WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

IMPLEMENTING REMOTE MONITORING OF INDUSTRIAL SENSORS WITH IOT

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ABSTRACT—

The project presents a comprehensive solution for monitoring and managing critical industrial parameters. It employs an array of sensors, including gas and fire sensors, DHT11 for environmental monitoring, current and voltage sensors, coupled with a microcontroller. This system's core concept revolves around real-time detection and alerting. If any of the sensors detect abnormal readings or potential hazards, the system triggers alerts through a buzzer and an IoT notification mechanism. By integrating these components, the project aims to enhance industrial safety, enable proactive responses to environmental issues, and facilitate remote monitoring and control of essential parameters through a secure embedded web server. This multifaceted approach ensures that industries can maintain optimal conditions and swiftly address emerging threats.

INTRODUCTION

The project represents a cutting-edge solution for the proactive monitoring and management of crucial industrial parameters. In today's rapidly evolving industrial landscape, ensuring the safety and efficiency of various processes is of paramount importance. To address this, our project combines a variety of essential components, including gas and fire sensors, a DHT11 sensor for temperature and humidity data, current and voltage sensors, and a microcontroller. These components collectively form a comprehensive system designed to monitor, alert, and control.

The fundamental concept behind this project revolves around the real-time detection of deviations in industrial parameters. In the presence of abnormal readings or the triggering of sensors, the system immediately responds by activating a buzzer to signal on-site personnel and simultaneously sends IoT alerts. This dual-alert mechanism ensures that any potential issues, such as gas leaks or fires, are swiftly communicated to relevant personnel for a rapid response. Furthermore, the system is integrated with an embedded web server, which provides a secure and convenient interface for remote monitoring and control. This not only enhances operational efficiency but also ensures that parameters stay within predefined safety limits.

By employing this advanced system, industries can bolster their safety protocols, minimize risks, and optimize their operational processes. The project's fusion of sensor technology, microcontroller capabilities, and IoT connectivity represents a robust and reliable solution for safeguarding industrial environments while enabling efficient parameter control and oversight.

LITERATURE SURVEY

A. Digital Twin for the Oil and Gas Industry Overview, Research Trends, Opportunities, and Challenge

This paper presents the literature study on the need for dependency of technology in enhancing the productivity, efficiency and also the safety of the operations happening in the industries. The paper proposes that with the deployment of emerging technologies in Oil and Gas industries to construct digital twins of their assets.

B. Nuclear Power Plants with Artificial Intelligence in Industry 4.0 Era: Top-Level Design and Current Applications—A Systemic Review.

This paper presents a systematic review of how Artificial Intelligence could be benefitted from Nuclear Power Plants in a top to down fashion. This paper also discusses about the limitations in the current Nuclear Power Plants and show to integrate Artificial Intelligence with Nuclear Power Plants.

C. Research on an Online Monitoring System for Efficient and Accurate Monitoring of Mine Water.

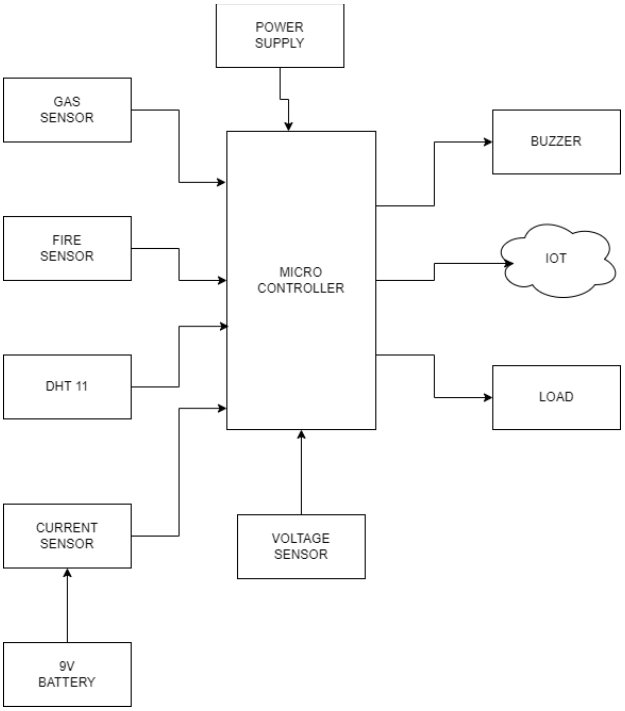
This paper focuses on the theory of multi sensor networks in estimating the mine water quality, quantity monitoring equipment, and mine water Internet of Things communication systems. The experimental results show that the system could realize the real-time wireless monitoring of mine water quality and quantity information with stable and fast data transmission capability. Further the system analyses, and processes abnormal data, has sufficient timeliness while guaranteeing the validity of the data output from the monitoring platform.

METHODOLOGY EXISTING SYSTEM

The existing system for the project lacks an integrated and comprehensive approach to monitoring and controlling industry parameters. Traditional systems often rely on individual sensors with limited connectivity and response capabilities. They typically lack the ability to provide real-time alerts or centralized control. In such systems, sensors may operate in isolation, and there is no provision for remote monitoring or IoT-based alerts. As a result, they are less effective in ensuring timely responses to critical events, such as gas leaks or fires, and may lead to safety and operational challenges. The proposed project aims to address these limitations by creating a unified and secure system that leverages advanced sensor technology, microcontroller control, and IoT communication to enhance the monitoring and control of industrial parameters.

PROPOSED SYSTEM

The proposed system is a comprehensive and advanced solution for industrial parameter management. It combines a suite of critical components, including gas and fire sensors, a DHT11 for environmental monitoring, current and voltage sensors, and a microcontroller. This integrated system offers real-time monitoring and control of industrial parameters and enhances security through its embedded web server and IoT alert mechanism. In the event of sensor detections, it promptly triggers alerts through a buzzer and IoT notifications, ensuring swift responses to any deviations.



This Fig.1 Block Diagram

Innovative system empowers industries to optimize operational safety and efficiency while providing remote accessibility and control for comprehensive parameter management.

In the project, gas and fire sensors, along with the DHT11 environmental sensor and a 9V battery, are linked to a microcontroller. This microcontroller serves as the central hub for sensor data processing. Connected to the microcontroller are the current and voltage sensors. Whenever any of the sensors detect abnormal conditions, such as a gas leak, fire, or deviations in temperature, humidity, current, or voltage, the microcontroller triggers an alert system. This system includes a buzzer for immediate on-site alerts, as well as an IoT module for remote alerts through the internet. This block diagram represents an integrated solution for real-time parameter monitoring and safety, ensuring swift responses to critical events in industrial settings.

SOFTWARE AND HARDWARE REQUIREMENTS

The project necessitates the utilization of several software and hardware components to create a comprehensive monitoring system. On the software front, Arduino IDE serves as the primary development platform, facilitating programming in Embedded C for microcontroller functionality and IOT integration. This combination enables the system to process data from various sensors and communicate it over the network. As for hardware, the Raspberry Pico acts as the central processing unit, coordinating inputs from a diverse range of sensors including the MQ-135 gas sensor for air quality monitoring, a fire sensor for detecting potential hazards, DHT11 for temperature and humidity readings, ACS712 for current sensing, and voltage sensors for monitoring power supply parameters. Additionally, the inclusion of a buzzer enables audible alerts, while a 9V battery provides portability and backup power. The integration of these components results in a robust monitoring solution capable of capturing, analyzing, and responding to environmental data in real- time.

RESULTS AND DISCUSSIONS

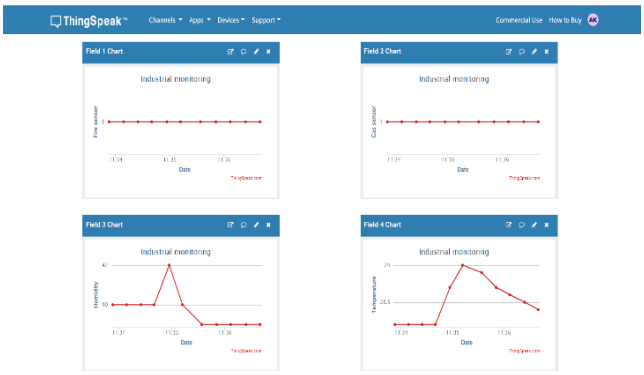


Fig.2 Graph of different sensors

The above figure indicates the graphical representation of the four sensors namely gas sensor, current sensor, fire sensor and temperature and humidity sensor. The graphical representation of these sensors allows real-time monitoring industrial appliances by continuously indicating through buzzers.

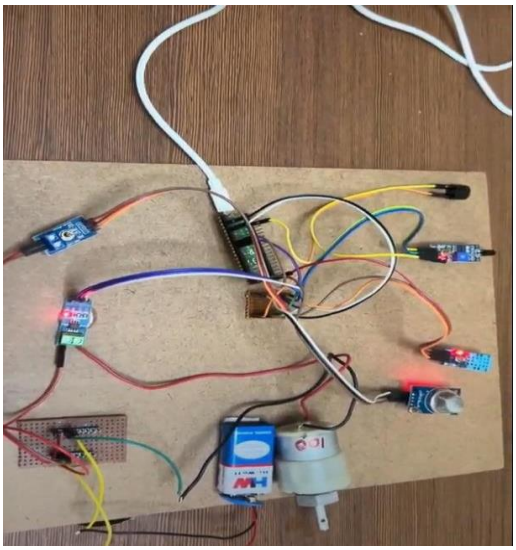


Fig.3 Hardware model

The above figure shows the hardware kit in creating and implementing remote monitoring of industrial sensors with IOT.

CONCLUSION

In conclusion, the project offers a robust and versatile solution for enhancing industrial safety and efficiency. By integrating various sensors, including gas and fire sensors, DHT11 for environmental data, and current and voltage sensors, we've created a comprehensive monitoring system. When any sensor detects abnormal conditions, our microcontroller triggers immediate alerts through a buzzer and IoT notifications, enabling swift responses to potential hazards. This project not only optimizes parameter control but also provides remote accessibility through IoT, improving overall operational flexibility. In the evolving landscape of industrial processes, this system represents a significant step towards ensuring safety, efficiency, and remote monitoring of critical parameters.

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