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Agni Dita- Electronic Sanitary Napkin Disposal System

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Abstract: *The problem of improper disposal of Absorbent Hygiene Products (AHP) is a major roadblock for achieving "Swachh Bharat Mission" goals for clean and green India. The destruction of disposable Absorbent Hygiene Products (AHP) has been a global issue for a very long time. Attempts to dispose AHPs were made- by flushing them down the toilet, which resulted in clogging or attempt of burning them down, which resulted in releasing toxic gas in the open air which is harmful for the environment. Although, efforts were made to solve the problem of disposing AHPs, with the help of incinerators, but no prior attempts have been made to satisfactorily and safely dispose of AHPs in such systems. The main objective of this system is to avoid land pollution and air pollution, by which we can put forward complete safety and solve the above-mentioned issues by making our incinerator smart and efficient. Hence, we have designed an electronic sanitary napkin disposal system. The proposed system hence put forth a solution as an essentially simple, cost efficient, fully automated construction, adapted to be hung on any wall in a lavatory, to dispose sanitary napkins. Our system consists of four chambers- the input hatch, the burning chamber, the ashtray and the gas treatment water tank. This system will be completely microcontroller driven with a display showing the current status of the system or any system alert.*

Keywords: Absorbent Hygiene Products (AHP), disposing, toxic gases, incinerator, electronic sanitary napkin disposal system, microcontroller, display

I. INTRODUCTION

According to a survey, over 90% of non-combustible Absorbent Hygiene products (AHP) are discarded into sewage systems, fields and water bodies (rivers, ponds, etc.) in India, which leads to huge environmental and health problems. Usage of disposable sanitary napkins approximately results in feminine care, which adds up to 3% of India's waste. According to solid waste management rules, responsibilities of generators were defined that is a compulsion to segregate waste, based into various streams, such as- wet waste (biodegradables), dry waste (plastic, paper etc), domestic hazardous waste (diapers, napkin, mosquito repellents, etc.,) and hand it over to the trashman or waste collectors.

Most sanitary napkins available in the market are made of cellulose, super absorbent polymers (SAP), plastic covering, and adhesives/ glue; many of these components do not decompose easily and remain in the environment (polluting soil and water sources). AHP wastes are fluff pulp. The fluff pulp is a chemical pulp (sulphate or sulphite) made from long fibre softwoods and superabsorbent polymer (SAP) which contains *sodium polyacrylate* $[-CH_2-CH-CO_2Na]_n$ which is non-biodegradable and is toxic to the nasal membranes which should not be inhaled.

Our system describes the products which give a solution for the above problem. The ideal outcome of our system is optimum control of the sanitary waste, with maximum efficiency which allows compliance with environment regulations; in particular, the monitoring of degradable ash as well as harmful gasses that are being released time and also conventionally liquifying toxic gasses in order to make them non-hazardous. Some available incinerators in the market are depicted below in figure 1(a), 1(b) and 1(c).

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Fig. 1(a) Ashudhinashak Clay Incinerators for Sanitary Napkins **Fig. 1(b)** Electrically Sanitary Napkin incinerator

Fig. 1(c) Automatic Sanitary Napkin incinerator

Incineration makes use of combustion to make waste much less harmful (sterilizes waste), lessen the extent of waste, and alternate the character of waste from solids to ash which could extra effortlessly be disposed of.

When incineration is accomplished properly, waste is transformed into tremendously innocent gases and incombustible stable waste (e.g., ash), and permissible gases from incineration are launched into the atmosphere (after fuel line cleansing or emission management measures).

Residue ash from right incineration may be amassed and disposed of in distinctive ash pits or managed landfills with no foremost risk. However, whilst incineration takes place in dangerous conditions (e.g., waste isn't always correctly segregated, combustion takes place in a poorly built incinerator with low burning temperature, no emission management features), poisonous compounds may be gift withinside the unburned waste, and dangerous gases may be launched into the air.

II. LITERATURE SURVEY

The paper, Smart Sanitary Napkin Disposal Machine was published in International Journal of Future Generation Communication and Networking which focuses on solving the issues of these incinerators by making them smarter and more efficient. We can overcome these problems by making the machine less heavy and easy to use as well as the machine should be environment friendly. The machine as promised will deliver the required output and help to reduce the pollution, health and various issues are discussed.

In, IOT based automatic destruction of disposable absorbent hygiene products and gas purification was published in International Journal of Advanced Research in Computer and Communication Engineering assesses the feasibility of degrading used disposable AHP wastes by incineration and exhaust gas purification. AHP includes Baby diaper, Feminine care pads (sanitary napkins), Nursing pads, etc. The gas emission from our unit should meet the Benchmark standards imposed by regulatory bodies (AHP waste incineration directive) for public health and environmental protection. Incineration unit of our proposed methodology adopts a number of advanced designs and process controls which are exclusively monitored by IOT.

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The paper, sanitary napkin disposal system was published in IJARIIE is one of the best ways to dispose menstrual waste is to burner is napkin using electrical fire-based burner without allowing smoke generate in the process to Escape into the atmosphere.

Menstrual Waste Management paper, was published in Ministry of Environment, Forest & Climate Change, Govt. of India assesses Sanitary waste disposal has become an increasing problem in India as the plastic used in disposable sanitary napkins are not biodegradable and lead to health and environmental hazards. Further, one major issue of sanitary waste has always been their categorization.

Menstrual Waste Management paper, which was published in International Journal of Pure and Applied Mathematics assesses Menstrual waste uses menstrual absorbents, other materials used to capture or absorb blood during menstruation. An estimated 36% of the female population of reproductive age in India are using sanitary napkins, producing one billion used pads per month.

III. OBJECTIVES

- To diminish the harmful emissions caused by burnt napkins such as sulphur dioxide (SO_2) and nitrogen oxide (NO) with additional harmful chemicals
- To manage hazardous waste such as super absorbent polymers (SAP), plastic covering, and adhesives/ glue; many of these components do not decompose easily and remain in the environment (polluting soil and water sources)
- To construct a cost-efficient and completely automated incinerator

IV. METHODOLOGY

4.1 Block Diagram

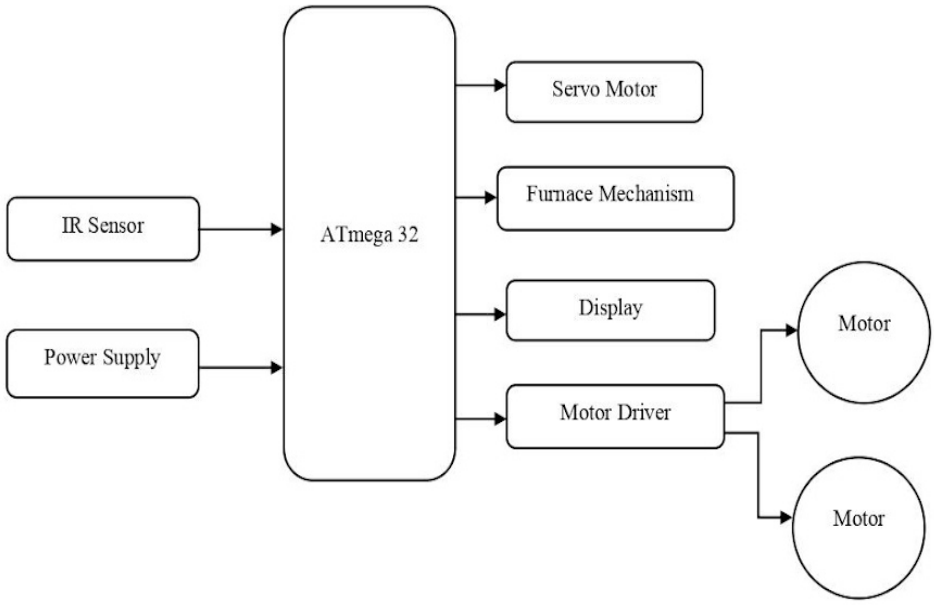

Fig: 4 (a)

The block diagram of proposed system is shown in the fig 4(a). The system is completely microcontroller driven. Atmega32 is main controller of our system. In our system, we have used 5V power supply for atmega32 and display. 12V power supply for 775 motors and 12V gear motors (100 rpm). A Dual Regulated power supply consists of 24V Step -down Transformer, Bridge Rectifier, filter capacitor and Regulator IC 7805 and 7812. The IR sensor works as input of our system, it senses the sanitary napkin. A servomotor motor is used to control the input hatch and regulates the furnace opening when a sanitary napkin is inserted into the hatch. The 16x2 LCD display is used to display the current status of our system. DC motors are used to control the exhaust fans which are placed in the burning furnace as well as gas treatment tank- where the purification of the toxic gases takes place. The motors are mainly used for extraction of gases from the furnace. The burning

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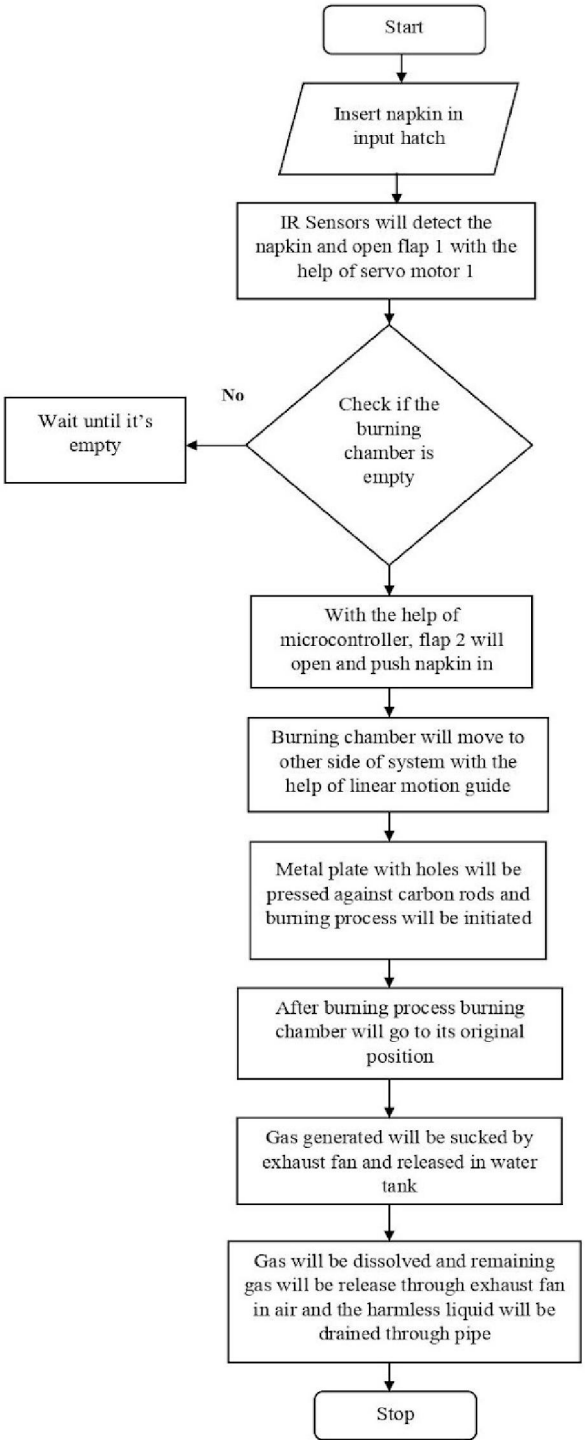
furnace is the main part of the project. It is made up of Refractory/Fire bricks. 4 carbon electrodes are placed at the bottom of the burning furnace which will act as a heating element, which may heat up to 1000°C. Ashtray is placed at the bottom of the burning furnace to collect the ash.

4.2 Flowchart



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4.3 Working

The input hatch consists of IR sensor and servo motors.

When napkin will enter through input hatch, IR sensor will sense the napkin and it will send the status of input hatch to the microcontroller, which will further access the servo motor 1 which will rotate the flap no.1 at 45º so that the sanitary napkin enters the next chamber. In gas collection chamber, servo motor 2 to rotate the flap no. 2 at 90º, in order to push sanitary napkin inside the burning furnace.

The burning furnace is a partially closed furnace, made of heat resistance bricks and carbon rods which are placed diagonally to each other in crossed fashion.

With the help of Linear Motion Guide (LM Guide), the burning furnace will move to another half of the system, where the burning process will take place, so that the gas generated due to burning will pass through hatch to the gas treatment tank. Flap no. 3 is attached near hatch through which the gas passes, the flap will help the napkin to stay firm against the carbon rods. Limit switches are placed on either side of the system to notify the position of the burning furnace.

The high current starts flowing through the carbon rods, due to low resistance of the carbon rod, it will heat up to generate higher temperature (up to 1000º C). The sanitary napkin placed on the carbon rod will catch the heat and it will start the burning process, which will last for about 30 sec to 2 min.

During the burning process, gases like Sulphur dioxide (SO_2), nitrogen oxide (NO) and some unidentified harmful gases are generated and then released. After the burning process, the burning furnace will restore to its standard position.

The released gases will be sucked by the exhaust fan in order to treat those harmful gases, they will be sent to the gas treatment tank.

Gas treatment tank will be filled with water. The sensor will be attached to monitor the level of water in the tank. These gases are later passed through water, as they are water-soluble. This helps the harmful gases to liquefy making them innocuous and non-addictive.

When sulphur dioxide which is aqueous in nature and nitrogen oxide which is in gaseous state mixed with liquid water it gives out sulphuric acid which is aqueous in nature and dinitrogen monoxide in gaseous state.

The Dinitrogen monoxide (N_2O), also known as *happy gas* is released into the air. Innocuous liquid- sulphuric acid (H_2SO_4) is later drained out through a pipe.

4.4 Chemical Reaction

$$SO_{2\,(aq)} + H_2O_{\,(l)} + 2NO_{\,(g)} \rightarrow H_2SO_{4\,(aq)} + N_2O_{\,(aq)}$$

V. ADVANTAGES

- The proposed system will be user-friendly as it is fully automatic and the user can monitor the status of the system through LCD display
- As the system has higher burning ability, so the time required for burning the napkin would be momentary
- Toxic smoke which is been generated by burning the sanitary napkin becomes indigenous, as it becomes soluble in water which deplete its poisonous nature
- It is an effective way of waste reduction as the sanitary napkin is discarded appropriately, which allows compliance with environment regulations.

VI. CONCLUSION

Degradation of disposable AHP wastes is the widely prevailing environmental problem in the world. Many researchers have given considerable attention aimed at establishing the removal of AHP wastes by incineration.

Our product removes both- Hazardous Absorbent Hygiene Product (AHP) waste and toxic gas effectively. This project efficiently incinerates AHP waste and purifies harmful smoke and liquifies it- which is completely soluble in water. We can conclude that this methodology is an ideal strategy for reducing pollution.

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