

Online Monitoring and Controlling of Green House Gases

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Abstract -In recent years, there are so many industries emitting the green house gases (GHG) which affect the human beings. The most harmful gases among all of them are CO₂, methane gas, CO, etc. So it is necessary to monitor these gases that leaks from industries through online. This system is developed to monitor the green house gas leakage such as CO₂, CO, Methane along with environmental parameter like humidity and temperature from industries by its corresponding sensors interfaced with the ARM7 controller. The sensors used in the system will continuously monitor the emission of gases from the industry. The criterion level which the industry can emit is specified by the controller. If the emission exceeds its criterion level, a alarm which is connected with the controller will indicate the industries to reduce its emission level. Later also if the industry does not reduce its level, the controller will shut off the power supply using relay.

Keywords— Green House Gases, ARM7 controller, Sensors, GSM module, Relay, Buzzer.

I. INTRODUCTION

An eco-friendly system which can be used in industries to reduce the emission level by the indication given by the system. Thus reducing the risk of air pollution. The greenhouse gases are known to be the major cause of global warming, as they trap heat in the earth's atmosphere. Gas leak detection is the process of identifying potentially hazardous gas leaks by means of various sensors. These sensors usually employ an audible alarm to alert people when a dangerous gas has been detected. The sensors used in the system will continuously monitor the emission of gases from the industry. The criterion level which the industry can emit is specified by the controller. If the emission exceeds its criterion level, a alarm which is connected with the controller will indicate the industries to reduce its emission level. Later also if the industry does not reduce its level, the controller will shut off the power supply using relay. After the industry reduces its emission level, the motor will starts to run Power consumption, portability, and system cost are important parameters in designing pervasive measurement systems. With these parameters in mind, ARM 7 monitoring system with a capability to monitor greenhouse gases, such as CO, CO₂, Methane along with environmental parameter like temperature and humidity is developed.

A. Literature Review

In the “An embedded system approach to monitor green house gases” [1]. In this paper, methodology used is

controller used is PIC & the disadvantage is it is operated manually.

In the “Energy Efficient Environment Monitoring System Based on the IEEE 802.15.4 Standard” [2] IEEE paper only monitoring is done & no controlling action is taken this problem is overcome by “Online monitoring of green house gas leakage in industries”[3] . In that, ARM controller is used for methodology purpose & alarm indication is given by LED

B. Objective of the Project

- To reduce emission of harmful gases to environment.
- To reduce pollution in environment.

II. PROPOSED PROJECT

A. Description

An Embedded based green house monitor is designed based on the measuring of various parameters like humidity, temperature, light intensity by sensors located at different places, where measured, processed, controlled and updated to owner through SMS using GSM modem. Design part consists of hardware and software description. The Fig 1 shows the detailed block diagram of the project.

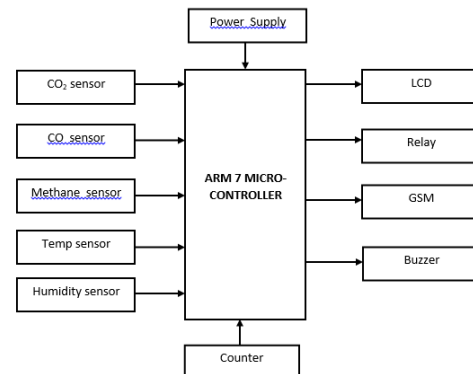


Fig.1. Detailed Block Diagram

B. Hardware Description

To design hardware for green house monitoring various sensors are used to control the environment. The parameters like temperature, humidity, CO₂, CO, methane, The green House monitoring system consists of sensor circuits, ARM 7 micro controller, LCD module to display the parameters, GSM modem to update user, mobile receiver, and required power supply unit. The output of the sensors are given as input to the micro controller to control, display the parameters and update the owner. Any parameter changing with set parameter for green house systems, the micro

controller will read and stores periodically, in turn it updates the user by sending SMS by service provider.

basic SMS related AT Commands are shown in Table 1 below:

Table 1. AT Commands

AT Command	Meaning
+CMGS	SEND MESSAGE
+CMSS	SEND MESSAGE FROM STORAGE
+CMGW	WRITE MESSAGE TO MEMORY
+CMGD	DELETE MESSAGE
+CMGC	SEND COMMAND
+CMSS	MORE MESSAGES TO SEND

1) **Microcontroller:** ARM, originally Advanced RISC Machine, is a family of reduced instruction set computing (RISC) architectures for computer processors, configured for various environments, developed by British company ARM Holdings. The LPC2138 microcontrollers are based on a 16/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine the microcontroller with 32 kB, 64 kB, 128 kB, 256 kB and 512 kB of embedded high-speed flash memory. A RISC-based computer design approach means ARM processors require significantly fewer transistors than typical complex instruction set computing (CISC) x86 processors in most personal computers.

2) *Sensors*

Gas Sensors:

This paper consists of different gas sensors which are methane sensor MQ-214 which detects the concentration of methane in the air and outputs its reading as an analog voltage. CO2 sensor MQ135, it is a sensitive material gas sensor which works in lower conductivity in clean air. CO sensor is sensitive material of MQ-7 gas sensor which detects the cycle of high and low temperature and detect CO when low temperature.

Temperature Sensor:-DS18S20

The DS18S20 digital thermometer provides 9-bit Celsius temperature measurements and has an alarm function with non-volatile user-programmable upper and lower trigger points. The DS18S20 communicates over a 1-Wire bus that by definition requires only one data line (and ground) for communication with a central microprocessor.

Humidity Sensor:-SY-HS-220

Humidity is the presence of water in air. The amount of water vapour in air can affect human comfort as well as many manufacturing process in industries. The presence of water vapour also influences various physical, chemical, and biological process. Humidity control is also necessary in chemical gas purification, dryers, ovens, film desiccation, paper and textile production, and food processing.

3) **GSM modem:** A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate. Generally, computers use AT commands to control modems. Reading of message from the SIM card inserted into the modem is done by sending the appropriate AT command to the modem. In addition to the standard AT commands, GSM modems support an extended set of AT commands some common

4) **Counter:** In this project, the transmitter section includes an IR sensor, which transmits continuous IR rays to be received by an IR receiver module. An IR output terminal of the receiver varies depending upon its receiving of IR rays. Since this variation cannot be analyzed as such, therefore this output can be fed to a amp) of LM 339 is used as comparator circuit. When the IR receiver does not receive a signal, the potential at the inverting input goes higher than that non-inverting input of the comparator IC (LM339). Thus the output of the comparator goes low, but the LED does not glow. When the IR receiver module receives signal to the potential at the inverting input goes low.

5) **Relay**

Relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts. The relay used in the system will shut on/off the power supply to industries based on the abnormal levels.

6) **Buzzer:** A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound.

B. Software Description

The software is designed in such a way that to read the parameters, display the parameters control the parameters and to monitor the green house monitoring systems. The software includes the reading of various measurements from sensors, converting analog to digital values, displaying in the LCD module and updating the user by sending the message for monitoring the green house. The ARM 7 microcontroller LPC2138 is used to do the A/D conversions, display the parameters and updating the user. The program

is written in Keil software.

controller will indicate an alarm through buzzer to reduce the emission

III. WORKING PROCEDURE

1. Start
2. Initialize LCD, counter
3. Display WELCOME message in LCD
4. Read all sensor.
5. If counter = low then increment counter, else display values in LCD.
6. Is S1 (CO₂ sensor)>2500ppm → send sms → relay off → stop
7. Is S2(CO sensor)>1000ppm → send sms → relay off → stop
8. Is S3(Methane sensor)>300ppm → send sms → relay off → stop
9. Read the message.
10. If new sms arrives → Read sms. Else go to step 11.
11. Checks whether power is on → switch on the relay. Else go to step 12
12. Stop

IV. SPECIFICATIONS OF THE PROJECT

1. Total Power =3.739W
2. Current = 0.6892A
3. Operating voltage =12V

V. SYSTEM DESIGN

Below is the system design.

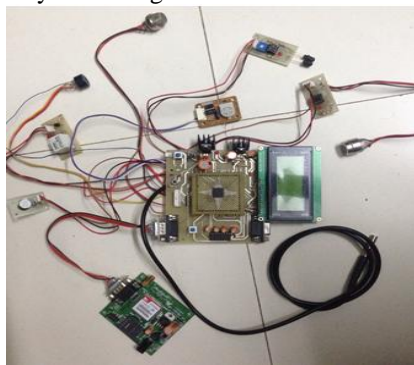


Fig. 2. System Design

VI. RESULTS AND DISCUSSION

The proposed system which is designed shows the simulation output of sensing the CO₂ gas, NO₂ gas, temperature and humidity in the industry environment. LED is used instead of buzzer. When the criterion level exceeds the controller will induce the LED to glow. If it glows, the motor will be stopped. Later if the emission gets reduced the LED will get off and the motor starts. By using Proteus and Keil software we saw the simulation output. Embedded C language is used for programming the concept. In future, hardware implementation can be done. By having criteria for the level of gases emitted from the industries, the ARM

VII. CONCLUSION

The multiple sensors input, A/D conversion program, display of parameters and updating the message to owner program is successfully build and run in the Keil software. Depends upon the analog value given the A/D conversion program changes it to corresponding digital value. The digital value is compared and corresponding parameters are detected. The time duration required for the execution the program is also found with the help of ARM 7 microcontroller

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