

Solid Waste Management through Different Methods

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Abstract— The management of solid and municipal waste is a method to change it into usable resources by applying appropriate technique. These appropriate techniques when implemented with proper care can convert most of the residual product into the useful forms which further can be used by the small industries for various purposes to provide suitable solutions to many problems. Hence in this research various problems and techniques are identified and out of which the technique with proper solutions can be then implemented to provide the solutions to various administrative bodies. Through the recent survey it has been found that the major problem of solid waste and its management has increased in last decades. Solid waste requires high quality of management to control its prevailing in the environment. Solid waste is basically defined as waste or discharged material generated from household, domestic units, commercial centres and industries. This waste when collected in high amount produces harmful effects which can finally result in disasters.

Key words: Municipal Solid Waste, Land filling, Incineration, Compositing and Plasma gasification

I. INTRODUCTION

One of the biggest problems is increasing the solid waste or municipal solid waste, by virtue of increasing population, industrial revolution is faced by the cities and towns also it relates to the management of discharge (i.e. in other words management of municipal waste material) The annual waste generation has been found that growth in proportion to the rise in population and development in cities. If the material becomes unusable in its physical without any chemical changes then it is categorized as physical waste. In the method of trash or garbage generation, if certain chemical changes are taking place then it is known as chemical waste generation. The waste is categorized in Solid, Liquid and Gaseous. The municipal solid waste is the unusable solid materials produced from combined household, industrial and commercial operation in a related field. It is categorized according to its origin (residential, industrial, domestic), according to its volume (organic material, glass, metal, plastic paper etc.). Management of solid waste reduces or eliminates bad impact on the nature and also human health and supports commercial development and improved quality of life. There are the number of methods are involved in effectively managing discharge for a municipality. These include monitoring, collection, transit, recycling and disposal. Management of solid waste reduces or eliminates bad impact on the nature and also human health and supports commercial development and improved quality of life. There are the number of methods are involved in effectively managing discharge for a municipality. These include monitoring, collection, transit, recycling and disposal.

II. METHODS TO OVERCOME ON SOLID WASTE MATERIAL

A. Land Filling

The method Landfills are project to highly overcome the venture that solid waste disposal can pose to the human health and natural nearby environment quality. This landfill is commonly placed in that areas or places where land facilities transact as natural fender between the landfill and the nearby environment. Just like suppose the area may be including of clay and soil which are impartially due to its firmly prepared particles. The regularly trash is draw out and consolidate to minimize the volume; a ceiling is then used to minimize the bad odour. At that moment the landfill is out of its volume it is packed with thick seal which is particularly composed of clay soil.

Few landfills are used to revive energy. The natural anaerobic decomposition of the waste in the landfill produces landfill gases which include methane Carbon Dioxide, and spoor of other gases. Methane is usually used as an energy source to generate electricity and heat. Thus few landfills are fitted with landfill gas collection (LFG) systems to stake on the methane being produced. The method of producing gas is very slow.

Landfills reduces the harmful effect of solid trash on the atmosphere by the following mechanisms

- 1) Segregation of waste through containment
- 2) Elimination of polluting route
- 3) Controlled collection and treatment of products of physical, chemical and organic changes within a trash dump – both liquids and gases
- 4) Environmental invigilate until the trash becomes stagnant.

Advantages of Landfill	Disadvantages of Landfill
Landfill site is inexpensive waste disposal option for the local council.	The sites will look ugly while it is being used for landfill.
Task will be created for local rig pickers.	Dangerous gases are given off from landfill sites cause domestic air pollution and bestowal to global warming
Lots of different type of trash can be disposed of by landfill in compare to other trash disposal methods.	Local streams could become polluted with toxins leaking via the ground from the landfill site.
The gases off by the landfill site could be collected and use for generating power.	Once the site has fraught it could not be able to be used for redevelopment as it could be too polluted.

Table 1: Advantages & Disadvantages of Landfill

B. Incineration

Incineration is also a trash or garbage treatment technology that includes combustion or deflagration of biological stuff

and/or materials Incineration and other high temperature garbage operating systems are stated as "thermal treatment". Incineration of discharge trash stuff or substances changes the waste into crematory bottom ash, flue gases, particulates, and heat, which is able to use to produce electric power. The flue gases are cleared pollutants before they are diffused in the atmosphere. An incinerator is a kiln for kindle trash. Present-day incinerators comprise pollution quenching instrument such as flue gas cleaning systems with Air Pollution Control arrangements. There are several types of incinerator plant design such as moving grate, fixed grate, rotary-kiln, fluidized bed etc.

Advantages of Incineration	Disadvantages of Incineration
Minimal of land is necessary liken to the dimensions of garbage disposal spots.	The air pollution monitoring requisite in incineration plants are extremely valuable. Very often up to one half of the value of a plant is because of air pollution monitoring features. As the rules can modify in the air pollution controls, could lead to much higher value in the forthcoming time.
The weight of the trash is minimize up to 25% of the starting value	Energy, generated by means of trash incineration is not likely to be practical for small society. So that incineration plants have be situated in the locations where the district heating network can easily be appended to many ménage.
The garbage mass is minimal to almost 10% of the starting value.	The every high technical standard of the plants require capable labourer, which leads to the facts that instead of high wages have to be paid.
The generated relics, ash and slag together with the evolved flue gases, are pungent-free liken to the partly offensive pungent due to dumps.	The relics from the flue gas cleaning can contaminate the surrounding if they aren't handled properly.
As the raw material required for garbage incineration, which is municipal trash, is said to be kind of renewable it helps to minimize the use of fossil fuels.	The assent of garbage incineration plants is very lousy.
By using the ashes for naturally suitable construction, low costs are provided and even the need for landfill efficiency is minimized.	People's Endeavour to avert trash generation are reduces when they know that that their trash is scalded in an incineration plant.

Table 2: Advantages & Disadvantages of Incineration

C. Compositing

The biological content of Municipal Solid discharge garbage or Waste tends to decay head most several smell and odor issues. It also leads to pollution of the surrounding. To confirm a secure disposal of the municipal solid waste it is desirable to minimize its pollution capacity and various processing methods are proposed for this objective. Composting method is absolute normally used and its results in generation of a stable product - compost which depending upon its attribute is able to use as a low class manure and soil conditioner. The method results in patronage of natural or environmental resources and is very vital processing method, particularly in agricultural and horticultural areas. The Municipal Solid trash in Indian city centers has a suited C/N ratio of approximately around 30 and is agreeable to composting. The farmers and landscape gardener are also habituated to the use of farmyard manure and therefore may adopt compost prepared from municipal solid discharge trash. While setting up a municipal scale mechanical compost plant the following gait need to be taken.

Advantages of Compositing	Disadvantages of Compositing
Changing garbage into a value-added resource by providing significant feedstock for the regions only licensed composting convenience.	The stuff is heavy and bulky, making it costly to transport.
Generating valuable materials, such as compost and manure, that develop soil and aids in plant growth	The nutrient formation of compost is highly mutable compared to chemical manure.
Inhibiting greenhouse emissions and leachate caused by decomposing biological landfill trash.	The nutrient value of compost is low as liken with that of chemical manure, and the rate of nutritive release is quite slow.
Increasing the life of the region's only landfill.	Agricultural users might have concerns about potential levels of weighty metals and other possible contaminants in compost, especially assorted municipal solid trash.

Table 3: Advantages & Disadvantages of Compositing

D. Plasma

Plasma is a charged fluid, which is described by having almost similar concentrations of negatively charged ions and proton ions. The physical description of this datum is commonly complicated and not easily described by the solid, liquid and gaseous situation of stuff—plasmas have also been defined the fourth state of matter for this case. Further though the search of plasma is modern, it is presumed that the most copious circumstance of matter in the universe, as it is the very material frame. On earth, we typically see plasma in the earthbound forms of lightning and open flames, and limited within fluorescent bulbs. . It is constituted whenever normal substance is heated approximately over 5,000° C, which results in electrically charged gases or fluids. They are recondite influenced by

the electrical interactions of the ions and electrons by the existence of a magnetic field.

E. Gasification

This modification permit for energy in a general solid form to be transmuted into a much more useful form, the gasification generally stated in engineering methods employs pyrolysis, the pained and near-anaerobic modification of a hydrocarbon to a useful, inflammable gas. The most recent evolution of gasification was employed in the late 1800’s as a means of converting coal into a form of gas. This “town gas” was comprehensively distributed for many uses ranging from industrial power and heat generation, in much the same way that natural gas is recently delivered and make in use.

F. Plasma Gasification

It is the only one of the most newly (latest) and beneficial process for Solid waste management. It covers gasification of solid in high temperature using plasma arc act towards the wear out gases and the integrated gas cycle is to generate electric energy, by using vitreous or pellucid slag as a bi-product in building construction industries.

The amalgamation of plasma and gasification distinct enough from garbage incineration. Incineration methods are low-temperature thermal method. Although the flue gases produced by deflagration often have adequate free C, hydrocarbons, and CO to be inflammable, the main yield of interest from incineration is heat. It is the heat from the combustion method that endows steam to produce electrical power via steam turbine produces and process. Further, incineration is normally an environmentally toxic method. As trashes are destroyed at low temperature and in typically atmospheric circumstance, fly-ash, inclusive noxious stuff, often getaway the process because of their buoyancy. Further, the low-temperature recombination of materials of fractional combustion results in the generation of polychlorinated di benzo-p-dioxins, human carcinogens, and colloquially define dioxins. To extent the generation of toxic as bi products, incineration features employ comprehensive trash filtering and recycling to recapture potentially toxic stuff from the incoming trash stream and extensive environmental controlling and flue gas and ash processing to recapturing detrimental impurities from the exhaust.

Plasma gasification technology is greatly appropriate for disposal of hazardous and gaseous trashes. It is now being seen as a tempting option for disposal of municipal solid discharge trash as well. This technology has an edge over the other method involving combustion as it can convert solid municipal waste into a clean, green, and regaining of fuel in the form of a SynGas with nearly about no relics that require further disposal. Plasma gasification is a method which turns biological stuff or material into Syngas, electricity, and slag using plasma. A plasma arc enable through an electric arc is applied to ionize gas and catalyze biological material into syngas and solid discharge trash (slag). It is used domestically as a form of waste operation and has been examined for the gasification of biomass and solid hydrocarbons, just like that coal, oil sands, and oil shale.

G. Plasma Torch

Plasma Torch contains closely spaced pair of tubular water cooled electrodes.

The gas/arc interaction generates the superheated process gas and leads to higher thermal efficiencies obtained for the plasma torch.

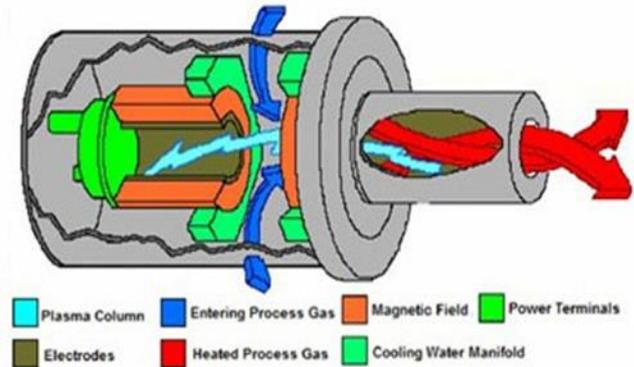


Fig. 1:

Advantages of Plasma Gasification	Disadvantages of Plasma Gasification
Plasma systems can transit heat much faster than conventional flames.	Extremely high temperatures, material durability of equipment.
Very effective for organic halogens, (PCBs and Dioxins). Eight “9’s” DRE has been observed.	High capital costs.
Greatly reduces municipal solid waste volume.	Complex process control and highly trained professionals are required.
Can minimize all waste streams.	Electricity is required as an energy source. This is more expensive than most thermal processes.

Table 4:

H. Important Parameters

Here are the some parameters which shows the plasma gasification method is the most beneficial method.

Parameters	Incinerations	Plasma Gasification System
Temperature in Primary chamber	500°-850° C	800°-900°C
Temperature in secondary chamber	Mostly < 900°C	1050 ± 50°C
Fuel required to attain temperature in secondary chamber for medical and plastic waste	Yes required	Not required
Condition of 1.5 second exposure requirement of gases to 1050°C	Rarely fulfilled	Fulfilled
Segregation of PVC and sharps required	Yes	No
Dependent of moisture content of input	Very much dependent	Does not depend on moisture content

Unburned organic residual content	Approx. 4%	Less than 0.2%
Foul odor removal system	Required	Not required

Table 5:

Performance Parameter	Plasma Arc Gasification	Incineration
Capacity Tons/Day	250	250
Conversion Efficiency MW-hr/Ton	0.5	0.4
Cost of Construction \$MM	250	125
Electricity / Day MW-hr/Day	108	69
Unit cost/ kW-hr US \$/ kW-hr/day	2300	1800
Unit cost / Ton US \$ / Ton / 10yr	273	137

Table 6:

Feature	Incineration	Plasma Torch
Volume Reduction	5:1	250:1
Weight Reduction	3:1	9:1
Integral smock stack	Require 100-300 ft	N/A
Increase in moisture content	Increase harmful emissions	No effect
Temperature control	Requires secondary fuel, may have cold spots	Easily maintained
Air emissions	Can exceed standards	Clean by-product gas
Landfill requirements	Bottom Ash leachable	None
Commercial by-product	Heat for electricity	Gas for electricity, slag for resale

Table 7:

III. CONCLUSION

As from the above research it has been deduced that the typical or commonly used process of solid discharge trash handling like composting, landfill and incineration are not too much subsidiary to completely abolish the issue of solid discharge trash handling. In this gloomy state plasma arc gasification has come out as a very good resultant technology which not only dissolves the garbage into elemental forms but also generates electricity and necessary by-products. The method works on a closed loop system which defends the environment from poisonous garbage. Economics of the methods tell that it may be very feasible for increasing economies and hence be able to happily apply in the countries like India.

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