MUNICIPAL SOLID WASTE TO ENERGY CONVERSION

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ABSTRACT

*Combustion of solid waste can be a main waste –to-energy treatment process. It is a common technique for producing both heat and electrical energy directly from solid wastes by controlled burning at high temperature which releases heat and smoke. Through the heated smoke which is used to run the turbine produces energy. Use of MSW to produce energy is very useful in big or crowded cities as t reduces the quantity and volume of the waste to be landfilled. Also the environment conditions of this process must be very precise to make it environmentally safe and the larger portion of investment is required for this purpose only***.**

KEY WORDS: *TURBINE, DYNAMO, BATTERY, SMOKE AND DUST FILTER, DC TO AC INVERTER.*

INTRODUCTION

Every country produces waste and garbage (i.e solid wastes) and in most of the countries waste management and energy production systems are under change. As we are mostly dependent on non-renewable sources of energy which will fell short in the upcoming years, it is required find an alternative. The most common technique for producing both heat and electrical energy from waste is direct combustion. Apart from renewable energy source, the energy produced from combustion of solid waste can also act as an alternative but it's efficiency will not be as par to the combustion produced from coal.

MSW contains organic as well as inorganic matter. The latent energy present in its fraction is recovered for gainful utilization of suitable waste processing and treatment technologies.

It has further benefit's which are as:

- Demand for landfilling is reduced.
- Transportation cost of waste to faraway places also reduces.

PROBLEM STATEMENT

Population growth, changes in technology and its development and urbanization level changes support to increase MSW generation. To solve the major environmental issues like effects of pollution, management of solid waste accumulation and also the need for alternative source from the available matter is the major problem, through this project these problems can be managed to certain level.

PROJECT JUSTIFICATION

During this project it was ensured that all the solid waste which are dumped by the location the municipality burns completely inside the combustion chamber provided for this process giving out maximum amount of heat and smoke .It is also assured that the smoke with maximum pressure is thrown out to the turbine to run it with highest

efficiency producing the rotary motion these producing energy with the help of dynamo. The main goal of project was to come up with an alternative of power generation of electricity for our basic need and house holds , which could at the same time reduce the municipal garbage and also can be cost effective methods which could be used in place of coal .

The electricity produced from this methods was stored in the batteries from where it was given output when and wherever needed.

LITERATURE REVIEW

Philips and Mondal studied MSW disposal in India and presented a mathematical framework of sustainability options.

Hossain et al investigated MSW and their different types in Bangladesh. They asserted that incineraton technology played an important role by reducing space for further landfills and performed an important role for production of energy.

Udomsri evaluated the potential of MSW incineration in Thailand to mitigate climate change and sustainable direction for development of electricity generation.

EXPRIMENTAL SETUP

The proposed setup consists of a combustion chamber where the solid waste are combusted and the high pressurized smoke released is used to drive the turbine which is connected to a dynamo. The rotary motion of the turbine produces mechanical work in the dynamo which produces electrical energy. The electrical energy is stored in a battery which is used further.

COMBUSTION CHAMBER

It is a chamber in which a solid wastes like paper, plastic, organic matter, slug etc. are burned at high temperature to release heat and smoke.

TURBINE

Turbine is mechanical device that extracts thermal energy from pressurized smoke and converts into rotary motion. Because the turbine generates rotary motion, it is particularly used to drive an electrical generator.

DYNAMO

It is an electrical generator. This dynamo produces direct current with the use of a commutator. The dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electrical current.

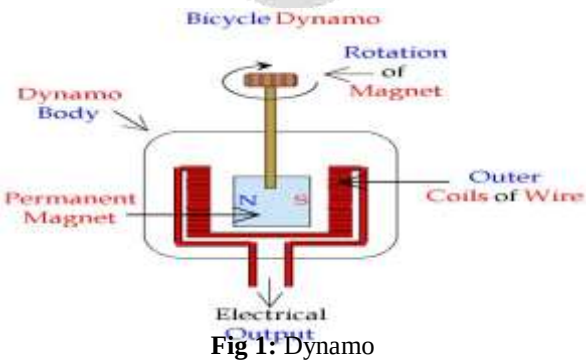

Fig 1: Dynamo

BATTERY

A secondary and rechargeable type battery is used. A battery uses one or more electrochemical cells, which stores chemical energy and make it available as electric current.

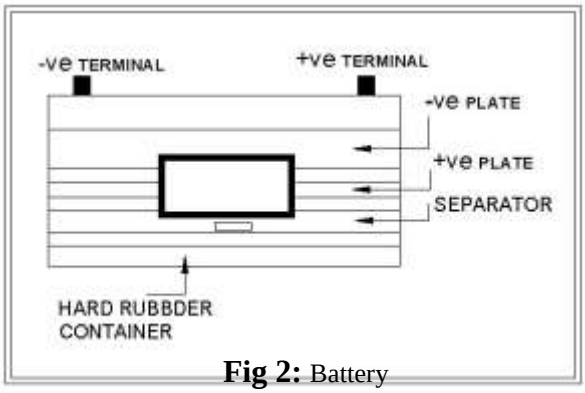

Fig 2: Battery

CALCULATIONS

TURBINES

Number of Blades = 25

Diameter = 10cm

INVERTER

It Converts DC to AC (4 Volts to 210 Volts)

BATTERY

4 Volt Rechargeable Battery

FORMULA TO BE USED

Area of Swept, $A = (22/7) \times (\text{radius of turbine})^2$

Velocity of the Turbine= $((22/7) \times D \times N)/60$

Where

D=diameter of turbine

N=number of revolution per minute

POWER AVAILABLE AT THE TURBINE,

$P = (1/2) \times \text{Density} \times (\text{Velocity})^3 \times Cp \times \text{Area}$

MODEL CALCULATION

Swept area by the turbine, $A = (22/7) \times \text{radius}^2$

$= 3.14 \times (0.05)^2$

$= \mathbf{0.00785\ m^2}$

Velocity of the turbine, V= ((22/7) x D x N)/60 = (3.14x0.10x45)/ 60 =**0.2357 m/s**

Power available at the turbine

=1/2x density x area x (velocity) ^{3} x Cp =1/2 x1.23 x 0.00785 x $(0.2357)^{3}$x0.4 =**$2.57x10^{-5}$ watts**

Revolutions Per Minute for turbine	Speed of turbine in m/s	Power Available At The Turbine
45	**0.2357**	**$3.222x10^{-5}$**
48	**0.2514**	**$3.875x10^{-5}$**
54	**0.2828**	**$4.374x10^{-5}$**
57	**0.2985**	**$5.1365x10^{-5}$**

Estimate Power in Different Speed

SMOKE AND DUST FILTER

The burning of solid wastes produces many dust particles and harmful smoke which are needed to be filtered to make it less harmful for the environ

APPLICATIONS

- In powerplants to produce electrical energy.
- Other industries where boilers are used.
- Waste water sewage treatment through heat energy.
- Curb the reliability on coal and petroleum energy sources.

FUTUIRE SCOPE

The solid wastes holds the greatest potential (organic or inorganic matter) to be used as an alternative of non-renewable sources of energy for production of electricity. As the resources will fell short in future and the wastes in form of plastic, wood, paper, metal, vegetative matter, animal dung etc. are increasing day by day, this method of using the wasters effectively for our purpose considering environmental issues will be of great use in future. Again and again municipal solid waste to energy conversion will also be an attractive and efficient way to resolve waste management and can be used to meet a portion of the electricity demand in the cities.

The modern technologies are not acting as a limiting factor in implementing recycling activities, but it's economics which will determine what is acceptable including the management cost and also the environmental cost and benefits**.**

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