URBAN WASTE MANAGEMENT: A REVIEW

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Abstract:

A improving quality of human life style and increasing consumption of resources had unplanned and negative side effect on the urban environment generation waste. Now a day's cities are facing problems such as high volume of waste, cost involved, technologies and methodologies used for purpose of disposal and also influence of waste on local and global environment. This paper mainly focuses on urban environment issue concerning such as disposal methods, safety issue regarding residents and which are the challenges and also focusing on to the technical engineering methods for waste disposal. This paper will give the resent status of solid waste management in India. And also cover various methods used for handling various types of solid and liquid waste.

Keywords: Urban waste management, Classification of waste, methods for disposal, wastes effect,

1. INTRODUCTION

Most business defines waste as "anything that does not create value" (BSR, 2010). Waste management is exact name for the collection; transportation, disposal, recycling and monitoring waste .this include waste material that is produced by human activity. This material is avoided due to its adverse effects on human health and environment. The mission is improve the lifestyle and decrease the consumption of resource which had unplanned and negative side effect on urban environment. Now a day's cities are struggling with the problem such as high volume waste, methods and technology use for waste disposal, cost involves. This waste create problem like air, water, soil pollution also impact on health. So there is need to control and proper dispose of waste.

1.1 Classification of waste [1]

- Solid waste: vegetable waste, household waste, kitchen waste.
- E-waste: discarded electronic device such as computer, system, TV, music, smart phones.
- Metal waste: unused metal sheet, metal scraps etc.
- Plastic waste: plastic, bags, bottles, buckets, etc.
- Nuclear waste: unused materials from nuclear power plants.
- Liquid waste: thermal power plant, water used for different industries.

Basically waste having main two types:

1. **Dry waste (non-biodegradable waste)**

- Ashes
- Paper and plastic
- Rubber, rags
- Cardboard and cartons
- Packaging of all kinds
- House sweeping (dust etc.)
- Container of all kinds
- Foil, wrappings, pouches and tetra pack
- Discarded clothing, furniture and equipment
- Metal of all kinds
- Discarded electronic atoms from offices
- Printer cartridges and electronic parts.

2. **Wet waste (Biodegradable waste)**

- Waste from food and tea stalls/shops etc.
- Sanitary waste
- Flower and fruit waste including eggshells and bones
- Kitchen waste including food waste of all kind
- Garden sweeping waste consisting of green.

2. LITERATURE REVIEW

There have been a number of papers which have reviewed the trend of MSW generation and composition, as well as management including collection, transport and disposal in different location.

Ashish.R.Mishra, et.al (2014) studied solid waste management this was case study. This present paper based on study carried out on solid waste management by Yavatmal Municipal Corporation. Total solid waste generation was 24 tons/day in yavatmal city and 36 to 40 metric tons of waste generated per year .in this paper most focus on 6 steps as follows waste generation, storage, collection, segregation and processing, disposal. Where start collection of solid waste from door to door then community bins after transfer

station and finally to disposal sites. There is site for solid waste management at village swaged situated at 8 km from the yavatmal city. Disposal of solid waste is done by following composting and land filling. [2]

Vaishali Anagal, et.al (2015) sustainable solid urban waste management is one type of case study. They studied in pune ARTI technology used for waste disposal. Using this technology biogas is generated KKPKP is very strong union play major role for economical sustainable waste management and waste recycling to next generation this improve the living standard .In this paper they had focus on slum, peri urban and low income areas. Waste disposal also create income source for poor people. [3]

Giuseppe Bonifaz, et.al (2016) studied gravity packaging final waste recovery based on gravity separation and chemical imaging control Plastic polymers are characterized by a high calorific value .they have been studied some techniques for separate that is :NIR hyper spectral imaging (HSI),gravity separation ,FT-IR spectroscopy and also calorimetric test. This technique capture image and help to separate polymers like PVC, PS, polyethylene (PE). [4]

Gianpaolo Ghiani, et.al (2012) studied capacitated location of collection sites in an urban waste management system in this paper we have faced the problem of locating collection sites in an urban waste management stem. We have proposed an optimization model which helps deciding the sites where to locate the garbage collection bins, as well as the number and the characteristics of the bins to be positioned at the different collection sites.

This model introduces constraints that, from one side, ensure the Quality of Service from the citizens' point of view, and, from the other side, allocate bins to collection sites, so to provide the least necessary capacity to fit the expected waste to be directed to the sites. [5]

Maher Arebey, et.al (2010) "Integrated advances for robust waste receptacle screening system". They studied strong waste of the receptacle also truck couch need aid continuously screen utilizing produced frame work. Utilizing technologic for example, RFID (radio recurrence identification), GPRS (general packer radio system) with Polaroid would constructed to robust waste checking framework. Those following units mounted in the trucks gather area data progressively through those GPS. This data is exchanged ceaselessly through GPRS with a vital database. Those clients have the ability with perspective the current area from claiming each truck couch in the gathering stage through a web-based provision What's more thereby wrist bindings that armada. Those trucks positions Also junk canister majority of the data need aid shown around an advanced. [6]

3. METHODOLOGY

Concluding from research URBAN waste management means we have to focus on collection, transportation, and disposal and recycling. Over 377 million urban people lives in around 7935 town and cities and generated 62 million tones of municipal solid waste per annum. According to information only 43 million tone of the waste is collected, 31 MT is dumped in and fill sites and 11.9 MT is treated. [7]

3.1 Biodegradable waste management

This type of waste is including food waste from household kitchen and restaurants and horticulture waste from municipal solid waste. There are two methods for processing wastes i. e when anaerobic decomposition in the absence of oxygen convert organic waste into biodegradable waste which convert into methane and liquid slurry. Alternatively, when organic matter waste decomposes in the presence of oxygen called aerobic decomposition, it breaks down into co_2, water and product compost which use for nourishment of the soil. [8]

3.1.1 Composting

The many people use chemical fertilizers for plant growth but only 20 to 50 % nitrogen in urea is absorbed by plants. The rest return off into streams and lakes it's harmful. So use compost is best way to reduce nitrogen waste. Decomposition of organic matter in the waste in the presence of oxygen with the help of micro-organisms or worms (such as red wigglers or earthworms) produces compost or vermin-compost, which is a humus rich soil conditioner. City compost from the biodegradable municipal solid waste provides an alternative to farmyard manure (like cow-dung) which has been valued from time immemorial for its rich microbial content that helps plants to take up soil nutrients. Compost use for improves water retention capacity of the soil and helps with drought-proofing. The requirement of less water per crop nitrous oxides (NO_x), among activities that do not add to the economy of the city The second largest emitter of hydrocarbons (HC); The second largest emitter of particulate matter (PM); is a welcome feature for a water-stressed future. By making soil porous, compost also makes stronger roots. [8]

3.1.2 Biomethanation

A technically more advanced method for bio-chemical conversion of biodegradable waste is anaerobic decomposition or biomethanation. With the action of microbes in the absence of oxygen, the organic matter is broken down with the release of biogas which contains methane. The gas can be used in place of conventional fuels like LPG or CNG. It can also be concentrated and bottled into Compressed Biogas (CBG) which in turn can be converted into electricity with the use of generators yielding 30 percent electricity conversion efficiency. However, almost 70 percent of the energy is lost as heat in the process of conversion. A by-product of biomethanation is slurry which is excellent liquid manure for agriculture. Biomethanation therefore not only produces energy but also delivers nutrients for soil. A medium biomethanation plant of 300 TPD that generated bio CNG has been set up under agreement between Pune Municipal Corporation and pune based private companies.

In Solapur, has set up India largest biomethanation plant. This plant having capacity around 400TPD also these plants generate electricity around 3 MW per day. In 2017,bio-CNG plant in Pune process only 75 TPD of biodegradable waste that waste collect from hotels, restaurants.[8]

3.2 Dry waste process

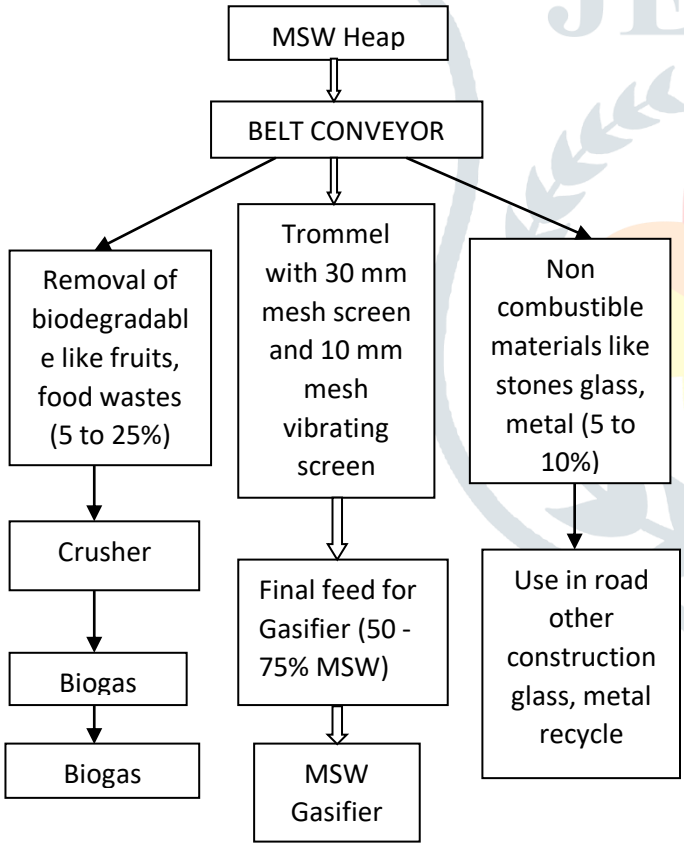
3.2.1 Incineration

A method suited for combustible refuse. Refuse is burnt Suited in crowded cities where sites for land filling are not available. This method having High construction and operation costs. Sometimes used to reduce the volume of solid wastes for land filling where two chambers is used. Primary chamber: designed to facilitate rapid desiccation of moist refuse and complete combustion of refuse and volatile gases. A ledge or drying hearth is provided for this purpose. Secondary chamber: between the primary chamber and the stack temperatures above 700 degree C. All unborn and semi burnt material are completely burnt here. All incineration based Waste-to-Energy plants must strictly follow the emission norms and have pollution control filters installed to regulate the release of harmful gases into the atmosphere. The emission norms have been made more stringent under Rules (2016) requiring that PM 2.5 emissions from the Waste-to-Energy plants be reduced to 50 ppm compared to 150 ppm under Rules (2000). There is need for real-time monitoring and open access to emissions data to ensure enforcement of the norms. Both the Central Pollution Control Board and the National Green Tribunal have been working towards these goals. [8]

3.2.2 Gasification

This method is easy to handle and best for conversion of waste into energy. In this process,
three main unit operation names as belt conveyor, vibrating screen and gasifier equipment are used and this process converts waste into energy.

As per shown above figure first MSW (100%) is treated using belt conveyor where using man power to separate biodegradables likes fruits, vegetables and food waste approximately 5-25 % MSW handle at this stage. as well as separate noncombustible material like stones, glass is approx 5-10 %MSWthis separated biodegradables waste use for biogas generation and noncombustible material likes stones etc use for construction of road. The main part of this system is generation of energy. For that energy generation remaining waste from belt conveyor again sends towards vibrating screen of 10 mm mesh. This vibrating screen convert waste into small fine shaped waste (50-75%MSW). Then pass towards gasifier where burning take place and finally formation of gas and this gasses use as power. [9]



Refuse Derived Fuel

Waste other than biodegradable, which is non-recyclable and non-hazardous in nature but possesses high calorific value can be used for energy recovery through the process of combustion. To increase the energy output, the
Waste is shredded, dried and then compressed into pellets or briquettes, called Refuse Derived Fuel (RDF). These can be used in many industries in place of coal for heat generation. However, the temperature of the furnace should be maintained strictly at 1000 °C or above so that toxic air pollutants such as dioxins and furans are not released upon the combustion of RDF. [10]

3.2.3 Fluidized Bed Combustion

The sand moves in a container when it is blown upward by air from the bottom. The sand remains stable, until the air flow-rate reaches a certain level. This state is called a stationary bed. As the flow exceeds the minimum fluidizing rate, the sand starts moving like boiling water. This is what is called the fluidized bed. The fluidized bed is applied in combustion facilities by using the large amount of specific heat contained in the sand. After the bed temperature reaches a certain point using auxiliary fuel, the firing fuel is deposited in the bed. Mixed with billions of grains of sand, the waste is rapidly dried, gasified and burned. The vertical motion found

in most conventional a fluidized bed is not sufficient to carry the fuel throughout the bed. Light materials stay on the surface and burn there, and most of the combustion heat leaves the bed for the freeboard, sometimes making it difficult to maintain the bed temperature at the desired level. [11]

3.3 Liquid waste management

Sewage is waste water containing solid and liquid excreta coming from houses, streets, industries etc. Industrial companies produce both hazardous and non hazardous wastewater because of their manufacturing and production systems, including wastewater that contains EPA listed and characteristic wastes**.** The treatment of this wastewater has become a key component to a profitable operation. Companies require a cost effective effluent treatment solution that can help them manage their entire wastewater stream that meets all federal and local standards, and is environmentally friendly. Sewage is waste water containing solid and liquid excreta coming from houses, streets, industries etc. The treatment to such sewage mainly focused on three things. They are:

(a)Remove the suspended particles.

(b)To reduce the organic matter through decomposition by bacterial action is call as Aerobatic system.

(c)To produce germ free water which actually safe for environment. [12]

Reverse osmosis (RO)

A special type of filtration that uses as semi-permeable, thin membrane with pores small enough to pass pure water through while rejecting larger molecules such as dissolved salts(ions) and other impurities such as bacteria. Reverse osmosis is used to produce highly purified water for drinking water systems, industrial boilers, food and beverage processing, cosmetics, pharmaceutical production, seawater desalination, and many other applications. This method is based on principle which say that fluid always pass from higher concentration to lower concentration. Semi-permeable membranes were first constructed using cellulose acetate (CTA) but later the industry switched primarily to the use of a thin film composite (TFC) being placed on top of a stronger substrate. TFC membranes are primarily used today. [13]

3.4 Electrical waste management

1. E waste collection
2. Product wise categorization
3. Disassembly
4. Segregation
5. PCB shredding
6. PCB crushing
7. PCB Pulverization
8. Separation
9. Homogenization
10. Valuation for metal content

4. COLLECTIONS AND TRANSPORT

In starting collection sites use as random place which nearby disposal area so transport cost reduces. Now new technology comes as follows:

4.1. Underground solution for urban waste management:

The underground waste collection system has into two major categories. The first category of underground collection systems is considered to follow a more traditional approach, where waste containers are replaced by underground collection points. These points are usually employing the underground or semi-underground placement of containers, sited in excavated shafts usually 2-3 m deep, having only their inlets in the surface environment. The waste containers are in the form of a cylindrical shape and usually placed along public right-of-ways. The capacity of container ranges from 0.6 to 5 m^3. The system is consisted of two parts, the outer shell and the inside bag that the waste are actually placed. Their greater portion is buried underground, whereas on ground level only the inlet structure with the characteristic shape is visible. The collection and transportation of wastes is carried out using specially adapted heavy trucks.

Fig 4.1 Underground waste management [14]

Further container fitted with compactor so can reduce the volume of waste .this underground container lies in its superior holding capacity and protect environment as compared traditional waste container. [14]

4.2. Integrated technology for solid waste Bin monitoring system

Combination of Zigbee technology and GSM is a latest trend in the acreage of decay collection. In this technology sensors are placed in accessible debris bins to ascertain a assertive optimum akin of waste. As the debris alcove the beginning level, adumbration will be transferred to the ambassador who will add accord adumbration to disciplinarian of accumulating barter for elimination the bin urgently. The indication will be send to the driver through SMS using GSM. [15]

5. IMPACT OF WASTE

1. Due to a lack of health and safety facilities to the waste collection crew in city, they are specifically facing occupational hazards, including strains from lifting, injuries from sharp objects and traffic accidents.
2. Open dumps on the roadside and heavily sized solid waste storage containers are also creating traffic blockage in the study area.

3. During rainy seasons, produced leachate from the open dumped sites is causing serious pollution to water bodies.

4. A high percentage of collected solid waste, plastic, etc., from city is being treated or disposed of in unsatisfactory ways, causing a severe aesthetic nuisance in terms of smell and manifestation and they may also cause the death of grazing animals which eat them. [16]

8. CONCLUSION

Most of the developing countries mean urban areas are not able to provide proper facilities for collection and disposal of communal solid waste to whole population. In most of city, solid waste is being dumped openly along roadsides. Due to lack of proper equipment and funding, the present solid waste management system is insufficient for cities. Considering the overall negative impacts associated with open dumping and open burning, these practices must be properly considered. The Sanitary land filling method is used mainly for organic material and as a result generates biogas. In case of electronic waste the metals like gold, silver, copper, palladium, etc are recovered. The remaining contents of the waste are sending for incinerations were it is burned. For solid waste management gasifire process is best as compared to open burning and land filling where solid waste converts into energy and this energy use for thermal plant and also for electric power generation. For liquid management having process like reverse osmosis, ion exchange method, zeolite method, nano-filtration method and sewage treatment method. Collection and transport waste is also important for waste management. Now days underground waste collection system as well as waste monitoring system using sensors .The concepts of 3Rs are being used in the waste management. Even the concept of 3Rs need to be rethought and 6Rs need to come in place-Refuse, Reduce, Reuse, Replenish, Recharge and Recycle.

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