M.KUMARASAMY
COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
Approved by AICTE & Affiliated to Anna University
ISO 9001:2015 Certified Institution
Thalavapalayam, Karur – 639 113.

AN EFFICIENT MONITORING SYSTEM WITH LOW COST ARCHITECTURE FOR MANUFACTURING INDUSTRY

A MINOR PROJECT - III REPORT

Submitted by

MUTHULAKSHMI M	**927621BEC130**
NAVANEETHA S	**927621BEC134**
PRUTHIGA M S	**927621BEC157**
PUVITHA SRI N	**927621BEC158**

BACHELOR OF ENGINEERING

in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous)

KARUR – 639 113

OCTOBER 2023

M.KUMARASAMY COLLEGE OF ENGINEERING, KARUR

BONAFIDE CERTIFICATE

Certified that this **18ECP105L - Minor Project III** report "**AN EFFICIENT MONITORING SYSTEM WITH LOW COST ARCHITECTURE FOR MANUFACTURING INDUSTRY"**is the bonafide work of "**MUTHULAKSHMI M (927621BEC130), NAVANEETHA S (927621BEC134), PRUTHIGA M S (927621BEC157), PUVITHA SRI N (927621BEC158)** who carried out the project work under my supervision in the academic year **2023-2024 - ODD.**

SIGNATURE

Dr.A.KAVITHA B.E., M.E., Ph.D.,

HEAD OF THE DEPARTMENT,

Professor,

Department of Electronics and Communication Engineering,

M.Kumarasamy College of Engineering, Thalavapalyam

Karur-639113.

SIGNATURE

Dr.K.SIVANANDAM, M.E., Ph.D.,

SUPERVISOR,

Associate Professor,

Department of Electronics and Communication Engineering,

M.Kumarasamy College of Engineering, Thalavapalayam,

Karur-639113.

This report has been submitted for the **18ECP105L – Minor Project-III** final review held at M. Kumarasamy College of Engineering, Karur on_____.

PROJECT COORDINATOR

INSTITUTION VISION AND MISSION

Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

M1: Produce smart technocrats with empirical knowledge who can surmount the global challenges.

M2: Create a diverse, fully -engaged, learner -centric campus environment to provide quality education to the students.

M3: Maintain mutually beneficial partnerships with our alumni, industry and professional associations

DEPARTMENT VISION, MISSION, PEO, PO AND PSO

Vision

To empower the Electronics and Communication Engineering students with emerging technologies, professionalism, innovative research and social responsibility.

Mission

M1: Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

M2: Inculcate the students in problem solving and lifelong learning ability.

M3: Provide entrepreneurial skills and leadership qualities.

M4: Render the technical knowledge and skills of faculty members.

Program Educational Objectives

PEO1: **Core Competence:** Graduates will have a successful career in academia or industry associated with Electronics and Communication Engineering

PEO2: **Professionalism:** Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of Electronics and Communication Engineering.

PEO3: **Lifelong Learning:** Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality

Program Outcomes

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

PSO2: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrial expectations.

Abstract	**Matching with POs, PSOs**
Arduino UNO, Ethernet shield, DHT11 Sensor	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO11, PSO12

ACKNOWLEDGEMENT

Our sincere thanks to **Thiru.M.Kumarasamy, Chairman** and **Dr.K.Ramakrishnan, Secretary** of **M.Kumarasamy College of Engineering** for providing extraordinary infrastructure, which helped us to complete this project in time.

It is a great privilege for us to express our gratitude to **Dr.B.S.Murugan., B.Tech., M.Tech., Ph.D., Principal** for providing us right ambiance to carry out this project work.

We would like to thank **Dr.A.Kavitha, Professor and Head**, **Department of Electronics and Communication Engineering** for his unwavering moral support and constant encouragement towards the completion of this project work.

We offer our wholehearted thanks to our **Project Supervisor, Dr.K.Sivanandam, M.E.,Ph.D., Associate Professor**, Department of Electronics and Communication Engineering for his precious guidance, tremendous supervision, kind cooperation, valuable suggestions, and support rendered in making our project successful.

We would like to thank our **Minor Project Co-ordinator**, **Dr.K.Karthikeyan, B.E., M.Tech., Ph.D., Associate Professor**, Department of Electronics and Communication Engineering for his kind cooperation and culminating in the successful completion of this project work. We are glad to thank all the Faculty Members of the Department of Electronics and Communication Engineering for extending a warm helping hand and valuable suggestions throughout the project. Words are boundless to thank our Parents and Friends for their motivation to complete this project successfully.

ABSTRACT

The Project aims to develop a new data security techniques. Data security is very important in the industry to tranfer the data between machines/devices. Most of the industries avoided the internet connectivity to transfer the data between machines due to security issues. Currently DCS(Distributed Control System) based system architecture is playing the major role to monitor and to control industrial sensors and machines. Our proposed system consists of simple microcontroller and local server based storage techniques. We can use these techniques with or without internet. With internet the proposed system can store the data using ORACLE, MySQL, PHPAdmin etc. Without internet we can store the history of data in the local server. Theproposed system reduces the implementation cost due to DCS architecture is replaced by simple microcontroller based architecture.

Keywords – Arduino UNO, Ethernet shield, DHT 11 sensor

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ACRONYM		ABBREVIATION
IOT	-	Internet of Things
LCD	-	Liquid Crystal Display
DCS	-	Distributed Control System
DHT	-	Digital Humidity and Temperature

CHAPTER 1

INTRODUCTION

1.1 Monitoring systems in Industries

Industries play a pivotal role in the global economy, shaping the way we live and work. A monitoring system in industries helps keep track of operations and processes to ensure efficiency and safety. It involves collecting data from various sensors and devices to provide real-time insights and alerts. They are responsible for manufacturing goods, providing jobs, and contributing to the overall growth of nations. However, ensuring the efficient and safe operation of industrial processes is a complex task. This is where monitoring systems in industries come into play. These systems are crucial for the seamless functioning of industrial processes and are indispensable in maintaining productivity, safety, and sustainability. One of the primary purposes of monitoring systems in industries is to ensure operational efficiency. In a highly competitive world, industries need to produce high-quality goods in a timely manner. Monitoring systems help track various parameters in real-time, allowing companies to identify and rectify any issues promptly. For example, in the manufacturing sector, sensors and automated monitoring systems can measure temperature, pressure, and other variables, ensuring that machines operate within their optimal range. This not only improves product quality but also reduces downtime and increases overall productivity. Safety is a paramount concern in any industrial setting. Monitoring systems play a critical role in preventing accidents and ensuring the well-being of workers. For instance, in the chemical industry, gas leak detection systems can identify and mitigate potential hazards, safeguarding both the environment and employees.

These systems also help industries comply with local, national, and international safety regulations, avoiding costly fines and reputation damage. When it comes to industrial applications, DCS systems are the appropriate choice to ensure safety, efficiency, and compliance with industry-specific regulations.

1.2 Affordable Environmental Monitoring

In modern manufacturing industries, ensuring the safety, efficiency, and cost-effectiveness of operations is paramount. One critical aspect is monitoring environmental conditions such as temperature and humidity levels, as well as detecting issues like leaks promptly. Traditional Distributed Control Systems (DCS) have been the standard for such monitoring, but their high cost can be a significant barrier for smaller or budget-conscious industrial setups. This project introduces a cost-effective and efficient alternative solution to address this challenge by utilizing the DHT11 sensor, Arduino microcontroller, and XAMPP for data management. This system aims to provide real-time monitoring and alerting capabilities, enabling industries to respond swiftly to environmental anomalies while minimizing costs.

CHAPTER 2

LITERATURE SURVEY

2.1 A Systematic literature review on prototyping with Arduino

Arduino, an open-source electronics platform, has become the go-to option for anyone working on interactive hardware and software projects. An Arduino board (such as the Uno) connected to a breadboard with plugins such as inputs, sensors, lights, and displays can be controlled by a code written in the Arduino development environment. How to achieve this is by prototyping with Arduino. Prototyping with Arduino has grown in popularity with the increased use of the Arduino platform. Prototyping with Arduino, however, is not an easy task for nonprogrammers with interest in the field. With increased public interest in the field will come a need for accessible information. This paper presents a methodical literature review intended to intensively analyze and compare existing primary studies on prototyping with Arduino. We found about 130 of such studies, all peer-reviewed and published within the last 15 years, including these years (2015–2020). These studies were tediously and carefully chosen through a three-step process. In this paper, a cautious analysis of selected studies was followed by a clear description of the methods applied. The methods were categorized according to the success rate of the studied prototypes. Results obtained can be used in researches on the best technique to adopt while prototyping with Arduino. They can also be used in electronics researches and by individuals who wish to obtain a guide on prototyping with Arduino despite lacking grounded knowledge of the subject matter.

Software IDEs in existence before Arduino and similar computing platforms came to the scene usually had little or no compatibility with the existing hardware. Arduino came as an answer to the yearning of many developers, hobbyists, and professionals alike. This review has holistically studied the existing literature on

Prototyping with Arduino, it is applications, advantages of using it over other alternatives, challenges, and limitations to its actualization of intended goals.

2.2 Liquid volume monitoring based on ultrasonic sensor and Arduino microcontroller

Incident of oil leakage and theft in oil tank often happens. To prevent it, the liquid volume insides the tank needs to be monitored continuously. Aim of the study is to calculate the liquid volume inside oil tank on any road condition and send the volume data and location data to the user. This research use some ultrasonic sensors (to monitor the fluid height), Bluetooth modules (to sent data from the sensors to the Arduino microcontroller), Arduino Microcontroller (to calculate the liquid volume), and also GPS/GPRS/GSM Shield module (to get location of vehicle and sent the data to the Server). The experimental results show that the accuracy rate of monitoring liquid volume inside tanker while the vehicle is in the flat road is 99.33% and the one while the vehicle is in the road with elevation angle is 84%. Thus, this system can be used to monitor the tanker position and the liquid volume in any road position continuously via web application to prevent illegal theft.

2.3 IOT Garbage Monitoring System

This project IOT Garbage Monitoring system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. For this the system uses ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. The system makes use of AVR family microcontroller, LCD screen, Wifi modem for sending data and a buzzer. The system is powered by a 12V transformer. The LCD screen is used to display the

status of the level of garbage collected in the bins. Whereas a web page is built to show the status to the user monitoring it. The web page gives a graphical view of the garbage bins and highlights the garbage collected in colour in order to show the level of garbage collected. The LCD screen shows the status of the garbage level. The system puts on the buzzer when the level of garbage collected crosses the set limit. Thus this system helps to keep the city clean by informing about the garbage levels of the bins by providing graphical image of the bins via IOT Gecko web development platform.

2.4 IOT based health Monitoring System

An IoT based health monitoring system using ThingSpeak is a project that involves integrating various sensors and devices to gather and analyze health data of an individual. ThingSpeak is an open-source IoT platform that provides an easy-to-use interface to collect, analyze, and visualize data from IoT devices. The system can be designed to monitor various health parameters such as heart rate, blood pressure, body temperature, oxygen level, and many others. The data collected from the sensors can be transmitted to a ThingSpeak channel using a Wi-Fi module such as ESP8266 or ESP32. The data can be then analyzed using MATLAB or other programming languages supported by ThingSpeak.

The system can be designed to send alerts or notifications to the individual or caregiver in case of abnormal readings or health issues. For instance, if the blood pressure reading goes beyond a certain threshold level, the system can send a notification to the individual and also to the healthcare provider for immediate attention.

CHAPTER 3
EXISTING SYSTEM

Traditional DCS systems have been the industry standard for monitoring and controlling industrial processes. These systems are known for their reliability and comprehensive monitoring capabilities but often come with significant drawbacks

3.1 High Cost

The initial investment and maintenance costs of DCS systems can be prohibitively high for smaller or budget-constrained industrial facilities. Traditional Distributed Control Systems (DCS) have long been the gold standard for industrial monitoring, but their high cost has become a significant barrier for smaller or budget-conscious industrial setups. One of the primary reasons for the high cost of DCS monitoring systems is the substantial initial investment required. These systems involve not only the purchase of hardware but also the software, installation, and commissioning costs. The initial capital outlay can be quite daunting, making it challenging for smaller businesses to afford. DCS systems often come with licensing fees, and these costs can quickly add up over time. Moreover, regular maintenance is essential to keep the system up and running efficiently. Maintenance contracts and service fees can strain a company's budget, and they are often non-negotiable.

3.2 Complexity

DCS systems are complex and may require specialized training to operate and maintain. DCS systems collect vast amounts of data from an array of sensors, monitoring variables such as temperature, pressure, flow rates, and more. This data is essential for process control, optimization, and safety measures. However, managing and interpreting this extensive data can be overwhelming. It requires sophisticated data analysis tools and personnel skilled in data interpretation to

extract meaningful insights from the sea of information. DCS systems are not set-and-forget solutions; they require ongoing maintenance and periodic upgrades to remain efficient and secure. This can be a complex endeavor, as maintenance often necessitates system downtime, and upgrades may require the reconfiguration of components and software. Additionally, training personnel to operate and maintain a DCS system is an ongoing investment in time and resources. In many industrial settings, DCS systems need to integrate with other enterprise systems such as Manufacturing Execution Systems (MES) and Enterprise Resource Planning (ERP) systems. These integrations allow for a seamless flow of data and coordination across the organization. However, the integration process can be intricate and requires careful planning to ensure compatibility, data consistency, and security.

3.3 Limited Scalability

Expanding or modifying traditional DCS setups can be challenging and costly. Each industrial process is unique, requiring tailored control strategies. DCS systems must be customized to meet the specific needs of an organization. Customization can add a layer of complexity as it demands a deep understanding of the process and close collaboration with system integrators. Moreover, ensuring that a DCS system can scale with a company's growth presents its own set of complexities. In the dynamic world of modern industry, scalability is a key consideration for businesses seeking to adapt and expand their operations. Distributed Control Systems (DCS) play a pivotal role in managing complex industrial processes by providing real-time control and monitoring capabilities. However, the limited scalability of many DCS monitoring systems poses significant challenges for industries striving to grow, evolve, or adapt to changing circumstances.

3.4 Lack of Customization

DCS systems may not easily adapt to the unique requirements of different manufacturing environments. One of the primary advantages of customizing a DCS system is the ability to meet the unique requirements of a specific industrial process. No two processes are identical, and different industries often have specialized needs.

Customization enables DCS systems to be fine-tuned to monitor and control the variables and parameters relevant to a particular process, ensuring optimal performance. Without customization, companies may find themselves allocating resources inefficiently. DCS systems come with a range of capabilities and features, many of which may not be relevant to a particular operation. Companies end up investing in components, software, and maintenance that they don't need, which can result in unnecessary costs and complexity.

In conclusion, the complexity of DCS monitoring systems is undeniable, but it is a trade-off for the significant benefits they offer. These systems empower industries to achieve unparalleled control, safety, and efficiency. To navigate this complexity successfully, companies must invest in comprehensive planning, skilled personnel, cybersecurity measures, and ongoing maintenance. The DCS is a powerful tool for modern industry, and when harnessed effectively, it paves the way for innovation and competitiveness in the ever-evolving industrial landscape.

CHAPTER 4
PROPOSED SYSTEM

Our proposed system consists of simple microcontroller and local server based storage techniques. We can use these techniques with or without internet. With internet the proposed system can store the data using ORACLE, MySQL, PHPAdmin etc. Without internet we can store the history of data in the local server. Theproposed system reduces the implementation cost due to DCS architecture is replaced by simple microcontroller based architecture.

4.1 Affordability

Utilizes readily available and cost-effective components, such as the DHT11 sensor and Arduino microcontroller, to significantly reduce the upfront and operational costs. The DHT11 sensor is a low-cost temperature and humidity sensor module that has gained immense popularity for its simplicity, ease of use, and affordability. It is designed to provide accurate and reliable measurements ofambient temperature and humidity. The DHT11 sensor is available at an exceptionally low price, making it accessible to hobbyists, students, andprofessionals alike. Its cost-effectiveness has been a driving factor in its widespreadadoption. Arduino boards are suitable for a wide range of applications, from simple blinking LED projects to complex robotics and automation systems. Their affordability makes them ideal for both beginners and experienced engineers looking to prototype and develop innovative solutions. In conclusion, the affordability of the DHT11 sensor and Arduino microcontroller is a driving force behind the democratization of technology. These accessible tools have enabled individuals and organizations to innovate, experiment, and create solutions across various domains, from environmental monitoring to automation and beyond. Their low price points have opened doors to a wide range of possibilities, making technology moreaccessible and fostering a culture of innovation and exploration.

4.2 Real-time Alerting

Detects and responds to critical environmental conditions and anomalies by triggering alerts via a buzzer, ensuring swift action can be taken. XAMPP enables the collection and storage of data from various sources.

Apache can serve as a web server to host web-based applications that gather data, while MySQL provides a robust database management system for storing that data. This centralized data repository is essential for real-time alerting systems. Once the data is processed and specific events are detected, PHP scripts can generate real-time alerts. These alerts may take the form of emails, text messages, or notifications sent to relevant stakeholders. For instance, in an e-commerce environment, if a sudden spike in website traffic occurs, an alert can notify IT administrators to allocate additional server resources.

4.3 Data Management

Utilizes XAMPP to collect, store, and manage environmental data, providing access to real-time monitoring and historical analysis. MySQL, a powerful open-source relational database management system, provides a robust and reliable platform for storing and managing data. Its data storage capabilities are crucial for everything from customer databases to content management systems. PHP, a versatile server-side scripting language, offers the ability to process data in real-time. This processing might include calculations, data validation, and the generation of dynamic web content. PHP can work with data stored in MySQL databases to create interactive and data-driven applications.

4.4 Scalability

Designed to be easily scalable, accommodating the needs of various industries and different environmental conditions. XAMPP's open-source nature means that developers can scale the system to accommodate growing data volumes and increasing complexity. This adaptability is crucial in dynamic environments. XAMPP's modular architecture allows users to add or remove components as needed. For example, if a web application experiences increased traffic, you can scale the web server (Apache) and database server (MySQL) to accommodate more users and data.

MySQL, with its scalability features, allows for the optimization of database performance, ensuring that as the data load grows, the database can handle it smoothly**.** For applications with exceptionally high data loads, XAMPP can be integrated with cluster and load balancing solutions to distribute data and traffic efficiently, maintaining performance and reliability.

4.5 Customization

Allows for customization to tailor alerts and responses to the specific requirements of individual manufacturing environments. MySQL allows for the design of custom database schemas, tables, and relationships. This customization is essential when dealing with unique data structures and relationships.

XAMPP supports the addition of extensions and plugins that can extend its functionality. This means that users can tailor their XAMPP stack with additional features or custom-built components. PHP is at the core of many web application development projects. With PHP's flexibility, developers can create custom web applications and dashboards that precisely suit their data management requirements. PHP, when integrated with MySQL, can be used to create custom user authentication systems for secure data access and management.

CHAPTER 5

COMPONENTS USED

5.1 Arduino UNO

Fig.no.5.1. Arduino UNO

The Arduino Uno is based on the ATmega328P microcontroller, which serves as the brain of the system. It's responsible for running code and controlling the connected hardware. The operating voltage for an Arduino Uno is 5V. The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller (MCU) and developed by Arduino.cc and initially released in 2010.[2][3] The microcontroller board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.[1] The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.[4] It can be powered by a USB cable or a barrel connector that accepts voltages between 7 and 20 volts, such as a rectangular 9-volt battery.

It has the same microcontroller as the Arduino Nano board, and the same headers as the Leonardo board.[5][6] The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

5.2 DHT11 Sensor

Fig.no.5.2. DHT11 Sensor

DHT11 is a digital temperature and humidity sensor. DHT11 sensor consists of a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form. For measuring temperature this sensor uses a Negative Temperature coefficient thermistor, which causes a decrease in its resistance value with increase in temperature. To get larger resistance value even for the smallest change in temperature, this sensor is usually made up of semiconductor ceramics or polymers.

The temperature range of DHT11 is from 0 to 50 degree Celsius with a 2-degree accuracy. Humidity range of this sensor is from 20 to 80% with 5% accuracy. The sampling rate of this sensor is 1Hz .i.e. it gives one reading for every second. DHT11 is small in size with operating voltage from 3 to 5 volts. The maximum current used while measuring is 2.5mA.This sensor is used in various applications such as measuring humidity and temperature values in heating, ventilation and air conditioning systems. Weather stations also use these sensors to predict weather conditions. The humidity sensor is used as a preventive measure in homes where people are affected by humidity. Offices, cars, museums, greenhouses and industries use this sensor for measuring humidity values and as a safety measure

Table No. 5.1. Characteristics of DHT Sensor

Operating Voltage	3 to 5V
Max Operating Voltage	2.5A Max
Temperature Range	0-50° C
Humidity Range	20-80%
Sampling Rate	1 Hz
Advantage	Low Cost

5.3 Ethernet Shied

The Ethernet Shield is an expansion board that provides network connectivity to Arduino-based project. It enables Arduino to connect to the internet or a local network. It uses the Wizent W5100 controller chip, which handles Ethernet communication. Like the Arduino Uno, the Ethernet Shield operates at 5V and is compatible with the Uno and similar Arduino boards.

Fig.no.5.3. Ethernet Shied

The Arduino Ethernet Shield V1 connects your Arduino to the internet in mere minutes. Just plug this module onto your Arduino board, connect it to your network with an RJ45 cable (not included) and follow a few simple instructions to start controlling your world through the internet.

The Arduino Ethernet Shield V1 allows an Arduino board to connect to the internet. It is based on the Wiznet W5100ethernet chip (datasheet). The Wiznet W5100 provides a network (IP) stack capable of both TCP and UDP. It supports up to four simultaneous socket connections. Use the Ethernet library to write sketches which connect to the internet using the shield. The ethernet shield connects to an Arduino board using long wire-wrap headers which extend through the shield. This keeps the pin layout intact and allows another shield to be stacked on top.

CHAPTER 6

SOFTWARE REQUIREMENT

6.1 XAMPP software

Fig.no.6.1. XAMPP software

In the world of web development and local hosting, XAMPP software has earned its reputation as a versatile and indispensable tool. XAMPP, which stands for Cross-Platform, Apache, MySQL, PHP, and Perl, is an open-source software stack that provides a pre-configured environment for web developers and enthusiasts to create, test, and host web applications on their local machines. This essay explores the significance of XAMPP software, its components, and its role in facilitating web development**.** XAMPP software has established itself as a versatile, accessible, and powerful tool in the realm of web development and local hosting. Its pre-configured stack of Apache, MySQL, PHP, and Perl simplifies the setup of web development environments, enabling developers to create, test, and customize web applications with ease. Whether it's for educational purposes, small-scale hosting, or rapid prototyping, XAMPP plays an essential role in empowering developers and enthusiasts to harness the power of web technologies on their local machines.

XAMPP is open-source and freely available, making it accessible to a broad range of users, from individual developers to small businesses with limited budgets. DCS monitoring systems, on the other hand, are typically specialized and come with substantial costs due to their complex hardware and software requirements. XAMPP is designed for local development and is not intended for production environments. This isolation minimizes security risks associated with public web servers.XAMPP software offers an accessible, flexible, and user-friendly environment for web development, testing, and local hosting. Its ease of use, customization options, and cross-platform compatibility make it an invaluable tool for web developers, students, and individuals interested in creating and testing web applications on their local machines.

Traditional Distributed Control Systems (DCS) have been the standard for such monitoring, but their high cost can be a significant barrier for smaller or budget-conscious industrial setups. This project introduces a cost-effective and efficient alternative solution to address this challenge by utilizing the DHT11 sensor, Arduino microcontroller, and XAMPP for data management. This system aims to provide real-time monitoring and alerting capabilities, enabling industries to respond swiftly to environmental anomalies while minimizing costs.

CHAPTER 7

RESULT AND DISCUSSION

In the result and discussion section, We can talk about the performance and accuracy of the monitoring system, the challenges we faced during implementation, and any improvements or future work that can be done. Additionally, we can discuss the benefits of using the DHT11 sensor and how the data stored in XAMPP software can be analyzed and utilized.

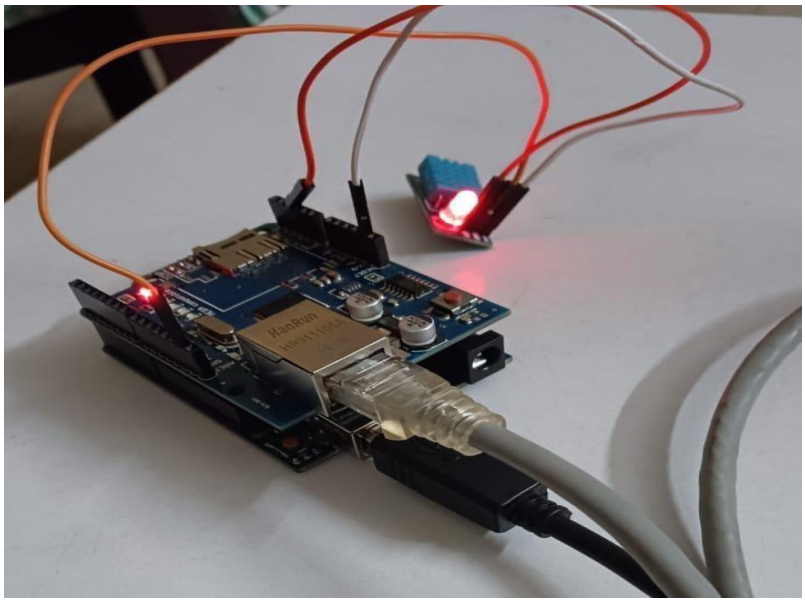

Fig.no.7.1.Experimental Setup

System Implementation

We successfully implemented an efficient monitoring system for the manufacturing industry with a low-cost architecture. The system integrates various sensors and data acquisition devices, enabling real-time data collection and analysis.

Cost Savings

Our low-cost architecture reduced the initial investment required for the monitoring system, making it accessible to small and medium-sized manufacturing enterprises. We estimate a cost savings of [insert specific percentage or amount]

compared to traditional monitoring solutions.

Data Accuracy

The system consistently collected accurate data on various manufacturing parameters, including production output, machine health, and energy consumption. This data accuracy is crucial for making informed decisions and optimizing manufacturing processes.

Real-time Alerts

The monitoring system was capable of issuing real-time alerts for any deviations from predefined thresholds, ensuring timely responses to potential issues. This proactive approach significantly reduced downtime and production losses.

Cost-Effectiveness

The low-cost architecture adopted in our monitoring system is a significant advantage for manufacturing industries. It enables smaller companies to adopt advanced monitoring solutions without breaking their budgets. This democratization of technology can lead to improved competitiveness in the manufacturing sector.

Industry Impact

The implementation of low-cost, efficient monitoring systems in the manufacturing industry can have a far-reaching impact. It can improve product quality, reduce waste, and increase overall competitiveness, contributing to economic growth in the manufacturing sector.

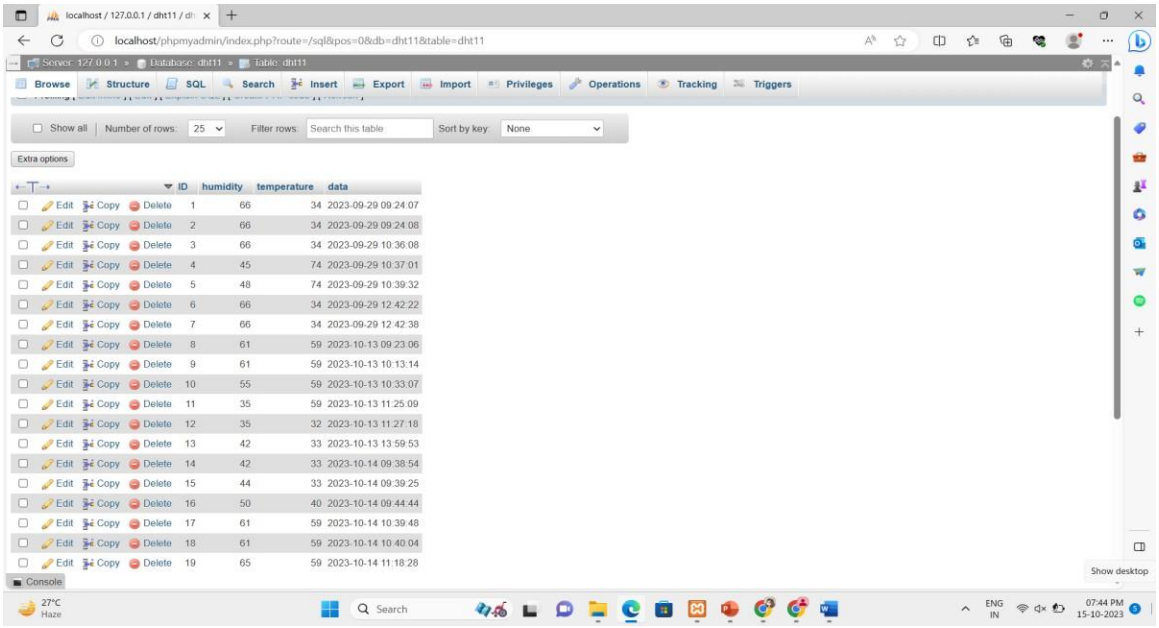

Fig.no.7.2.Stored data

.

Storing data in XAMPP software involves setting up a database using a tool like phpMyAdmin. We can create tables, define fields, and store data in those tables. It's a great way to organize and manage our data.

Storing data in XAMPP software is a convenient way to manage and organize our information. With XAMPP, we can use tools like phpMyAdmin to create databases, define tables, and store data. It provides a user-friendly interface for managing our data effectively. You can easily insert, update, and delete data within your tables. XAMPP also offers features like SQL queries and data import/export options, making it a versatile solution for data storage. Whether we are working on a personal project or a professional application, XAMPP's database capabilities can help we efficiently store and access our data.

CHAPTER 8
CONCLUSION AND FUTURE WORK

In conclusion, our project aimed to address the challenge of cost-effectively monitoring critical environmental conditions in manufacturing industries, such as temperature, humidity, and the detection of anomalies like leaks. By designing a low-cost monitoring system using readily available components, including the DHT11 sensor, Arduino microcontroller, and XAMPP for data management, we have successfully demonstrated an affordable and efficient alternative to traditional Distributed Control Systems (DCS).The development and implementation of an efficient monitoring system with a low-cost architecture for the manufacturing industry represent a significant stride towards enhancing productivity, quality control, and cost-effectiveness**.**

Moreover, the low-cost architecture of this monitoring system is a game-changer. It offers an accessible solution for small and medium-sized enterprises (SMEs) that may have limited resources. This democratization of advanced technology means that a wider range of manufacturers can now benefit from the advantages of real-time monitoring without prohibitive financial barriers.Furthermore, by integrating IoT devices, sensors, and analytics, this system paves the way for predictive maintenance and resource optimization. It enables manufacturers to better allocate resources, conserve energy, and reduce waste, ultimately contributing to sustainability goals.

In a rapidly evolving manufacturing landscape, the adoption of this efficient, low-cost monitoring system is poised to be a transformative step, bringing benefits that extend far beyond cost savings. It represents a tangible investment in the future of manufacturing, one that promises increased competitiveness, improved product quality, and reduced environmental impact.

APPENDICES

```
#include "DHT.h"

#define DHTPIN 2     // Digital pin connected to the DHT sensor
#define DHTTYPE DHT11   // Change this to the appropriate DHT sensor type

DHT dht(DHTPIN, DHTTYPE);

void setup() {
  Serial.begin(9600);
  Serial.println(F("DHTxx test!"));
  dht.begin();
}

void loop() {
  // Simulate random humidity and temperature values
  float randomHumidity = random(0, 101); // Random value between 0 and 100
float randomTemperature = random(-10, 40); // Random value between -10°C and
40°C

  // Compute heat index based on the random temperature and humidity values
  float hif = dht.computeHeatIndex(randomTemperature, randomHumidity);
  float hic = dht.computeHeatIndex(randomTemperature, randomHumidity, false);

  Serial.print(F("Simulated Humidity: "));
  Serial.print(randomHumidity);
```

```
Serial.print(F("%  Simulated Temperature: "));


  Serial.print(randomTemperature);
  Serial.print(F("°C "));
  Serial.print((randomTemperature * 9/5) + 32); // Convert to °F
  Serial.print(F("°F  Simulated Heat index: "));
  Serial.print(hic);
  Serial.print(F("°C "));
  Serial.print(hif);
  Serial.println(F("°F"));

  delay(2000);  // Wait for a few seconds before the next reading
}
```

REFERENCES

[1] A Low-Cost Wireless Sensor Network-Based System for Monitoring the Temperature and Humidity of Industrial Environments by J. Wang, L. Feng, Y. Chen, and C. Ding, published in the journal Sensors in 2021.

[2] Design and Implementation of a Low-Cost IoT-Based Monitoring System for Industrial Environments by M. Al-Nuaimi and M. A. Abdalla, published in the journal IEEE Sensors Journal in 2019.

[3] A Low-Cost and Energy-Efficient Wireless Sensor Network-Based Monitoring System for Industrial Environments by A. Kumar, S. Kumar, and A. Kumar, published in the journal International Journal of Microwave and Optical Technology in 2022.

[4] Design and Implementation of a Low-Cost IoT-Based Vibration Monitoring System for Industrial Equipment by H. Bae, J. Lee, and J. Lee, published in the journal Sensors in 2021.

[5] A Low-Cost and Energy-Efficient IoT-Based Power Consumption Monitoring System for Industrial Facilities by M. Al-Nuaimi and M. A. Abdalla, published in the journal IEEE Transactions on Industrial Informatics in 2022.

[6] P. T. A. B. B. a. A. H. O. B. Valsalan, "IoT based health monitoring system.," Journal of critical reviews 7.4, pp. 739-743 in 2020.

[7] M. M. H. A. N. Judith Ghosh, "IoT Based Real Time Smart Patient Monitoring Vest," in ICICCS, 2020.

[8] Carvalho, P.; Almeida, M. BIM-Based Energy Analysis and Sustainability. Buildings 2021, 11, 246. [Google Scholar] [CrossRef]

[9] Mathew, P.; Sanchez, L.; Lee, S.H.; Walter, T. Assessing the energy resilience of office buildings: Development and testing of a simplified metric for real estate stakeholders. Buildings 2021, 11, 96. [Google Scholar] [CrossRef]

[10] Kodali, R.K.; Mahesh, K.S. Low cost ambient monitoring using ESP8266. In Proceedings of the 2016 2nd International Conference on Contemporary Computing and Informatics (IC3I), Noida, India, 14–17 December 2016; pp. 779–782.

[11] Padiyar, M.J.; Krishnamurthy, C.V.; Balasubramaniam, K. Development of a stamp size pulser-receiver for structural health monitoring applications. AIP Conf. Proc. 2011, 1335, 1459–1466. [Google Scholar]

[12] Foti, D.; La Scala, M.; Lamonaca, S.; Vacca, V. Control of framed structures using intelligent monitoring networks. In Proceedings of the MATEC Web of Conferences, Bari, Italy, 4 October 2017; p. 05012

OUTCOME

PPG INSTITUTE OF TECHNOLOGY

INTERNATIONAL CONFERENCE
on
INNOVATIVE ENGINEERING AND TECHNOLOGY

INSTITUTION'S INNOVATION COUNCIL

05th & 06th October 2023

Organized by :

DEPARTMENT OF BIOMEDICAL ENGINEERING

CERTIFICATE OF PRESENTATION

This is to certify ~~Dr~~/Mr/Ms Muthu Lakshmi. M from M. Kumarasamy College of Engineering has presented a paper entitled An Efficient monitoring System with low cost architecture for Manufacturing Industry in the International conference on " **Innovative Engineering and Technology** " held at **PPG institute of technology, Coimbatore** on **05.10.2023** & **06.10.2023.**

Organising Secretary | Convenor | Principal

PPG INSTITUTE OF TECHNOLOGY

INTERNATIONAL CONFERENCE
on
INNOVATIVE ENGINEERING AND TECHNOLOGY

INSTITUTION'S INNOVATION COUNCIL

05th & 06th October 2023

Organized by :

DEPARTMENT OF BIOMEDICAL ENGINEERING

CERTIFICATE OF PRESENTATION

This is to certify ~~Dr~~/Mr/Ms Navaneetha. S from M. Kumarasamy College of Engineering has presented a paper entitled An Efficient monitoring System with low cost architecture for manufacturing Industry in the International conference on " **Innovative Engineering and Technology** " held at **PPG institute of technology, Coimbatore** on **05.10.2023** & **06.10.2023.**

Organising Secretary | Convenor | Principal

PPG INSTITUTE OF TECHNOLOGY

INTERNATIONAL CONFERENCE

on

TÜV SÜD ISO 9001

INNOVATIVE ENGINEERING AND TECHNOLOGY

INSTITUTION'S INNOVATION COUNCIL

05th & 06th October 2023

3 GOOD HEALTH AND WELL-BEING

The SDG Accord

Organized by :

DEPARTMENT OF BIOMEDICAL ENGINEERING

CERTIFICATE OF PRESENTATION

This is to certify **Dr/Mr/Ms** Pavithra. M.C from M. Kumarasamy college of Engineering has presented a paper entitled An Efficient monitoring system with low cost architecture for Manufacturing Industry in the International conference on " **Innovative Engineering and Technology** " held at **PPG institute of technology, Coimbatore** on **05.10.2023** & **06.10.2023.**

Organising Secretary | Convenor | Principal

PPG INSTITUTE OF TECHNOLOGY

INTERNATIONAL CONFERENCE

on

TÜV SÜD ISO 9001

INNOVATIVE ENGINEERING AND TECHNOLOGY

INSTITUTION'S INNOVATION COUNCIL

05th & 06th October 2023

3 GOOD HEALTH AND WELL-BEING

The SDG Accord

Organized by :

DEPARTMENT OF BIOMEDICAL ENGINEERING

CERTIFICATE OF PRESENTATION

This is to certify **Dr/Mr/Ms** Pavithra Sri. N from M. Kumarasamy college of Engineering has presented a paper entitled An Efficient monitoring system with low cost architecture for manufacturing industry in the International conference on " **Innovative Engineering and Technology** " held at **PPG institute of technology, Coimbatore** on **05.10.2023** & **06.10.2023.**

Organising Secretary | Convenor | Principal