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IOT Based Smart Napkin Incinerator

Deepika^{N1}, Jayasri V², Mariesakki V³, Monisha RP⁴, A.H. Jainab Ruxana⁵

Department of Biomedical Engineering, Dhaanish Ahmed Institute of Technology Coimbatore, Tamil Nadu, India

ABSTRACT: This concept propose an environmentally friendly method of disposing of sanitary waste by using an incinerator, a microcontroller, and sensors. The microcontroller of the device controls the incineration with an infrared detector placed close to the dispensed intake. The sanitary waste is sent into the incinerator, where it burns to generate ash and gases. The gases pass via charcoal as the medium, crop cotton, and UV light-filtered chimneys to reduce smells and carbon-di- oxide emission. Erroneous management of menstrual waste can have detrimental impacts on the atmosphere and public health, especially in the rural areas and in female-only housing and educational institution. The proposed approach take this into account by ensuring proper disposal by destroying napkins at a low temperature. By using such technologies, public hygiene and environmental quality or improved and the incinerated ash as possible of manure.

KEYWORDS: Sanitary Waste, Incinerator, Microcontroller, Environmental Quality, Menstrual waste, Public hygiene, Proper Disposal.

I. INTRODUCTION

Waste disposal has emerged as a pressing issue in India, compounded by the non-biodegradable nature of materials used in products like sanitary napkins, which pose significant environmental and health hazards. The consequences are particularly severe due to deficiencies in neighborhood waste management practices, as well as inadequacies in solid waste control and transportation networks prevalent in both rural villages and urban towns. Moreover, the categorization of sanitary waste, whether as plastic or biomedical, adds complexity to its disposal process, creating further challenges in waste management. In the context of waste disposal, the Bio-Medical Waste Management Rules delineate specific protocols for the handling of various materials, emphasizing the need for sterilization or incineration to eliminate pathogens. However, the absence of reliable statistics and documentation underscores a broader neglect of waste management concerns in the nation. This lack of attention is striking, especially considering the staggering statistics highlighted by studies such as "Sanitary Protection: Every woman's health right," which indicates that a mere 12 percent of menstruating women in India have access to disposable sanitary napkins. Additionally, the Environment portal Down to Earth estimates that a staggering 432 million pads are disposed of each month. The issue extends beyond waste management; it intersects with broader challenges in menstrual hygiene, a topic still fraught with misinformation, myths, and taboos in Indian society. Despite the crucial role of sanitary pads in maintaining hygiene, many women and girls lack access to these essential products. The consequences are dire, with incidents of reproductive tract infections being 70 percent more prevalent among affected individuals. Economic barriers further compound the problem, with 88 percent of women resorting to unhygienic alternatives like sand, rags, or cloth due to the inability to afford sanitary pads.

Challenges in Menstrual Hygiene Management:

Menstrual hygiene management remains a daunting challenge in India, where societal stigmas and economic constraints hinder access to essential menstrual hygiene products. The transition into adolescence, marked by the onset of menstruation, represents a critical period in a girl's life, necessitating special attention to ensure proper hygiene practices. However, lack of knowledge and awareness, coupled with cultural taboos, often exacerbate the difficulties faced by young girls in managing their menstrual health.

The Role of Waste Disposal:

Within the broader context of waste disposal, the challenges posed by sanitary waste are particularly pronounced. The non-biodegradable nature of materials used in products like sanitary napkins exacerbates environmental degradation and health risks, especially in the absence of proper waste management infrastructure. The unorganized methods of waste collection and disposal prevalent in many regions further compound the problem, leading to unsanitary conditions and environmental pollution.



The Need for Incineration:

One proposed solution to the challenge of sanitary waste disposal is incineration. Incinerators offer a scientifically sound method of disposing of used sanitary napkins, ensuring the complete destruction of pathogens and minimizing environmental contamination. By converting napkins into sterile ash at relatively low temperatures, incineration addresses both the health and environmental risks associated with improper waste disposal practices.

II. EXISTING SYSTEM

The current systems addressing the challenges of automatic stretchers with sanitization lack comprehensive integration, leading to limitations and drawbacks. Various individual solutions or technologies are employed, each with its own set of shortcomings:

Smart Sensors: Equip the napkin incinerator with sensors to detect napkin disposal and fill levels. These sensors could be infrared sensors, weight sensors, or any other appropriate technology.

Connectivity: Integrate IoT capabilities to enable communication between the napkin incinerator and a central server or cloud platform. This could be achieved through Wi-Fi, Bluetooth, or other wireless protocols.

Data Transmission and Analysis: Collect data from the sensors regarding napkin disposal frequency, fill levels, temperature, etc. Transmit this data to a cloud platform for analysis.

Remote Monitoring and Control: Provide users with a mobile app or web interface to remotely monitor the status of the napkin incinerator, including fill levels and operational status. Allow users to control certain functions remotely, such as starting the incineration process or adjusting settings.

Automated Alerts and Notifications: Implement automated alerting systems to notify users when the napkin incinerator needs maintenance, when it's nearing full capacity, or when there are any malfunctions or safety concerns.

Energy Efficiency: Incorporate features to optimize energy usage, such as smart scheduling of incineration cycles based on usage patterns or energy-efficient heating elements.

Safety Features: Ensure the system incorporates safety mechanisms to prevent accidents, such as automatic shutdown in case of overheating or malfunction.

Integration with Waste Management Systems: Explore integration with broader waste management systems to optimize collection routes or facilitate recycling of materials if applicable

III. PROPOSED METHODOLOGY

The "IoT based smart napkin incinerator" project proposes an integrated system that aims to enhance women's hygiene. The proposed system includes the following components and advantages:

Developing an IoT-based smart napkin incinerator involves integrating various technologies to ensure efficient, safe, and user-friendly operation. Below is a proposed methodology for designing and implementing such a system:

Requirement Analysis: Identify the key requirements and objectives of the smart napkin incinerator system. These may include: Automatic napkin disposal and incineration. Monitoring of napkin incineration process. Safety measures to prevent accidents. Remote control and monitoring capabilities via IoT.

Hardware Selection: Choose appropriate hardware components such as: Incinerator unit: Select a compact and efficient incinerator capable of handling napkins safely. Temperature sensors: Install sensors to monitor incineration temperature. IoT microcontroller (e.g., Arduino, Raspberry Pi): Select a microcontroller capable of interfacing with sensors and connecting to the internet. Safety features: Include components like smoke detectors, fire extinguishers, and



emergency shutdown mechanisms.

Sensor Integration: Integrate temperature sensors within the incinerator to monitor the temperature during the incineration process. Implement smoke detectors to detect any abnormal smoke levels, indicating potential issues with the incineration process.

IoT Connectivity: Connect the microcontroller to the internet using Wi-Fi or Ethernet connectivity. Implement secure communication protocols (e.g., MQTT) to ensure data integrity and confidentiality.

User Interface Development: Develop a user-friendly interface for controlling and monitoring the incinerator remotely. Design a mobile application or web interface allowing users to Start/stop the incineration process.

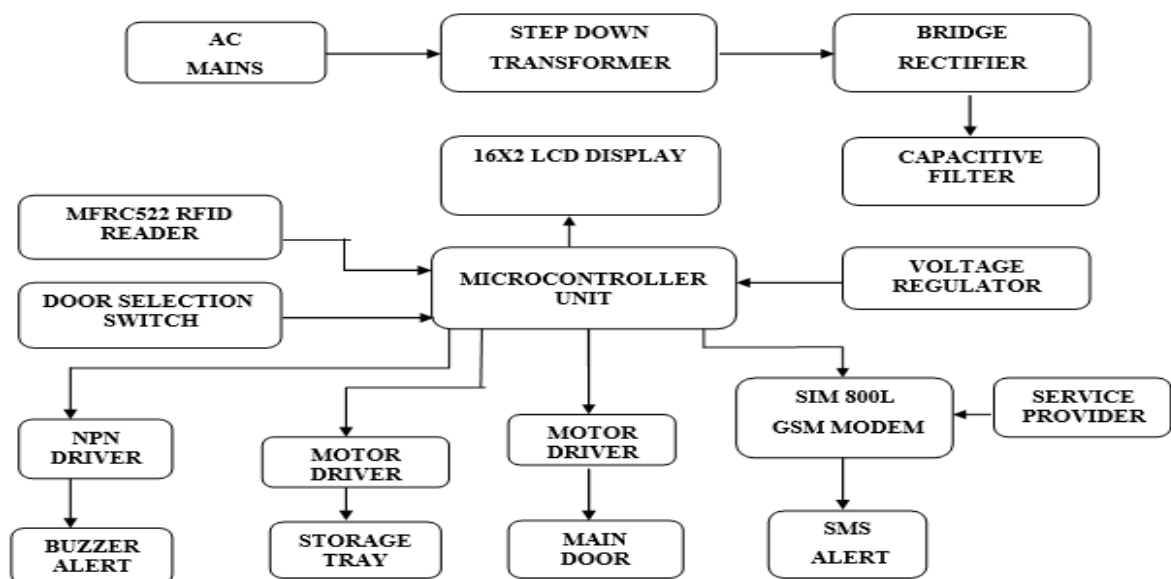
Safety Measures: Implement safety protocols to prevent accidents, such as: Emergency shutdown mechanism triggered by abnormal temperature or smoke levels. Automatic cutoff if the incineration process exceeds safe operating parameters.

Data Logging and Analytics: Implement a data logging system to record temperature, smoke levels, and other relevant parameters. Analyze the collected data to identify patterns, optimize incineration processes, and detect any anomalies.

Testing and Iteration: Conduct thorough testing to ensure the reliability, efficiency, and safety of the system. Gather feedback from users and stakeholders to identify areas for improvement. Iterate on the design based on testing results and feedback.

Deployment and Maintenance: Deploy the smart napkin incinerator system in appropriate locations such as public restrooms, hospitals, or commercial establishments. Establish a maintenance schedule for regular inspection, cleaning, and calibration of sensors and incinerator components. Provide ongoing support and updates to ensure the continued functionality and effectiveness of the system

IV. BLOCK DIAGRAM



Block Diagram of IoT Based Smart Napkin Incinerator



V. EXPLANATION

The block diagram for the "IoT based smart Napkin Incinerator" project can be summarized as follows . An IoT-based Smart Sanitary Napkin Disposal Machine is a sophisticated solution designed break down its components and functionalities in detail:

AC Main: The AC main serves as the primary power source for the device, ensuring continuous operation.

Step-Down Transformer: This component is responsible for reducing the voltage from the main power supply to a suitable level for the device's operation, ensuring safety and compatibility.

Bridge Rectifier: It converts the alternating current (AC) from the transformer into direct current (DC), which is required for powering various electronic components of the machine.

6x2 Display: The 16x2 display provides a user-friendly interface for interacting with the machine. It can display relevant information such as instructions, status updates, and notifications.

Capacity Filter: The capacity filter helps in containing and managing the disposed sanitary napkins efficiently, ensuring optimal usage and preventing overflow.

VI. WORKING METHODOLOGY

The working methodology of an IoT-based sanitary napkin incinerator involves a seamless integration of various components and processes to ensure efficient and user-friendly operation. At its core, the device consists of an incineration chamber equipped with advanced thermal management systems and safety mechanisms. When a sanitary napkin is disposed of into the incinerator, sensors detect its presence and initiate the combustion process. The IoT connectivity allows for remote monitoring and control, enabling users to access the device's status and functionality through smartphone applications or web interfaces. Users can initiate disposal cycles, monitor usage statistics, and receive real-time notifications regarding operation and maintenance requirements.

Once a disposal cycle is initiated, the incineration chamber heats up to high temperatures, ensuring complete combustion of the sanitary napkin while minimizing energy consumption and emissions. Throughout the process, temperature sensors and other monitoring devices continuously track critical parameters to ensure safe and efficient operation. In the event of any anomalies or safety concerns, automated safety mechanisms, such as fire detection and extinguishing systems, are activated to mitigate risks and safeguard users and the environment.

The user interface, typically in the form of a touchscreen display or smartphone application, provides an intuitive platform for users to interact with the incinerator. From initiating disposal cycles to accessing usage logs and adjusting settings, the user interface simplifies the entire process, making it accessible to users of all backgrounds.

Moreover, the IoT capabilities of the device enable the collection of valuable data regarding usage patterns, operational efficiency, and maintenance requirements. By analyzing this data, stakeholders can identify optimization opportunities, tailor services to user preferences, and proactively address maintenance issues, thereby maximizing the longevity and performance of the incinerator.

Overall, the working methodology of an IoT-based sanitary napkin incinerator combines advanced technology, efficient combustion processes, and user-friendly interfaces to revolutionize menstrual hygiene management, promote environmental sustainability, public health, and operational efficiency.

VII. FUTURESCOPE

The future scope for IoT based smart napkin incinerator is promising. Below mentioned are some potential advancements:

- **Research and Regulatory Compliance:** Conduct thorough research on local regulations and standards regarding



sanitary waste disposal and emissions from incineration. Ensure compliance with environmental regulations, emission limits, and safety standards for incinerators.

- **Efficiency Optimization:** Optimize the combustion process for efficient disposal of sanitary napkins while minimizing energy consumption and emissions. Consider features such as rapid heating elements, insulation, and combustion chamber design to achieve high combustion efficiency.
- **Temperature Control and Monitoring:** Implement temperature control mechanisms to ensure proper combustion temperature is maintained throughout the process. Integrate sensors and monitoring systems to track temperature levels, airflow, and other relevant parameters for safe and effective operation.
- **Automatic Operation and User Interface:** Design user-friendly interfaces with simple controls for initiating and monitoring the incineration process. Incorporate automation features such as automatic lid opening/closing and self-cleaning functions to enhance convenience and hygiene.
- **Emissions Control and Environmental Impact:** Install emission control systems such as filters and scrubbers to minimize air pollutants and odors released during incineration. Consider the environmental impact of the disposal process, including the potential for ash residue. Develop strategies for ash management and disposal in an environmentally responsible manner.
- **Manufacturing and Distribution:** Once the design is finalized, establish manufacturing processes to produce the compact incinerator units at scale. Develop distribution channels to make the product accessible to target markets, including public institutions, commercial facilities, and households.

VIII. CONCLUSION

In conclusion, the IoT-based smart napkin incinerator represents a pioneering solution in waste management and hygiene maintenance. By seamlessly integrating IoT technology, it offers unprecedented efficiency, convenience, and sustainability in disposing of used napkins. Through real-time monitoring, remote management, and data analytics capabilities, it optimizes resource usage, minimizes environmental impact, and enhances user experience. With its ability to adapt to diverse settings, from public restrooms to healthcare facilities, it promises to revolutionize sanitation practices globally. Embracing such innovative solutions not only improves hygiene standards but also underscores our commitment to building a cleaner, smarter future for generations to come.

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