
ENHANCED ACCIDENT PREVENTION SYSTEM IN UNDERGROUND COLLIERIES USING LabVIEW

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ABSTRACT

In the present scenario major mine disaster takes place through explosion and fire. The proposed system comprises of a Compressed Natural Gas (CNG) sensor, a driver circuit & a Blower connected to the LabVIEW. The explosion takes place due to increase in methane concentration during this critical situation, the emergency signal is sent to the fire and police department through GSM network using LabVIEW. Apart from these safety measures, in case of any personal health problem for the miners working underground, a health trigger is provided inside the mine, when the trigger is pressed in case of emergency condition the information is sent to the first aid and rescue team via LabVIEW to the speakers.

1. INTRODUCTION

The coal mining process in India was established in the year of 1774 by John Sumner and Suetonius Grant Harry of the East India Company in the Raniganj Coal Field. Further it is expanded all over India with large amount of production. India is the third largest producer of coal in the world compared with China at first place and the US at second. The coal in India is under the Government sector. The mining, exploitation and utilization of coal are done by various Indian companies in which CIL and its associated companies are the major ones.

In addition to CIL, the NLC operates the Neyveli mines in Tamil Nadu State. Singareni Collieries Ltd. operates the bituminous mines in Andhra Pradesh and Tata Iron and Steel Company (TISCO) operates mines in Bihar to supply coking coal to their own steel plants. From the day coal mining is started, the major issue faced by the miners is Safety.

As per the statement of the Chairman, Coal India Limited, Mr.Partha S. Bhattacharya - "WE HAVE NOT BEEN ABLE TO IMPROVE MINE SAFETY STANDARDS IN THE LAST 4/5 YEARS DUE TO LACK OF TECHNOLOGY".

The Coal Mine Safety Act was passed in 1974 by Indian Government and formed a committee headed by Directorate general of Mine Safety. They examined problems faced by the miners and the factors that lead to disaster. They came up with large number of solutions with lack of technology as stated by the Chairman, Coal India Limited. Thus these solutions are being documented without any implementation.

2. LITERATURE SURVEY

[1]Sweta Basu,Sutapa Pramanik, Sanghamitra Dey, Gautam Panigrahi, Dipak Kumar Jana. In the present article, we have proposed a novel type-2 fuzzy logic system(T2FLS) for the prediction of fire intensity and its risk assessment for risk reduction in an underground coal mine. Recently, for the observation of underground coal mines, wireless underground sensor network (WUSN) are being concerned frequently. In the present context, a WUSN based fire monitoring system is

developed using fuzzy logic approach to enhance the consistency in decision making system to improve the risk chances of fire during coal mining. We have taken Mamdani IT2FLS as fuzzy model on coal mine monitoring data to consider real-time decision making (DM).

[2]Isaac O. Osunmakinde Semantic Computing Group, School of Computing, College of Science, Engineering and Technology, University of South Africa, This paper investigates the presence of the inherent types of toxic fumes in critical regions and their suspension and trends in the air and intends to generate knowledge that will assist in preventing miners from contracting diseases. Useful demonstrations of the system were carried out to provide similar knowledge to safeguard engineers from the inhalation of toxic gases. This provides early warning for safety agents. The system has proven to be suitable for deployment in underground mines.

[3]S Kubheka, University of Johannesburg, Department of Mining Engineering. Underground coal mines are more prone to underground fires, this is due to fact that coal itself is a combustible matter. The need for designing, implementing safety measures and systems to prevent and mitigate the impact of underground fires is of utmost importance. Coal mines all over the world are implementing new technologies to prevent, detect, suppress and monitor underground fires. This report elucidates on the causes of underground fires in coal mines, the detection methods, the prevention methods, fire suppression methods, alerting and evacuation during fires, latest technological trends and lastly the need for training on fire awareness. The conclusion will give a brief discussion on the new technology that I'm currently designing which I believe will enhance and effectively monitor environmental conditions undergrounds.

3. OBJECTIVE OF THE PROPOSED PROJECT

The main objective of our project is,

- To reduce the Human Death Ratio in the Mine explosion & Accidents
- To inform the status of the emergency condition to various departments.
- If explosion take place, quick transmission of information to emergency care center to intimate the status of the mines.
- To provide maximum assistance before explosion take place.
- To incorporate the technology and make more versatile applications for the purpose of human safety.

4. BLOCK DIAGRAM DESCRIPTION

The proposed model is used to identify and indicate the explosion and status of victims in mines and collieries. To indicate the victim status such as Personal Health Problem of a Miner and the emergency information's like Blower Failure, Increase in Methane Concentration, Mine at Risk and some periodic alerts will be transmitted to the various departments like Electrical and Mechanical Department, First Aid Team, Rescue Team and also to the Fire Service and Police through GSM.

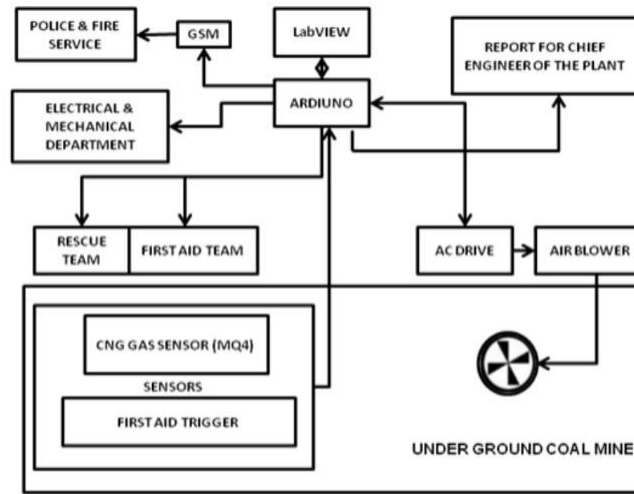


Fig.1: Block diagram

OPERATION

Compressed Natural Gas Sensor (MQ4) is placed in the underground mine, in order to measure the toxic methane gas concentration and is visualized using LabVIEW. The sensor module has been interfaced with the LabVIEW through ARDUINO DAQ, by means of an output cable. The increase / decrease in the methane concentration in underground coal mine can be monitored in the LabVIEW window and is viewed in level indicator, graphical view and also in explosion level meter. The other toxic gas like CO is also measured in a level indicator for safety purpose.

A control signal is generated by LabVIEW when the methane gas concentration reaches initially to 200ppm (before the critical zone of 400-1000ppm), to the AC Drive of the Blower through the output cable of ARDUINO DAQ. This AC drive circuit controls the Blower which sucks the air from the atmosphere and blows into the underground coal mine field. Thus methane gas is diluted.

5. STUDY AREA AND METHODOLOGY

The MQ-4 gas sensor can detect the natural gas concentrations present anywhere from (200to10000) ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple with 5v power supply to the heater coil, add a load resistance, and connect the output to an ADC.



Fig.2 Compressed Natural Gas Sensor

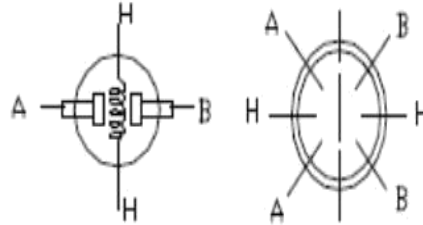


Fig.2 pin diagram of gas sensor

6. SOFTWARE AND HARDWARE REQUIREMENTS

6.1 SOFTWARE REQUIREMENTS

The various software that we use for this project is:

1. LabVIEW software

6.2 HARDWARE REQUIREMENTS

The various hardware that we use for this project is:

1. Compressed Natural Gas (CNG) sensor
2. ARDUINO
3. AC-DC Regulator
4. DC Blower
5. Buzzer
6. First Aid Trigger
7. GSM

7. CONCLUSION

This project will be a mile stone for the prevention of death due to explosion in coal mines by using this complete security system, which can reduce the Loss of Life. The widely expanding technology LabVIEW is used, where the complete security of the mine is provided by using a single platform, which is more advantageous.

8. FUTURE SCOPE

In this security system, each individual can be provided with a Torched Helmet, an Individual Microphone and a Pulse Sensor in the form of a wrist watch to monitor the health status of each individual [3]. This can avoid them in leading to emergency conditions, due to their personal health disorder. In addition the concept of this model can be applied in the gas storage area, ere the blast due to gas leakage takes place.

9. REFERENCES

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