



Waste Incineration and Energy Production

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Abstract: India generates about 60 million tons of trash every year. 10 million tons of garbage is generated in just the metropolitan cities! Waste is a major environmental problem in all over the world. With increasing population and advancement in science and technology, natural resources are also exploited. As a developing country, one of the major crisis faced by India is waste management. India generates about 60 million tons of waste every year. Increasing population and advancement in science and technology has begun to exploit the natural resources also. Nowadays an emphasis is given on waste management. Rather than managing waste, we should be looking forward for innovative methods to dispose and recycle waste. Even though solid waste is being recycled in various methods, organic waste is still a question mark. When organic waste is dumped in landfill, it undergoes anaerobic decomposition and generates methane, which is a 25 times more potent greenhouse gas than carbon dioxide. Our project is simply a implementation of burning organic waste using incinerator and transforming the heat produced into voltage. Conversion of heat to electricity is carried out by thermoelectric generator.

Keywords: Incineration, Arduino Microcontroller, Step up Booster, Thermoelectric Generator

I. INTRODUCTION

As a developing country, one of the major crisis faced by India is waste management. India generates about 60 million tons of waste every year. Increasing population and advancement in science and technology has begun to exploit the natural resources also. Nowadays an emphasis is given on waste management. Rather than managing waste, we should be looking forward for innovative methods to dispose and recycle waste. Even though solid waste is being recycled in various methods, organic waste is still a question mark. When organic waste is dumped in landfill, it undergoes anaerobic decomposition and generates methane, which is a 25 times more potent greenhouse gas than carbon dioxide. In countries where land is more scarce this landfill method is not practically possible. Incineration plants are used for waste management. Incineration is a disposal method in which solid organic wastes are subjected to combustion so as to convert them into residue and gaseous products. The energy from waste offers recovery of energy by conversion of non recyclable materials through various process including thermal and non thermal technologies. Energy that is produced in the form of electricity, heat, fuel using combustion pyrolyzation, gasification or anaerobic digestion is clean and renewable energy with reduced carbon emissions and minimal environmental impact than any form of energy. Though we have various methods in energy generation using incineration plants It cannot be implemented in small scale and its manufacturing cost is very high since it requires highly expensive components like turbine, generators etc. it also requires a huge area for its construction. It requires highly qualified labours so we have to provide high wages. Our proposed system is an effective method for organic waste management and electrical energy is also being produced from organic waste in small scale as well as in large scale with effective cost. It's more reliable and eco friendly. We are focusing on a local area, such as hospitals, educational institutions, hotels and so on

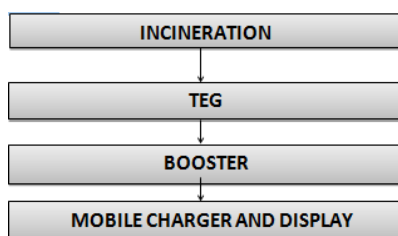
II. RELATED WORK

There are several approaches for the waste management literature. The policy options and measures summarized below represent a menu of possible actions that city leaders may consider to improve their municipal waste management practices' which will in turn contribute to improving the living environment of its citizens [2]. While specific programmes/projects and the scale of interventions may differ from city to city depending on their unique characteristics (geography, population, waste streams, etc.), overarching policy directions may apply regardless of such differences.[1] The possible future policy options available with the policy makers for management of municipal solid waste are to promote either/all of the existing alliances between private-private enterprises, private-public enterprises and private-public-community[4].The selected scenario should be based on socio-economic, environmental and health considerations. It should fulfill the basic goal of recycling the maximum waste generated, creating maximum employment through cleaner methods without bringing any threat/reducing the potential health hazards to the lower rung of the waste recycling sector and improving their socio-economic conditions, as well[3] Another option is to



promote formation of micro-enterprises among the waste-recycling sector through various policies. It is observed from various case studies of developing countries like Latin America, Egypt, etc[4] that if waste pickers and recyclers get official recognition from the local authorities and they organize themselves and institutionalize their activities, there is an overall improvement in the living conditions of these people. Micro-enterprises in the field of solid waste management sector are a new process in India and only few examples are available. The Self Employed Women's Association (SEWA), Ahmadabad, India successfully improved the living conditions of women paper pickers, by organizing them into cooperatives and by searching for easily accessible raw materials in bulk quantity

III. METHODOLOGY



A. Hardware analysis and components:

The following components have been utilized for the implementation of this project

- a. **Waste:** The organic waste (peels of vegetables, dry leaves etc) is dumped into the incinerator.
- b. **Incinerator:** Incineration is essentially a controlled process of burning waste materials. It reduces the total volume of the waste materials, making it easier for the public authorities to manage public garbage. The incinerator produces heat, ie later converted towards producing electricity. Conversion of heat to electricity is carried out by thermoelectric generator
- c. **Thermoelectric generator:** Seebeck Effect : In 1821 Thomas Seebeck, a German physicist discovered that when two dissimilar metal (Seebeck used copper and bismuth) wires are joined at two ends to form a loop, a voltage is developed in the circuit if the two junctions are kept at different temperatures. The pair of metals forming the circuit is called a thermocouple. The effect is due to conversion of thermal energy to electrical energy. The existence of current in the closed circuit may be confirmed by the deflection of a magnetic needle caused by the magnetic field of the current. Joule heating produced in the wires closing the circuit with a capacitor to accumulate measurable charge placing a sensitive ammeter or galvanometer in the circuit measuring the amount of chemical deposit at the electrodes of an electrochemical cell.
- d. **Booster:** The CE8301 Series is a CMOS PFM-control step-up switching DC/DC converter that mainly consists of a reference voltage source, an oscillator, and a comparator. The PFM controller allows the duty ratio to be automatically switched according to the load (light load: 50%, high output current: 75%), enabling products with a low ripple over a wide range, high efficiency, and high output current. With the CE8301 Series, a step-up switching DC/DC converter can be configured by using an external coil, capacitor, and diode. The built-in MOS FET is turned off by a protection circuit when the voltage at the LX pin exceeds the limit to prevent it from being damaged. This feature, along with the mini package and low current consumption, makes the CE8301 Series ideal for applications such as the power supply unit of portable equipment.
- e. **Arduino Uno Microcontroller:** The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.
- f. **LCD Display :** The HD44780U dot-matrix liquid crystal display controller and driver LSI displays alpha numerics, Japanese kana characters, and symbols. It can be configured to drive a dot-matrix liquid crystal display under the control of a 4- or 8-bit microprocessor. Since all the functions such as display RAM, character generator, and liquid crystal driver, required for driving a dot-matrix liquid crystal display are internally provided on one chip, a minimal



system can be interfaced with this controller/driver. A single HD44780U can display up to one 8-character line or two 8-character lines. The HD44780U has pin function compatibility with the HD44780S which allows the user to easily replace an LCD-II with an HD44780U. The HD44780U character generator ROM is extended to generate 208 5 ×8 dot character fonts and 32 5 ×10 dot character fonts for a total of 240 different character fonts. The low power supply (2.7V to 5.5V) of the HD44780U is suitable for any portable battery-driven product requiring low power dissipation.

B .Working Principle

Organic waste, or green waste, is organic material such as food, garden and lawn clipping. We use a chamber, called incinerator for the combustion of these organic waste. Incinerator is waste treatment process that involves the combustion of organic substances. This methodology is described as thermal treatment. Incineration of waste materials converts waste into ash, flue gas and heat. The heat generated by incineration can be used to generate electric power. The heat thus produced is converted to electrical energy by using thermoelectric generators (TEG), also called Seebeck generators. It is a solid state device that converts heat flux (temperature differences) directly into electrical energy through a phenomenon called seebeck effect. These generators can be used here in order to convert waste heat to additional electric power. This electricity produced can be stored for further use by using a battery and also voltage generated can be displayed using a LCD display.

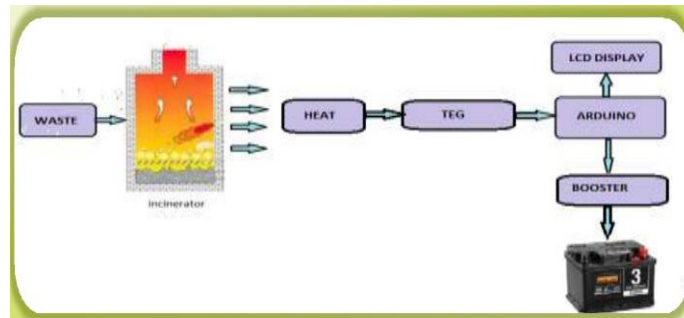
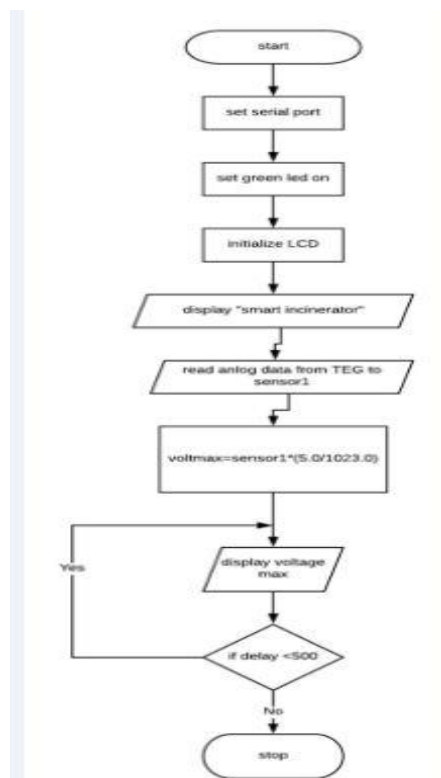


Figure 1: Block diagram

C. LCD Display interfacing





V. RESULTS AND DISCUSSION

At the present we get a 5 volt as a output. Thus we are converting a useless product to a useful product i.e waste to electricity .In the prevailing society the rate of diseases is increasing due to the dumping of waste. By this system we can reduce this. Pollution rate can also be controlled .It can be considered as an efficient method for the proposed system. We are assuring that it will be a boon to the entire society.

VI. FUTURE SCOPE

We can change the voltage range up to 24 voltages. An excellent system can be achieved with the increase in the voltage level .we can able to implement a nature friendly system which is of less pollution. A low cost efficient system can produced If, it is implemented in the large the energy scarcity problem can be drastically reduced

CONCLUSION

Our proposed system is an effective method for organic waste management and electrical energy is also being produced from organic waste in small scale as well as in large scale with effective cost .It more reliable and eco friendly. We are focusing on a local area, such as hospitals, educational institutions, hotels and so on .Heat is a form of non conventional energy which can be converted to electricity by simple means. Hence it can be implemented and maintained easily. We can even implement it in houses, residential units . Thus the produced electricity can be stored and used. The benefits of our project are an eco friendly method for managing waste. It is Free from pollution. The most prominent method is that it converts non conventional energy to conventional energy. The by-product ash can be used as fertilizers.

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