Smart and Secure Industrial Environmental Pollution and Faults Identification Control System

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Abstract - To control and monitor the parameters causing pollution and reduce the effect of these parameters without affecting the environment from Industrial pollution. The pollution causing parameters in industries are continuously sensed by various sensor which senses the factors like gas level, temperature level, pH level and noise. The information will be send to pollution control department through IOT module if anyone the parameters exceeds the standard level. These systems find the level of smoke released, machineries temperature, noise in the Industrial environment and the amount of pH present in the industry during industrial process .The pollution from industry is monitor and control effectively and data is transferred through cloud communication.

Key Words: **Internet of things, PIC Controller (PIC16F877A), Node MCU (12E), Indication panel, Sensors.**

1. INTRODUCTION

The terms monitoring and assessment are frequently confused and used concurrently. The industrial quality assessment is an evaluation in relation to the standard quality set by the pollution control board. To build a robust System that measures the industrial pollution and decrease the human interference to monitor the Industrial pollution and provide safety environment for the workers to work in. The industrial pollution is monitor and control by the Wireless System. To build a robust system that evaluates the industrial pollution continuously and indicates when there is an increase in the emissions and take action to control it. The industrial pollution parameters are continuously sensed from different sensor from different sensor, initially, to sense the different factors like Gas level, Ph, temperature level and noise. The output of sensor is an analog form so controller needs ADC module which can convert analog signal to digital signal so that controller can understand. If any parameters exceeds its standard level, indicator panel will show red light if they are not taking any measure form the industry the information will send to control authority/pollution control department through IOT module.

2. SOURCES OF POLLUTANTS

In recent years, the rapid industrialization across various parts of Asia has been a boon to the economy. Unfortunately, the rise in industrialization and the standard of living are coupled with poor implementation of government rules and regulations, which result in increased concentration of pollutants. If exposed beyond permissible exposure limits(PELs)as published by the occupational safety and health administration(OSHA).

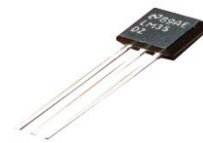## 3. HARDWARE COMPONENTS

3.1 LM35 Sensor

Fig.1 LM35 sensor

Lm35 is a temperature sensor that is used to measure the temperature with an electrical output compared to temperature (in ^{o}c).The scale factor of Lm35 is .01V/^{o}c. It measure the temperature correctly when compared to thermistor. LM35 has an output voltage that is proportional to the Celsius temperature. The sensitivity of LM35 is 10mV/degree Celsius.LM35 does not need any exterior calibration and maintains an exactness of +/- 0.4^{o}c at room temperature and +/-0.8^{o}c over a range of 0°c to +100°c. One more significant characteristics of this sensor is that it draws just 60 microamps and it has low self-heating capacity.

3.2 MQ7 Gas sensor

MQ7 Gas sensor detects concentration of the carbon Monoxide in the Air .The sensor can measure concentration of 10 to 10,000 ppm. The sensor can operate the temperature from -10 to 50°c and consumes less than 150 mA at 5V.This sensor has high sensitivity and fast response time. The sensor's output is an analog resistance. It make detection by method of cycle high and low temperature and detect CO at low temperature. This sensor has an operating voltage of 3.3-5V.

3.3 pH Sensor

Fig.2 pH sensor

pH sensor is used to measure the acidity and alkalinity of a liquid. pH value of a solution is ranges from 1 to 14. pH probes measures pH by measuring the voltage or potential difference of the solution in which it is dipped. Hence a pH probe measures the potential difference generated by the solution by measuring the difference in hydrogen ion concentration using the nearest equation and displays the pH as output.

3.4 Node MCU

Fig.3 MCU node

NodeMCU is used in Embedded IOT platform. It initially included firmware which runs on ESP8266 WI-FI SoC from Express if System and hardware is based upon ESP-12 module and it support ESP32 32-bit MCU was added. The firmware uses the Lua scripting language .It is based on the eLua project, and built on the Express if Non-OS SDK for ESP8266.It uses many open sources projects, such as lua-cjson and spiffs. The version 1.0 is the 5th design of NodeMCU devkit. This uses CP2102 as UART bridge and can flash firmware automatically by using NodeMCU-flasher and it has a voltage regulator to convert from 5V to 3.3v which is the required by the ESP21E module.
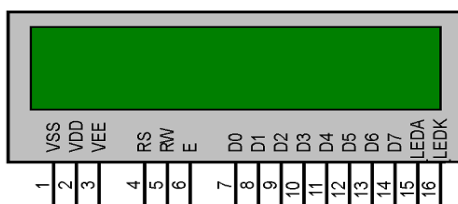
3.5 LCD Display

Fig.4 LCD screen

A liquid-crystal display (LCD) is a flat panel display or other electronically modulated optical devices that uses the light modulating properties of liquid crystals. Liquid crystal do not emit light directly, instead using a backlight or reflector to produces images in colour or monochrome.
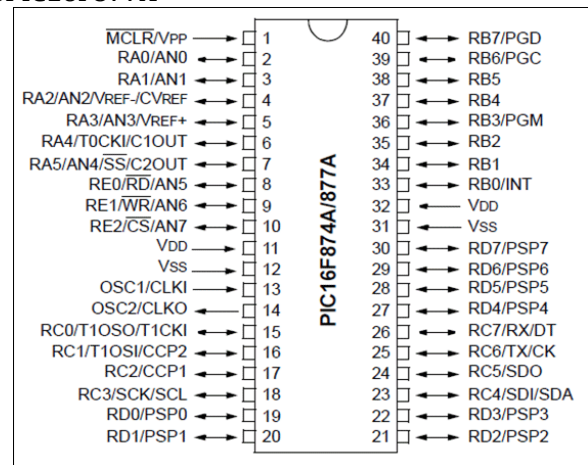
3.6 PIC16F877A

Fig.5 PIC controller

PIC is a family of Harvard architecture microcontrollers made by Microchip Technology, derived form the PIC1640.Orginially developed by General Instrument's Microelectronics Division. The name PIC initially referred to "Programmable Interface Controller".PIC are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collections of applications notes, availability of lower cost or free development tools, and serial programming capability. Microchip announced on February 2008 the shipment of its six billionth PIC processor.

4. SOFTWARE UTILIZED

MPLAB IDE is an integrated Development Environment, highly configurable software program that incorporates powerful tools to help you discover, configure, develop, debug and qualify embedded designs for most of Microchip's microcontroller and digital signal controllers. MPLABIDE works seamlessly with the MPLAB development ecosystem of software and tools, many of which are completely free. MPLAB X IDE brings a host of features to help you quickly debug your projects and minimize your development time. some newer features include Data Visualizer, I/O View, Helpful design Resources and Easy to use.

PROTEUS is a Design Suite Software tool suite used primarily for electronic design automation. The software is used mainly by electronics design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

PICKIT 2 is a family of programmers for PIC microcontrollers made by Microchip Technology. They are used to program and debug microcontrollers, as well as program EEPROM. Some models also feature logic analyser and serial communications (UART) tool.

5. RESULT

The aim of this system is to aid in reducing pollution which is caused by industrial activities and to monitor the level of pollution .In our research, we implemented sensors to be used to detect the presence of undesired gas, heat, quality of water and sound produced by industries .The sensor provide continuous monitoring and record the data continuously, where these result are reported and analyzed using Internet of Things technology.
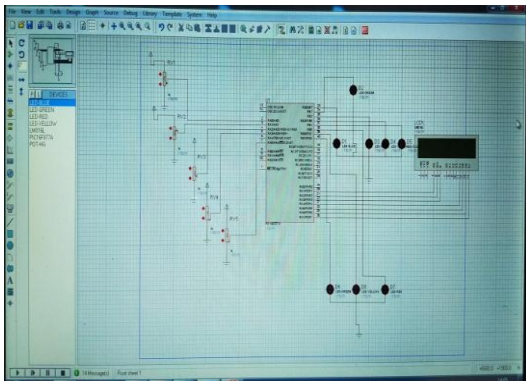

Fig.6 Proteus output

6. CONCLUSION

The IOT concept can be applied to a wide range of applications. We implemented the use of IOT in Industrial pollutions monitoring and this project, real time gas, heat, quality of water, sound pollution monitoring system based on IOT is presented. Real time monitoring of gas, heat, quality of water, sound quality parameters ensures that the industrial emissions level are maintained throughout and helps us to track all the data in a single place cloud and reduce the pollution based on the collected data.

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