

Sanitary Waste Disposer

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Abstract - The demand for sanitary products is increasing in the society, which in turn results in growing mountains of these wastes. To manage these wastes initiative should be taken to install incinerators across the country to burn sanitary wastes. At the point where the incinerator emissions are being disputed, the mission of devising a machine for the elimination of sanitary waste finds its place. In an attempt to provide with affordable and eco-friendly sanitary waste disposer, the system is designed in such a way that it will incinerate sanitary wastes such as napkins and diapers completely with minimal flue gas emission using the process of filtration, utilizing solar energy, electrical power and energy from bio-fuel. The work targets on the disposal of both sanitary napkins and diapers, which make up a large part of sanitary wastes. The prototype about to develop is mainly based on one of the recent technology in 'Internet of Things'. IOT devices are used to enable remote health monitoring and emergency notification. Specialized sensors are equipped that enable monitoring of the individuals in changing diapers and its combustion. The whole system is interconnected within a centralized computer network for continuous surveillance.

Keywords: sanitary napkins and diapers; solar energy; IOT; sensors; centralized network;

I. INTRODUCTION

According to World Census, 50.8% of the world population includes female and 24% of children. At the same time, it is estimated that 432 million sanitary pads are already been disposed of every month in the country and this is expected to grow multi-fold in the coming years and diapers generate 7.6 billion pounds of garbage each year. A survey discovered that teenage girls in rural India often dropped out of school or took prolonged leaves of absence once they hit menstruation. Until few years ago certain unhygienic methods such as old rags were used. Women are still shying away from adopting sanitary napkins because once used they found it hard to get rid of them. As per the study conducted in 2011, titled 'Sanitary Protection: Every Woman's Health Right' estimated that only 12% of the 335 million menstruating women have access to disposable sanitary napkins. It is quite difficult and unhygienic for women and girls to go out and dig

it into the sand and burn it because of social problems. Furthermore, disposable diapers that contain absorbent chemicals are thrown away after use and this take half a millennium to completely decompose. Improper dispensation of nitrogenous waste is a major cause in the spread of infectious diseases. The dumping of one used diaper is an issue of great concern with regards to solid municipal waste management [5]. On the other hand, there is no convenient system of movement of garbage in rural India. At this instance, the lack of concern for sanitary waste management in our country leads to a drastic environmental issues.

As stated by Solid Waste Management (SWM) Rules, 2016, most of the sanitary wastes are disposed after segregation into biodegradable and non-biodegradable components. And one of the major issues of sanitary waste is their categorization – biomedical or plastic waste. A larger proportion is non-biodegradable. Inappropriate handling of the used pads and diapers is already posing a major challenge because they grow harmful pathogens that cause serious health and environmental hazards. The Biomedical Waste Management Rules, 2016 indicates that items contaminated with blood and body fluids should be incinerated, autoclaved or micro waved to destroy pathogens. But the guidelines provided by the government failed to make a lasting impact in rural areas and the situation continues to remain grim [3]. This is largely because of the challenge imposed by 3As: Awareness, Accessibility, and Affordability.

II. EXISTING SYSTEM

- A. The existing system of sanitary napkin disposal is named as 'Ashuddhi-Nashak'. It is shown in fig 1. The napkin to be disposed is thrown from the top opening. Newspaper is put into the system and fire is lit from the bottom opening. As the newspaper burns, the napkin too gets burnt. The ash is collected at the bottom, which can be thrown away manually [1].
- B. The Sanitary Napkin Disposal Incinerator (fig 2) was the next stage of development, which helped the public to overcome the problem of sanitary napkin disposal. Although this development helped to reduce the immense soil pollution, the cost of the manufactured system is still a problem for the rural society.

C. In Japan, researchers have come up with a cheap, disposable sensor that uses Wi-Fi to signal when a diaper is wet (as shown in fig 3). Mechanical flexibility of electronic devices is very important and has great application in medical and healthcare. Here, the sensing is done electronically. The alert might come in the form of an audible tone on a smart phone [4].



Figure 1: Ashuddhi-Nashak



Figure 2: Sanitary Napkin Disposal Incinerator

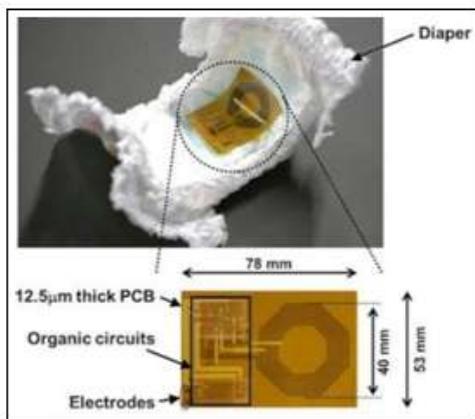


Figure 3: Diaper with wireless sensor

Till the date, initiatives were made only for the disposal of used sanitary napkins for menstrual waste stream. And no initiatives were reported for the collection and disposal of other sanitary wastes such as diapers, tampons, condoms and other similar wastes.

III. PROPOSED WORK

The current dilemma of sanitary waste management can be resolved using a solar based sanitary waste disposer system, discarding both sanitary napkins and diapers. The apparatus can run on both electric power and organic energy. Additionally, solar power is utilized by means of solar panel for the working of this system. The salient features of the designed prototype are:

- Simple installation
- Wall and floor mountable
- Electrically operated
- Solar Panel
- Auto thermal cut off for safety
- Stainless steel body
- CO2 filter
- Spider coil
- Ash collecting tray
- Napkin counter
- LCD display with temperature and timer
- Sensors
- Computerized network

The immediate impact of the proposed project is to provide hygienic and safe disposal of sanitary napkins and diapers through the installment of eco – friendly sanitary waste incinerator machines at needy places like schools/ colleges/ hospitals/ hostels/ public toilets/ nursing homes/ bus depots/ railway stations/ malls at low cost. The system aims at the reduction of air and soil pollution. The outcome of the proposed work is that it helps to reduce the sanitary waste disposal to a large extent.

IV. IMPLEMENTATION

The various steps involved in the Solar based sanitary waste disposer is depicted in fig. 4. Some of the major components of the system are explained below:

a) Solar Panel

The solar panel converts the energy from sun to electrical energy. The specifications of solar panel used are: 12V, 5Watt 18.7 mono crystalline solar panel 370 mm X 350 mm dimensions.

b) Battery

The battery is used to supply electric power. The battery gets charged via the solar panel and supplies power to the devices. The proposed work uses a 12 V battery to store the energy.

c) Sterilizer

A sterilizer is used to destroy microorganisms, by bringing to a high temperature with steam, dry heat or boiling liquid. It destroys the ability of the production of microbes. The human wastes from the diaper are first sterilized and then send to the furnace.

d) Furnace

A furnace is a device used for high-temperature heating. The name is derived from Greek word Fornax, which means oven. The furnace is designed such that it withstands high temperatures and has a longer life. Inside the furnace is a tray wound with coil. This coil burns the napkin and diaper to ashes. The furnace houses a removable tray at the bottom, which collects the ash. The collected ash is disposed manually.

e) Spider coil

Spider coil serve as the heating element for the device and are responsible for burning the sanitary waste to ashes. They are easy to use. The coil should be strong enough to withstand the force offered by the napkin and diaper when it is dropped by the user. The coil should be thin so that it gets heated quickly without consuming lot of power.

f) CO₂ filter

The smoke coming from the furnace contains harmful gases such as CO₂. The CO₂ filter ensures that CO₂ is filtered before the gas is left to the atmosphere. The chimney has a high voltage negative grid across it.

So as the smoke goes past the negative grid, the small carbon particles get negatively charged and gain electrons. Further, there are positively charged plates that attract the negatively charged carbon particles. Once these particles are heavy on the plate, they fall down into the container and are cleaned periodically.

V. SOCIOECONOMIC RELEVANCE

Two main concerns which affect sanitary waste management practices are: first, many people lack access to appropriate waste management options that may lead unsafe disposal of these wastes. Secondly, the lack of proper disposal and treatment options may lead to unhygienic environmental conditions.

Against this adversity, incinerators have emerged as a solution for the favored disposal and treatment option, particularly in remote areas and highly populated areas where pollution is a major concern. However, challenges exist in terms of cost and the operation of incinerator as well as their environmental impact with emission control features.

Sanitary wastes such as napkins and diapers thrown with routine waste or thrown in open spaces can contaminate water bodies as well as soil which causes major environmental impact. These wastes buried in soil take hundreds of years to degrade. Increased awareness of access to safe and hygienic system is very essential in order to tackle this situation. Unsafe management of mounting volume of sanitary waste is a major challenge in present society.

VI. DEVELOPMENT

The further development of the proposed project includes the recent technology in 'Internet of Things' (IOT). The technology of smart diaper is incorporated. IOT devices are used to enable remote health monitoring and emergency notification. The project is designed for the current generation, when both the parents are working, helps to monitor their children, notifying via smart phones when the diaper is full to change. Specialized sensors are equipped that enable monitoring of the individuals in changing diapers. The smart diaper contains sensors attached to the diaper, that monitors whether the diaper is soiled, as well as alert for excrement [6]. The whole system is interconnected within a centralized computer network for continuous surveillance. That is, the signals from the sensors are sent to a computerized system, where the care-taker can get the details of the infant/patient, whose diaper needs to be changed.

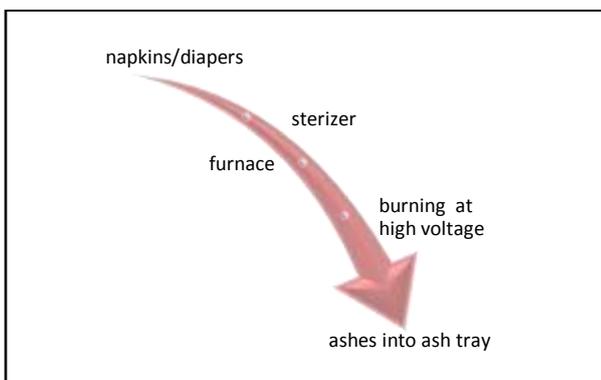


Figure 4: Steps in sanitary waste disposer

VII. CONCLUSIONS

Nowadays, sanitary products are being used in more and more households which in turn results in growing mountains of these wastes. A survey study shows that allotting 12 napkins to a woman per month it is found that this added up to 432 million soiled pads enough to cover a land fill spread over 24 hectares. Also diapers generate 7.6 billion pounds of garbage each year. Disposable diapers are the 3rd largest consumer item in landfills, and represents 30% of non-biodegradable waste [9]. To manage these wastes initiatives should be taken to install incinerators across the country to burn sanitary waste. The proposed model discourages the usage of closets for disposing of the used sanitary products which in turn block the septic tank and regular blockage cleaning at a higher cost. This project aims to install eco-friendly sanitary waste disposer in rural or urban India at needy schools, colleges, shopping places government hospitals and other public places.

The sanitary waste disposer is designed and developed in order to overcome the problem of improper sanitary waste management in an eco-friendly manner. The model discourages the usage of closets for disposing of the used sanitary products which in turn block the septic tank and regular blockage cleaning at a higher cost. This project aims to install eco-friendly sanitary waste disposer in rural or urban India at needy schools, colleges, shopping places government hospitals and other public places.

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