Real Time Industrial Air Pollution Monitoring System

Ms.Mrunali Takekar[1], Ms.Priyanka Sonar[2], Prof.B.N.Shinde[3]
Department of Electronics And Telecommunication[1,2,3] ,Savitribai Phule Pune University[1,2,3]
Email: takekarmrunali@gmail.com[1] ,priyasonar1207@gmail.com[2] , shinde.bhushankumar@kbtcoe.org[3]

Abstract- The main objective of the project is to propose a system where we will monitor the Air Pollution over a web server using internet and will send notification when the air pollution goes beyond a certain level. Node MCU (ESP8266) module is used for this purpose. Now-a-days, the industrialization increases the degree of automation at the same time it increases the pollution by releasing unwanted parameters like smoke, temperature, humidity and various gases in an industrial as well as neighboring areas. Since, this project consists of the IOT based Air Pollution Monitoring System it will show the extended values of gases on webpage as well as buzzer will blow which will alert the respected authority when the pollution goes beyond certain level. Since, we can monitor the pollution level on webpage from anywhere using our computer or mobile. We can install this system anywhere in industries.

Keywords- Node MCU, Internet of things (IoT), Smoke sensor, CO Sensor, CH4 Sensor, Temperature and Humidity Sensor.

1. INTRODUCTION

Now-a-days, the industrialization increases the degree of automation at the same time it increases the pollution by releasing unwanted parameters like smoke, pollutants, temperature and humidity in an industrial as well as neighboring areas. Due to recent technological advances, the construction material for small and low cost sensors became technically and economically feasible. So there should be a system to monitor and asses the industrial pollution. Particular attention is given to factors which may affect human health and the health of the natural system itself. Industrial monitoring is the collection of information at different locations of industries and at regular intervals of time in order to provide the data which may be used to define current conditions. Due to the complexity of parameters large variations are found between different industries.

Air pollution caused by the industries is one of the leading causes of climate change. The air is directly impacted, yet the effects go far beyond air quality issues. Greenhouse gas emissions can cause physical damage to plants and reduce crop yields. Air pollution has severe human health effects. Ozone, for example, causes irritation to the respiratory system. Since this system is mainly use to monitor the air pollution.

Since, this project consists of the Arduino based Air Pollution Monitoring System it will continuously monitor the quality of the air in PPM and is displayed on LCD as well as on webpage so that we can monitor it very easily. We can install this system anywhere in industries. When pollution goes beyond some level, we can send alert alarm so that respected authority will come to know about the increased level of gases.

2. LITERATURE REVIEW

[1] The Application of Zigbee Based Wireless Sensor Network and GIS in the Air Pollution Monitoring. The paper reviews the development of the technology of air pollution monitoring, point out the shortages of the current monitoring technology, and bring forward the advantage of the technology of the ZigBee based wireless sensor network in air pollution monitoring, discusses the GIS technology, focusing on the requirements of air pollution monitoring system. Finally, based on the above mentioned, the application schema of the ZigBee based WSN and GIS is designed and discussed in detail.

[2] Automated Control System for Air Pollution Detection in Vehicles. This paper aims at using those semi-conductor sensors at the emission outlets of vehicles which detects the level of pollutants and also indicates this level with a meter. When the pollution/ emission level shoots beyond the already set threshold level, there will be a buzz in the vehicle to indicate that the limit has been breached and the vehicle will stop after a certain period of time, a cushion time given for the driver to park his/her vehicle. During this time period, the GPS starts locating the nearest service stations. After the timer runs out, the fuel supplied to the engine will be cut-off and the vehicle has to be towed to the mechanic or to the nearest service station.

[3] IOT-based air pollution monitoring and forecasting system: Using empirical analysis, conventional air automatic monitoring system has high precision, but large bulk, high cost, and single datum class make it impossible for large-scale installation. Based on introducing, Internet of Things (IOT) into the field of environmental protection, this paper puts forward a kind of real-time air pollution monitoring and forecasting system.

3. EXISTING METHODS

Some of the existing instruments for air pollution monitoring are Fourier Transform Infrared (FTIR) Instruments, gas chromatograph and mass spectrometers. These instruments provide fairly accurate and selective gas readings. A gas sensor that is compact, robust with versatile applications and low cost could be an equally effective alternative. Some of the gases monitoring technologies are electrochemical, infrared, catalytic bead, photo ionization and solid state. The existing monitoring system largely uses smart transducers interfaced module with semiconductor gas sensors which uses 1451.2 standard.

STIM was found to an efficient monitoring system but for the power requirement and ability to expand for large development. One of the large scale sensor networks for monitoring and forecasting is Environment Observation And Forecasting System (EOFS). Air Pollution monitoring system based on geo sensor network with control action and adaptive sampling rates proposed in also can't be vast deployment due to high cost.

4. NEED OF PROJECT WORK

Continuously monitoring the air quality and controlling the main pollutant concentrations in that particular region. Making people aware about the causes, consequences of air pollution and related health risk. It also provides an action to be taken in order to control the increased level of pollutants in the particular industrial sector. Provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment.

5. PROBLEM STATEMENT

In this project, we are interfacing various gas sensors with an Arduino UNO board and all the real time values are been displayed on LCD display. If any of the sensor value exceeds the threshold value, an indication is given through an alert system and all the data which is been displayed on LCD is stored and monitored through a webpage as well.
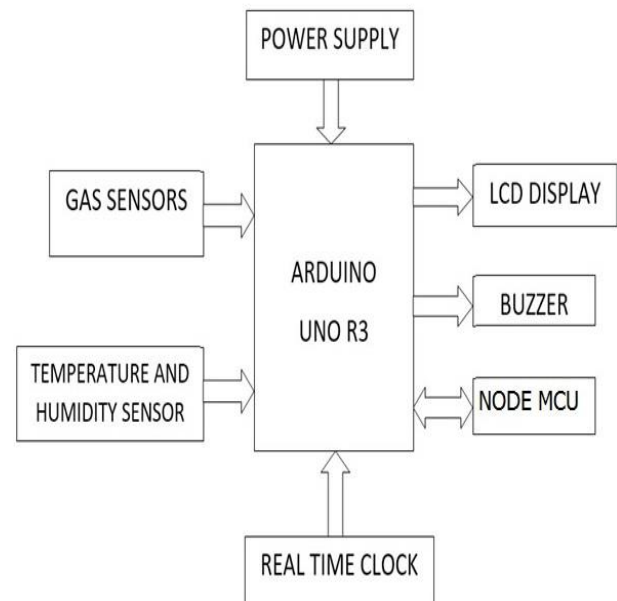
6. BLOCK DIAGRAM

Fig.1. Block Diagram of Implemented System

There are four sensors interfaced with Arduino UNO board, which are placed at the respected location from where the gases are been released. All the real time values are been displayed on LCD display. Also all these data is been monitored through webpage by having interface with Node MCU. When the gases exceeds the threshold value, an indication is given through alarm.

International Journal of Research in Advent Technology, Special Issue, ICATESM 2019
E-ISSN: 2321-9637
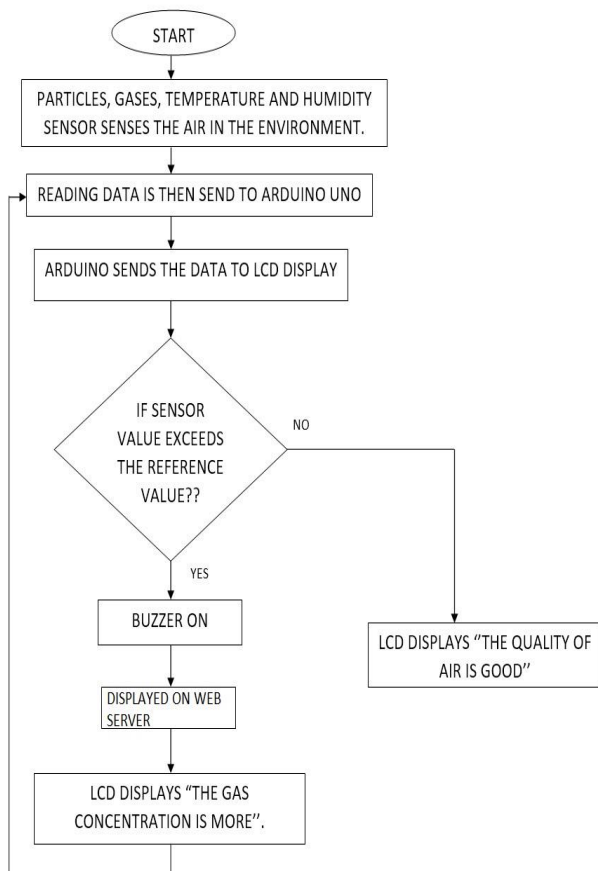*Available online at www.ijrat.org*

7. FLOW CHART

Fig.2. Flow chart of Implemented System

7.1. Hardware Requirements

(1) Arduino UNO R3: The Arduino UNO is an open-source micro controller board based on the Microchip ATmega328P micro controller. The 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.

(2) Gas sensors: The MQ series of gas sensors use a small heater inside with an electrochemical sensor. It is suitable for detecting various hazardous gases such as CO, Smoke and methane. Due to its high sensitivity and fast response time, measurement can be taken as soon as possible. The output is an analog signal and can be read with an analog input of the Arduino.

(3) NODE MCU: ESP8266 is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. The features of ESP8266 are extracted on Node MCU Development board. Node MCU (LUA based firmware) with Development board/kit that consist of ESP8266 (wifi enabled chip) chip combines Node MCU Development board which make it stand-alone device in IoT applications.

7.2. Software Requirements

(1) Arduino IDE Software: The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, mac OS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino board.

(2) IoT Protocols: MQTT: An MQTT system consists of clients communicating with a server often called a "broker". A client may be either a publisher of information or a subscriber. Each client can connect to the broker.

(3) ISIS Proteus: ISIS provides the development environment for PROTEUS VSM. This product combines mixed mode circuit simulation, micro-processor models and interactive component models to allow the simulation of complete microcontroller based designs.
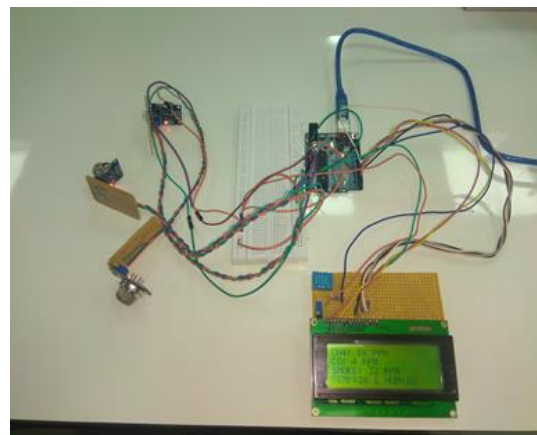
8. MODEL OF PROTOTYPE

Fig.3. Overview of the project with all the modules

International Journal of Research in Advent Technology, Special Issue, ICATESM 2019
E-ISSN: 2321-9637
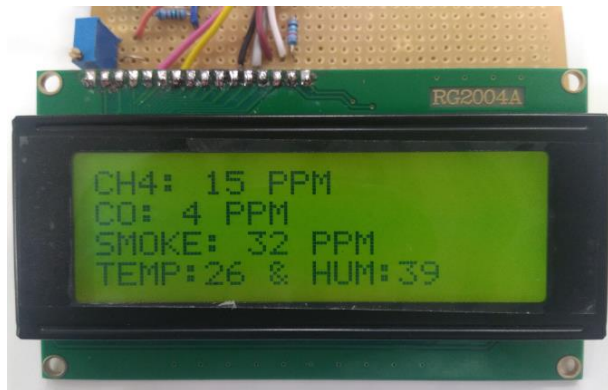*Available online at www.ijrat.org*

9. RESULTS

Fig.4. Output Analysis

10. OBJECTIVES

(1) To develop a real time air quality monitoring system for a particular industrial region.

(2) To perform a detailed level analysis of major pollutants and their sources.

(3) Continuous update of change in percentage of quality.

(4) To display the data continuously on LCD and making aware the concerned authority using GSM about the increased level of pollutants.

(5) Leads to an understanding of whether national or regional air quality standards and environmental outcomes are being met, and whether areas of concern are being identified.

11. ADVANTAGES

(1) Sensors are easily available
(2) Detecting the wide range of gasses including methane, smoke and CO2, Co etc.
(3) Simple, compact and easy to handle.
(4) Sensor having long life and less cost.
(5) Simple drive circuit.
(6) Continuous update of change in percentage of quality.
(7) Visual output.
(8) System is real time.

12. APPLICATIONS

(1) It is also mainly used in Roadside Pollution monitoring.
(2) Normally it is mostly used in industries to control the pollution which release the different types of gasses that are harmful for the environment.
(3) It is also used in Site selection for reference monitoring stations.
(4) At indoor ambient air quality monitoring system.
(5) The main application for the project is to make the data available to the citizens so that he can take some action on it.

11. CONCLUSION

It is possible to monitor the air pollution formed due to industries in reasonable cost. We can monitor the Air Pollution over a web server using internet and will send notification when the air pollution goes beyond a certain level. We can monitor the pollution level from anywhere using our computer or mobile. When pollution goes beyond some level, we can alert the respected user/authority by blowing buzzer and displaying it on LCD display as well as webpage. So we are continuously monitoring the real time industrial air pollution values.

REFERENCES

[1] Vlgyesi, P., Ndas, A., Koutsoukos, X., and Ldeczi, 2008, Air Quality Monitoring with Sensor Map, In Proceedings of the 7thinternational Conference on information Processing in Sensor Networks, pp.529-530, April 2008.

[2] R. Rajagopalan and P.K. Varshney, Data Aggregation Techniques in Sensor Networks: A Survey, IEEE Communication Surveys and Tutorials, Vol. 8 (4), pp.48-63, December 2006.

[3] S.R.N. Purnima Reddy, Design of Remote Monitoring and Control System with Automatic Irrigation System using GSM-Bluetooth, in International Journal of Computer Applications , Volume 47, No.12, pp. 12-25,2012.

[4] A. Lay-Ekuakille,P.Vergallo, and N.I.Guannoccaro Prediction and validation of outcomes from air monitoring sensors and network of sensors, in Proceedings of the 5th International Conference on Sensing Technology, pp. 73-78,2011.

[5] Srinivas Devarakonda, Parveen Sevusu,

Hongz Hang Liu, Ruilin Liu, Liviu Iftode, Badri Nath Urbcomp Real-Time Air Quality Monitoring Through Mobile Sensing In Metropolitan Areas13, August 2013 Acm.

[6] Al-Ali, A. R.; Zualkernan, I.; Aloul, F., "A Mobile GPRS Sensors Array For Air Pollution Monitoring," Sensors Journal, IEEE, Vol.10, No.10, Pp.1666, 1671, Oct. 2010.

[7] Raja Vara Prasad Y1, Mirza Sami Baig2, Rahul K. Mishra3, P. Rajalakshmi4, U. B. Desai5 And S.N. Merchant6 Real Time Wireless Air Pollution Monitoring System Ictact Journal On Communication Technology: Special Issue On Next Generation Wireless Networks And Applications, June 2011, Volume 2, Issue 2.