THE EFFECT OF ENVIRONMENTAL REGULATION ON SOLID WASTE TO ELECTRICAL ENERGY TRANSFIGURATION

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ABSTRACT

Due to being solid state, noiseless and maintenance free, thermoelectric devices have found wide applications in different areas since they discovered over 180 years ago .With the increase of population of a country, proper management of cumulative of domestic waste becomes more acute for maintaining green environment. In conventional approach number of trucks collects the MSW and then transport and transfer these domestic waste in a pre-specified location, but all the above jobs are not properly monitored and burning the waste in common areas that affects the lives and property .This paper provides the generation of power by disposing the domestic solid waste without destructing the land, by using garbage collector and thermoelectric method in order to make pollution free. From the availability of many sources, we choose the burning of solid waste by thermoelectric method because in these days the disposal of solid waste is a great challenge and so we adapted efficient way to dispose and getting energy from the waste. Here, thermoelectric method is adapted for power generation, heater is used to burn the waste.

Key words: Thermoelectric generator, Heater, Microcontroller ATmega328,GSM module, serial communication

INTRODUCTION

Generally solid waste is defined from the household refusal. The non-hazardous solid wastes are from industries, institutions such as hospitals, markets and streets. All these types of solid waste are a problem to environment. In developing countries, waste management is becoming a social issue due to unmonitored act.

A significant amount of solid waste generated in country are not collected and managed properly. In the conventional approach, a number of trucks from the municipal authority are sent to the waste bins to collect the solid waste (SW). The wastes are loaded in the truck and then transported and transferred to the pre-specified locations. However the category of the people involved in collecting and transporting the wastes are usually not responsible enough to make the job well done. Very often the wastes are not collected from each and every waste bin properly due to driver's attitude.

PROPOSED METHODOLOGY

SYSTEM OVERVIEW
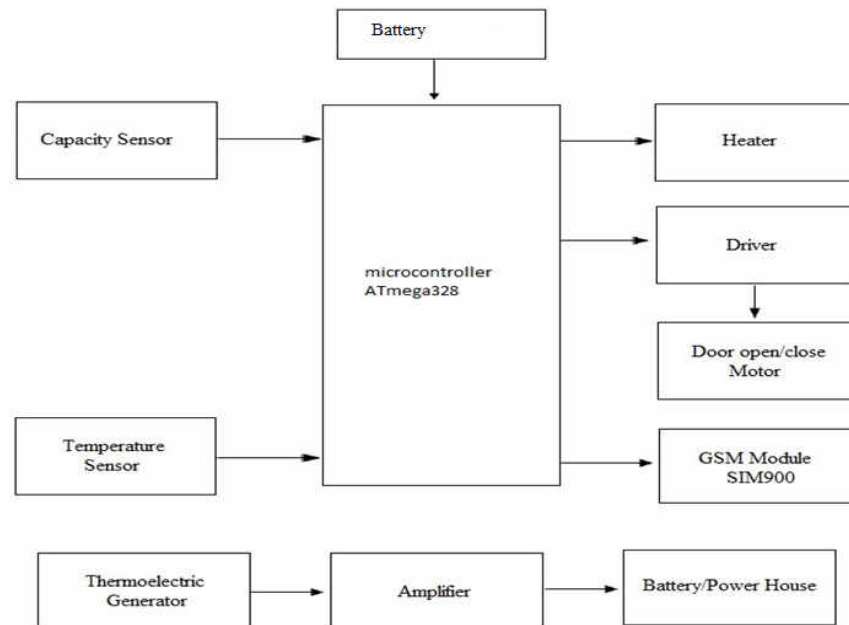
TERMINOLOGIES

1. MICROCONTROLLER

The AVR is a 8-bit RISC single chip microcontroller, which was developed by Atmel 1996.The AVR was one of the first microcontroller families to use on-chip flash memory for program storage. TheAtmega328 has 23 I/O ports which are organized into 3 groups:

Port B (PB0 to PB7)

Port C (PC0 to PC6)

Port D (PD0 to PD7)

B port is used as a serial communication port, C port is used as analog to digital converter and D port is used as external timer and counter. The ATMEGA328 has some special features: they are high performance, low power Atmel AVR 8-bit microcontroller, high endurance non-volatile memory segments.

2. CAPACITY SENSOR

IR transmitter and Receiver

IR LED emits infrared radiation. This radiation illuminates the surface in front of LED. Surface reflects the infrared light. Depending on reflectivity of the surface, amount of light reflected varies. This reflected light is made incident on reverse biased IR sensor. When photons are incident on reverse biased junction of this diode, electron-

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hole pairs are generated, which results in reverse leakage current. There are three IR sensors used in the top of the garbage collector in order to find out, if the garbage collector is full or not. If garbage collector is full, the IR produce 3.3v and the signal is given to the microcontroller.
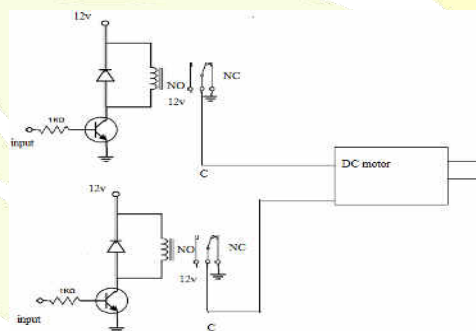

Figure 1: IR Sensor

3. DRIVER CIRCUIT

Figure 2:Relay Driver

The electromagnetic relay consists of a multi-turn coil, wound on an iron core, to form an electromagnet. When the coil is energized, by passing current through it, the core becomes temporarily magnetized. The magnetized core attracts the iron armature. The armature is pivoted which causes it to operate one or more sets of contacts. When the coil is de-energized the armature and contacts are released. The coil can be energized from a low power source such as a transistor while the contacts can switch high powers such as the mains supply. The relay can also be situated remotely from the control source. Relays can generate a very high voltage across the coil when switched off. This can damage other components in the circuit. To prevent this a diode is connected across the coil. The cathode of the diode is connected to the most positive end of the coil. The spring sets (contacts) can be a mixture of n.o n.c and c.o. Look at the page on switches to see how they can be used in circuits. Various coil operating voltages (ac and dc) are available. The actual contact points on the spring sets are available for high current and low current operation. The REED RELAY has a much faster operation than the relays described above. The circuit above is a motor control circuit using a low voltage relay to control a high power motor. When the "start" button is pushed, the 12 volt circuit is completed and the relay is energized. The three sets of contacts close and 240 volts is applied to the motor. Since there is now a closed relay contact across the "start" switch, when the button is released the relay continues to be energized and the motor continues to run. The relay has "latched on". When the "stop" button is pushed the 12 volt circuit is broken. The relay is de-energized and the motor stops. In our project we are using two

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relays for run the dc motor forward and reverse direction. First we are giving 5v to relay1, from output of microcontroller and relay2 is connected to ground pin in microcontroller, in this condition motor is run in forward direction. Next alternatively, we are giving 5v to relay2 and ground to relay1, in this condition motor is run in reverse direction.

4. TEMPERATURE SENSOR

A temperature sensor is a device, typically, a thermocouple that provides for temperature measurement through an electrical signal. Its measurement is by detection of heat radiation, particle velocity, kinetic energy, or most commonly, by the bulk behavior of a thermometric material. If it senses the temperature above room temperature and it gives the signal to microcontroller.

5. THERMOELECTRIC GENERATOR

Figure 3: Thermo Electric GeneratorTEP1-126T200

Thermoelectric materials can be used for either cooling or power generation. Its construction consists of arrays of N & P type semiconductors in which, by applying a heat source on one side and a cooling heat sink to the other side, electric power is produced and vice versa. When a temperature difference is established between two ends of semiconductor element, a voltage is generated.

The red line is connected to the positive electrode, the black line is connected with the cathode, and there is a temperature difference between the positive and the negative. In our project we are using three thermoelectric generator that are placed in the bottom of the garbage collector. If the temperature difference is reaches to above 40^0c, the generator produces 2.2v output. The tested outputs are shown in below table.

Temperature	Voltage	Current
40	2.2v	390mA
60	3.6v	489mA
80	4.8v	569mA
100	6.0v	658mA
120	7.2v	759mA

3.3v to 12v Amplifier

This module is a non-isolated step-up (boost) voltage converter featuring adjustable output voltage and high efficiency. This amplifier is used to increase the output voltage of thermoelectric generator.

Figure4: Amplifier

XTW6009 is a 4 a switch current high-performance step-up (BOOST) module. The XL6009E1 module USES the second generation of high frequency switch technology as the core chip, LM2577 performance far beyond the first generation of technology. If the input / output current is more than 2A (need to plug heat sink), if the output power is higher than 15 W, advise to add the heat sink. Atlast the amplifier output is stored in the battery.

6. GSM MODULE

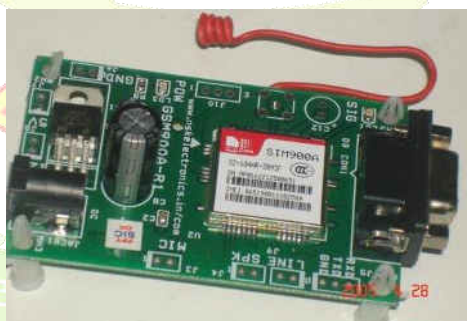
Figure 5: GSM module

GSM/GPRS Modem is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/1800MHz.The Modem is coming with RS232 interface, which allows you to connect microcontroller with RS232 Chip (MAX232). The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer. The onboard Regulated Power supply allows you to connect wide range unregulated power supply. AT Commands are broadly differentiated in two categories as below:

1. Basic Commands

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2. Extended Commands

Basic Commands are those commands that do not start with '+'. For Example, ATD Note (For Dial), ATA Note (For Answer).

Extended Commands are those commands that starts with '+'. For Example, AT+CMGS Note (For Send SMS). All GSM AT Commands are Extended Commands.

7. SOFTWARE

Platform: arduino software

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and pen the serial monitor.

8. RESULTS AND DISCUSSION

The system was implemented by first designing the hardware and later the software. It was rigorously tested for its proper operation and reliability. Hardware design began by designing individual circuits and their testing. Suitable modifications were carried out at various stages as necessary. After the confirmation of the proper operation of each circuitry, the Printed Circuit Board (PCB) was designed. The circuit was rigorously tested once again after mounting of all components on the PCB. Voltage levels and signals were checked for their correctness at various stages. Some minor modifications were carried out as needed.Software design was started after the hardware was fully fabricated and tested successfully. Programs were written by using Arduino software and tested successfully. After the program was dumped the system undergoes into checking process and the system functioned as expected and the desired results were produced.

9. CONCLUSION

The objective of the project was to produce energy from solid domestic waste. With the objective keeping in front, a micro-controller based embedded system integrated with serial communication and GSM technology is developed in this project. Since it is a micro-controller based embedded system, it is portable and low cost. Of the variety of technologies available, thermo electric effect has attracted particular attention for converting domestic waste into more useful and valuable electrical energy. A municipal authority can use this type of system to monitor the wastage clearance status in real time and based on the recorded information, they can prepare different reports and measure the performance.In the increase of population, to overcome the land destruction, we can adopt this methodology which helps to prevent the environment that are getting affected due to burning the waste in open source.

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