International Research Journal of Engineering and Management Studies (IRJEMS)
Volume: 03 Issue: 04 | April -2019 ISSN: 1847-9790 || p-ISSN: 2395-0126

NRF BASED COALMINE MONITORING SYSTEM

G V Vinod[1], Lanka Sairam[2], Balla Chandu[3], Sudi Sumanth[4], Kuchipudi Dhanya Deepika[5]

[1] Asst .Prof., Dept. Of ECE , GIER [A], Rajamahendravaram, East Godavari District, Andhra Pradesh

[2,3,4,5] *B. Tech students, Dept. of ECE, GIER [A], Rajamahendravaram, East Godavari District, Andhra Pradesh*

Abstract –*Today safety of miners is a major challenge. Miner's health and life is vulnerable to several critical issues. On a day to day basis miners are exposed to toxic gases which are not easily detected. Network reachability in the mines are very sparse. We propose an Nordic Radio Frequency (NRF) antenna-based coal mining protection mechanism where the antenna reach can be traced to the location of mining job. and The main aim of the project is to replace Bluetooth with Antenna by increasing range, performance efficiency and to reduce the cost. We have implemented using Nordic Radio Frequency (NRF) Antenna which is a transceiver in this current project.*

Key Words: NRF, Transceiver, Miners, Toxic

1. INTRODUCTION

Antennas are used to transmit and receive information through changes in the electromagnetic fields that surround them.

1.1 Types of Antennas

1. Log-Periodic Antenna
2. Wire Antennas
3. Travelling Wave Antennas
4. Microwave Antennas
5. Reflector Antennas

The antennas operating at microwave frequencies are known as microwave antennas. NRF antennas comes under microwave antennas.

1.2 NRF Antennas

NRF 24L01 transceiver module. It uses the 2.4 GHz band and it can operate with band rates from 250kbpw up to 2Mbps. If used in open space and with lower band rate its range can reach up to 10 meters.

2. EXISTING SYSTEM

In the existing system Bluetooth radio was used to connect the human with the modules connected to a sensor networks with controller to exchange information from them to the end module (controller). The output was monitored and controlled by Bluetooth device. Due to mainly underground developing, tens of kilometers of roadway, too many production processes, scattered operation sites, staff mobility and poor working conditions, serious potential accidents, it is urgent to create a mind gas concentrations wireless monitoring system. In order to protect the safety of mine workers, developing a monitor system that can be monitoring gas concentration within a point starting safety alarm to remind workers to leave quickly when the concentration reaches a set value it is also necessary to transmit the collected data to the controlled room outside through some simple ways it includes the acquisition front end terminal gas sensor, Bluetooth module transceiver terminal and monitoring center. This article mainly describes the achievement of Bluetooth transceiver modules and data acquisition and wireless dad transmission.

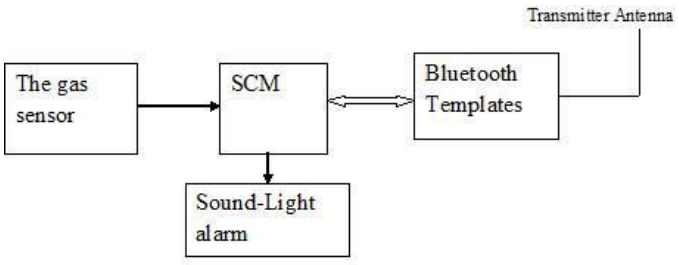

Fig-1 Transmission Section

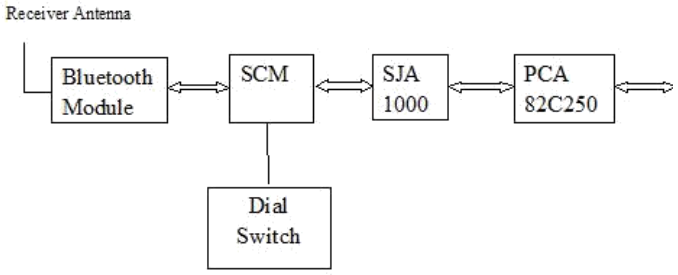

Fig-2 Receiver Section

3. METHODOLOGY

In this article, we proposed an NRF based mine monitoring system, which has greater reachability, compared to its predecessors this system also proposes note-based connectivity to each of antenna attached systems. One side will be connected with sensor networks to monitor temperature, gas leakage and oxygen levels in coal mines this module is a transmitter module the other end is connected with output devices such as LCD screens are sirens. This is receiver module.

There are two blocks of circuits that are connected with NRF modules ne is acting as a transmitter and the other is acting as a receiver the circuit which is acting as a transmitter is connected with DHT11 and a gas sensor. The circuit which is acting as a receiver is connected with an LCD and a buzzer. The real time values of the temperature and humidity will be updated on these receiver side of the modules. Whenever the threshold limit of the gas or temperature cross, then the buzzer will be high and the buzzer signal will be given as the output and also updated on the receiver side of LCD of the system.

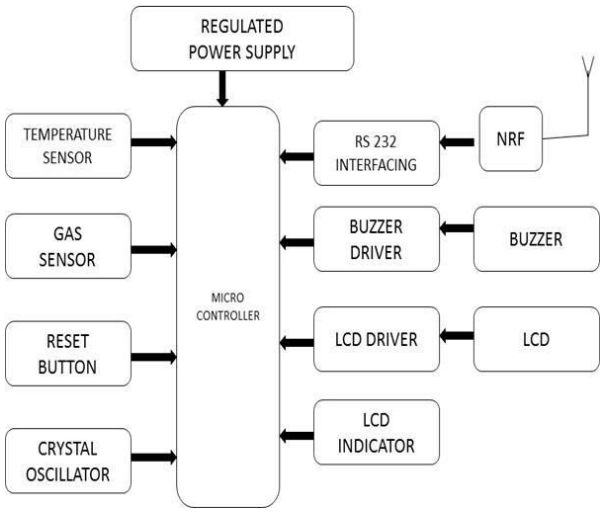

Fig-3 Transmitter section of NRF antennas in coal mines

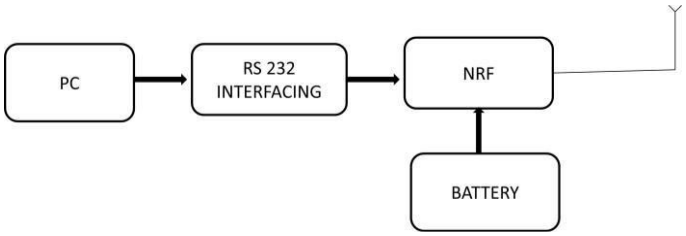

Fig-4 Receiver section of NRF antennas in coal mines

3.1 Selecting between Sensor type and module type

When it comes to measuring or detecting a particular gas the MQ series gas sensors are the most commonly used ones. These sensors can be either purchased as a module or as just the sensor alone. If you are trying to only detect (Not measuring ppm the presence of the gas the you can buy it as a module since it comes with an op-amp comparator and digital out pin. But if you plan to measure the ppm of a gas it is recommended to buy the sensor alone (without module)

3.2 Where to use mq-2 gas sensor

The mQ-2 gas sensor can detect or measure gases like LPG, Alcohol, Propene, Hydrogen, CO and even methane. The module version of this sensor comes with a Digital Pin which makes this sensor to operate even without a microcontroller and that comes in handy when you are only trying to detect one particular gas. When it comes to measuring the gas in ppm the analog pin has to be used, the analog pin also TTL driven and works on 5v and hence can be used with most common micro controllers.

If you are looking for a sensor to detect or measure gases like LPG, Alcohol, Propone, Hydrogen, CO and even methane with or without the micro controller then the sensor be the right choice for you.

3. 3 How to use mq-2 sensors to detect gas:

Using an MQ sensor it detects a gas is very easy you can either use the digital pin or the analog pin to accomplish this. Simply power module with five volts and you should notice the power LED on the module to glow and when no gas it detected the output LED will remain turned off meaning the digital output pin will be 0v. Remember that these sensors have to be kept n for pre heating time (mentioned in features above) before you actually work with it. Now, introduce the sensor to the gas you want to detect and you should see the output LED to go high along the digital pin if not used the potentiometer until the output gets high. Now every time your sensor gets introduced to this gas at this

particular concentration the digital pin will go high (5v) else will remain low (0v). You can also use the analog pin to achieve the same thing read the analog values(0-5v) using a micro controller this value will be directly proportional to the concentration of the gas to which the sensor detects. You can experiment with values and check how the sensor reacts to different concentration of the gas.

RESULT

After connecting the Transmitter and Receiver sections with the help of Pc by considering it as a voltage source. By passing the gas near the gas sensor and seeing that no air is passed we can observe the buzzer sound when it crosses the prescribed limits and we can also observe the humidity, Temperature by using our NRF based coal mine monitoring system.

After passing the gas then buzzer sound blows and the humidity, temperature and gas percentage comes on the LCD screen and we get our required output showing the values of humidity, temperature and gas percentage.

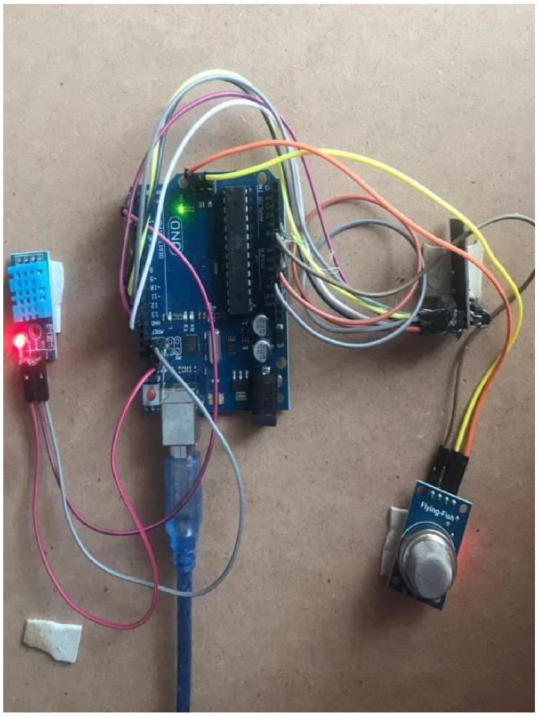

Fig-5 Transmitting section

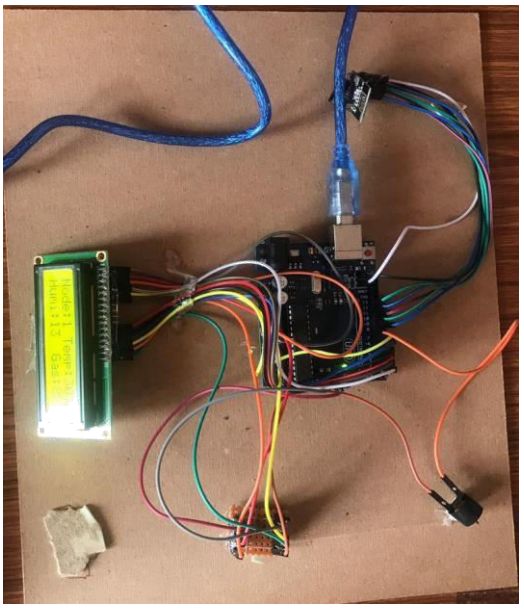

Fig-6 Receiver Section

Fig-7 Output

CONCLUSION

The project "**NRF BASED COAL MINE MONITORING SYSTEM**" has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using Antennas with the help of growing technology the project has been successfully implemented.

ACKNOWLEDGEMENT

The authors can acknowledge any person/ authorities to this section.

REFERENCES

[1] **K. Gong, Z. N. Chen, S. Q, P. Chen and W. Hong**, "Design of a microwave communications", IEEE Trans. Antennas propag., Vol.60, no.12 and pp.6023- 6026, Dec 2012.

[2] **K.L. Lau, K.M. Luk and K.F. Lee,** "Design of a microwave antenna," IEEE Trans. Antennas Propag., vol. 54, no. 4, pp. 1332–1335, Apr., 2006.

[3] **Qu and S.W**,"Bandwidth Enhancement of Wide-Slot Antenna Fed by CPW and Micro wave Line", Bandwidth Enhancement of Wide-Slot Antenna Fed by CPW and Microwave", Antennas and Wireless Propagation Letters, IEEE, pp15 – 17, Dec. 2006.

[4] **Rafi, G. and L. Shafai**, "Broadband microwave antenna with V - slot," IEEE Proc. Microwave. Antenna Propag, Vol. 151, No. 5, 435-440, October 2004.

[5] **D.M. Pozar, D.H. Schaubert**, 'Micro wave Antenna, The Analysis and Design of Micro wave Antennas and Array'. New York, IEEE Press, 1995.

[6] **M. S. Alam, M. T. Islam, N. Misran, J. S. Mandeep**, " A Wideband Microwave Antenna for 60 GHz Wireless Applications," Electronics IR Electrotechnika, ISSN 1392-1215, vol. 19, no. 9, 2013.

[7] **C.A. Balanis**, Antenna Theory; Analysis and Design, 3rd edition new work; Wiley; 2005.

[8] **K. K. Sharma and Ravi Kumar Goyal**, "H-Slotted Microwave Antenna at 60 GHz millimeter wave frequency band for 5G communication", IEEE conference at Chitkara University, Punjab on Communication System and Network Technologies(CSNT-2016), 05-07, March 2016.

[9] **Kun Wang, Jonas Kornprobst and Thomas F. Eibert**, "Microwave fed broadband mm wave antenna for mobile applications", 2016 IEEE International Symposium on Antennas and Propagation (APSURSI), Pages: 1637 - 1638, 2016.

" Double U Slotted Microwave Antenna", For GPS Applications International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT), 2016.

[11] **Kin-Lu Wong** "Antennas for Wireless Communications" Microwave journal vol. EC-8, pp. 330-334, Sep. 1959.

[12] **Kwok W. Leung** "Antennas for Wireless Communications" Microwave journal vol. EC-9, pp. 334-340, Jun. 1984.

[13]**Dimitris Anagnostou**" Antennas for Wireless Communications" vol. EC-8, pp. 523-544, April. 1986.

[14] **Arun K. Bhattacharyya** "Antennas for Wireless Communications" vol. EC-8, pp. 345-365, Oct. 1988.

[15] **Thomas Ebiert** "Antennas for Wireless Communications" vol. EC-9, pp. 434- 454, Jul. 1990.