

# IOT Based Factory Monitoring System

Sakshi Ahire, Yash Dayma, Rutuja Kshirsagar, Gayatri Chaudhari and Prof.S.V.Pawar, MVP’s KBT College ofEngineering

## Abstract:

Temperature and humidity are crucial parameters for monitoring and analyzing room conditions in different settings such as hospitals, laboratories and industry. They play a vital role in maintaining appropriate temperatures, moisture levels, and product quality control. In manufacturing and scaling industries, it is essential for higher authorities to regulate the surrounding environment’s temperature within a standard threshold and monitor temperature fluctuations. To address these needs, we propose an IoT-based temperature monitoring system that utilizes a private wireless sensor network (WSN) for secure and seamless data transmission from IoT devices to a server. The collected data is then displayed on a monitor, ensuring integrity and confidentiality for stakeholders and factory authorities. We have also proposed an SMS alert system for the factory supervisor.

**Keywords-** *IOT, temperature monitoring,, SMS alert,wireless sensor network,(WSN).*

## I. INTRODUCTION

In this system we have taken consideration of all conditional and environmental parameters such as temperature and humidity. The system promises to give the best possible solution for the client, for boosting in manufacturing of products by monitoring the quality. The proposed system comes under the industry 4.0 domain where we will be using the WSN network for interacting installed sensor-repeater units. In this system the sensor unit will sense the data based on the environmental parameters like temperature and humidity and pass it to the gateway via repeaters. Once the reading data reaches the gateway data which was captured in the form of reading will get passed to the server and once the server receives data and stores the data it will get displayed on the web based dashboard. If the parameters exceed the standard range set by the company then the supervisor will get the notification alert via SMS .So by proposing this system the factory supervisor and other authorized person will be able to monitor the quality of the products which are being manufactured in the manufacturing zone from their office and they will also be able to make graphical analysis of the production environment..

### 1. Proposed System

#### A. System Architecture

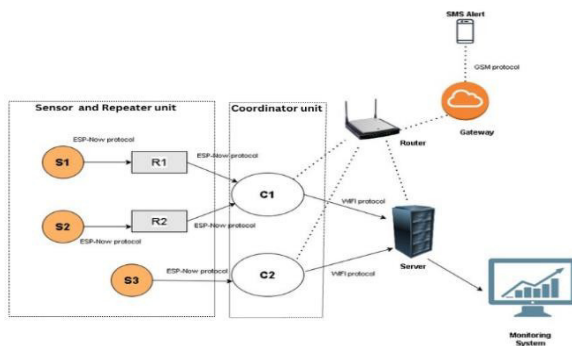


Fig. 1. Architecture of factory monitor system

#### Sensor and Repeater Unit:

Sensor nodes are important part of system . To monitor environmental factor of production environment we use DHT-22 temperature sensors to scene environment factor like humidity and temperature.

Distance between Raspberry-pi server and sensor nodes are more than the range of sensor for extend the range we use repeater nodes. which are connected in ad-hoc manner for sending data sense by sensor node to the server. Sensor nodes and repeater nodes communicating with ESP Now protocol.

#### Coordinator unit:

Data from all sensor nodes through repeater nodes are collected by coordinator. Coordinator is implemented near to the server .coordinator collect all data and sends to the Raspberry-pi data server. Coordinator uses Wifi protocol to communicate with Raspberry-pi data server.

#### Server unit:

System having Raspberry-pi data server which is mini computer with Raspbian embedded OS. Server unit collect all data which are sense by sensor unit and stored the data in MYSQL database .stored data used for functionality of web based monitoring system . sever and monitoring system Communicate via same wifi (wifi protocol).

#### SMS gateway:

TTGO Sim800L device use as a gateway. It check the data from server and compare with threshold of the temperature if parameter exceeds the range gateway sends SMS alert on the mobile of factory supervisor . TTGO Sim800L inbuilt socket for SIM card from which alert SMS send on the mobile using GSM protocol

#### Display monitor:

Display monitor is web based embedded system . System gets data from server and perform the functionality .

Functionality of the system are-

- Trends-

Trends are the graphical representation of the temperature reading from each sensor nodes.

- Configure the devices-  
Connection of devices like sensor node , repeater node and coordinator managed in manage devices option . There is edit option from which admin can change name of device, location of device, connection of device.
- Manage SMS Alerts-  
Manage SMS alerts option provide the SMS template and option of add the mobile numbers of the supervisor.
- Data backup-  
In the data backup provide functionality to manage the backup of the sensor data and configure device backup file can download in CSV format, other functionality to truncate the database.

### B. Functional Requirements

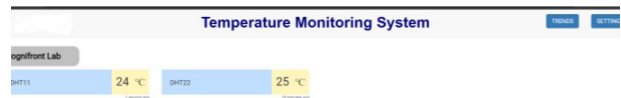
- Send data-  
Data from sensor nodes are must me transfer through the repeater to the server.
- Sense data-  
Sensing data from production environment is most important part which is dependent on sensor nodes.
- Collect data –  
Coordinator is entity which collect all the data of each sensor nodes, data must be stored into the database for the functionality of system.
- Send notification-  
Parameter exceed the range SMS gateway responsible to send alert notification on the mobile of supervisor.
- Display graph-  
Data from the sensor nodes represent in graphical format to analysis of factory environment.

### C. System Non-Functional Requirements

1. Performance requirements - When an unpredictable failure (e.g. Environment Changes, System Failure, reliable data) occurs, system needs to recover briefly.
2. Safety requirements - Data should be handle securely while transferring through devices.
  - i) Data security
  - ii) Sensor security
3. Security requirements - Operations perform on code must be able to work without any error under any consequences.
  - Authentication
  - Logging
  - Authorization

## II. Results

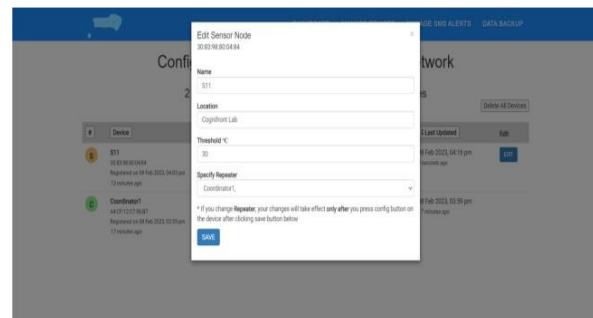
The proposed system is designed to increase production of industry by monitoring the temperature, so we design real time monitoring system to maintain temperature parameters. For this we have use Wireless Sensor Network ,which has sensor nodes and repeater nodes and coordinator nodes. We are using a DHT22 temperature sensor rather than DHT11 as it is more accurate and we monitored using the Temperature Monitoring System which is a web based system , here functionality of system are you can configure devices , manage access, trends of sensor, sms alert, download configuration report, download temperature reading report . Sensor nodes send to the server where server stores data into the database and it sends to display monitor.



The dashboard of system show readings of temperature in Celsius of particular room with time. It has two buttons trends and settings. On clicking the trends buttons it shows graph of particular sensor with date and time. In the settings where admin can login with credentials.



The trends shows the graph which is hourly, daily and monthly based it shows variations according to changes in temperature and time of sensor.



The configuration of devices is done of coordinator, repeater and sensors and it shows list where we have to enter name location, threshold value for up to which it should be maintained if it is highit gives alert in red.

IV. Conclusion

IOT based Factory monitoring system promises to fulfill all the client requirements where the proposed system will help the client to boost the production capacity of factory product as the system will help clients to improve the quality of the product. The system is designed in such a way that it is easily maintainable, understandable and user friendly for the client. As per the requirements the system is made of hardware and software components that allow control of different parameters in their factory and which will help the factory supervisor to monitor tyres easily and eventually will help to improve the quality of the production

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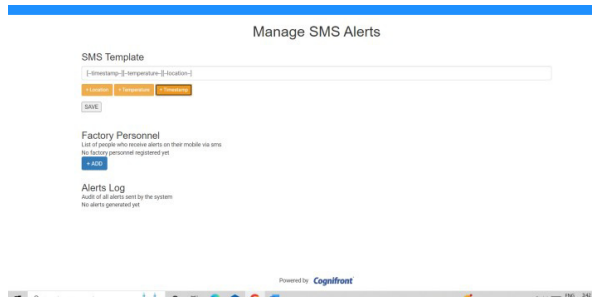
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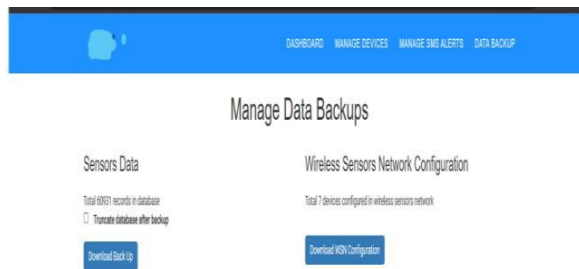
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Here we can manage SMS alert as temperature goes above threshold value where there is list of people. We can add people to whom we want SMS to take required action against it.



We can manage backups of data collected by sensors and device configuration which is in CSV format. The data is stored in database and backup files can be downloaded.

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