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IOT-ENABLED INDUSTRIAL FAULT MONITORING SYSTEM FOR IMPROVING EQUIPMENT PERFORMANCE AND MANAGEMENT

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ABSTRACT

The Internet of Things (IoT) has emerged as a revolutionary technology, garnering widespread recognition and adoption. Its core principle involves interconnecting physical objects or "things" with computer software, sensors, and a network connectivity to facilitate seamless data collection and exchange. In our latest endeavor, we are pushing the boundaries of IoT by enabling remote management and control of physical items through the Internet.

Through the power of IoT, we are developing a cutting-edge system that autonomously monitors various industrial applications. This innovative solution not only provides real- time data collection, but also incorporates advanced algorithms to generate instant alerts, alarms, and intelligent decision- making capabilities. By harnessing the potential of IoT, we are paving the way for efficient and streamlined industrial processes, enabling enhanced productivity, safety, and optimization. Our project stands as a testament to the transformative nature of IoT and potential to revolutionize how industries operate in the modern era.

Designing an IOT-Enabled Industrial Fault Monitoring System for Improving Equipment Performance and Management is the goal of this project. In order to monitor and manage industrial applications and operations employing sensors (oil, gas, and DHT sensors), with the help of an Android-based smartphone or tablet. The utilization of the Internet of Things (IoT) in industrial fault monitoring systems offers the capability to detect various issues such as temperature fluctuations, overvoltage occurrences, and the presence of gas or smoke. This project aims to create an automated solution that tracks and monitors the prevalence of malfunctions, eliminating the need for human intervention. By leveraging IoT technologies, the system can swiftly identify and alert stakeholders about potential faults, enhancing operational efficiency and safety in industrial settings.

Keywords: Liquid Sensor, DHT Sensor, Gas Sensor, LCD, Buzzer, WI-FI module

I. INTRODUCTION

Technology development is an ongoing process that necessitates our constant readiness and awareness of new advancements. These technological changes have significantly enhanced various aspects of our daily lives. One area that has seen rapid growth in web technology, with all data systems now accessible on the internet. As a result, the need for automation has become increasingly apparent. Instead of relying on cumbersome server systems for data management, monitoring, and control, the trend is shifting toward the establishment of distributed web control systems. These systems utilize web pages and built-in web applications to enable remote login and monitoring, offering convenience and efficiency in handling data. The integration of Internet control systems with the Internet of Things (IoT) brings forth numerous benefits, including energy conservation, enhanced comfort, and efficient operations.

The potential impact of IoT on human history is significant, as it has the capability to generate, analyze, and make data-driven decisions regarding interconnected devices and objects [1]. The industrial sector is one area where IoT is extensively employed. With an increasing emphasis on safety and security, we are developing an industrial monitoring system that utilizes IoT technology to prevent accidental explosions caused by gas leaks [2]. This system also serves as a security mechanism. As the scope of social production expands and people's awareness of safety significance grows, various measures have been implemented to address industrial faults and hazards. For instance, gas explosions can lead to significant time and financial losses, as well as reduced industrial productivity. Therefore, it is crucial to develop an automated monitoring and control system that can effectively regulate industrial parameters and ensure safety. Imagine a world

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where everyday objects around you are not just ordinary things, but smart and connected devices that cancommunicate with each other. The fascinating technology behind this magical transformation is called the Internet of Things, or IoT for short. IoT enables everyday objects to become smart and connected devices, allowing them to communicate with each other and make our lives easier.
At its core, IoT is like a giant web of interconnected devices, like your smartphone, your fridge, your car, and even your wristwatch. These devices are equipped with tiny sensors, cleverly hidden antennas, and tiny brains called microcontrollers. They can sense and collect information from their surroundings, share that information with other devices, and take actions based on it.

Think of it as a massive team of invisible helpers working behind the scenes to make your life easier and more efficient. For example, let's say you're running low on milk. Your smart fridge, being a part of the IoT family, can sense that and automaticallyadd milk to your shopping list on your phone. When you're at the grocery store, your phone can guide you to the exact aisle where the milk is located. How convenient is that?

But the magic doesn't stop there. IoT can be found in industries like healthcare, agriculture, transportation, and even in our cities. In healthcare, tiny wearable devices can monitor your heart rate, sleep patterns, and activity levels, providing valuable insights to your doctor and helping you stay healthy. In transportation, IoT enables vehicles to communicate with each other and with traffic signals, making roads safer and traffic flow smoother. And in cities, IoT can help optimize energy consumption, reduce waste, and improve public services. IoT is like a symphony of technology, where each device plays its part to create a harmonious and interconnected world. It's a world where everyday objects become intelligent, where data flows seamlessly, and where automation and convenience enhance our lives. So next time you see a seemingly ordinary object, take a moment to wonder if it's secretly a part of the IoT family, working diligently to make the world a better place, one smart device at a time.

With the increasing prevalence of temperature, humidity, gas, and industrial security systems, industrial ownersare actively seeking ways to safeguard their premises and enhance the value of their establishments [3]. With the escalating rates of criminal activities such as burglaries, thefts, and other security breaches in urban centers, it has become increasingly imperative for business owners to prioritize the implementation of robust industrial security and monitoring systems. Recognizing the pressing need for enhanced security measures, we have embarked on a project dedicated to developing a comprehensive and advanced industrial security solution. Our system encompasses state-of-the-art surveillance technologies, intelligent sensors, and cutting-edge algorithms to effectively deter intrusions and safeguard industrial premises. By leveraging the latest advancements in security technology, our solution offers a proactive approach to threat detection and prevention [4]. Through real-time monitoring, rapid response capabilities, and seamless integration with an existing security infrastructure, we aim to provide business owners with peace ofmind and a heightened sense of security. In an era where security threats are becoming increasingly sophisticated, our unique industrial security and monitoring system offers a robust defense against potential risks, protecting valuable assets, ensuring the safety of personnel, and preserving the integrity of industrial operations. With our solution, business owners can mitigate therisks associated with criminal activities and focus on their core operations with confidence.

Monitoring these factors, such as temperature, humidity, and gas levels, is essential to identify any abnormal increases and take appropriate precautionary measures [5]. However, currently, available solutions are often expensive, cumbersome, and lack portability. Gas leaks and the presence ofpersonnel in industrial settings are two significant contributors to industrial accidents.

In today's world, any type of gas leakageposes a significantproblem, be it in households, industries, or restaurants [6]. Therefore, having reliable monitoring and defect detection system is more important than ever. Sensors, play a critical role in such systems as they provide the necessary data for defect detection. They can be integrated into machines and shared with other functions like control or monitoring, enhancing their functionality. Additionally, data from production management systems can also be valuable in certain situations. The goal is to create a comprehensive solution that effectively monitors industrial parameters and detects any potential defects or safety risks.

II. LITERATURE SURVEY

M. Chandra Mohan Reddy Proposed an Industrial fault monitoring System to detect the leakage of various gas such as LPG,CO, and CH4, which causes various health problems and also has a possibility of an explosion is published in 2022.

Akshara Viju, Prathamesh Shukla, Aditya Pawar, and Prathamesh Sawant proposed IoT Based Industrial Monitoring and Fault Detection System. Using the IoT idea, industrial applications can create alerts or alarms or make wise judgments. Automated factories and

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processes must be extremely adjustable and adaptable since it would be too expensive to rebuild them for every alteration and design change. It is published in 2020.

Ms. Bhagyashree Dattatray Daware, Prof. Hatkar A.A Proposed Industrial Monitoring and Fault Detection Using Android. They designed this Project by using different sensors and Controllerssuch as ARM7 controllers, Sensors, ULN2803 (Device Driver), GUI, and WIFI modules. To implement a device that works using an Android application. Here the system is developed which monitor, detects, and controls the industrial parameters. Here a similar automation system is designed which will monitor and controls industrial parameters such as temperature, humidity, vibration, gas, moisture, and fire.

Li Da Zu, "Internet of Things in Industries: A Survey" IEEE Transactions on Industrial Informatics, vol. 10, no. 4, November 2014. This review paper's primary contribution is its methodical summary of the state-of-the-art IoT in several industries.

V. Ramya, B. Palaniappan proposed an Embedded system for Hazardous Gas Detection and Alerting. The main objective of the initiative is to design a toxic gas detection and warning system utilizing microcontrollers. The LCD display continuously sensed and displayed dangerous gases, such as propane and LPG. If the typical amount of these gases is exceeded.

Surya Prakash Sharma and Prof. S.K. Srivastava designed IoT based Industrial fault Monitoring Systems In these systems automatically cover artificial operations and induce cautiousadmonitions or make intelligent opinions using the concept of IoT

III. PROPOSED SYSTEM

This project aims to provide practical experience and an in-depthunderstanding of the emerging technologies related to the Internet of Things (IoT). With a focus on studying different industry variables, we have chosen the concept of an "IoT- enabled industrial fault monitoring system for equipment performance and management." The primary objective is to monitor and analyze changes in threshold values for gas sensors,temperature sensors, humidity sensors, and liquid detectors. Bydeveloping this system, we intend to gain valuable insights intothe implementation of IoT in industrial settings and explore thepotential benefits it offers [7]. This project will involve designing and deploying sensors capable of collecting real-time data on various parameters. The collected data will be analyzed to identify any deviations from normal levels and trigger appropriate notifications or actions to prevent potential faults oraccidents.

Through this hands-on endeavor, we aim to enhance our knowledge of IoT technologies, gain practical skills in data, analysis and monitoring, and contribute to the development of more efficient and secure industrial processes. If these parameters reach their threshold value, we get an alarm/buzzer on. In this industrial monitor and fault detection system, We closely examine the gas leakage detection for a variety of gases.Such as LPG, CO, and CH4, which cause various health problems and also have a possibility of an explosion [8].

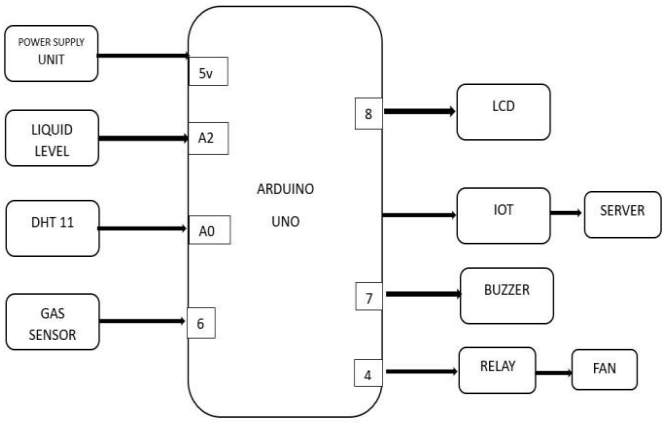

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Fig 1: Block Diagram

This proposed system consists of many modules such as a Power Supply Unit for power flow, Liquid level to detect the liquid quantity in the industry, DHT 11 is used for two purposes i.e., to check the Temperature and Humidity in the room, In the system, a gas sensor is employed to detect the presence of gas. The Arduino Uno is utilized as the microcontroller to process the sensor data and control the overall system. An LCD display is integrated to provide visual feedback and information. IoT technology enables the system to connect and communicate with the cloud server. A buzzer is included to generate audible alerts or warnings when necessary.

Additionally, a fan can be incorporated as part of the system for ventilation or to mitigate potential gas-related risks as shown in Fig.1

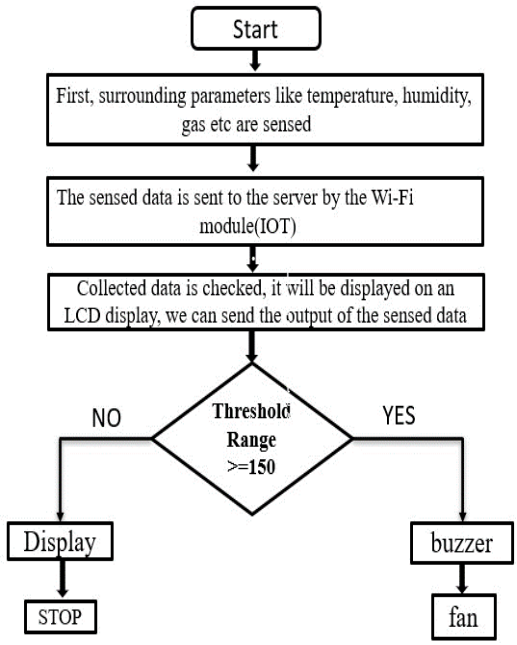

Fig 2: Flow Chart of Proposed System

The project starts with initializing the IoT-Enabled Industrial fault monitoring system for improving equipment performance and management devices where all the sensors' components are interconnected with the Arduino Uno and the analysis starts from then as shown in Fig.2. If the connection is successfully established, the sensors since the values and transmit them using Wi-Fi. These values are then securely stored in the cloud for further analysis and access. The sensed values are viewed on display and in a data-stored table if they are below the threshold values. If the sensed values are above the threshold values, then we get an alert as a buzzer. If the values are displayed on display, then the data is stored in the Cloud platform. By this, the data can be analyzed by the supervisor for further diagnostics. This is how an industry monitoring device works.

Advantages of the proposed project:

- Minimize downtime

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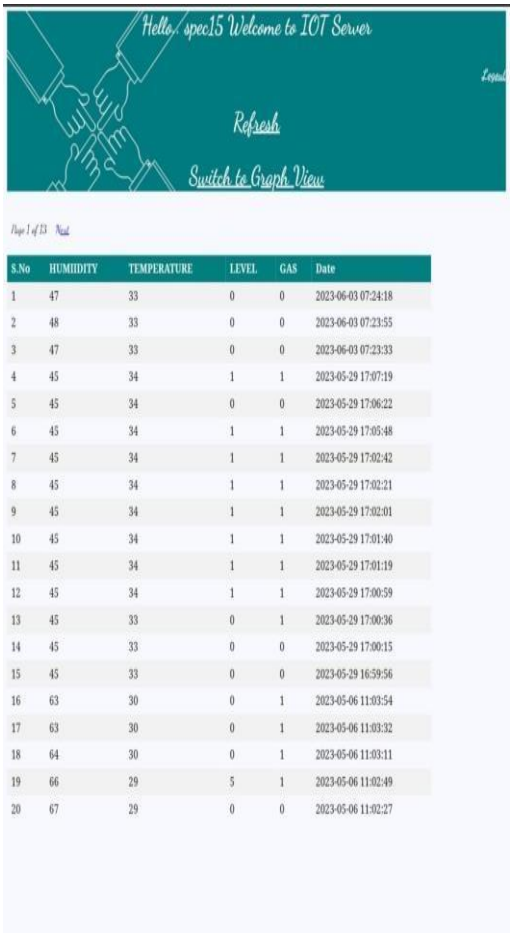
- Increase, the safety of plant operations
- Reduce repair costs
- We can add a circuit that can send out safety instructions like"vacate the area" whenever a fire or gas leak is detected.
- The System may be monitored and managed from anywhere.

IV. RESULTS

Here we show all the results we got from these Projects. The data collected by the sensors is stored in the cloud,and it is regularly updated at 15-second intervals. Whenever there is a change in the parameters sensed by the sensors, an alert message is immediately generated to notify the relevant parties. This real-time notification system ensures prompt action can be taken in response to any detected anomalies or deviations from normal values.

Table 1: A Wi-Fi module enables the storage of data inthe cloud.



S.No	HUMIDITY	TEMPERATURE	LEVEL	GAS	Date
1	47	33	0	0	2023-06-03 07:24:18
2	48	33	0	0	2023-06-03 07:23:55
3	47	33	0	0	2023-06-03 07:23:33
4	45	34	1	1	2023-05-29 17:07:19
5	45	34	0	0	2023-05-29 17:06:22
6	45	34	1	1	2023-05-29 17:05:48
7	45	34	1	1	2023-05-29 17:02:42
8	45	34	1	1	2023-05-29 17:02:21
9	45	34	1	1	2023-05-29 17:02:01
10	45	34	1	1	2023-05-29 17:01:40
11	45	34	1	1	2023-05-29 17:01:19
12	45	34	1	1	2023-05-29 17:00:59
13	45	33	0	1	2023-05-29 17:00:36
14	45	33	0	0	2023-05-29 17:00:15
15	45	33	0	0	2023-05-29 16:59:56
16	63	30	0	1	2023-05-06 11:03:54
17	63	30	0	1	2023-05-06 11:03:32
18	64	30	0	1	2023-05-06 11:03:11
19	66	29	5	1	2023-05-06 11:02:49
20	67	29	0	0	2023-05-06 11:02:27

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Fig 4: Parameter readings are updating

In Fig. 4, the LCD provides the reading of humidity (H), temperature (T), gas level (G), and liquid level (L), which is actively uploaded to the cloud.

Fig 5: Gas Detected

Every detected parameter is shown on LCD such as Gas detected, High Humidity, High temperature, and High Liquid level as shown in Fig.5

The above Table.1 shows the readings of different parameters such as humidity, temperature, liquid level, andgas level with date and time in a tabular column.

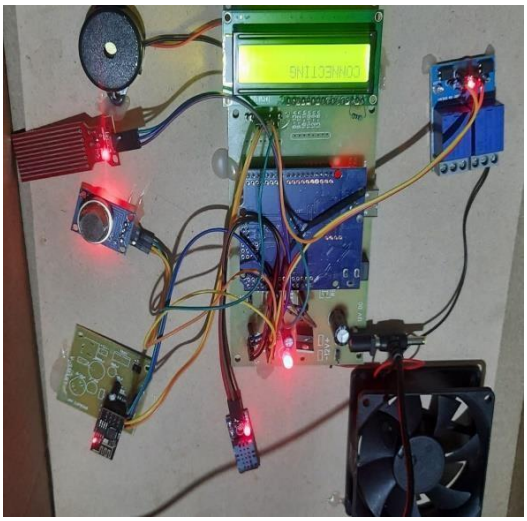

Fig 3: Compete for a setup of Hardware

In Fig. 3, all modules are connected with ArduinoUno to set up the hardware for the project.

V. CONCLUSION

This project aims to acquire extensive knowledge about the technicalaspects of digital electronics systems, and the Internet of Things (IoT). We achieve the core objective of our industrial monitoring system by digitally integrating highly precise sensors and microcontrollers.

We have incorporated sensors to detect various environmental parameters, and when these parameters reach undesired conditions, the

observed data is communicated to the central control center. By leveraging the capabilities of the Industrial Internet of Things (IoT), businesses in the manufacturing and logistics sectors can better meetthe demands of the rapidly evolving digital era.

The Industrial Internet of Things utilizes IoT technology across supply chains and production processes. To develop an effective industrial IoT strategy, it is crucial to incorporate machine learning and big data technologies By working on this project, we aim to gainpractical experience in implementing IoT solutions in industrial settings and explore the potential for improving efficiency, productivity, and decision-making through data-driven insights.

VI. FUTURE SCOPE

In the future, we can use this project in many applications.As we have a combination of sensing devices and IoT, we can upgrade the project to the next stage by using different applications.The research can extend to cover additional parameters such as automatic turn-off modules, and adding different types of sensors. This study presents a system that requires ongoing network connectivity. In this project, we can use different applications like controllers, ARM 7, ULN2803 (Device Driver), Android applications, and GUI.

REFERENCES

M. Chandra Mohan Reddy et al., “Industrial fault monitoring system” International Journal of Research in Engineering, IT and Social Sciences, ISSN 2250-0588, ImpactFactor: 6.565, Volume 12 Issue 7, July 2022, Page 43-46.

Akshara Viju, Prathamesh Shukla, Aditya Pawar, and Prathamesh Sawant “IoT Based Industrial Monitoring and Fault Detection System” International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056,Volume: 07 Issue: 06 | June 2020.

Rajesh. G, Renuka Gayathri. S, Parthipan. V, Mizpah Jenny “Industrial Machine Controlling and Monitoring System” International Journal of Pure and AppliedMathematics Volume 116 No. 21 2017, 105-111 ISSN: 1311-8080

Ms. Bhagyashree Dattatray Daware, Prof. Hatkar A. An “Industrial Monitoring and Fault Detection Using Android” International Journal for Research & Development in Technology. Volume-8, Issue-1, (July-17) ISSN (O): - 2349- 3585

Li Da Zu “Internet of Things in Industries: A Survey” IEEE Transactions on Industrial Informatics, vol. 10, no. 4, November 2014.

Surya Prakash Sharma and Prof. S.K. Srivastava designed“IoT-based Industrial fault Monitoring Systems”
Volume:04/Issue:08/August-2022 e-ISSN: 2582-5208

V. Ramya, B. Palaniappan “Embedded system for Hazardous Gas detection and Alerting” International Journal of Distributed and Parallel Systems (IJDPS) Vol.3, No.3, May2012

Kavini Lavu. N, Kaviya.D, Logalakshmi. A, Priyanka. R, Dr. Sumathi.S, “Real Time Gas Leakage Detection System Using Cloud” International Journal of Innovative Research inScience, Engineering, and Technology An ISO 3297: 2007 Certified Organization Volume 7, Special Issue 1, March 2018