



# SANITARY NAPKIN WENDING MACHINE

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## Abstract:

The automated vending machine for sanitary napkins represents an innovative approach to meeting the urgent demand for accessible menstrual hygiene products across various settings. It accommodates a wide array of preferences by providing different sizes and brands of napkins, ensuring that users can find a product that suits their specific requirements. The integration of digital payment methods, including mobile and contactless options, facilitates a smooth, cashless transaction process, which is especially advantageous for upholding hygiene standards in public or communal areas.

A significant advancement of this machine is its incorporation of the ESP32 microcontroller, which supports secure transactions and allows for remote monitoring. With real-time inventory management, operators can keep track of stock levels and receive maintenance notifications remotely, ensuring that the machine remains functional and well-stocked. This capability is vital for locations with high foot traffic, enabling timely restocking and minimizing downtime. By deploying this solution in environments such as schools, workplaces, public restrooms, and transit stations, the initiative not only enhances menstrual hygiene but also tackles accessibility challenges, empowering women and girls by providing straightforward and stigma-free access to essential products. This initiative marks a significant advancement in public health, menstrual equity, and the acceptance of menstrual care in public settings.

**Index Terms – ESP32, Menstrual Hygiene, Online payment, Different Sizes and Brands.**

## I. INTRODUCTION

Effective management of menstrual hygiene is crucial for enhancing the health, comfort, and confidence of women in both public and private settings. Unfortunately, many areas still lack accessible and sanitary options for acquiring sanitary napkins, leading to daily obstacles and disruptions, particularly in schools, workplaces, and public venues. The introduction of an automated vending machine for sanitary napkins directly addresses these deficiencies by providing a selection of products in various sizes and brands, enabling women to select items that suit their individual preferences. This solution guarantees quick and convenient access to essential products, alleviating discomfort and offering a streamlined approach to menstrual hygiene management, irrespective of the location.

The vending machine is equipped with a secure online payment system that accommodates multiple digital payment options, including mobile wallets and UPI, promoting cashless transactions that enhance both hygiene and user convenience. This feature reduces physical contact, which is vital for public health and safety, especially in busy areas. Furthermore, the machine's IoT-enabled technology allows for real-time inventory monitoring and maintenance notifications, ensuring that operators can keep the machine fully operational and stocked. This capability is particularly beneficial in high-demand settings, facilitating timely restocking and minimizing downtime, which is essential for dependable service.

Constructed for durability and user-friendliness, this vending machine promotes effective menstrual hygiene management while creating a supportive atmosphere in both urban and rural communities. By broadening access to sanitary products, this initiative not only contributes to public health but also helps to challenge the stigma associated with menstruation. This inclusive and innovative solution is instrumental in empowering women by ensuring that menstrual hygiene products are easily accessible in public spaces, schools, and workplaces.

## II. PROBLEM STATEMENT

The goal is to design and implement a sanitary napkin vending machine that integrates online payment capabilities and accommodates various napkin sizes. This machine must provide a seamless user experience by enabling secure transactions via mobile payments, ensuring that users can easily select and purchase the appropriate size of napkin. The design must also include a reliable dispensing mechanism to handle different napkin sizes accurately, preventing jams or dispensing errors.

Additionally, the system must ensure robust connectivity and data security to protect user information and facilitate smooth transaction processing. The machine should feature an intuitive interface for ease of use and include mechanisms for monitoring machine performance, managing inventory, and generating maintenance alerts.

## III. OBJECTIVES

- 1) To Develop a sanitary pads vending machine that can accommodate various napkin sizes and brands.
- 2) To Integrate an online payment system to facilitate easy purchasing and transaction processing.
- 3) To Optimize machine operation to maximize output while maintaining quality standards.

## IV. PROPOSED ARCHITECTURE

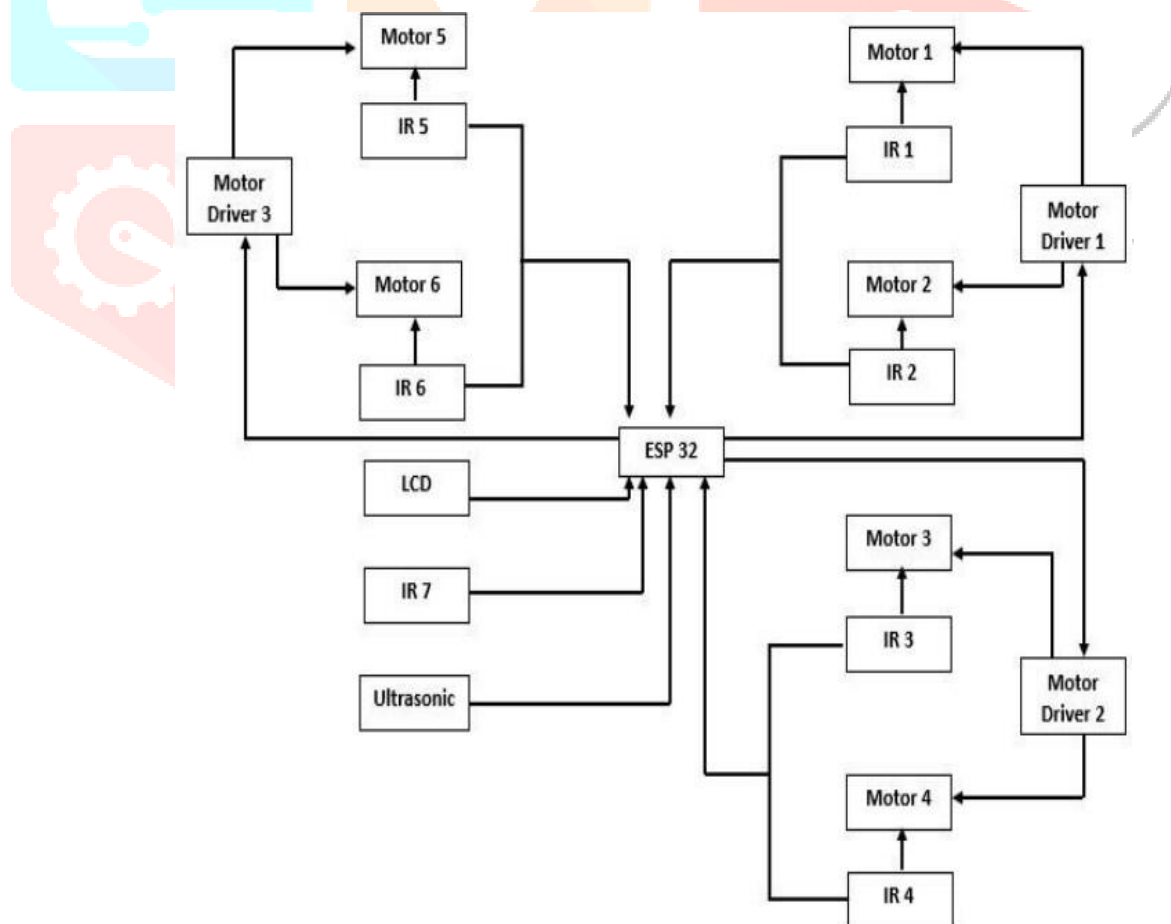


Fig.1 Proposed Architecture

- **ESP32**

The ESP32 microcontroller serves as the pivotal element in the sanitary napkin vending machine, driving its effective functionality through robust processing and connectivity capabilities. With integrated Wi-Fi and Bluetooth, the ESP32 supports critical operations such as remote monitoring, cashless payments, and real-time inventory management. This connectivity allows operators to receive prompt alerts regarding restocking requirements and technical malfunctions, thereby minimizing downtime and ensuring product availability. Furthermore, the ESP32 features a secure online payment system that accommodates various digital payment methods, enabling users to transact via mobile wallets and QR codes, which enhances hygiene by reducing physical contact.

From a hardware perspective, the ESP32's compatibility with sensors and motors allows for precise management of the vending mechanism, enabling accurate detection of stock levels and the smooth dispensing of napkins in various sizes and brands. Its low power consumption makes it suitable for continuous operation, particularly in areas with limited power supply. Additionally, the microcontroller supports a user-friendly interface with LCD displays, improving the vending machine's accessibility by providing clear instructions for product selection and purchase. With the ESP32 as its foundation, the vending machine represents a reliable, efficient, and convenient solution that promotes menstrual hygiene management across a range of public.

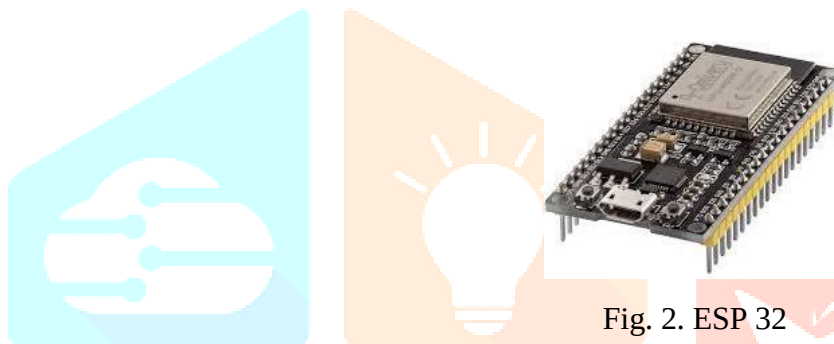


Fig. 2. ESP 32

- **DC Motor**

A 12V DC motor is an electric motor designed to function with a 12V direct current power source. It transforms electrical energy into mechanical motion through the interaction of magnetic fields within the stator and rotor. The motor's speed can be regulated by varying the voltage, while its rotational direction can be altered by reversing the current's polarity.

These motors are frequently utilized in applications such as vending machines due to their compact size, ease of control, and affordability. In the context of your vending machine, the 12V DC motor powers the dispensing mechanism, activating springs to release a napkin when prompted by the ESP32 microcontroller.

A 12V DC motor in a sanitary napkin vending machine is used to drive the dispensing mechanism. When activated, it rotates to release a napkin from the storage compartment. The motor operates on 12V DC power and is controlled by the ESP32, which triggers it based on user input or sensor feedback.



Fig. 3 DC Motor

- **Motor Driver**

The L298 motor driver functions within a voltage range of 4.5V to 46V for motor operation and 5V to 7V for its logic circuitry. It is capable of providing a continuous current of up to 2A per channel, with the ability to manage peak currents reaching 3A. This driver allows for control of motor direction (forward, reverse, brake, coast) and enables speed modulation via PWM at frequencies up to 25 kHz. Additionally, it includes features for overcurrent and thermal protection, incorporating a thermal shutdown mechanism to avert overheating. The L298 is commonly utilized in robotics and automation, particularly for controlling 12V DC motors in applications such as napkin dispensing in vending machine.



Fig. 4 Motor Driver

The L298 motor driver is a dual H-bridge integrated circuit designed for the control of both DC motors and stepper motors. It facilitates the operation of motors in forward and reverse directions while also allowing for speed regulation through PWM signals. In the context of a vending machine, the L298 is responsible for managing the 12V DC motor that dispenses napkins, adjusting both direction and speed according to commands received from the ESP32.

- **IR Sensor**

An IR sensor generally functions within a wavelength spectrum of 700 nm to 1 mm, utilizing infrared light to identify objects or variations in distance. Depending on the specific model, it can detect items from mere millimeters to several meters away. These sensors typically feature a detection angle ranging from 30 to 60 degrees, enabling them to sense objects within a specified area.

The sensor is composed of an infrared emitter (LED) and a photodetector (such as a photodiode or phototransistor) that captures the reflected infrared light. Key specifications often include a 5V supply voltage, minimal power consumption, and a rapid response time, making IR sensors well-suited for applications such as proximity detection and position sensing in devices like vending machines.



Fig.5 IR Sensor

An IR (Infrared) sensor is a device designed to detect infrared light, enabling it to identify the presence of objects or gauge distances. In the context of a sanitary napkin vending machine. This sensor can be utilized to determine when a napkin has been dispensed or to detect the proximity of a user's hand for interaction purposes. The operation of the sensor involves emitting infrared light and analyzing the reflection from surrounding objects.

- **LCD Display**

The 16x4 LCD is a liquid crystal display that consists of 16 columns and 4 rows, enabling it to present a total of 64 characters simultaneously. This display is frequently utilized in embedded systems, providing a straightforward method for conveying text, instructions, status updates, and notifications. In the context of a sanitary napkin vending machine, the 16x4 LCD, managed by the ESP32, delivers crucial information to users, including product options, transaction updates, and machine notifications. Equipped with a backlight for improved visibility in different lighting environments and adjustable



contrast settings, the 16x4 LCD promotes an intuitive user interface and enhances the overall experience of using the vending machine.

Fig. 6 LCD Display

- **Android Application**

The Android application designed for the sanitary napkin vending machine will incorporate a user-friendly front-end crafted with XML, ensuring a smooth interface for users to choose their preferred brand, size, and payment methods. The design will be intuitive, allowing users to navigate the vending process effortlessly, supported by clear prompts and instructions. The back-end, built using Java, will manage the application's essential functions, including processing user selections, validating payments, and overseeing server communications. Java will facilitate efficient task execution, such as updating inventory and handling transactions, resulting in a responsive and effective system.

A PHP-based API will enable seamless interaction between the application and the server, managing tasks such as payment processing, inventory oversight, and data transfer. This API will authenticate transactions, verify product availability, and activate the dispensing mechanism when necessary. The entire system will be hosted on Hostinger, providing dependable performance and secure data management. To enhance accessibility, a QR code generated with Python will allow users to swiftly download the application by scanning the code, simplifying the installation process and improving user convenience.

## **V. IMPLEMENTATION AND WORKING**

The sanitary napkin dispenser is engineered to deliver a smooth and intuitive user experience, guiding users from the selection of a napkin to its dispensing. The process initiates when the user engages with the machine's interface to choose a napkin according to their desired brand and size. The system then automatically calculates the total cost based on the selection and presents the payment amount on the LCD screen, ensuring transparency regarding the price. After the customer opts for mobile payment, the system awaits payment confirmation before proceeding. The payment interface is designed to support secure mobile payment options, facilitating efficient transaction completion for users.

Upon receiving confirmation of payment, the ESP32 microcontroller activates the motor driver, which in turn powers the 12V DC motor to commence the dispensing process. The motor's rotation engages a spring-loaded or gravity-driven mechanism that guides the selected napkin toward the exit. The napkins are strategically organized within the dispensing unit to ensure that only one napkin is dispensed at a time. The machine is calibrated to handle various napkin sizes and brands, ensuring consistent performance across different products. As the napkin approaches the exit, an infrared sensor (sensor 7) positioned near the machine's exit detects its presence. When the napkin reaches the specified location, the sensor sends a signal to the microcontroller to stop the motor, preventing additional dispensing and ensuring the napkin is ready for the customer to collect.

In addition to its role in detecting the napkin's position, sensor 7 significantly enhances the user experience by sensing when a customer is nearby. This prompts the system to pause and prepare for easy retrieval, providing the customer with a clear indication that the napkin is ready for collection.

## VI. FLOWCHART

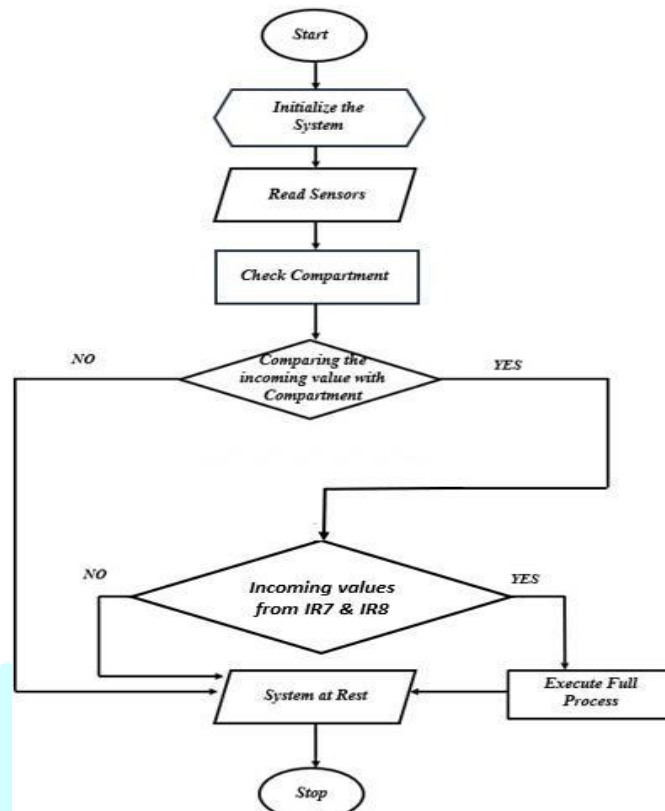


Fig. 7 Flowchart

This flowchart illustrates the operational logic of a system designed to monitor and react to specific conditions.

## VII. CONCLUSIONS

The introduction of a sanitary napkin vending machine equipped with online payment options, powered by ESP32 technology, is set to greatly improve accessibility and convenience for women in various settings, including public areas, educational institutions, workplaces, and remote locations. This initiative aims to simplify menstrual hygiene management, ensuring that women can discreetly obtain essential products in places where access may be restricted. The incorporation of online payment systems will facilitate secure and efficient transactions, removing the necessity for cash and

providing a smooth experience through digital payment platforms.

Additionally, the machine will be designed to send automatic alerts regarding stock levels and any technical malfunctions, enabling operators to remain updated on maintenance requirements and ensuring continuous functionality.

Utilizing ESP32 technology will allow for effective operation and remote monitoring, delivering real-time information about the machine's status, including inventory and operational performance. This advancement is anticipated to have a positive effect on public health by catering to the varied needs of women, diminishing the stigma associated with menstrual hygiene, and empowering women to manage their health with confidence and privacy.

## VIII. RESULT

The development of a fire-extinguishing robot typically involves testing its effectiveness in navigating environments, detecting fires, and deploying extinguishing mechanisms. Here's an outline of the factors that are commonly evaluated and potential results: A successful robot should be able to navigate complex environments (e.g., stairs, uneven ground) autonomously or semi-autonomously. Performance can vary based on terrain type, with challenges often seen in cluttered spaces. Ensure the robot reliably detects fire and high temperatures. Accurate and prompt detection of heat and flames is critical. Results show that combining infrared and thermal imaging sensors typically provides better detection accuracy, with reduced false positives.



Fig. 8: Model of vending machines



Fig. 9: Application of Vending Machine

## Admin Login

Login

Fig. 10: Admin Panel

Whisper Ultra Soft Sanitary (XL Plus) pads (Only Single pad).

Price : 20.0

Available Quantity : 1

Update

Fig. 11: Price Update

The admin panel of a sanitary napkin vending machine allows operators to manage and monitor machine functions remotely. It provides access to data on inventory levels, showing when the napkins need replenishing. The panel also tracks usage statistics, helping administrators identify peak demand times. It enables settings adjustments for machine operations, such as pricing or dispensing options. Additionally, the admin panel can send alerts for machine malfunctions or maintenance.

The price of napkins in a vending machine can be updated through the admin panel, allowing operators to adjust prices in real-time based on market fluctuations. This feature ensures that the vending machine remains competitive and aligned with current market rates.

## REFERENCES

- [1] Chaudhary, P., Singh, R., & Bhardwaj, A. (2021). Challenges in the Implementation of Sanitary Napkin Vending Machines: A Review. *Journal of Public Health Research and Development*, 8(3), 120-126.
- [2] Patkar, A., Bhatt, R., & Patel, D. (2020). Workplace Productivity and Menstrual Hygiene: The Impact of Sanitary Napkin Vending Machines. *Journal of Occupational Health*, 62(4), 256-264.
- [3] Kothari, R., & Shaikh, S. (2020). Eco- Friendly Sanitary Napkins: A Sustainable Solution for Menstrual Hygiene. *Environmental Science and Pollution Research*, 27(19), 24578- 24584.
- [4] Aditi Abhimane, Dr. Anil L. Wanare (2019). Sanitary Napkin Vending Machines with Various Size and Payment Options: *journal of Emerging Technologies and Innovative Research*, 6(6), 2349-5162.
- [5] R.W. Webster, P.W. Ross(1999), "Controlling a Java enabled Pepsi(R) vending machine over the World Wide Web", *Industrial Electronics Society*, 1999. IECON '99 Proceedings. The 25th Annual Conference of the IEEE.
- [6] Rincy Merrin Varkey (2014), "Design and implementation of smart vending machines" *International journal of computer networks and wireless communications*. Aug. 2017.
- [6] Nandesh K N, et.al, "Improving the Efficiency of Weigher using PLC Controller", *IJRET: International*

- [7] C.J. Clement Singh, K. Senthil Kumar,” Single Electron Device based automatic te vending machine”, Information and Communication Technology in Electrical Sciences (ICTES 2007), 2007. ICTES. IET-UK International Conference [3]Dattu B. Shinde & Reshma S. Waghmare, “PLC Based Industrial Timer Controller for Multiple Machines”, International Journal of Emerging Technologies in Engineering Research (IJETER) Volume 4, Issue 8, August (2016)

