

Review on Sanitary Waste Management with the Help of Incinerator

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Abstract - The critical issue of waste management, particularly focusing on sanitary waste and the challenges associated with its disposal. It highlights the environmental and health risks posed by improper disposal of sanitary napkins, stressing the need for educating women on proper disposal methods. It emphasizes the prevalence of nonbiodegradable plastic in sanitary napkins, posing a challenge as this plastic can take centuries to decompose. The disposal methods for sanitary waste vary between urban and rural areas, with most urban women disposing of napkins in dustbins, leading to landfill accumulation. In contrast, rural women tend to wash and bury napkins in pits.

The passage underscores the adverse consequences of poor menstrual waste management, including medical complications and health hazards due to infectious bacteria carried by disposed sanitary napkins. It also highlights the staggering amount of nonbiodegradable waste generated by women over their menstruating years. The discussion also touches on the behavioural aspect, stating that even when disposal facilities are available, human psychology may hinder significant changes in disposal patterns. Transitioning to the explanation of a sanitary waste incinerator, it defines it as a specialized facility designed to safely dispose of various waste types that could pose health risks if not treated properly. These facilities utilize advanced technology to burn waste at high temperatures, reducing volume and eliminating pathogens, toxins, and organic matter to prevent disease spread and environmental pollution.

Key Words: Waste Management, Sanitary Waste, Disposal Challenges, On-Biodegradable Plastic, Sanitary Waste Incinerator

1. INTRODUCTION

The increasing generation of waste, coupled with the lack of proper waste management, poses a critical risk to both the environment and public health. The rapid growth of urbanization and industrialization has exacerbated this problem. Various types of waste, such as food, electronic, commercial, industrial, and medical waste, are generated. It is crucial to handle and dispose of each type of waste separately. However, the waste management authorities are facing serious challenges due to a lack of facilities for

treating and disposing of these waste materials, particularly hazardous waste such as sanitary (menstrual) waste. This issue is not limited to India but is a global concern. Sanitary napkins are the most common method of menstrual hygiene management among women, with disposable pads being the most widely used, especially in urban areas of India. Sanitary waste presents a unique challenge as nearly 90% of a sanitary napkin consists of non-biodegradable plastic, including the thin top layer known as a dry weave top sheet, which is made from a plastic polymer called polypropylene. Plastic does not biodegrade and can take many years to decompose when buried in soil. Open burning of such waste releases harmful dioxins and furan gases. Therefore, safe disposal of sanitary waste is essential. Educating and guiding women and girls on the proper disposal of sanitary pads is crucial to maintaining cleanliness, hygiene, and safety, thus preventing unwanted diseases. To protect our environment, every woman must take care and initiative to carefully dispose of their used sanitary pads. In the long run, hygiene and sustainability can only be achieved through education. In both rural and urban areas, women should educate each other about the pros and cons of sanitary pad disposal. In some schools, due to a lack of sanitary facilities, girls dispose of their pads in toilets, often leaving them wrapped or unwrapped in the toilet corners, which results in unsanitary conditions. Whether at home or in public places, women may flush their used pads, leading to sewage system blockages. It's important to note that every month, 353 million women and adolescent girls across India need to dispose of their sanitary waste. However, in some cases, women dispose of menstrual waste without considering proper disposal methods. Even when facilities are provided, behavioural patterns may not change significantly due to human psychology. One remarkable fact is that a single woman can generate up to 125 kg of nonbiodegradable waste throughout her menstruating years alone. This contributes to the significant waste implications, with 355 million women generating substantial plastic waste that takes 500-800 years to decompose. Studies have shown that one sanitary pad could take from 500 to 800 years to decompose, as the plastic used is not biodegradable, posing health and environmental hazards. According to research by the Central Pollution Control Board of India (CPCB), the methods of disposing of sanitary napkins vary between urban and rural settings. Most urban women dispose of sanitary napkins in dustbins, leading to landfill accumulation. In rural areas, women prefer to wash napkins and bury them in pits. The method also varies



when women use sanitary napkins at home or in school/workplace settings. In public washrooms, due to poor infrastructure, sanitary napkins are often flushed or left in open areas. Few women incinerate soiled sanitary napkins. Poor menstrual management and improper disposal of sanitary waste led to various medical complications, highlighting the need for raising awareness on menstrual management, breaking the silence and stigma around menstruation, and promoting cleanliness in our country. Disposed sanitary napkins may carry infectious bacteria like E. coli, which can cause hepatitis. Waste collectors who segregate such waste with their bare hands are easily exposed to diseases.

What is a sanitary waste incinerator?

A sanitary waste incinerator is a specialized facility designed to safely dispose of various types of waste, specifically focusing on waste that could pose health risks if not properly treated. These facilities are equipped with advanced technology to burn and decompose waste at extremely high temperatures, effectively reducing its volume and eliminating harmful pathogens, toxins, and organic matter.

The primary purpose of a sanitary waste incinerator is to prevent the spread of diseases, minimize environmental pollution, and manage waste that cannot be easily recycled or treated through conventional methods. These facilities are crucial in handling medical, pharmaceutical, and hazardous waste generated by hospitals, laboratories, clinics, and industries.

2. Presently available method to dispose of sanitary waste.

2.1 Incinerator

The incinerator is used as a burner, which burns, sanitary waste—instant disposal of used napkins in a very fast and hygienic way. The incinerator is an electrical machine. There are different types of incinerators available in the market as per the capacity, power source etc.

2.2 Red dot bin

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

2.3 Dumping yard

This is the most commonly used method everywhere. In this method, all types of waste are dumped in open space. But due to the environmental reaction bacteria take place. This bacterium is very harmful to the environment.

2.4 Sanitary landfills

Sanitary landfills are the isolated sites. it is a pit in which the sanitary waste is filled. However, it causes soil pollution, reducing the quality of soil and groundwater pollution.

3. Objectives

- Evaluate the effectiveness of incinerators in managing sanitary waste.
- Assess the environmental impact of incineration as a disposal method for sanitary waste.
- Examine the economic feasibility of implementing incinerators in sanitary waste management.
- Investigate the role of incinerators in reducing health hazards associated with improper disposal of sanitary waste.
- Explore the potential of incinerators in addressing challenges such as cost, quantity, and safety in sanitary waste management.
- Analyze the efficiency of incorporating precipitators and carbon filters in controlling pollution and harmful fumes during the incineration process.
- Provide recommendations for improving sanitary waste management practices through the use of incinerators.

4. Literature Review

A. Dr S. R. Kalambe, Khushboo Lute, Shrusti Bhutange, Karuna Tawade, Jyoti Tembhare, Aman Mahajan (2020) This research paper discusses the critical issue of menstrual waste disposal and proposes a solar-based sanitary waste dispenser as a solution. It highlights the environmental and health risks posed by improper waste disposal methods such as burning in open spaces or dumping in landfills. The review discusses various available methods like incineration, red dot bins, dumping yards, and sanitary landfills, emphasizing their limitations and environmental consequences. It delves into the components of a solar-based system, including solar panels, charge controllers, batteries, a DC motor, and a heating coil. The solar panel, crucial for this project, absorbs sunlight to generate electricity stored in batteries, powering the waste disposal system, which includes a shredder, burner, and ash collector.

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The review also outlines the advantages of this system including effective waste disposal, lower power consumption, and user-friendliness, while drawbacks involve machine noise and size. In conclusion, the paper emphasizes the urgency of adopting commercial waste disposal methods to curb environmental harm. The solar-based system stands out for its hygiene, portability, and energy efficiency, aligning with initiatives like Swachh Bharat Abhiyan. [1]

 B. Pratiksha Pawar, Nikalje Prathmesh, Unni Aneesh, Bhosale Ninad, Biradar Visnu, Kulkarni Sudharm (05 May 2022) This research focuses on solving the issue of disposing of menstrual waste



Block Diagram [1]

by using an incinerator. The system involves an incinerator powered by electricity that heats a coil, which in turn burns sanitary napkins when put inside. The heating coil operates on the principle of generating heat when electricity passes through a resistant material, similar to how household appliances Burn 36% Other Method 2% Dustbin 58% Flush In Toilets 4% Burn Other Method Dustbin Flush In Toilets like electric irons work. The incinerator's design incorporates materials like nichrome alloy for the heating coil and a removable ash collector to gather the burnt ashes. The outer layer is made of Bakelite for easier handling, and the incinerator is surrounded by refractive material like silicon dioxide. This design is adaptable and can be used in schools, colleges, hospitals, and offices. Menstrual hygiene is essential for women's health and well-being. Proper management means using clean menstrual materials, changing them privately, and having access to safe disposal facilities. Poor menstrual hygiene can lead to health issues and negatively impact physical and mental well-being. The disposal techniques for menstrual waste vary based on geographic location, cultural beliefs, and access to disposal facilities. Urban areas often use disposable sanitary products and dispose of them in bins or toilets, while rural areas use reusable materials or burn/wash them privately. The incinerator proposed here aims to address the growing issue of waste disposal from disposable sanitary products. It is user-friendly, easy to maintain, and made with materials resistant to heat and corrosion. The resulting ash from the incinerator is biodegradable, contributing to environmental friendliness. Improper disposal of menstrual waste not only affects the environment but also poses health risks to communities. This proposed setup offers a solution to this pressing problem, aiming to maintain a cleaner environment and ensure better health for everyone, especially women facing challenges during menstruation.[2]

C. Prof. Meena Ugale, Yash Pawar, Pradnya Chavan (2020) The proposed system, a Sanitary Disposal System, Napkin addresses the environmental and health issues associated with improper disposal of sanitary pads. The system incorporates an electrical fire-based burner to incinerate used sanitary napkins efficiently and cleanly. By utilizing Arduino UNO R3. temperature sensors, LCD. and other components, the system ensures controlled burning and minimizes harmful emissions-the micro steel gauge filter further aids in removing toxic gases from the exhaust. The existing problem revolves around the unsanitary disposal of napkins, leading to health hazards and environmental pollution. The proposed system aims to provide a cleaner and more hygienic solution. It operates at a maximum temperature of 120°C for safety reasons, and the prototype demonstrated successful disposal of various materials, including sanitary napkins and A4 paper. While the current implementation is on an educational level, the system could be adapted for industrial use by increasing the operating temperature. This would further reduce burning time and minimize smoke generation. The



Sanitary Napkin Disposal System offers a practical and efficient approach to address the challenges associated with menstrual waste disposal.[3]

Results [3]

Material	Count	Temperature	Burning Time	Ash generated
A4 Size Paper	1	80	10 Min	< 1 gram
Whisper	6	120	15 minutes each	< 5 grams
Stayfree	6	120	15 minutes each	< 5 grams



Paper Ash [3]



Whisper Ash [3]

Stayfree Ash [3]

D. R. Borooah, H.N. Chanakya, S. Dasappa (2019) In simple terms, this study looked at two common machines in India used to dispose of sanitary napkins. These machines are meant for homes and are designed to burn used napkins. The study found some problems with these machines. The first one didn't heat up quickly, leading to more harmful gases being released when burning the napkins. The second machine had a different issue-it didn't burn the napkins efficiently. When burning a small number of napkins, both machines didn't meet the pollution standards set by the government. But when burning a larger number at once, the efficiency dropped even more. The researchers tried to fix these issues. They found that by making the machines heat up more before burning and changing the way air flows inside, they could reduce the harmful gases released. However, they also tested a different approach. Instead of using electricity, they used LPG gas, which is commonly used for cooking in India. This worked better. The napkins burned efficiently, and the harmful gases released were below the government's allowed limits. In simple terms, the study suggests that there are better ways to design these machines or even consider using gas for burning napkins at home, making them safer and more effective.[4]

E. Ms Shrutika Shinde, Ms Vaishnavi Barate1, Ms Saakshi Amrale, Ms Tulsi Kenjale1, Ms Vaishnavi Naik, Mr Ratan Patil (1 Jan 2020) This paper talks about the problems with getting rid of waste in India, especially sanitary waste like menstrual products. It points out that many people don't know much about managing waste, and there's not enough information available. The authors focus on the increasing use of disposable sanitary napkins and how they cause issues when thrown away. The research discusses studies about how girls and women deal with menstruation, the problems they face, and the need for better education. One solution proposed is using small incinerators at home to safely burn sanitary waste. The paper suggests that this could be a practical and affordable way to deal with the problem, reducing the burden on waste collectors and improving community health. Overall, the paper emphasizes the importance of spreading awareness, educating people, and creating policies to manage menstrual waste better. The idea is to find simple, cheap, and easy solutions to make things better for everyone.[5]



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- F. Sreedharan, Simrah Fathima (Oct 2021) The research talks about a big problem in India - not enough women use sanitary napkins during their periods. They suggest a solution with two main parts: a machine to easily get sanitary napkins and a device to safely dispose of used ones. The vending machine, working with a special card and buttons, helps women get sanitary napkins easily. The incinerator, like a small burning machine, helps in throwing away used napkins cleanly. This can be important, especially in public places and schools. The study shows how these solutions can make a big difference, not only for women's health but also for keeping our environment clean. This could be a good step to improve how we handle menstrual waste and make things better for everyone.[6]
- G. Rajanbir Kaur, Kanwaljit Kaur, Rajinder Kaur (2018) The text explores menstrual hygiene practices and challenges faced by women in developing countries due to cultural beliefs, restrictions, and inadequate waste disposal techniques. It delves into various absorbent types used during menstruation, from reusable cloth pads to commercial sanitary pads, tampons, menstrual cups, and innovative products like bamboo or banana fibre pads. Concerning menstrual waste disposal, it highlights the lack of appropriate techniques and the adverse consequences of improper disposal, such as clogging sewage systems and environmental pollution. Additionally, it emphasizes the role of men, boys, teachers, and policymakers in supporting menstrual hygiene management and creating awareness. Lastly, it presents strategies better menstrual waste management, for including the need for eco-friendly sanitary products, improved disposal techniques like incinerators or chutes, and the importance of education, proper infrastructure, and supportive policies in schools and communities.[7]



A) Clay Incinerator [7]

B) Mud Incinerator [7]

C) Cement Incinerator [7]

H. H. Megha M V, M A Chinnamma, Anitha K Subash (06 June 2021) The research introduces an incinerator-based system for sanitary napkin disposal at Thrissur Municipality. It focuses on burning napkins at a lower temperature through grinding, aiming for efficient combustion within 40 minutes for 100 kg of waste. The process produces ash, flue gas, and heat, treated with a carbon filter ensuring 95% purification. Additionally, it generates 1000 litres per hour of hot water for domestic use. The system boasts user-friendly features, pollution reduction, and affordability, appealing to various settings and NGOs. Clear specifications and a conclusive 6 | P a g e emphasis on a scientific and clean disposal method for sanitary napkins summarise the paper's intent and practical application in addressing waste management concerns.[8]

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- I. Sharika C, Chithra Chandran Adumb, Daina Joy, Elizabeth Jose Paul, Ashly Thomas (September 2019) The document highlights the pressing issue of increasing sanitary waste due to pads and diapers, proposing an ecofriendly waste disposer using IoT and various energy sources. It underscores the immense waste generated, challenges in current disposal methods, and existing systems like incinerators. However, cost remains a hurdle, especially in rural areas. Overall, it emphasizes the need for an affordable, efficient, and accessible solution to manage sanitary waste effectively.[9]
- J. Gautami Bhor1, Sayali Ponkshe (2018) Waste risks health pickers face in handling unsegregated waste, including sanitary pads. Despite instructions, improper disposal persists, putting waste pickers at risk. They receive low pay, minimal support, and lack safety gear. The proposed solution is "Dahini," a cost-effective sanitary napkin incinerator. At 4000 INR, it is affordable and can be installed in washrooms, schools, households, etc. This aims to safely dispose of sanitary waste at its source, with awareness campaigns supporting this initiative.[10]
- K. P. Yasotha and P. Kiruthika (May 2021) In summary, the online survey revealed that a majority of women in the 17 to 25 age group are well-informed about napkins, highlighting the physical and mental challenges faced during menstruation. Notably, 72% of employed women higher education pursuing reported the availability of sanitary pad dispensing machines at their workplaces. The survey indicated a preference for disposable sanitary pads, with the brand Whisper being favored among various options. Additionally, some respondents expressed interest in alternative products with herbal coating, fragmentation, and thinner designs. Overall, the findings suggest a willingness to embrace new menstrual hygiene products if they offer alternatives without side effects.[11]

5. CONCLUSIONS

Through research and review papers on incinerators, several issues arise in their disposal processes. These problems encompass aspects such as costs, quantity management, safety concerns, etc. To address these issues and pollution control, our proposed solution involves the utilization of an LPG-based incinerator. To reduce pollution and harmful fumes, we intend to incorporate precipitators and carbon filters into the system.

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