up of long chain hydrocarbons with additives and can be moulded into finished products (excluding compostable plastic or polymer confirming IS/ISO 17088:2008) (Plastic Material by Prof. J.A. Brydson). These polymers are broken in presence of suitable catalyst, into monomers such as ethylene, propylene, vinyl, styrene and benzene. These monomers are then chemically polymerized into different categories of plastics. There are two categories of plastics: 1. Recyclable Plastics (Thermoplastics): PET, HDPE, LDPE, PP, PVC, PS. Non-Recyclable Plastics (Thermoset & others): Multilayer & Laminated Plastics, PUF, Bakelite, Polycarbonate, Melamine, Nylon etc.

Plastics Waste:

Environmental Issues and Challenges:

The quantum of solid waste is ever increasing due to increase in population, developmental activities, changes in life style, and socio-economic conditions, Plastics waste is a significant portion of the total municipal solid waste (MSW). It is estimated that approximately 10 thousand tons per day (TPD) of plastics waste is generated i.e. 9% of 1.20 lacs TPD of MSW in the country. The plastics waste constitutes two major category of plastics; (i) Thermoplastics and (ii) Thermoset plastics. Thermoplastics, constitutes 80% and thermoset constitutes approximately 20% of total post-consumer plastics waste generated in India. The Thermoplastics are recyclable plastics which include; Polyethylene Terephthalate (PET), Low Density Poly Ethylene (LDPE), Poly Vinyal Choloride (PVC), High Density Poly Ethylene (HDPE), Polypropylene(PP), Polystyrene (PS) etc. However, thermoset plastics contain alkyd, epoxy, ester, melamine formaldehyde, phenolic formaldehyde, silicon, urea formaldehyde, polyurethane, metalized and multilayer plastics. The environmental hazards due to mismanagement of plastics waste include the following aspects:

- Littered plastics spoils beauty of the city and choke drains and make important public places filthy;
- Garbage containing plastics, when burnt may cause air pollution by emitting polluting gases;
- Garbage mixed with plastics interferes in waste processing facilities and may also cause problems in landfill operations;
- Recycling industries operating in non-conforming areas are posing unhygienic problems to the environment.

Environmental Issues on disposal of Plastic Waste: Indiscriminate littering of unskilled recycling/reprocessing and non-biodegradability of plastic waste raises the following environmental issues:

- During polymerization process fugitive emissions are released.
- During product manufacturing various types of gases are released.

- Indiscriminate plastic waste disposal on land makes the land infertile due to its impervious nature.
- Burning of plastics generates toxic emissions such as Carbon Monoxide, Chlorine, Hydrochloric Acid, Dioxin, Furans, Amines, Nitrides, Styrene, Benzene, 1, 3- butadiene, CCl_4, and Acetaldehyde.
- Lead and Cadmium pigments, commonly used in LDPE, HDPE and PP as additives are toxic and are known to leach out.
- Non-recyclable plastic wastes such as multilayer, metalised pouches and other thermoset plastic poses disposal problems.
- Sub-standard plastic bags, films etc. pose problem in collection and recycling.
- Littered plastics give unaesthetic look and choke the drain.
- Garbage mixed with plastics interferes in waste processing facilities and also cause problems in landfill operations.
- Recycling industries operating in non-conforming areas are posing environment problems due to unsound recycling practices.

Figure 1

Salient Features of the PWM Rules, 2011:

a. The plastic carry bags used for the purpose of carrying or dispensing commodities but don't include these bags which are integral part of packaged products. The thickness of bag shall not be <40µ;
b. (ii) Carry bags can also be made from compostable plastics conforming IS/ISO:17088:2008;
c. (iii) Prescribed Authority for registration, manufacture & recycling shall be State Pollution Control Board (SPCB) or Pollution Control Committee (PCC). And for enforcement of Rules relating to use, collection, segregation, transportation & disposal of plastic waste, shall be concerned Municipal Authority;
d. Multilayered pouches or sachets used for packaging of gutkha etc. shall not use plastic material in any form;
e. Every carry bags made from plastic shall bear a label or mark "recycled" as per IS:14534:1998. Each carry bag made from "Compostable Material" shall bear a label "Compostable" & shall conform to IS/ISO:17088:2008;
f. No carry bag shall be made available free of cost by retailers to consumers. The concerned Municipal Authority may be notification determine the minimum price for carry bags in order to encourage re-use so as to minimize plastic waste generation;
g. Each State Government shall for constitute a State Level Advisory (SLA) Body to monitor implementation of Rules. This body shall meet once in a year and may invite experts, if it considers necessary.
h. The Plastic Waste Management (PWM) shall be as under;
i. Recycling, recovery or disposal of plastic waste shall be carried out as per the rules, regulations and standards stipulated by the central government from time to time;
j. Recycling of plastics shall be carried out in accordance with the Indian Standard IS 14534:1998 titled as Guidelines for Recycling of Plastics, as amended from time to time;

The Municipal Authority shall be responsible for setting up, operationalisation and co-ordination of the waste management system and for performing the associated functions, namely :- (i) to ensure safe collection, storage, segregation, transportation, processing and disposal of plastic waste; (ii) to ensure that no damage is caused to the environment during this process; (iii) to ensure setting up of collection centres for plastic waste involving manufacturers; (iv) to ensure its channelisation to recyclers; (v) to create awareness among all stakeholders about their responsibilities; (vi) to engage agencies or groups working in waste management including waste pickers, and (vii) to ensure that open burning of plastic waste is not permitted;

- For setting up plastic waste collection centres, the Municipal Authority may ask the manufacturers, either collectively or individually in line with the principle of Extended Producer's Responsibility (EPR) to provide the required finance to establish such collection centre;

- Recyclers shall ensure that recycling facilities are in accordance with the Indian Standard: IS 14534:194 titled as Guidelines for Recycling of Plastics and in compliance with the rules under the Environment (Protection) Ad, 1986, as amended from time to time;
- The concerned Municipal Authority shall ensure that the residues generated from recycling processes are disposed of in compliance with Schedule II (Management of Municipal Solid Wastes) and Schedule III (Specifications for Landfill Sites) of the Municipal Solid Wastes (Management and Handling) Rules, 2000 made under the Environment (Protection) Act, 1986, as amended from time to time;
- The Municipal Authority shall incorporate the said rules in the Municipal Bye- laws of all the Urban Local Bodies;
- The Municipal Authority shall encourage the use of plastic waste by adopting suitable technology such as in Road Construction, Co-incineration etc. The Municipal Authority or the operator intending to use such technology shall ensure the compliance with the prescribed standards including pollution norms prescribed by the Competent Authority in this regard.
- Each SPCB or PCC shall prepare and submit Annual Report to CPCB by 30th day of September each year. The Central Pollution Control Board (CPCB) shall consolidate the report on use of plastic carry bags, sachets/pouches etc. and management of plastic waste. The consolidated report along with recommendations on implementation of the Plastic Waste (Management & Handling) (Amendment) Rules, 2011 will be submitted to MoEF by 30th Day of December

An Overview of Plastic Waste Management:

Disposal of plastic waste is a serious concern in India. New technologies have been developed to minimize their adverse effect on the environment. Currently Worldwide accepted technology used for the plastic disposal is incineration; however, the incinerators designed poorly, releases extremely toxic compounds (chlorinated dioxins and furans) therefore, raising several environmental issues. In India for safer disposal of plastic waste various technologies have been experimented. One of these is described as below;

Utilization of plastic waste in road construction: The process of road laying using waste plastics is designed and the technique is being implemented successfully for the construction of flexible roads at various places in India.

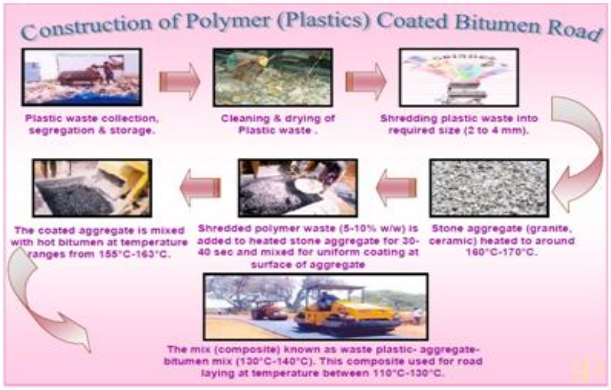

Figure 2: Schematic flow diagram of plastic coated bitumen road construction

Conclusion

Utilization of MSWC is the most cost effective MSW management option over traditional means such as landfilling or incineration as it enables recycling of potential plants nutrients. Soil microbial biomass use the nutrients present in compost. Plastics will increase the melting point of the bitumen. The use of the innovative technology not only strengthened the road construction but also increased the road life as well as will help to improve the environment and also creating a source of income. Plastic roads would be a boon for India's hot and extremely humid climate, where temperatures frequently cross 50°C and torrential rains create havoc, leaving most of the roads with big potholes.

Acknowledgement

The author thankful to Dr. Gangula Mohan Rao, Department of Chemistry C.K.M. Arts and Science College for support.

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