

Generation of Electricity by Using Solid Waste

Spoorti¹, Dr. Srinivas Kushtagi², S K Ingankal³

P.G Student, Department of Civil Engineering [Environmental Engineering] P.D.A. College of Engineering,
Kalaburagi, India¹

Professor, Department of Civil Engineering [Environmental Engineering] P.D.A. College of Engineering,
Kalaburagi, India²

Asst. Professor, Department of Civil Engineering [Environmental Engineering] P.D.A. College of Engineering,
Kalaburagi, India³

Asst. Professor, Department of Civil Engineering [Environmental Engineering] P.D.A. College of Engineering,
Kalaburagi, India⁴

ABSTRACT: Generally day by day the generation of solid waste is increasing every day in everywhere. The landfill sites are increasing. The generation of solid waste is increasing along with the increasing of the population. In order to control the generation of solid waste and to reduce the pollution we are making this project in which we have been making this for the purpose of the control of solid waste generation and to reduce the pollution by generating electricity by heating process. We have been collected the solid waste such as plastic waste, paper waste, card board waste, plastic bottles detergent bottles, toys, rigid pipes etc. we avoided glass, petroleum products which effects the heating process. And the solid waste is subjected to incineration process.

I. INTRODUCTION

Solid Waste to energy is the process of generating energy in the form of electricity or heat from the primary treatment of waste, or the processing of waste into a fuel source. Waste to energy is a form of energy recovery. Most Waste to energy processes generate electricity and/or heat directly through combustion, or produce a combustible fuel commodity, such as methane, methanol, ethanol or synthetic fuels.

II. SCOPE

The generation of electricity from solid waste facilities typically reduce waste volumes by 90%. Fewer and smaller landfills are needed to process ash and this protects a valuable natural resource – land. Trucking of waste long distances can be greatly reduced.

OBJECTIVES:

1. To find out calorific value of the solid waste.
2. To measure the generated electricity.
3. To find the alternate for thermal energy and to utilize our daily waste for our beneficial.
4. To mitigate the load of waste on land.

III. VARIOUS SOURCES AND TYPES OF SOLID WASTE:

1. Residential: Residences and homes where people live are some of the major sources of solid waste. Garbage from these places include food wastes, plastics, paper, glass, leather, cardboard, metals, yard wastes, ashes and special wastes like bulky household items like electronics, tires, batteries, old mattresses and used oil. Most homes have garbage bins where they can throw away their solid wastes in and later the bin is emptied by a garbage collecting firm or person for treatment.

2. Industrial: Industries are known to be one of the biggest contributors of solid waste. They include light and heavy manufacturing industries, construction sites, fabrication plants, canning plants, power and chemical plants. These industries produce solid waste in form of housekeeping wastes, food wastes, packaging wastes, ashes, construction and demolition materials, special wastes, medical wastes as well as other hazardous wastes.

3. Commercial: Commercial facilities and buildings are yet another source of solid waste today. Commercial buildings and facilities in this case refer to hotels, markets, restaurants, go downs, stores and office buildings. Some of the solid wastes generated from these places include plastics, food wastes, metals, paper, glass, wood, cardboard materials, special wastes and other hazardous wastes.

4. Institutional: The institutional centres like schools, colleges, prisons, military barracks and other government centres also produce solid waste. Some of the common solid wastes obtained from these places include glass, rubber waste, plastics, food wastes, wood, paper, metals, cardboard materials, electronics as well as various hazardous wastes.

5. Construction and Demolition Areas: Construction sites and demolition sites also contribute to the solid waste problem. Construction sites include new construction sites for buildings and roads, road repair sites, building renovation sites and building demolition sites. Some of the solid wastes produced in these places include steel materials, concrete, wood, plastics, rubber, copper wires, dirt and glass.

6. Municipal services: The urban centres also contribute immensely to the solid waste crisis in most countries today. Some of the solid waste brought about by the municipal services include, street cleaning, wastes from parks and beaches, wastewater treatment plants, landscaping wastes and wastes from recreational areas including sludge.

7. Treatment Plants and Sites: Heavy and light manufacturing plants also produce solid waste. They include refineries, power plants, processing plants, mineral extraction plants and chemicals plants. Among the wastes produced by these plants include, industrial process wastes, unwanted specification products, plastics, metal parts just to mention but a few.

8. Agriculture: Crop farms, orchards, dairies, vineyards and feedlots are also sources of solid wastes. Among the wastes they produce include agricultural wastes, spoiled food, pesticide containers and other hazardous materials.

9. Biomedical: This refers to hospitals and biomedical equipment and chemical manufacturing firms. In hospitals there are different types of solid wastes produced. Some of these solid wastes include syringes, bandages, used gloves, drugs, paper, plastics, food wastes and chemicals. All these require proper disposal or else they will cause a huge problem to the environment and the people in these facilities.

IV. CLASSIFICATION OF SOLID WASTES

1. Biodegradable: solid wastes are those that can be broken down (decomposed) into their constituent elements by bacteria and other micro-organisms. Food waste, manures and waste from producing crops are the main biodegradable wastes. If the decomposition process takes place in the absence of air (anaerobically), methane gas can form. Methane is a powerful greenhouse gas and can explode if enough of it accumulates and an ignition source (such as an electrical spark) is present. The decomposition may also produce offensive and irritating smells. However, controlled anaerobic decomposition can produce biogas - a useful fuel for heating, cooking and even power generation.

2. Non-biodegradable: These solid wastes are those that do not decompose by microbial action. These wastes include plastic containers, scrap metal, food and drink cans and plastic bags. Materials in solid wastes can also be classified as combustible or non-combustible, depending on whether they will burn or not. Depending on the inherent dangers associated with its physical and chemical properties, solid waste can be classified as either hazardous or non-hazardous.

V. SOLID WASTE MANAGEMENT METHODS

1. Collection: in this process the types of solid waste is collected from various places. Proper solid-waste collection is important for the protection of public health, safety, and environmental quality. It is a labour - intensive activity, accounting for approximately three quarters of the total cost of solid-waste management.

2. Segregation: Waste segregation at source is mandatory. Households are required to separate waste into three streams Organic or Biodegradable waste, Dry waste (such as plastic, paper, metal and wood), and Domestic Hazardous waste (diapers, napkins, mosquito repellents, cleaning agents).

3. Transportation: The transportation of waste is the movement of waste over a specific area by trains, tankers, trucks, barges, or other vehicles. The types of wastes that may be transported range from municipal garbage to radioactive or hazardous wastes. Wastes may also be released while being loaded or unloaded during transportation.

4. Waste processing/treatment: Out of the waste segregated, wastes most suitable for energy generation with right properties are selected and are subjected to further treatment where the entire material inherits homogenous properties - optimum calorific value, lower pollutant content, deodorized, low moisture content, etc

5. Energy generation: Energy generation is the process of generating electric power from sources of primary energy. For utilities in the electric power industry, it is the stage prior to its delivery (transmission, distribution, etc.) to end users or its storage. Electricity is not freely available in nature, so it must be "produced" that is, transforming other forms of energy to electricity.

IMPACTS OF WASTE ON EARTH:

1. Solid wastes result in air pollution, water pollution and soil pollution.
2. Solid wastes also cause many diseases as these wastes are breeding place for many vectors.
3. Substances like polythene bags block drain pipes thereby paralysing the whole drainage system.
4. Stray animals ingest some harmful substances along with food from waste, which may result in many diseases and ultimately death of these animals, and further increase solid waste.

VI. SOLID WASTE DISPOSAL AND MANAGEMENT

Solid waste disposal Management is usually referred to the process of collecting and treating solid wastes. It provides solutions for recycling items that do not belong to garbage or trash. Solid waste management can be described as how solid waste can be changed and used as a valuable resource.

Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn lead to pollution of the environment. Diseases can be spread by rodents and insects. The tasks of solid waste disposal management are complex technical challenges. They can also pose a wide variety of economic, administrative and social problems that must be changed and solved.

GENERATION OF ELECTRICITY:

Electricity is generated throughout the world in many ways using a variety of resources. The three most common resources used are natural gas, nuclear and coal. But renewable sources of generation are quickly growing, the most common way to generate electricity is through the transformation of kinetic energy into electricity by large Electric generators. The vast majority of electrical generation is produced through electromagnetic induction, where mechanical energy through a turbine drives a generator rotate to produce electricity.

INCINERATION METHOD:

Incineration is a waste treatment process that involves the combustion of substances contained in waste materials. Industrial plants for waste incineration are commonly referred to as waste-to-energy facilities. Incineration and other high-temperature waste treatment systems are described as "thermal treatment".

Incineration of waste materials converts the waste into ash, flue gas, heat and electricity. In some cases, the heat that is generated by incineration can be used to generate electric power. Incineration with energy recovery is one of several waste-to-energy technologies such as gasification, pyrolysis and anaerobic digestion.

MATERIALS AND METHODOLOGY:

The Purpose of making this project is to generate electrical energy from waste materials like plastic, rubber, garbage and bad stuff etc. and store that electrical energy in the battery through the circuit and use that electrical energy to operate the whole project. And the LED bulb is shown to be turned on and the use of filters to control pollution from energy production.

In order to control the generation of solid waste and to reduce the pollution we are making this project in which we have been making this for the purpose of the control of solid waste generation and to reduce the pollution by generating electricity by heating process. We have been collected the solid waste such as old plastic waste, paper waste, cardboard waste, plastic bottles detergent bottles, toys, rigid pipes etc. we avoided glass, petroleum products which effects the heating process. And the solid waste is subjected to incineration process.

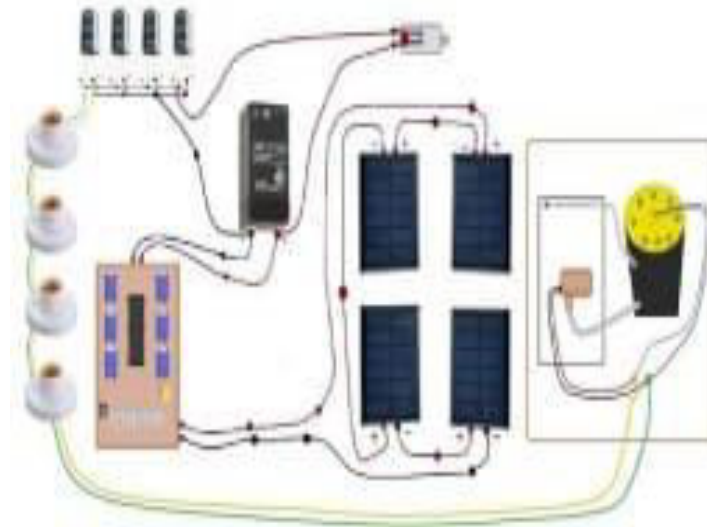


Fig. Incineration model setup

ADVANTAGES:

1. Decreases Quantity of Waste:

Incinerators can decrease the quantity of waste by 95% and reduce the solid quantity of the original waste by 80-85% depending on the components that were in solid waste. Therefore incineration reduces the dependency on landfills.

2. Efficient Waste Management: Incineration plays a vital role in making waste management easier and more efficient. Incineration can burn up to 90% of the total waste generated and sometimes even more.

3. Production of Heat and Power:

Incineration plants generate energy from waste that can be used to generate electricity or heat. During the 1950s, energy costs increased considerably. So a lot of countries incorporated the heat and energy produced from waste incinerators for the generation of power by using steam turbines. It can be used to power the needs of people living nearby.

4. Reduction of Pollution:

Research has shown that solid waste incinerators are less likely to pollute the environment than landfills. One particular study done during a 1994 lawsuit in the US showed that a waste incinerator location was more environment-friendly compared to a landfill.

5. Uses of Ash:

The ash that comes from the combustion of waste can be used in construction, get shipped or even landfilled. Shipping of ash is cheaper than transporting of unburned trash.

6. Saves on Transportation of Waste: Incineration plants can be near cities or towns. This is advantageous since it means waste does not have to be driven for long distances for dumping. It significantly reduces the cost of transport, the money can then be spent on the wellbeing of the community and sustaining the growth of a city.

DISADVANTAGES:

1. It is Expensive:

The installation of an incineration plant is an expensive process. Particularly, the costs of constructing the infrastructure to the costs of operating the incineration plants are very high.

2. Pollutes the Environment:

Incinerators produce smoke during the burning process. The smoke produced includes acid gases, carcinogen dioxin, particulates, heavy metals, and nitrogen oxide. These gases are poisonous to the environment. Research has shown that dioxin produced in the plant is a cancer forming chemical.

3. The Possibility of Long-term Problems:

Incineration does not encourage recycling and waste reduction. This is not a calculated strategy for any society. The point of focus should be on reducing waste and recycling most of it.

VII. CONCLUSION

Solid Waste to energy is the process of generating energy in the form of electricity or heat from the primary treatment of waste, or the processing of waste into a fuel source. In this paper the collected waste is burnt in a electricity generating model set-up, after the burning of waste the energy is generated by blowing bulbs through the connections made in the model. And lastly the Calorific value is measured by using the Bomb Calorimeter.

REFERENCES

1. Shariar KF, Al Bustam H. Waste to energy: a new dimension in generating electricity in Bangladesh. *International Journal of Engineering and Technology*. 2012 Aug 14(4)
2. Peerapong P, Limmeechokchai B. Waste to electricity generation in Thailand: Technology, policy, generation cost, and incentives of investment. *Engineering Journal*. 2016 Aug 29;20(4):171-7.
3. Paulraj CR, Bernard MA, Raju J, Abdulmajid M. Sustainable waste management through waste to energy technologies in India-opportunities and environmental impacts. *International Journal of Renewable Energy Research (URER)*. 2019 Mar 21,9(1):309-42
4. Subramani T, Murugan R. Generation Of Electricity Using Solid Waste Management in Krishnagiri Municipality. *International Journal of Engineering Research and Applications*: 4(6)222-32.
5. Ouda OK, Raza SA, Al-Waked R, Al-Asad JF, Nizami AS. Waste-to-energy potential in the Western Province of Saudi Arabia. *Journal of King Saud University-Engineering Sciences*. 2017 Jul 1;29(3):212-20.
6. Elwan A, Arief YZ, Adris Z, Muhamed NA. Life cycle assessment-based environmental impact comparative analysis of composting and electricity generation from solid waste *Energy Procedia*. 2015 Apr 1;68:186-94.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details