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Solar Based Sanitary Waste Dispenser

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ABSTRACT

Hygiene related to women is the most important thing that has to be properly taken care of. Disposal of sanitary waste had become a major issue for the society because the diseases causing bacteria brings threat to surrounding area in case of hygiene. Incomplete and inaccurate knowledge about menstruation is obstructing the path of menstrual hygiene management. Women use sanitary napkins in menstruation time and manage that harmful waste by disposing them in open, with domestic waste, burning in open which create soil and air pollution and sometimes they flush them in toilets which cause choking. Modern techniques like incineration can make a remarkable contribution to reduce the waste. For this a solar based sanitary waste dispenser has been proposed, which shredder's the waste in small pieces & burns the sanitary waste and convert it in ash. It is an ecofriendly incinerator as it is a solar energy based system and also reduces the effect of harmful gases coming out while burning the waste.

Keywords : Hygiene, Waste Dispenser

I. INTRODUCTION

The lack of proper waste management as compared to increasing waste generation can pose risks for health and environment. The wide growth of urbanization and industrialization is worsening the condition day by day. We are familiar with different types of waste like food, electronic, commercial, industrial, medical, etc. It is essential that each type of waste should be handled and get disposed separately. The waste managing body is facing critical consequences due to deficiency of facilities to treat and dispose the waste materials. Because of improper waste handling harmful waste can result to environmental and health problems. One of such harmful waste is sanitary (menstrual) waste. It's a crucial issue not only in India but also other countries too. The disposal techniques and the superstitions regarding menstruation, it is the need to bring out a solution for

managing this waste. Almost 90% of a sanitary napkin is made up of plastic. The thin top layer dry-weave top sheet is made of a plastic polymer polypropylene, since plastic is non- biodegradable material it takes a long time (years) to decompose when buried in soil. If it is burned openly it releases harmful dioxins and furan gases. Hence safe disposal of this sanitary waste is essential. To resolve this problem sanitary waste incinerator are being used. Incinerator is a safe scientific method for the disposal of sanitary waste which converts the waste into ash when burned at a certain level of temperature. In this process the fumes that generate while burning can be properly disposed in air after filtering it or reducing its harmfulness. These incinerators are used at a certain level of temperature and can be used in controlling the environment by taking the care that the gases that would release should not be harmful.

These incinerators can be installed in schools, industrial, institutional, community level.

II. CASE STUDY

In this paper we are giving the solution to dispose the sanitary napkins. but before we proposed this system we have searched about the present available methods for disposal, and we found that the proper disposal of sanitary waste is not available.

Presently available methods to dispose sanitary waste are:

- Incinerator
- Red dot bin
- Dumping yard
- Sanitary landfills

Incinerator:

Incinerator used as a burner, which is burn, the sanitary waste. Instant disposal of used napkins in a very fast and hygienic way. Incinerator is a electrical machine.

We have visited in NEERI. They developed "GREEN DISPO. It is an incinerator with improved technical design. It has improved combustion chamber as compared to other products used in market. It has less energy combustion .There is two combustion chamber in these device.



Red dot bin:

It is a campaign to dispose the sanitary waste. In this method the sanitary waste securely wrapped and marked with red dot and put into the waste container this method is required more time to segregate the waste.

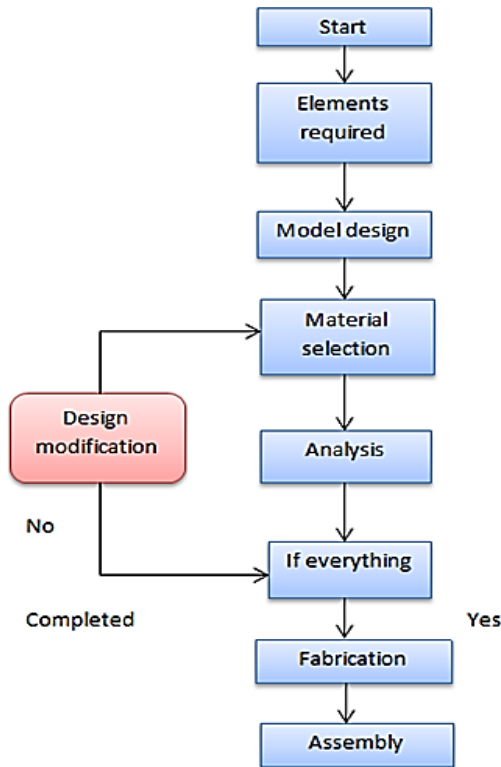
Duping yard:

This is most commonly use method in everywhere. In this method the all type of waste are dump in open space. But due to the environmental reaction bacteria are takes place .this bacteria is very harmful to environment.

Sanitary landfills:

Sanitary landfills are the isolated sites. it is a pit in which the sanitary waste are filled. But it causes soil pollution, reduced the quality of soil and ground water pollution.

III. METHODOLOGY



Solar panel

Solar panel refers to a panel designed to absorb sun's rays as a source of energy for generating electricity or heating. It is also known as photovoltaic solar panels, solar modules, solar plates are made of silicon cells which convert sunlight into electricity. Solar panel is used to charge battery to run the dispenser. This work uses a 12V, 16W polycrystalline solar panel. Solar panel is made of semiconductors like silicon after the invention of the transistor. When sunlight falls, electrons in the solar panel start flowing towards positive and negative terminals and generate electricity. Solar panel comes with more advantage than disadvantage. Solar panels produce ecofriendly, clean and free energy for a span of 25 years, which is its greatest advantage.

Types of solar panels

The most commonly available solar cells are made from high-grade silicon that is treated with negatively and positively charged semi-conductors, phosphorous and boron. According to the crystalline structure, solar panels can be separated into the following types:



1. Mono/crystalline silicon panel

The silicon has a single and continuous crystal lattice structure with almost no defects or impurities. The principal advantage of mono/crystalline cells is their high efficiency, typically around 15 percent, although the manufacturing process required to produce mono/crystalline silicon is complicated, resulting in slightly higher costs than other technologies. Different manufacturing methods are used, depending largely upon the method of growing, or pulling a perfect crystal that has a solid, cylindrical shape.

2. Poly -or multi -crystalline silicon panel

Polycrystalline panels are produced using ingots of multi-crystalline silicon. They are cheaper to produce than mono-crystalline panels, due to simple manufacturing process. They tend to be slightly less efficient, however, with average efficiencies of around 12 percent.

3. Amorphous silicon panel

Amorphous silicon panels are composed of silicon atoms in a thin homogenous layer, rather than a crystal structure. Amorphous silicon is produced by deposition onto a substrate, rather than wafer sawing so the cells can be thinner. For this reason, amorphous silicon is also known as a thin film PV technology. However, the efficiency of amorphous panels is less than crystalline-based cells, with typical efficiencies of around 6 percent, but they require less material and cheaper to produce. The low cost makes them ideally suited for many applications where high efficiency is not required and low cost is important.

4. Dye-sensitised solar panel

Dye-sensitised solar panel technology is best considered as artificial photosynthesis. It performs well under indirect radiation, during cloud conditions, and when temporarily or permanently partially shaded. Efficiencies over time are still to be established but technically that could achieve around 10 percent or more, and they are very effective over a wide range of sunlight conditions.

Charge Controller

Charge controller is also known as charge regulator or battery regulator. It limits the rate at which electric current is added to or drawn from electric batteries.



Each time batteries were charged deep cycle with solar panels, it's necessary to use a charge controller in the circuit in order to protect the battery from

overcharging or from over discharging. It protects from overcharging and overvoltage, which can reduce battery performance or lifespan and may pose a safety risk. It suppresses deep discharging a battery or performs controlled discharges, depending on the battery technology. It may also monitor battery temperature to prevent overheating.

Battery

This battery is used to supply electric power to the dc motor to run the shredder and to heating coil. The battery contains one or more deep cycle batteries, connected in series and /or parallel depending on the voltage and the current capacity needed. The batteries store the power produced by the solar panels and discharge it when you need it.



Battery rating is 12V, 5Ah is used for the hardware module.

The different types of batteries

- Lead acid battery
- Nickel cadmium (NiCad) battery
- Nickel metal hydride (NiMH) battery
- Lithium ion battery
- Zinc-air battery

Here, we have used Lead acid Batteries.

Lead acid battery

The anode and cathode in a typical lead acid battery are made from lead and lead dioxide, and they are bridged by an electrolyte of a solution that is roughly one third sulphuric acid. As the battery discharges electricity, the chemical reaction gradually converts the two electrodes into lead sulfate. Recharging the battery partially reverses the conversion.

They have one of the lowest energy-to-weight and energy-to-volume battery designs in existence making them very big and heavy for the total amount of power they can put out. However, they aren't very good in roles that require a steady, low or middling supply of electricity over a long period of time. They also have long recharging times.

DC motor

The electric motor operated by dc current is called dc motor. Dc motor is used to drive the shredder .This work uses a 12V, 30 rpm motor. It converts DC electrical energy into mechanical energy. It works on the principle that when a current carrying conductor is placed in a magnetic field, it experiences a torque and has a tendency to move. It lays for its operation on the force which is known to exist on conductor carrying a current while situated in a magnetic field. The primary advantage of dc motor is the can develop constant torque over wide speed.



Types of dc motor

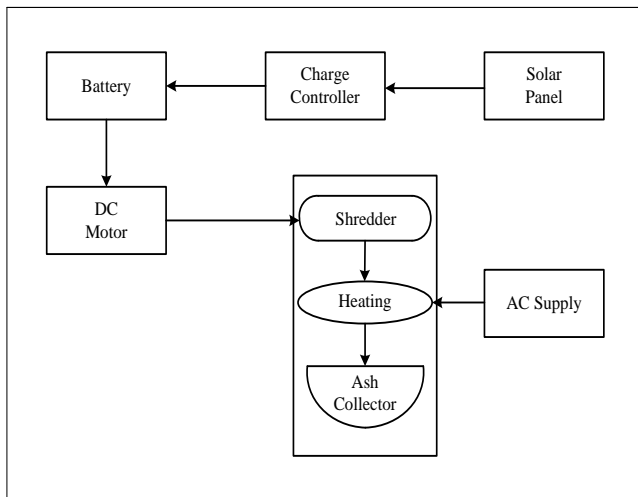
1. Shunt motor: Shunt motor in which the field winding is connected in parallel with the armature.
2. Series motor: series motor in which armature and field winding are connected in series
3. Compound motor: This type of motor has two field winding one of which is connected in parallel with the armature and other in series with it.

Heating coil



It is a heating element that converts electrical energy into heat through the mechanism of joule heating. The heating coil is used to burn the shredded sanitary napkin to convert it into ash form. This work uses 1200 watt heating coil. Electrical heating coils converts' electrical energy into heat as electric current through the element encounters resistance resulting in heating of the element. This process is independent of the direction of current .A coil is a heating element attached to the heating unit itself.

BLOCK DIAGRAM



WORKING

As this project is solar based, solar energy is the most important factor. Fig1 represents the flow of work. The sun rays will be absorbed by the solar panel this solar energy is stored in a battery. In between solar panel and the battery charge controller is connected which gives protection against overvoltage. The solar energy that is stored in a battery is then supplied to the solar based sanitary waste dispenser.

In fig 2 we can see the connection and the arrangement of components. Solar panel collects the solar energy and stores that energy in the battery in the form of electrical energy. Supply from battery is given to the solar based sanitary waste dispenser. Dispenser consists of three parts shredder, burner and ash collector. Connection from the battery is given to the motor which is connected in the shredder mechanism as well as to the burner. Shredder is the mechanism that cuts the raw waste into small particles. Waste that is converted into small particles falls on burner. A burner burns these particles completely and converts that waste particles into ash. This ash is then collected into the ash collector. We can reuse this ash as a fertilizer for plants. Connection from the battery is given to the motor

which is connected in the shredder mechanism as well as to the burner.

ADVANTAGES AND DISADVANTAGES

Advantages:

- ✓ Effective burning of waste material
- ✓ Less power consumption
- ✓ Safe disposal of waste
- ✓ User-friendly

Disadvantages:

- ✓ Humming noise
- ✓ Size and weight of machine

IV. CONCLUSION

Disposal of sanitary waste has always been a hectic issue for people. Still there are some people who use traditional methods for disposal of sanitary waste. Commercial methods are introduced now to avoid inconvenience in safe disposal of this waste. People need to use this commercial method to avoid the harm to the environment due to improper disposal of waste.

Solar based sanitary waste dispenser is the unique system which uses solar energy and thus requires less energy compared to other commercial methods. Our project provides a hygienic way to destroy the napkin also it is portable. It also plays a role for the Swachh bharat abhiyan reducing the risk of diseases. This system can also combined with the vending machine to make a whole system as one unit.

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