



A REVIEW ON MINE SAFETY SYSTEM USING IOT

¹Aher Harshal Ramesh , ²Turkane Rupal Vilas, ³Varpe Gayatri Dattatray, ⁴Waghmare Namrata Sunil, ⁵V. R. Aware

¹UG Scholar, Electronics and telecommunication, AVCOE, Sangamner

²UG Scholar, Electronics and telecommunication, AVCOE, Sangamner

³UG Scholar, Electronics and telecommunication, AVCOE, Sangamner

⁴UG Scholar, Electronics and telecommunication, AVCOE, Sangamner

awarevr@gmail.com

ABSTRACT-

Today, it is extremely difficult to keep mine workers safe. A few fundamental problems, such as the working environment and its delayed effects, leave a miner's health and life defenceless. A new and inventive approach is needed to increase mining profitability, reduce costs, and keep miners' safety in mind. The suggested system has two sections: one to track the status of the mineworkers, and the other to track everything. Air pollution in the mine worker area is mostly caused by outflows from integrated gases and particulate matter emissions. Such as Sulphur dioxide (SO₂), Nitrogen dioxide (NO₂), Carbon monoxide (CO), and so forth we are utilizing the smoke sensors to monitor the particular gas level in the mine. To monitor the concentration level of unsafe gases, semiconductor gas sensors are utilized. If any gas sensor value goes beyond the threshold range at that point the microcontroller will allow an alert to the person through a buzzer and sends the information to the monitoring section module and in the monitor received data will be uploaded to the webpage through IoT

I. INTRODUCTION

This chapter acts as the thesis's introductory chapter. It discusses safety concerns and communication issues in underground mines. The necessity of system detection and realtime monitoring is also briefly mentioned. It also outlines the thesis' goals and organisational structure. First paragraph When it comes to the wellbeing and safety of employees, underground mining operations are a risky business. These dangers result from the various methods used to extract the various minerals. The risk increases with mine depth. These safety concerns are really serious, particularly when it comes to the coal sectors. Consequently, whether mining is done for coal or any other resource, worker safety should always be a top priority. Problems of ventilation and the potential for collapse. However, the utilization of heavy machinery and the methods performed during excavations result in safety risks in all types of mining. Modern mines often implement several safety procedures, education, and training for workers, as health and safety standards, which lead to substantial changes and improvements and safety levels both in opencast and underground mining. Coal has always been the primary resource of energy in India, which has significantly contributed to the rapid industrial development of the country. About 70% of the power generation is dependent on it thus, importance of coal in the energy sector is indispensable.

But the production brings with it the other byproducts, which prove to be a potential threat to the environment and the people associated with it. Instead of that, the present work is a sincere attempt in analyzing the graveness and designing a real-time monitoring system of detection by using IoT technology.

II. BLOCK DIAGRAM

A. The Block Diagram

Wireless sensors have been used to assess the study on the realtime monitoring of poisonous gases and other factors present in underground mines. The development of a realtime monitoring system enables reliable communication between mine workers utilising IoT and a sharper, point perspective of the underground mine system. With the help of IOT software, this system is employing an LCD to display the parameters in the subterranean portion where the sensor unit is situated as well as on the monitoring unit. This would help all the miners working there to save their lives before any casualties happen. When sensor values exceed the threshold level, an alarm is set off. Also, this method saves all the data to the computer for later review. The governing element also contributes to

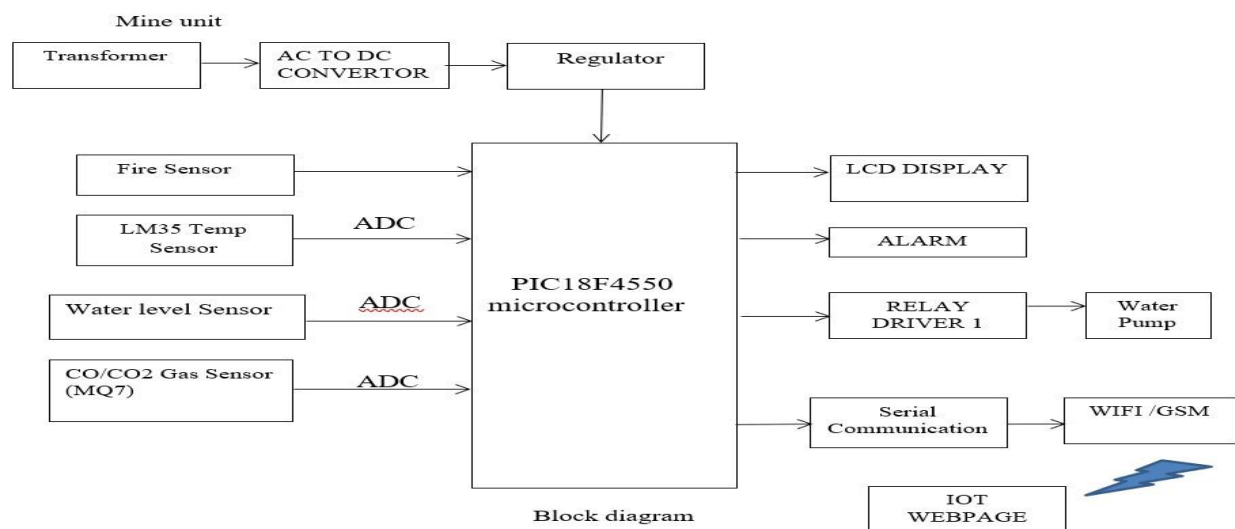


Fig.1. Block Diagram Of Mine Unit.

B. Hardware Implementation

It includes several types of sensors, and microcontroller shows the block diagram of the Mine Unit operation which consists of the fire sensor, water sensor, gas sensor, and temperature sensor.

1) Fire sensor:



Flame Detection Sensor Module is sensitive to flame, but also can detect ordinary light. Usually used as a flame alarm. Detects a flame or a light source of a wavelength in the range of 760nm-1100 nm. Detection point of about 60 degrees, particularly sensitive to the flame spectrum. Sensitivity is adjustable, and stable performance.

Features:

- Operating voltage 3.3V-5V
- Output a. analog voltage output. digital switch outputs (0 and 1)
- With a mounting screw hole PCB size: 3cm * 1.6cm
- Comparator chip LM393 ,it is stable.
- Flame detection distance, lighter flame test can be triggered within 0.8m, if the intensity of the flame is high the detection distance will be increased.

2) Gas sensor:

Gas Sensor(MQ2) module is useful for gas leakage detection (home and industry). It is suitable for detecting H₂, LPG, CH₄, CO, Alcohol, Smoke, or Propane. Due to its high sensitivity and fast response time, measurements can be taken as soon as possible. The sensitivity of the sensor can be adjusted by a potentiometer.

Features :

- Wide detecting scope
- Stable and long lifetime
- Fast response and High sensitivity
- Operating Voltage is +5V
- Can be used to Measure or detect LPG, Alcohol, Propane, Hydrogen, CO and even methane
- Analog output voltage: 0V to 5V
- Digital Output Voltage: 0V or 5V (TTL Logic)

3) Water Level Sensor:

Level sensors are used to detect the level of substances that can flow. Such substances include liquids, slurries, granular material and powders. Level measurements can be done inside containers or it can be the level of a river or lake.

- Maximum Load: 50 W
- Max Switching Voltage: 100V DC
- Minimum Voltage: 250V DC



- Maximum Switching Current: 0.5 A
- Max Load Current: 1.0 A

4) Temp sensor LM35 :

LM35 is an analog, linear temperature sensor whose output voltage varies linearly with change in temperature. LM35 is three terminal linear temperature sensor from National semiconductors. It can measure temperature from -55 degree celsius to +150 degree celsius. The voltage output of the LM35 increases 10mV per degree Celsius rise in temperature. LM35 can be operated from a 5V supply and the stand by current is less than 60uA. The pin out of LM35 is shown in the figure below.

- It has an output voltage that is proportional to the Celsius temperature.
- The scale factor is .01V/oC or 1mV/C.
- Another important characteristic of the LM35 is that it draws only 60 micro amps from its supply and possesses a low self-heating capability. The sensor self-heating causes less than 0.1 oC temperature rise in still air.
- In this circuit, parameter values commonly used are:
 - $V_c = 4$ to 30v
 - 5v or 12 v are typical values used.
 - $R_a = V_c / 10-6$

5) Liquid Crystal Display:

LCD (Liquid Crystal Display) screen is an electronic display module and finds a wide range of applications. A 16x2 LCD display is a very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in a 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

6) PIC18f4550 Microcontroller :

The PIC18F4550 microcontroller is a 8-bit microcontroller from Microchip Technology, which is widely used in embedded systems. It is part of the PIC18 family of microcontrollers.

specifications:

- CPU: 8-bit Enhanced Flash Microcontroller



- Program Memory Size: 32KB
- RAM Size: 2KB
- Data EEPROM Size: 256 Bytes
- Operating Voltage Range: 2.0V to 5.5V
- Operating frequency:12MHZ

IV. CONCLUSIONS

Wireless sensors have been used to assess the study on the realtime monitoring of poisonous gases and other factors present in underground mines. Time monitoring system is created to offer a more precise and point-to-point view of the underground mine system and to offer dependable communication between basement units utilising WIFI/GSM. It will be useful to all miners present inside the mine to save their lives before any casualties occur because this system is displaying the parameters on the LCD at the underground portion where sensor unit is mounted as well as on the monitoring unit. When sensor values exceed the threshold level, an alarm is set off. Also, this method saves all the data to the computer for later review. Moreover, the regulating element aids in methane control.

REFERENCES

- [1] Nisha Dube¹, Prof. K.S.Ingle² PG Student, Dept. of ECE “*Intelligent Mining: A Monitoring and Security System for Coal Mine Workers*”, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Vol. 5, Issue 1, January 2016.
- [2] Daniele.Huber NicolasVandapel “*Automatic 3D Underground mine mapping*”, The Robotics Institute Carnegie Mellon university. The 4th International Conference on Field and Service Robotics, July 14–16, 2003.
- [3] Warsha M.Choudhari Professor, Datta Meghe, “*Coal Mine Security System*” half octagonal monopole antenna at minim International Journal of Applied Information Systems (IJAIS) – ISSN: 2249-0868 Foundation of Computer Science FCS, New York, USA Volume 4– No.10, December 2013.
- [4] Prof. Himanshu K. Patel, Deep H. Desai, Tanvi G. Badheka, “*GSM Based Flexible Calling System*” International Journal of Engineering Trends and Technology (IJETT) – Volume 4 Issue 4– April 2013
- [5] S.Vandana, PG Scholar, “*Development of Coalmine Safety System Using Wireless Sensor Network*” Department of Electronics and Communications Engineering Sri Vasavi Engineering College, Tadepalligudem Andhra Pradesh, India, 2012.

