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ARDUINO BASED CONTROLLER FOR INCINERATOR

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ABSTRACT:Today the disposal of waste is become a serious problem. Both biodegradable and non- biodegradable waste can prove hazardous for health. If proper and complete is not done-there are different methods of waste disposal, they are Landfill, Incineration or combustion, Recovery and recycling, Plasma gasification,Composting, Waste to energy, Avoidance or waste minimization. The incinerator burns or incinerates waste like solid cloth, cotton waste, sanitary napkins, paper, towels etc. The waste gets converted in to ash and other non- hazardous residues. The biggest advantage of this type of method is that it reduce the volume of solid waste to 20%-30% of the original volume, decreases the space they take up and reduce the stress on land fill. The process is also known as thermal treatment where solid materials are converted by incinerators in to heat, gas, steam and ash. The incinerator is uses friendly and manually operated.

There are different methods of incineration, they are Electrical, Flame, Liquid gas, Solar,Gas. The electrical method of incineration process needs high power and main disadvantage of this method is power wastage. This disadvantage minimizes Self Powered Incinerator. The heart of the Self Powered Incinerator is Arduino board. Arduino board controls the most of the functions in the incinerator. Arduino is an open-source platform which consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) .

KEYWORDS: Waste management, Arduino, Incinerator, Instrumentation, Safety, Control, Solar panel

I.INTRODUCTION

A waste treatment technology, which includes the combustion of waste for recovery energy, is called as "Incineration". Incineration coupled with high temperature waste treatment is recognized as thermal treatment. During the process of incineration the waste materials that is treated is converted in to IBM , gases, particles and heat. These products are later used for generation of electricity. The gases, flue gases are first treated for eradication of pollutants before going in to atmosphere. Incineration reduces the mass of the waste from 95%-96%.This reduction depends up on the recovery degree and composition of materials.

The term incineration means to burn something until nothing is left but ashes. An incinerator is a unit or facility used to burn ,trash and other types of waste until it is reduced to ash. The device is constructed of heavy , well insulated materials ,so that it close not gives off extreme amount of external heat . The high level of heat kept inside the furnace or unit. So that the waste is burned quickly and efficiently. If the heat were allowed to escape, the waste would not burn as well.

This furnace is designed to dispose of trash or waste effectively, eliminating the high cost of having it hauled away and deposited elsewhere ,piling even more rubbish a top existing landfill. Incinerators also serve to keep dangerous materials from finding their way to landfill where they can harm people, including those that the work in such facilities. Another benefit is the fact that the device can produce power in the process of waste burning, though not all activity does harness that power.

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II.ARDUINO BASED CONTROLLER

The major parts of arduino based controller for self-powered incinerator are,

- Solenoid Valve
- Mesh
- Arduino (Temperature Controller, Timer)

SOLENOID VALVE

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid . In the case of a two-port valve the flow is switched on or off. In the case of a three port valve, the outflow is switched between two outlet ports. Multiple solenoid valves can be placed together in a manifold.

Solenoid valves are the most frequently used control element in fluids. Their tasks are to shut off release does, distribute or mix fluids. They are found in many application areas. Solenoids are fast and safe switching, high reliability, long survive life, good medium compatibility of the materials used low control power and compact design.

Principle

Solenoid is a simple electromagnetic device that converts electrical energy directly in to linear mechanical motion, but it has a very short length of movement.

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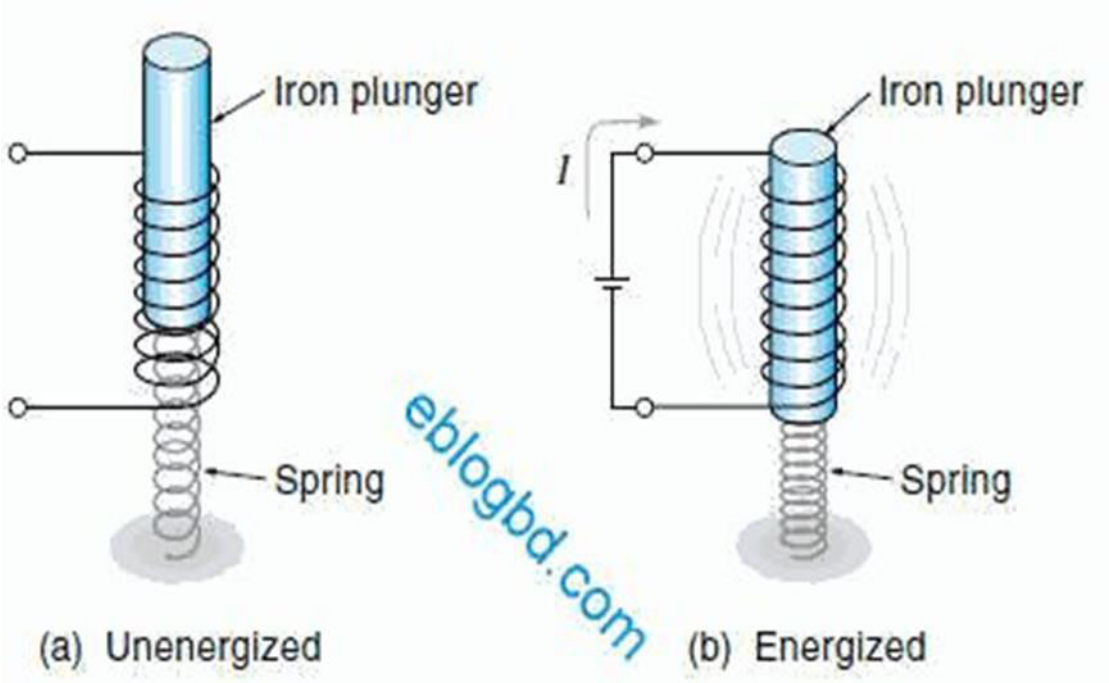

III.OTHER MAJOR COMPONENTS

Solenoid

The solenoid consists of a coil if wire with an iron plunger that is allowed to move through the center of the coil. Above figure shows the solenoid in the UN energized state. The plunger is being held about halfway out of the coil by a

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spring. When the coil is energized, the resulting magnetic field pulls the plunger to the middle of the coil. The magnetic force is unidirectional a spring is required to return the plunger to its UN energized position.

Solenoid valve is the combination of a basic solenoid and mechanical valve. So a solenoid valve has two parts namely –Electrical solenoid, mechanical valve. Solenoid converts electrical energy to mechanical energy and this energy is used to operate a mechanical valve that is to open, close or to adjust in a position.

Components of Solenoid

Common components of solenoid valve are,

- Solenoid subassembly
- Solenoid coil
- Core tube (plunger tube, armature tube, solenoid valve tube)
- Plunge nut
- Shading coil
- Spring
- Backup washer
- Diaphragm
- Beed hole
- Disc
- Valve body
- Seat

Operation of Solenoid

There are many valve design variation. Ordinary valve can have many ports and fluid paths. A two way valve, for example, it has two ports. If the valve is open then, the two ports are connected and fluid may flow between the ports. If the valve is closed then, ports are isolated.

If the valve is open, solenoid is energized then the valve is termed normally open. Similarly if the valve is closed when the solenoid is not energized then the valve is termed as normally closed.

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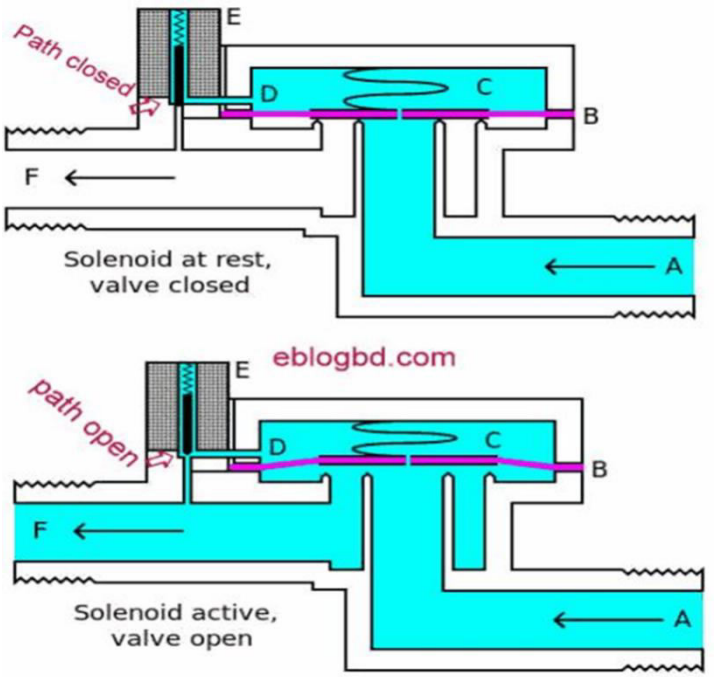

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Solenoid valve are also characterized by how they operate. A small solenoid can generate a limited force. If that force is sufficient to open and close the valve then a direct acting solenoid valve is possible.

MESH

Mesh is a barrier made of connected standard of metals, fibers or other flexible, ductile metal. A metal is similar to web or a net in that it has many attached or woven standard.

Metal mesh is used in *Incinerator*. The purpose of meshes in incinerator is to filter the ash and collect in ash box.

A metal mesh may be woven, knitted, expanded, photo-chemically attached or electro formed (screen filter) from steel or other metal. The opening or space enclosed by the threads of a net between knot and knot, or the threads enclosing such a space.

For ash filter, after combustion in incinerator wire meshes are used, which is also called wire cloth or wire fabric, is a versatile product that has thousands of different applications throughout the world. From industrial uses, such as sifting and filtration, to commercial uses, such as insect screening and animal fencing. Wire mesh is a common product that most of us see and use every day.

There are different types of wire meshes. The metals and alloys listed below are commonly used in woven wire cloth and some types of welded wire mesh. Different alloys and small variations in element content produce a wide range of corrosion, abrasion, and heat resistant characteristics.

- Alloy mesh
- Brass mesh
- Bronze mesh
- Copper mesh

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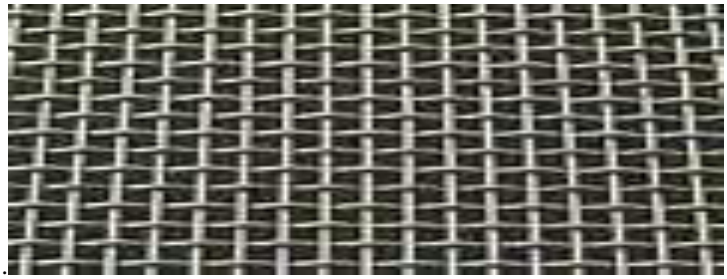
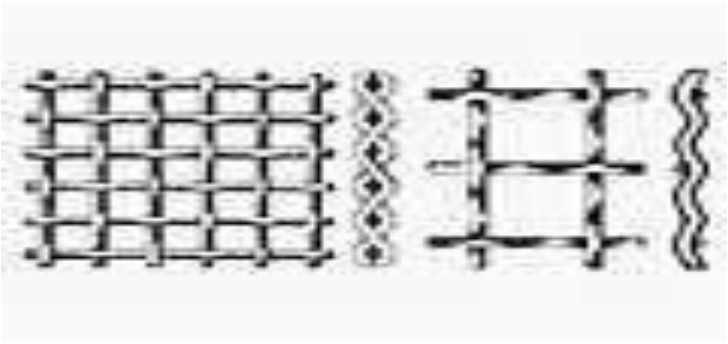
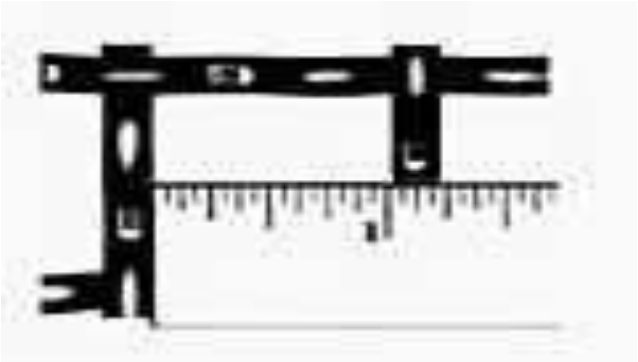
- Plain Steel mesh
- Other alloy meshes



Relatively low cost, high strength metal for many general applications such as filtration, window guards, fireplace screens, and shaker screens. It is primarily constructed of Iron (Fe) with small additions of carbon (0.05-1.30%). Small variations in carbon content create various desirable property variations. High carbon content increases resistance to abrasion and impact, making it useful for gravel and stone separating in the mining and coal industries. Galvanizing plain steel wire mesh improves durability and corrosion resistance. Width opening of plain steel mesh is 1.850”-1.2490”.





IV.ARDUINO

Arduino is the main part of Self powered Incinerator .In this incinerator mainly Arduino is used for control temperature, control gas flow through the solenoid valve and it also used for Timer function.

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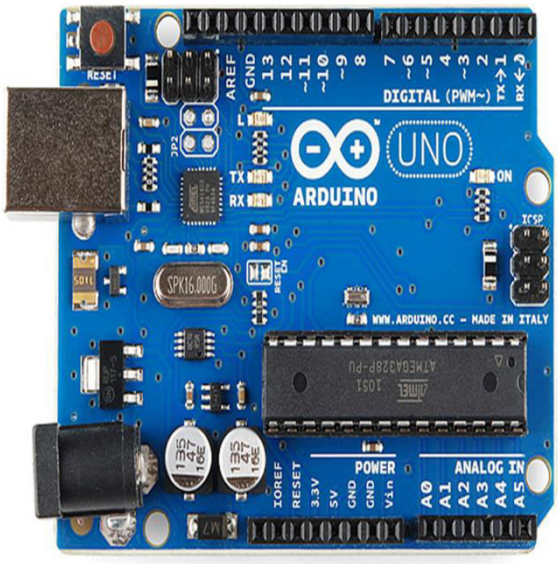
Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable.

The Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

V. ARDUINO BASED CONTROLLER

Arduino is common term for a software company, project, and user community that designs and manufactures computer open-source hardware, open-source software, and microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog I/O pins that can interface to various expansion boards (termed shields) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages, C and C++.



The first Arduino was introduced in 2005, aiming to provide a low cost, easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

Arduino boards are available commercially in preassembled form, or as do-it-yourself kits. The hardware design specifications are openly available, allowing the Arduino boards to be produced by anyone. Industries estimated in mid-2011 that over 300,000 official Arduinos had been commercially produced,[2] and in 2013 that 700,000 official boards were in users' hands.

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The Arduino hardware and software was designed for artists, designers, hobbyists, hackers, newbies, and anyone interested in creating interactive objects or environments. Arduino can interact with buttons, LEDs, motors, speakers, GPS units, cameras, the internet, and even your smart-phone or you're TV! This flexibility combined with the fact that the Arduino software is free, the hardware boards are pretty cheap, and both the software and hardware are easy to learn has led to a large community of users who have contributed code and released instructions for a huge variety of Arduino-based projects.

V. CONCLUSION

The use of Arduino makes "Arduino based controller for Incinerator" is cost effective. The Arduino has many advantages one of the advantage is ready to use structure. As the Arduino comes in a complete package and from which includes the 5v regulator, a burner, an oscillator, a microcontroller, serial communication interfaces, LED and headers for the connections. In Arduino board we can use several functions. So it is very flexible. The other advantage is the examples of codes. Arduino is its library of examples present inside the software of Arduino. It is effortless function. The coding of Arduino is very easy. It is an automatic unit conversion capability. Then it has the large community.

In this incinerator we can dispose both bio degradable and non-bio degradable wastes.

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