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Generation of Electricity from Heat

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Abstract -Heat-to-Energy is a developing management in countries. There are many different technologies to generate electricity from heat. However, reuse and recycling are first prioritized as left a fraction of waste can be used as energy recovery. The initial cost to generate electricity from solid waste incineration is prohibitively high due to its cost of advance technology and the cost of equipment to control emissions. Thailand is agricultural based country and has experiences of many technologies to utilize waste to energy. Landfill gas and thermal gasification are increasingly interesting alternatives to municipal solid waste incineration and it is recommended that biogas technology is suitable and is cost effective in management of organic waste or animal manure waste.

This research studied in existing technologies in terms of electricity generated from waste, long term government policy, carbon dioxide reduction, electricity cost production and incentive investment.

Key Words: Stirling engine .inverter, battery ,generators.

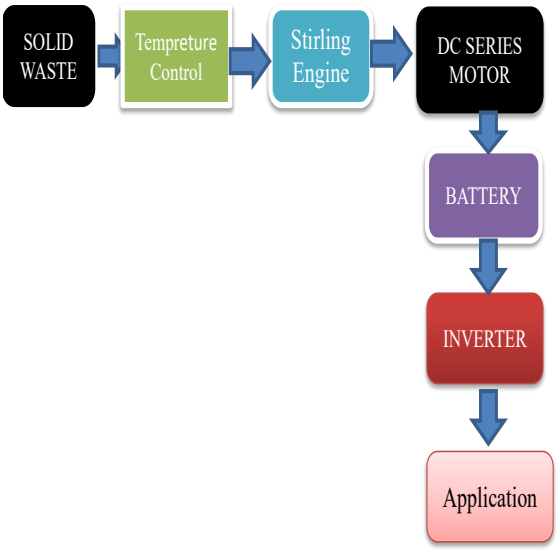
1.INTRODUCTION

Due to rapid increase in the production and consumption processes, societies generate as well as reject solid materials regularly from various sectors -agricultural, commercial, domestic, industrial and institutional. The considerable volume of wastes thus generated and rejected is called solid wastes. India produces 42.0 million tons of municipal solid waste annually at present. Per capita generation of waste varies from 200 gm. to 600 gm. per capita / day. Average generation rate at 0.4 kg per capita per day in 0.1 million plus towns. Collection efficiency ranges between 50% to 90% of the solid waste generated. Nowadays consumption- driven society produces an enormous amount of waste. This large amount of waste puts huge pressures on the city authority to manage waste in a more sustainable manner. Waste management systems have not received as much nation in the city planning process as other sectors such as water or energy. Therefore, gaps can be observed in waste management in current city planning. Rapid industrialization and population explosion in India has led to the migration of people from villages to cities, which generate thousands of tons of MSW daily.

The MSW amount is expected to increase significantly in the near future as the country strives to attain an industrialized nation status by the year 2020. Poor collection and inadequate transportation are responsible for the accumulation of MSW at every nook and corner. The management of MSW is going through a critical phase, due to the unavailability of suitable facilities to treat and dispose of the larger amount of MSW generated daily metropolitan cities. Unscientific disposal causes an adverse impact on all components of the environment and human health. MSW management encompasses planning, engineering, organization, administration, financial and legal aspects of activities associated with generation, storage, collection, transport, processing and disposal in an environmentally compatible manner adopting principles of economy, aesthetics and energy conservation. The management of MSW is going through a critical phase, due to the unavailability of suitable facilities to treat and dispose of the larger amounts of MSW generated daily in metropolitan cities. The MSW amount is expected to increase significantly in the near future as India strives to attain an industrialized nation status by the year 2020.

The management of MSW requires proper infrastructure, maintenance and upgrade for all activities. This becomes increasingly expensive and complex due to them continuous and unplanned growth of urban centers. The difficulties in providing the desired level of public service in the urban centers are often attributed to the poor financial status of the managing municipal corporations. Wastes placed in landfills are subject to either groundwater underflow or infiltration from precipitation and as water percolates through the waste, it picks up a variety of inorganic and organic compounds, flowing out of the wastes to accumulate at the bottom of the landfill. The resulting contaminated water is termed leachate and can percolate through the soil. Municipal landfill leachate is highly concentrated complex effluents which contain dissolved organic matters; inorganic compounds; heavy metals and xenobiotic substances.

2.BLOCK DIAGRAM



2.1 SOLID WASTE

A term that is used to refer to the process of collecting and treating solid wastes. It also offers solutions for recycling items that do not belong to garbage or trash. As long as people have been living in settlements and residential areas, garbage or solid waste has been an issue. Waste management is all about how solid waste can be changed and used as a valuable resource. Solid waste management should be embraced by each and every household including the business owners across the world. Industrialization has brought a lot of good things and bad things as well. One of the negative effects of industrialization is the creation of solid waste.

2.2 TEMPERATURE CONTROL

Ideal for use in the glass, ceramics or the metal industry: the test 835-T2 high temperature infrared thermometer is the ideal professional tool for a wide variety of thermal applications in the high temperature range. The test 835-T2 infrared thermometer has an extremely wide temperature range which allows you to carry out thermal measurements up to 1500 °C - and all from a safe distance. It doesn't matter whether the objects are small, hard to reach, moving or very hot. Thanks to the leading-edge technology tucked away inside, the test 835-T2 high temperature infrared thermometer allows you to measure the temperature in all four cases quickly and safely.

Features

Digital Display

Temperature Range : -50^{O}c To 70^{O} c

Temperature Accuracy +/-0.1^{O}c

Display Size: 36*16 Mm

Power Source: Dc 1.5v

The temperature sensor can also be used to automatically measure the degree of emission of a particular surface. This makes it easier to carry out subsequent infrared measurements.

There is also a wide range of optional accessories - including a tripod and a robust carry case – that allows you to customize your test 835-T2 infrared thermometer to suit your needs.

2.3 STIRLING ENGINE

The aim of this project was to design, build, and test a Stirling engine capable of generating between 200-500 watts of electricity. Several designs were studied before settling on an alpha type configuration based around a two-cylinder air compressor. Concentrated solar energy was considered as a potential heat source, but had to be replaced by a propane burner due to insufficient solar exposure during the testing timeframe. The heater, cooler, regenerator, flywheel and piping systems were designed, constructed, and analyzed. Instrumentation was built into the engine to record temperatures throughout the assembly. Several tests were performed on the engine in order to improve its running

efficiency, and critical problem areas were isolated and addressed.

Working of Stirling Engine –

Most of the working gas is in the hot cylinder and has more contact with the hot cylinder's walls. This results in overall heating of the gas. Its pressure increases and the gas expands. Because the hot cylinder is at its maximum volume and the cold cylinder is at the top of its stroke (minimum volume), the volume of the system is increased by expansion into the cold cylinder

The system is at its maximum volume and the gas has more contact with the cold cylinder. This cools the gas, lowering its pressure. Because of flywheel momentum or other piston pairs on the same shaft, the hot cylinder begins an upstroke reducing the volume of the system.

The system is at its minimum volume and the gas has greater contact with the hot cylinder. The volume of the system increases by expansion of the hot cylinder.

Low Capacity Stirling Engine –

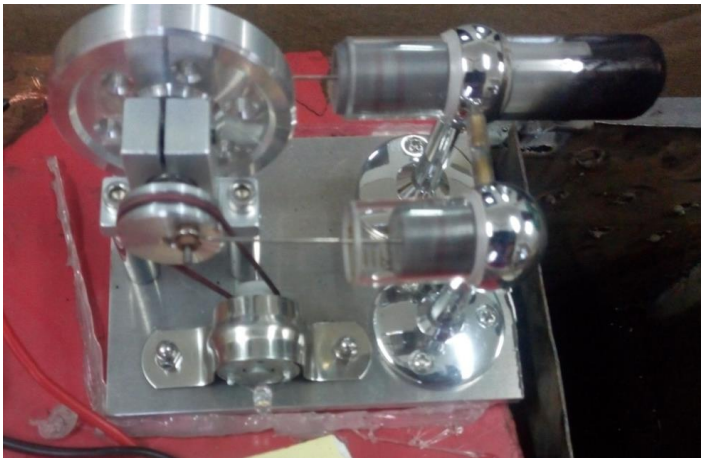


Figure 05 Stirling Engine

Features:

- Model: SC001
- Max. Speed: 1300 to 1500 RPM
- Running Speed: 200 RPM
- Size: 105*90*84 MM/ 4.13 *3.54*3.30 in
- Material: Steel, and Aluminum
- Weight: 540g

It's mainly constructed by metal so it is heavy thereby can work stably on table. It's mainly constructed by metal so it is heavy thereby can work stably on table. It's an amazing conversation pieces on your desk, decorative and impressive. It's funny to see people's looks and reactions when they squeeze a little shot for this Stirling engine.

Light the alcohol burner, let it warm the glass cylinder for 20 seconds, and then give the wheel a gently push, it will run like a charm. All of your guests want to know what happened, ice-breaking success. To be admired and to be talked more from your friends if you have this magic stuff. This Stirling engine designed reasonable and compact. You can bring it home, school office with convenient in your bag.

2.4 DC MOTOR AS GENERATOR -

Permanent magnet DC generators do not require external field excitation because it has permanent magnets to produce the flux. These are used for low power applications like dynamos. Separately-excite DC generators requires external field excitation to produce the magnetic flux. We can also vary the excitation to get variable output power. These are used in electro plating and electro refining applications. Due to residual magnetism present in the poles of the stator self-excited DC generators can able to produce their own magnetic field ones it is started. These are simple in design and no need to have the external circuit to vary the field excitation. Again these self-excited DC generators are classified into shunt, series, and compound generators. These are used in applications like battery charging, welding, ordinary lightening applications etc.

A dc generator can be used as a dc motor without any constructional changes and vice versa is also possible. Thus, a dc generator or a dc motor can be broadly termed as a dc machine. These basic constructional details or also valid for the construction of a dc motor. Hence, let's call this point as construction of dc machine instead of just construction of dc generator

2.5 BATTERY-

Batteries are an excellent emergency power source, but require some basic information to use properly. They are electrochemical devices. They have plates, usually metallic, and either a solution or a moist compound between the plates. A chemical reaction takes place in the battery when it is discharged that produces a flow of electrons out one plate on the negative side and into another plate on the positive side. Actually a single unit of a battery is a *cell.* A battery is called a "battery", because it is a "battery" of cells together. Each cell will have a characteristic voltage range between charged and discharged that is set by the electrochemical nature of the metals used and the reactions that go on in the solution, gel, wet powder, etc. between the plates. Some non-rechargeable batteries contain other chemicals to absorb waste byproducts from the chemical reaction that moves the electrons along.

Specification-

Voltage - 6 Volts

Current - 4.5A.H

Maximum Charging Current- 1.5A

Maximum Discharging Current- 75A

Floating Life- 2-3 Years

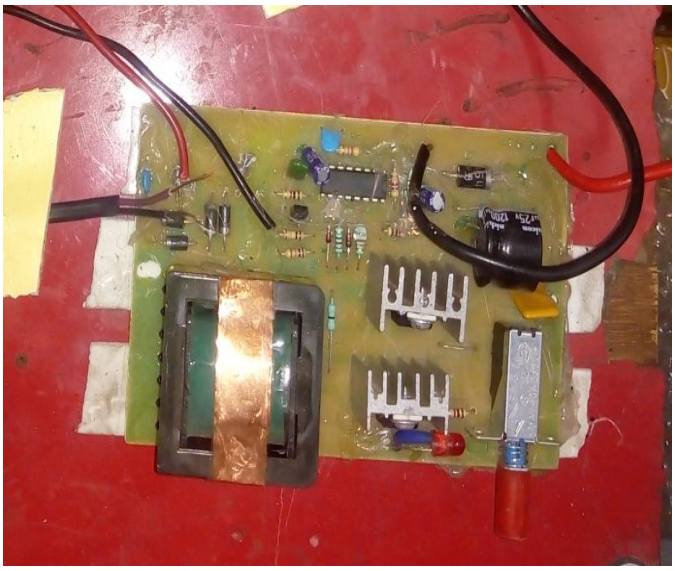
2.6 INVERTER

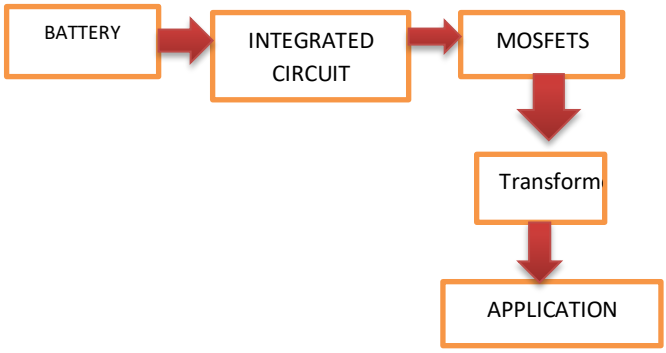
A power inverter, or inverter, is an electronic device or circuitry that changes direct current (DC) to alternating current (AC).The input voltage, output voltage and frequency, and overall power handling depend on the design of the specific device or circuitry. The inverter does not produce any power; the power is provided by the DC source.

A power inverter can be entirely electronic or may be a combination of mechanical effects (such as a rotary apparatus) and electronic circuitry.

This is the quite simple DC to AC inverter that provides 220 volt AC when a 12 volt DC power source is provided. It can be used to power very light loads, night lamps and codeless telephones, but can be modified into a powerful inverter by adding MOSSFETS. It uses 2 power IRFZ44 MOSSFET for driving the output power and the 4047 IC as an astable multi vibrator operating at a frequency around 50Hz.

The output of transformer has 9volt, 2amp on the secondary and 230 volt on primary. Use suitable heat sinks in MOSSFETs

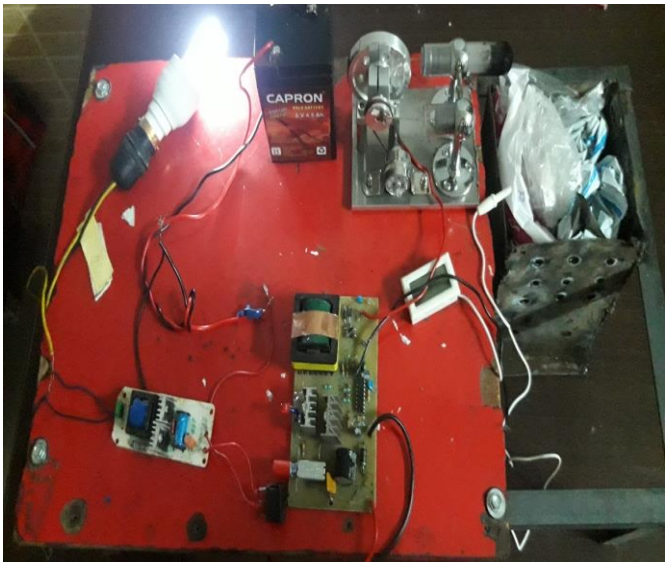




Block Diagram of Inverter

3.RESULT AND ANALYSIS

We perform a test on inverter to calculate the output voltage. The inverter gives output of approximately 220 Volt. We test the battery and check output of the battery.



Calculations:-1) 5.6 million plastic per annum

2) 15342 tons per day

3) 1kg plastic = 150 degree Celsius

4) Stirling engine required minimum 40 degree Celsius heat

= 40/150

=0.2666 kg

Testing of project:

Input voltage=6v

Input current=4.5amp

Inverter output= 70watt

Dc motor output voltage=12v

Speed of dc motor =300rpm

Led bulb = 3v

Inverter Calculation

Power drawn by battery

Voltage *current=6*4.5=27watt

Power drawn by inverter output

220v*0.113amp=27watt

Sr. No	Temperature In Degree Celsius	Speed In Rpm	Time In Seconds
1	40	180	30
2	48	240	45
3	51	310	55
4	70	820	67

Table No.4 Stirling Engine Testing

Stirling Engine Testing

Project Output Result-

Motor output=1W

Battery output=27W

Inverter output = (Motor output *Battery output)-losses

Inverter output=24W

Project Output= 24 watt

4. CONCLUSIONS

Waste to energy solves the problem of municipal solid waste disposal while recovering the energy from waste material with the benefits of environmental quality, increasingly accepted as a clean source of energy. The municipal solid waste is used as fuel for the production of electricity. The municipal solid waste should be considered as alternate source of energy and every municipal corporation should use this technology to reduced pollution, preserve coal, and reduce production of greenhouse gases protection the ozone layer. By using municipal solid waste as fuel the pollution will be reduced and we will get the power which can be used in the poor village were electricity is less.

By applying 47degree of heat , the engine start to rotate and it produce 2-3 volt energy output .To produce more output voltage high capacity of engine can be used , which produces 30-40 volts.

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