

IoT based Industrial Pollution Monitoring System

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Abstract - Industrialization increases the degree of automation and so it increases pollution by releasing pollutants into the atmosphere. There should be a system to monitor and assess the industrial pollution. Specific attention is given to the factors which affects the health of living organisms and Ecosystem. Industrial pollution 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. The proposed system aims in building a robust system that can measure the industrial pollution and help to reduce it and to decrease human interference in monitoring the industrial pollution and provide a healthy environment for the workers to work in. The system evaluates the industrial pollution continuously and indicates when there is an increase in the emissions and takes action to control it using wireless technology (i.e) Internet of Things.

Key Words: PIC Controller (pic16F877A), IOT, LCD, Buzzer, MQ-2 Sensor, MQ-6 Sensor, DHT22 Sensor.

1. INTRODUCTION

The terms monitoring and assessment are frequently confused and used synonymously. The process of industrial quality assessment is an evaluation of the industrial quality in relation to standard quality set by pollution control board. Due to the complexity of factors determining industrial quality, large variations are found between different industries. Similarly, the response to industrial impacts is also highly variable. To design an Industrial machine control and monitoring system using IOT. Surveillance is most important security systems in home, industrial, office and public places. To build a robust system that can measure the industrial pollution and help to reduce it and to decrease human interference in monitoring the industrial pollution to reduce pollution and provide a healthy environment for the workers to work in. To build a robust system that evaluates the industrial pollution continuously and indicates when there is an increase in emission and controls it using IOT.

1.1 DHT22 Sensor

This DHT22 is a temperature & a humidity sensor with a digital signal output. It provides high stability and reliability. It consists of a Negative temperature coefficient temperature measuring component and a resistive type humidity

measurement component. It can be connected to a microcontroller and offers quick, anti-interference ability and cost-effectiveness.

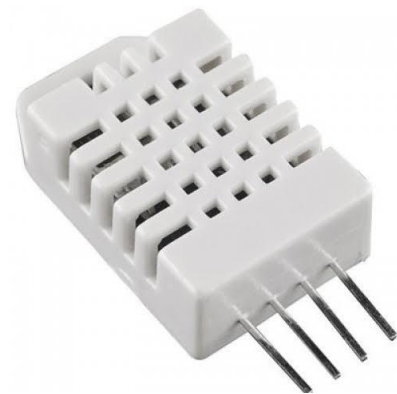


Fig -1: DHT22 Sensor

1.2 MQ-2 Sensor

A carbon monoxide analyzer or CO analyzer is a device that detects the presence of the carbon monoxide gas in order to prevent carbon monoxide poisoning. The circuit setup consists of analyzer head connected to an amplifying unit. A number of supporting resistances are used to avoid voltage drop across the circuit. Resistance value of MQ-2 is difference to various kinds and various concentration gases. So, when using these components, sensitivity adjustment is necessary. It is recommended that calibrating the detector for 200ppm CO in air and using Load resistance of about 10K Ω (5K Ω to 47 K Ω) increases circuit efficiency.



Fig-2: MQ-2 Sensor

1.3 MQ-6 Sensor

The MQ-6 Sensor can detect the small particles like cigarette smoke and it can distinguish small particles like smoke from large house dust by pulse pattern of signal output. It is used for detection of dust in the air, indoor air quality monitoring. The features are compact size and light weight (about W59x H46x D18 mm, 20g). It works on the principle of PWM (pulse width modulation) output (Low pulse output).



Fig-3: MQ-6 Sensor

1.4 GSM Module

SIM900A is an ultra-compact and reliable wireless module. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mmx24mmx3mm, SIM900A can fit in almost all the space requirements in user applications, especially for slim and compact demand of design.



Fig-4: GSM Module

1.5 LCD Display

A liquid-crystal display (LCD) is a flat panel display or other electronically modulated optical device that uses the light modulating properties of liquid crystals. Liquid crystals do

not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

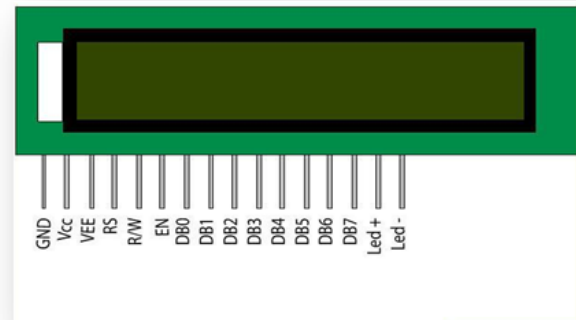


Fig-5: LCD Display

2. Existing System

As we know the industrial growth drastically increasing, environmental pollution related issues rapidly comes into existence. To fulfill the need of flourishing monitoring system, in our project we are establishing a network called Internet of Things, in which sensing devices are connected with wireless embedded computing system. Internet of Things is a technology that hook up the sensors with embedded system and allow the data from these sensors to travel over an Internet. We are implementing developing model which is able to monitors the inconstancy of parameter like Air, Noise, Temperature, Humidity and Light. In the proposed model we use microcontroller ATMEGA328 that is mounted on Arduino Uno board. We are using 5 sensors, MQ-7 as a gas sensor. It detect the concentration of carbon monoxide in air. To measure the fluctuations in noise levels we use M213 high sensitivity microphone sensor module. LM35 is used as a temperature sensor and SY-HS220 as humidity sensor. To measure the intensity of light LDR sensor is used. The values are displayed in the LCD display.

3. Proposed System

The Proposed system aims in designing a robust system that monitors real time emission levels and temperature of all the Industries and required areas, store all the collected data in and analyze them in cloud using Internet of Things. Our system uses various sensors such as temperature sensor, DHT sensor, MQ-2 sensor, MQ-6 sensor, Dust sensor to measure various parameters such as temperature, gas, dust respectively. PIC microcontroller is used which uses Reduced Instruction Set (RISC) program that reduces the complexity of the code significantly. WIFI module ESP8266 is used to store the data in the cloud which is flexible and easy to connect and it is connected through the hotspot. The data can be viewed in any browser including smart phones by logging in using the credentials.

3.1 Block diagram

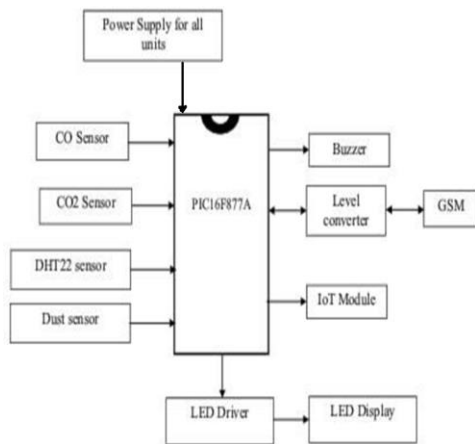


Fig -6: Proposed system

3.2 PIC 16F877A

PIC is a family of Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1640. Originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to "Programmable Interface Controller". PICs are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability. Microchip announced on February 2008 the shipment of its six billionth PIC processor. PIC16F877A have many applications in digital electronics circuits. PIC16F877A finds its applications in a huge number of devices. It is used in remote sensors, security and safety devices, home automation and in many industrial instruments. An EEPROM is also featured in it which makes it possible to store some of the information permanently like transmitter codes and receiver frequencies and some other related data. The cost of this controller is low and its handling is also easy. It is flexible and can be used in areas where microcontrollers have never been used before as in coprocessor applications and timer functions etc.

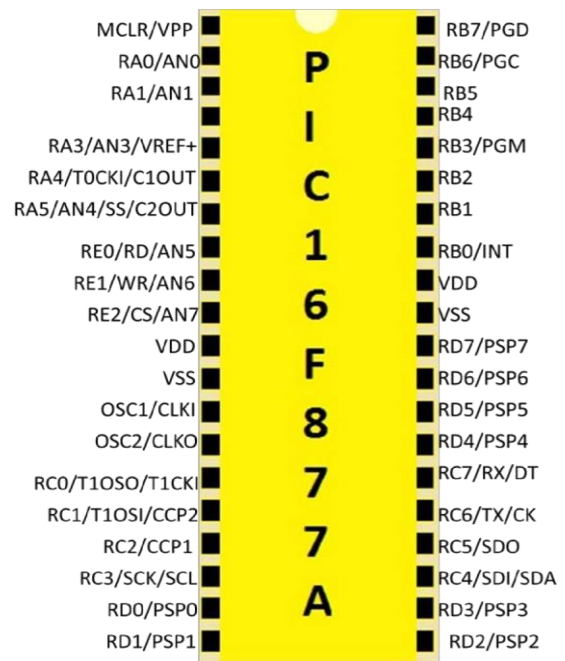


Fig- 7: PIC(16F877A)

3.3 Result and Discussion

The aim of this system is to aid in reducing respiratory problems due to industrial activities and to monitor the level of air pollution. The main focus is on finding solutions to the increasing problem of harmful gasses amounting from industrial practices in the country. In our research, we implemented sensors to be used to detect the presence of undesired gases in the air of residential areas near factories and industrial activities. The sensors provide continuous monitoring and record data for air pollution continuously, where these results are reported and analyzed using Internet of Things technology.

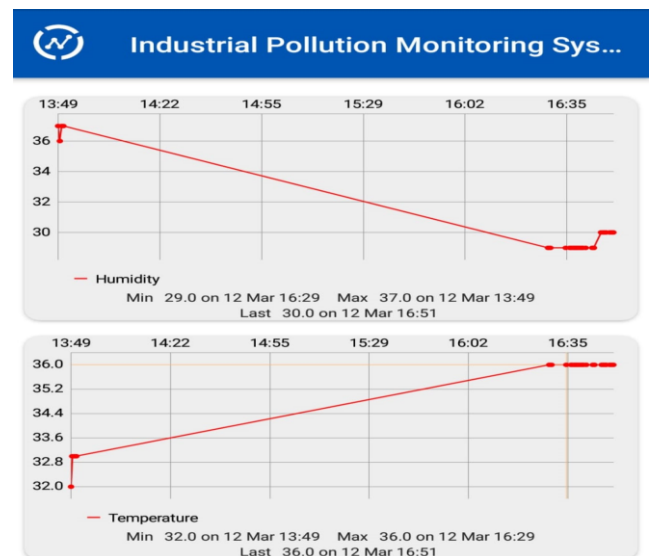


Fig -8: Software output

4. CONCLUSION

The IOT concept can be applied to a wide range of application. We implemented the use of IOT in Industrial pollution monitoring and this project, real time air pollution monitoring system based on IOT is presented. GSM is connected through level converter and an IOT module is connected to get the real time data so that the users can login and get data. Real time monitoring of air quality parameters ensures that the industrial emissions levels are maintained throughout and helps us to track all the data in a single place (i.e) cloud and reduce the pollution based on the collected data. The implementation cost is very economical as the sensors and the microcontrollers are easily available. The online database system has increased the flexibility by updating all current parameters of the industries over a common server. The camera can be upgraded in future with image processing algorithms to enable a fully automated system for safety, such as fire alarm, gas leakage. This enables to generate automated control action in the absence of the authorized user.

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