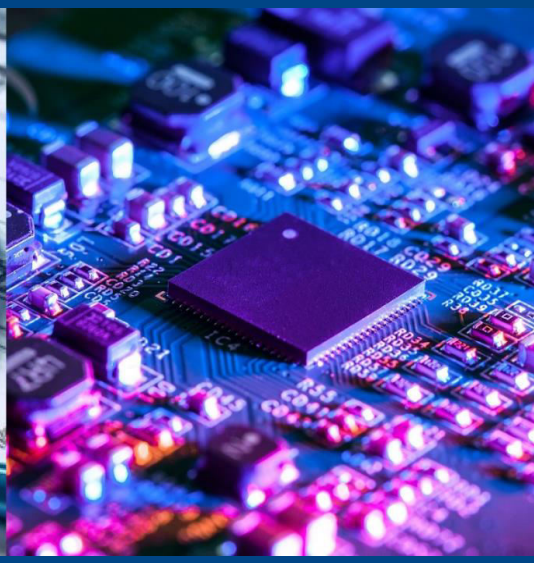
ISSN: 2582-7219





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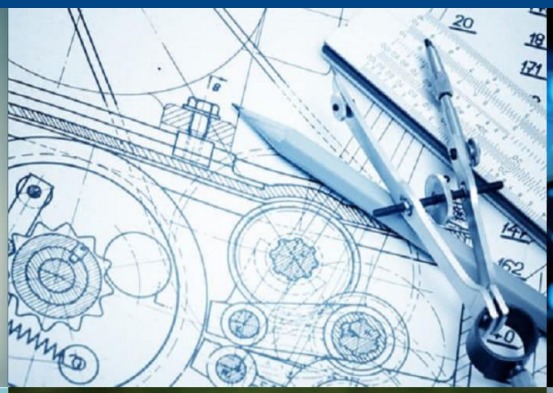

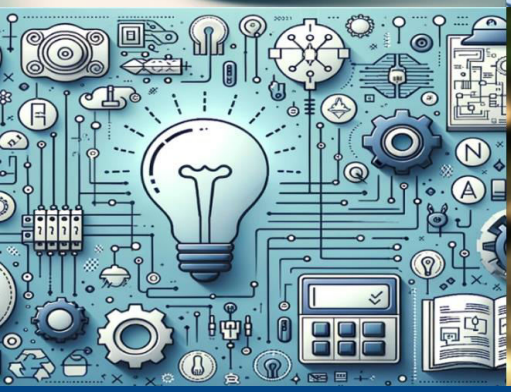

Impact Factor: 8.206 **Volume 8, Issue 6, June 2025**

© 2025 IJMRSET | Volume 8, Issue 6, June 2025| DOI:10.15680/IJMRSET.2025.0806136

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

An Overview of Smart Sanitization and Alcohol Detection System for Public Safety

Trupti Dhanadhya, Rajeshwari Jadhav, Tejashri Kathare, Kaveri Najan, Priya Jangle

Asst. Professor, Department of Electrical Engineering, Dr. D. Y. Patil Institute of Technology Pimpri, Pune, India

B.E. Student, Department of Electrical Engineering, Dr. D. Y. Patil Institute of Technology Pimpri, Pune, India

B.E. Student, Department of Electrical Engineering, Dr. D. Y. Patil Institute of Technology Pimpri, Pune, India

B.E. Student, Department of Electrical Engineering, Dr. D. Y. Patil Institute of Technology Pimpri, Pune, India

B.E. Student, Department of Electrical Engineering, Dr. D. Y. Patil Institute of Technology Pimpri, Pune, India

ABSTRACT: The COVID-19 pandemic has highlighted the need for advanced safety solutions in public spaces. This paper proposes an integrated system combining IoT-based health monitoring, automated sanitization, and alcohol detection to enhance public safety. A smart door system with face mask detection, contactless temperature screening, and audio-visual guidance minimizes human interaction. Additionally, an Arduino-based unit integrates a hand sanitizer dispenser, oximeter, heart rate monitor, and non-contact temperature sensor. An Automatic Walkthrough Sanitization Tunnel further improves safety by using disinfectants, UV-C rays, and real-time health monitoring to detect symptoms and trigger alerts when necessary. To address impaired driving, which contributes to nearly 40% of traffic-related fatalities, this paper explores alcohol detection technologies. IoT-based breath analyzers using MQ3 sensors and non-contact ethanol detection devices provide real-time alerts, ensuring accurate identification of intoxicated drivers. By integrating these technologies, this system offers a scalable and cost-effective approach to improving public health and road safety in high-risk environments.

KEYWORDS: Smart Starter, Agricultural Applications, Energy Conservation, IoT Sensors, Automation

I. INTRODUCTION

In modern agriculture, efficiency and sustainability are paramount. The use of 3-phase motors for various agricultural applications—such as irrigation systems, grain processing, dairy operations, and transportation of materials—is extensive. These motors are essential for powering equipment that drives productivity and operational effectiveness in farming. However, traditional motor systems often operate below optimal efficiency, resulting in excessive energy consumption, increased operational costs, and suboptimal performance. To enhance their efficiency, incorporating a capacitor bank into the motor starter system presents a viable solution. This approach not only improves the power factor but also significantly reduces energy consumption, ultimately contributing to cost savings and environmental sustainability.

A. Background

Maintaining public hygiene and safety in high-traffic areas like hospitals, malls, and offices has become increasingly important. Disinfectant misting chambers provide a contactless and efficient solution for reducing pathogen spread. These systems use motion-activated misting with Sodium Hypochlorite to ensure rapid and thorough disinfection. Their durable construction and automated operation make them suitable for public use. However, existing misting chambers have limitations, such as the absence of insulation, drainage systems, and backup power, which affect reliability and efficiency. Additionally, they focus solely on sanitization without addressing other safety concerns. Our Smart Sanitization and Alcohol Detection System improves upon this concept by integrating alcohol detection alongside automated sanitization. This dual-function system enhances both hygiene and security, making it particularly useful in workplaces, public transport hubs, and other sensitive environments.

B. Necessity

The Smart Sanitization and Alcohol Detection System is essential for maintaining hygiene and safety in public spaces, particularly in high-traffic areas such as hospitals, malls, airports, workplaces, and public transport hubs. The risk of

infectious disease transmission remains a major concern, and automated sanitization provides a consistent and effective way to reduce pathogen spread while minimizing reliance on manual cleaning. Additionally, intoxication in sensitive environments can lead to accidents and impaired decision-making, posing risks to public safety. By integrating alcohol detection, the system helps identify individuals under the influence, preventing potential hazards in workplaces, healthcare facilities, and transportation settings.

Designed for scalability and flexibility, the system can be deployed in various environments, from small offices to large public venues, ensuring broad applicability. It also incorporates eco-friendly disinfectants, reducing environmental impact while maintaining high hygiene standards. Automation plays a key role in enhancing efficiency, allowing continuous disinfection of high-touch surfaces and real-time alcohol detection without constant human intervention, thereby lowering labor costs and improving reliability. Moreover, the system offers customizable features, such as adjustable disinfection schedules and alcohol detection sensitivity, making it adaptable to different operational needs. By combining these capabilities, the Smart Sanitization and Alcohol Detection System provides a comprehensive solution for public health and safety, ensuring both hygiene and responsible behavior in high-risk areas.

C. Features

A. Automated Sanitization: The system features a contactless misting mechanism that sprays a fine mist of disinfectant, ensuring thorough and uniform sanitization of individuals and surfaces. This eliminates the need for manual cleaning, reducing human effort while maintaining high hygiene standards.

B. Alcohol Detection System: Equipped with advanced alcohol sensors, the system can detect individuals under the influence of alcohol. This feature is particularly useful in workplaces, public transport hubs, and healthcare facilities, where intoxication can lead to accidents or safety risks.

C. Scalability and Flexibility: The system is designed for various environments, from small offices to large public spaces like airports, malls, railway stations, and event venues. It can be customized to fit different operational needs, ensuring its suitability across multiple sectors.

D. Eco-Friendly Disinfectants: Traditional disinfectants often contain harsh chemicals that can be harmful to both humans and the environment. This system uses non-toxic, non-irritating disinfectants, ensuring user safety while reducing the environmental impact. It helps maintain air quality and prevents the accumulation of chemical waste.

E. Automation and Efficiency: By integrating motion sensors and automated controls, the system operates without requiring constant human supervision. This reduces labor costs while ensuring a consistent and efficient sanitization and alcohol detection process, even in high-traffic environments.

F. Customizable Settings: The system allows users to adjust sanitization schedules, fine-tune alcohol detection sensitivity, and focus on high-touch areas such as door handles, elevator buttons, and handrails. This flexibility ensures that hygiene and safety measures are tailored to the specific requirements of different locations.

G. Enhanced Public and Workplace Safety: The dual-function system ensures both hygiene and responsible behavior. By disinfecting individuals and detecting intoxication, it helps prevent disease transmission and safety hazards, making it highly beneficial for workplaces, transportation systems, and healthcare facilities.

D. Advantages

1. Enhanced Public Hygiene and Safety:The system provides automated, contactless sanitization, reducing the risk of disease transmission in high-traffic areas like malls, hospitals, offices, and public transport hubs.
2. Dual-Function System: Combines sanitization and alcohol detection in a single unit, addressing both hygiene concerns and public safety risks associated with intoxication.
3. Reduced Dependence on Manual Cleaning: Automation eliminates the need for frequent manual disinfection, ensuring consistent cleanliness while reducing labour costs and human effort.
4. Quick and Effective Sanitization: The misting system provides full-body disinfection within seconds, making it ideal for high-traffic environments where efficiency is crucial.
5. Prevention of Alcohol-Related Incidents: Detecting intoxicated individuals helps prevent accidents and safety hazards in workplaces, healthcare facilities, and public transportation systems.
6. Automation and Efficiency: Sensor-based operation ensures a touch-free process, reducing human intervention, improving efficiency, and maintaining a high level of hygiene and safety.
7. Reduced Health Risks in Workplace: Ensures employees and visitors in offices, industries, and healthcare facilities are not under the influence of alcohol, improving overall workplace safety and productivity.
8. Eco-Friendly and Non-Toxic Disinfectants: Unlike traditional chemical disinfectants, the system uses environmentally safe solutions that are non-irritating to users and sanitation workers.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

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9. Supports Existing Safety Measures: Can be integrated with security checkpoints, biometric access systems, and workplace safety protocols to enhance public health and security measures.

PROBLEM STATEMENT

1. Public spaces, especially high-traffic areas, demand effective hygiene and safety measures.
2. Existing systems lack integration of alcohol detection and automatic sanitization.
3. This gap increases potential health and safety risks.

II. LITERATURE REVIEW

1. AUTOMATIC BODY SANITIZER MACHINE

This paper proposes the development of an Automatic Body Sanitizer Machine to enhance hygiene during the COVID-19 pandemic. The machine addresses the critical need for effective sanitization by automating the process for comprehensive body coverage. Key features include proximity sensors that detect a user's presence, activating the machine automatically to minimize contact, and integrated temperature measurement for additional health screening. It dispenses a fine mist of sanitizer for full-body coverage, reducing the risk of virus transmission from surfaces and skin, while also incorporating a mechanism to eliminate dirt and dust particles.

2. AUTOMATIC SANITIZATION TUNNEL WITH TEMPERATURE MEASUREMENT

This paper proposes the development of an Automatic Sanitization Tunnel with Temperature Measurement, designed to enhance public safety during health crises like the COVID-19 pandemic. By integrating contactless temperature sensors and an automated sanitization system, the tunnel aims to provide effective disinfection while screening individuals for elevated body temperatures. The study explores existing technologies and methodologies, identifies gaps in the current literature, and outlines the design and functionality of the proposed system. Ultimately, the paper seeks to contribute to innovative solutions for public health and safety in crowded spaces.

3. SMART DISINFECTION AND SANITIZING TUNNEL

The experiments described in the paper involve the. direct use of a power-factor meter to control the periodic short-circuiting of the exciter field regulator of a synchronous condenser to effect the automatic correction of the power-factor of the con denser and load to a predetermined value. At the commencement, the author realised the difficulties likely to be encountered with the use of a powerfactor meter for this purpose as against the use, for example, of a solenoid connected to the mains as a standard of reference in a voltage regulator. The paper describes the application of the powerfactor correction apparatus with the attendant diffi culties to a synchronous induction motor and a salient-pole synchronous motor. The final tests of each of the series described proved the basic principle of the apparatus to be feasible.

4. DOOR OPERATED AUTOMATIC SANITIZING MACHINE WITH TEMPERATURE SENSOR

In this paper, the Non-Contact Temperature and Sanitizer Dispenser Device is proposed as an effective alternative to traditional contact thermometers and handheld devices for preventing the spread of SARS-CoV-2 infections. The device displays the measured temperature on an LCD screen and uses a pilot lamp indicator to signal if the reading is normal or exceeds 38 degrees Celsius. The data collected indicates that the temperature readings are accurate, aiding frontline workers in monitoring temperatures and dispensing alcohol to employees in various settings. Additionally, the machine's sanitizer spray evenly distributes the sanitizing liquid across the body, significantly reducing the risk of COVID-19 transmission among staff.

5. DESIGN AND IMPLEMENTATION OF ALCOHOL DETECTOR AND ACCIDENT DETECTION SYSTEM USING GSM MODEM

Nowadays, the number of vehicles is increasing significantly every year. Many accidents are occurring because of the alcohol consumption of the driver. After drinking alcohol, driving is the most reason for accidents in almost all countries all over the world. Therefore, alcohol detection system and automatic finding car accident place using GSM modem and GPS are presented in this paper. The combination purpose of alcohol detection and car accident detection systems is to save human life. If the car driver drinks alcohol, the alcohol sensor will sense alcohol concentration, will display it on the LCD and will turn off the car engine. In the accident detection system, the vibration sensor senses vibration when an accident occurs. If the sensor senses the car accident, the vibration sensor will give the

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III. METHODOLOGY

1. **Power Supply:** Provides DC power to all components.
2. **Alcohol Sensor:** Detects alcohol in breath and sends a signal to the microcontroller.
3. **IR Sensor:** Detects when someone enters the chamber, triggering the system.
4. **Microcontroller:** Processes sensor data, deciding whether to activate the sanitizer or buzzer.
5. **Buzzer:** Alerts security if alcohol is detected.
6. **Sanitizer Pump and Nozzles:** Dispenses sanitizer to ensure full-body sanitization when triggered.
7. **Overall Methodology:**

- The system is powered by a DC supply and uses an IR sensor to detect when a person enters the chamber. An alcohol sensor (MQ-3) then checks the person's breath. The microcontroller processes the input:
- If no alcohol is detected, it activates the sanitizer pump and mist nozzles for full-body disinfection.
- If alcohol is detected, a buzzer sounds to alert security and the sanitization is denied.
- This automated, contactless process ensures both hygiene and safety in public or controlled entry spaces.

IV. PROPOSED BLOCKED DIAGRAM

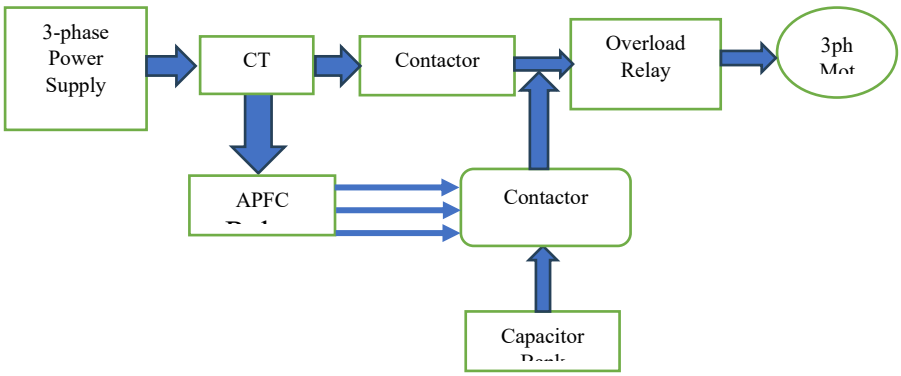

Fig B. Block Diagram

Circuit Diagram

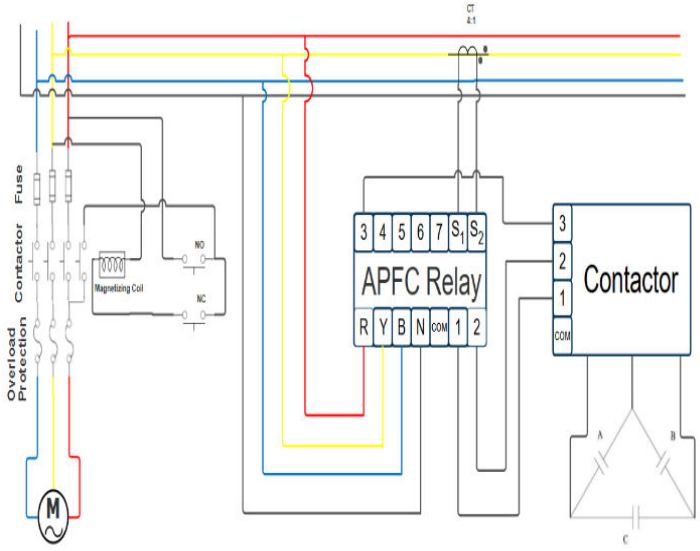

Fig B. Circuit Diagram

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I. COMPARATIVE ANALYSIS

CASE 1	CASE 2
DOL Starter P.F = 0.7 V = 415 V P = 3HP = 2238 W I = P/(√3*V*cosΦ) = 4.44 A Q = √3*V*I*sinΦ = 2278.71 VAR S = √(P²+Q²) = 3193.92 VA	DOL Starter with APFC P.F = 0.95 V = 415 V P = 3HP = 2238 W I = P/(√3*V*cosΦ) = 3.27 A Q = √3*V*I*sinΦ = 733 VAR S = √(P²+Q²) = 2354.98 VA

II. DETAILS OF HARDWARE

1. **Arduino Uno:** The central controller that processes inputs and triggers outputs**.**
2. **PIR Sensor –** Detects motion to activate the sanitization process.
3. **MQ-3 Alcohol Sensor –** Detects alcohol levels in a person's breath.
4. **Submersible Water Pump –** Dispenses the sanitizer when triggered.
5. **Channel Relay Module –** Controls the activation of different components.
6. **Buzzer –** Provides an alert when alcohol is detected.
7. **ICLM2596 –** Voltage regulator to manage power supply.
8. **PVC Pipe Support Structure –** Holds and aligns the mist nozzles.
9. **Mist Nozzles –** Ensures proper sanitization by spraying fine mist**.**

V. CONCLUSION

In conclusion, the pandemic taught us just how important it is to keep our public spaces clean and safe—and smart sanitization systems have played a big part in that. By combining automatic disinfection with alcohol detection, we're not only promoting hygiene but also encouraging responsible behavior before someone even steps into a building. While current systems do a good job, there's still room to grow—especially when it comes to making them easier to use, more affordable, and better at protecting privacy. Looking ahead, the goal is clear: smarter, safer spaces that help us live, work, and gather with more confidence.

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