



## **COAL MINING SAFETY SYSTEM WITH ARDUINO**

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**ABSTRACT-** The most important aspect of the mining workers Act is providing reliable communication for miners accidents. Reliable communication has always been a challenge in underground mines due to changing topologies and environment. Its mainly detect the human heart beat by using the temperature sensor. In addition, disasters disable wired communication in occurs due to the fire cause. These may damage the communication infrastructure which rescue efforts and endanger lives. Therefore, durable wireless solutions using advanced communication and sensor network technologies have been investigated to applied reliable communications in underground mines. In this paper, it designs a monitoring system for coal mine safety based on ASK Tx and ASK Rx modules with sensors. In this system it consists main module for ASK Tx and Rx based device which would cooperate together in order to transport disaster information. This system provides a efficient, faster and reliable communication even when disaster occurred. The designed coal mine safety monitoring system based on wireless sensor network .89S52 and GSM is adopted

**INDEX TERMS-** arduino, Microcontroller,Arduinouno,Temperature sensors ,gas leakage sensing circuit,ASK transmitter, Encoder,ASK Receiver,Voltage regulator.

### **1.INTRODUCTION**

Safety is the important role of many industry. In any hazardous work environment mines, safety of human life is an important concern, Negligence in the safety part may cause damaging of high quality equipment hampering of production or may cause loss of human life also in extreme cases. In the mining industry safety and security is a fundamental aspect of all. To avoid any types of unwanted signal all mining industry follows some basic precaution and signal. Communication is the most vital key factor today, to monitor different parameters continuously and to take necessary actions accordingly to avoid any types of hazards related to production, security, managing of human resources. To avoid loss of material and damaging of human

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health, security and safety system as well as reliable continuous faithful communication system is important in the interior of the underground coal mines. To enhance security, safety and productivity in underground coal mines, a reliable communication system must be established between workers, moving in the mine, and a fixed base station. It is very difficult to install the wired communication system inside mines after a landslide or damage due to many reason. If due to some reason any wire of the communication network damages, it may cause temporary interruption of the continuous process or may cause a long term break down of the system. To improve life safety, many systems has been designed, and have even been implementing the system in some countries today and many countries are to develop the safety system in the all over world.

## 2.LITERATURE REVIEW

In the hazardous environment, industrialized accident occurs. Due to which consequence may be very serious and it causes loss of environment, property and life. For moral ,legal & financial reasons hazardous environmental safety & security is more important. Wireless sensor network in industrial site , the deployment of distributed point source where the dangerous parameters used produced and stored is described seven characteristics , fundamental aspects for estimating and mission method were identified. For measurement of temperature using virtual instrumentation is by automatic process control in many industries. Some project sources in WSN systems that monitors coalmines are as follows:

- ZIGBEE Based intelligent helmet for coal miners
- Design of coal mine intelligent monitoring system based on ZIGBEE wireless sensor network,2016
- An event reporting and early warning safety system based on the internet of things for underground coal mines: A case study , 2017
- Application of WSN fire monitoring system in coal mining , 2017
- Design of underground coal mine monitoring system,

## 3. BLOCK DIAGRAM

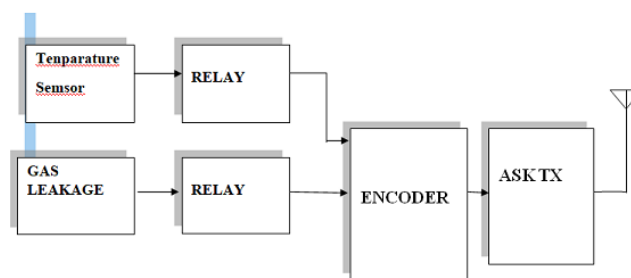


Fig 1:Block diagram of Transmitter

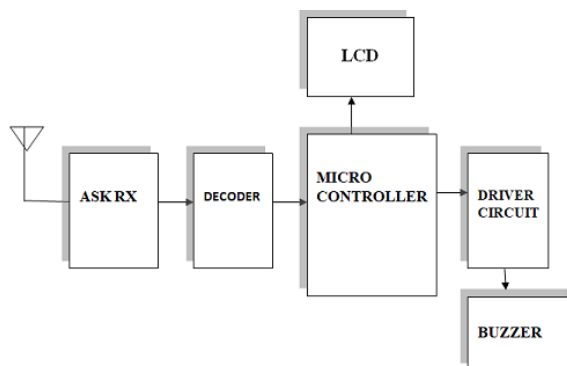


Fig 2:Block diagram of receiver

#### 4. HARDWARE DESIGN

##### TEMPERATURE SENSING CIRCUIT:

The NTC thermistor is used to detect the temperature in the mines, if temperature exceeds the threshold. The relay is deenergized and gives low pulse to the encoder input pin.

##### GAS LEAKAGE SENSING CIRCUIT :

MQ-6 semiconductor sensor is Combustible Gas Sensitive. The MQ-6 gas sensor is made up of SnO<sub>2</sub> which has lower conductivity in clean air. A simple electro-circuit is used here which is used to convert the changing conductivity into corresponding output signal of gas concentration. Both Methane and Propane can be detected easily by MQ-6 sensor because it has high sensitivity towards Methane, Propane and Butane. The o/p of gas leakage sensor used is fed to the encoder.

##### ENCODER & ASK Tx:

Encoding means converting from one form to another form. Consider a situation where a French and a German need to communicate such that neither of them understand each other's language, they would require an interpreter so that each of them can understand each other's message. Similarly many IC's function on different protocols and need this interpreter as an interface. The ENCODER converts the parallel data to serial data ASK Rx:

Decoding means converting from one form to another form. Consider a situation where a German and a French need to communicate such that neither of them understand each other's language, they would require an interpreter so that each of them can understand each other's message. The main function of decoder is to convert serial data to parallel data. The o/p of decoder (parallel data) is fed to the input port of microcontroller.

### MICROCONTROLLER:

It is heart of the system. All the controlling actions are implemented by microcontroller with the help of software program. The microcontroller is employed and the program is down loaded in the ROM, the microcontroller receives the signal from the input port and executes the instructions stored in the ROM and sends the signal through the outputport to the buzzer.

### VOLTAGE REGULATOR IC

Voltage regulator constitutes an indispensable part of the power supply section of all electronic systems. We are familiar with series regulator & shunt regulators designed with a discrete component. For fixed voltage outputs high performance integrated circuit type voltage regulators are now available in three pin versions. In general, The 78XX is a series of +ve voltage regulators while the 79XX is a series of -ve voltage regulators. The 'XX' represent the output voltage of the devices. For example, 7805 & 7806 are +5 & +6V regulators respectively. While 7905 & 7912 are -5 & -6V regulators respectively.

These voltage regulators IC's have a built-in short circuit protection as well as automatic thermal cutout. For high power amplification, these IC's should be mounted on suitable heat sinks.

The 7805 is a +voltage regulator. The main disadvantage of the regulator IC's is that it regulates or maintains the output constant, inspite of variations in the input supply. This regulator IC has a built-in short circuit protection and automatic thermal cutout.

### OVER TEMPERATURE SENSING:

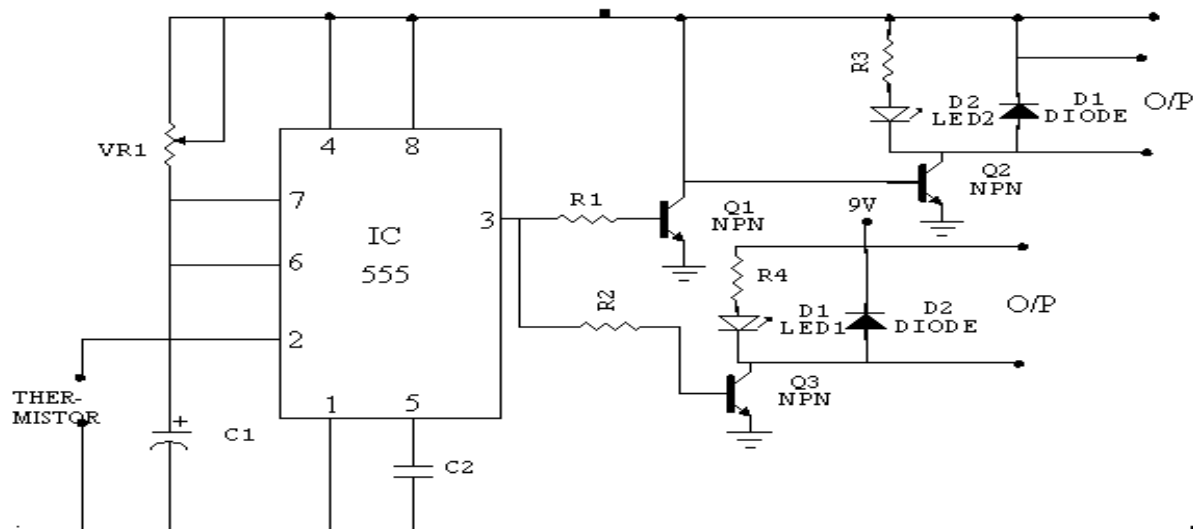


Fig 3:Over temperature sensor

Working of furnace heat sensing circuit:-

When the Furnace or boiler heat goes beyond the limit the thermistor senses and makes the 555 IC to trigger. This circuit is constructed with the help of 555 timer IC working in Monostable mode. When the thermistor gets heated it supplies the triggering pulse to the to the pin no.2 through the resistor R1 and the multivibrator triggers and produces the high voltage at pin no.3 and the makes the furnace T1 to conduct and T2 will be off. The o/p is taken at collector of T1 and fed to 8051.

Here whenever the fire occurs the heat is sensed by the thermistor connected to the trigger pin of the 555 timer IC. When the thermistor senses the heat, the resistance of thermistor goes low (NTC type) , the output of the thermistor becomes zero thereby providing an active low trigger to the IC 555. The IC is configured in the monostable mode. The output of 555 IC at pin No.3 becomes high, the o/p of 555 timer is fed to the base of the transistors Q1 and Q3 with a current limiting resistor R1 and R2. Now both the transistors starts conducting and goes to saturation region. The o/p is taken across D2 and connected to relay, now the relay is activated, with the help of relay contacts the low pulse fed to the microcontroller. Similarly when the thermistor is not heated, the output of the thermistor becomes high thereby providing an active high trigger to the IC 555. The output of 555 IC at pin No.3 becomes low and therefore both the transistors Q1 & Q3 are off and the relay is deactivated. But the transistor Q2 conducts, the Q2 o/p is not connected (here the transistor Q2 acts as a inverter circuit). The output of the IC is a pulse whose frequency is set by the resistor (R1) and capacitor (C1) according to the formula  $[F=1/(1.1 \cdot R \cdot C)]$ . In this case it produces a pulse with frequency of about 0.9 hertz and time period of 1.1 seconds. In monostable mode pin7 (discharge pin) and pin6 (threshold pin) are shorted while R1 is connected between pin7 and Vcc and C1 is connected between pin 6 and ground. Reset pin (pin4) is connected to Vcc while control pin is connected to ground through a capacitor. The output of the circuit is fed. to the encoder to the AD8 pin.

#### GAS SENSING CIRCUIT:

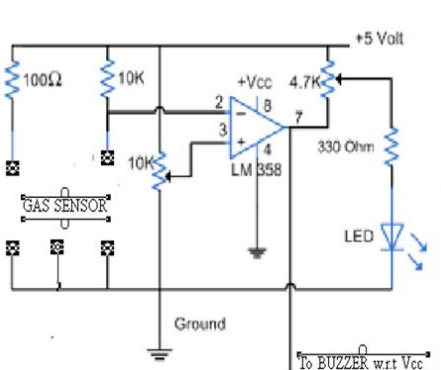


Fig 4:Gas sensor

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The above figure shows the Toxic gas sensor. when the power is made ON the gas sensor senses the leakage of toxic gas with the help of filament and provides the biasing to the op-amp LM 358. The sensitivity of the circuit can be varied with the help of variable resistor 4.7Kohms. The o/p is taken from the pin no.7 and connected to the encoder AD9 pin

ASK transmitter with encoder

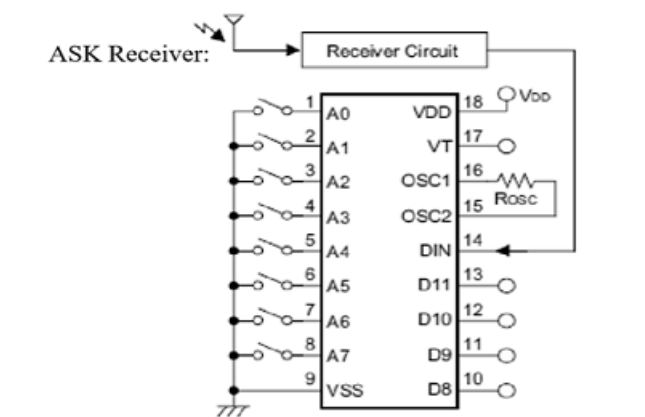
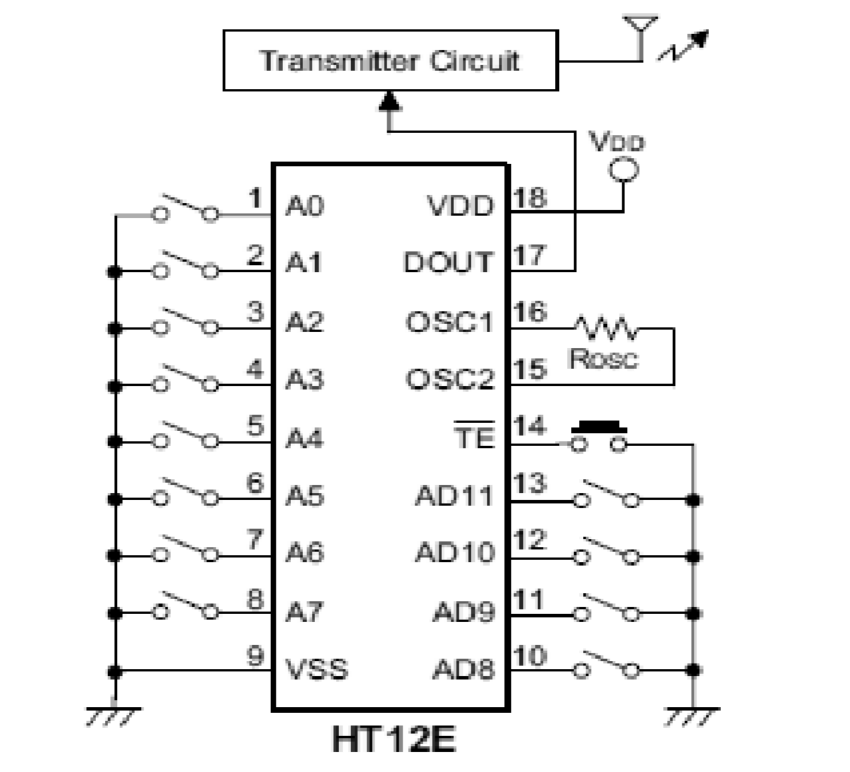
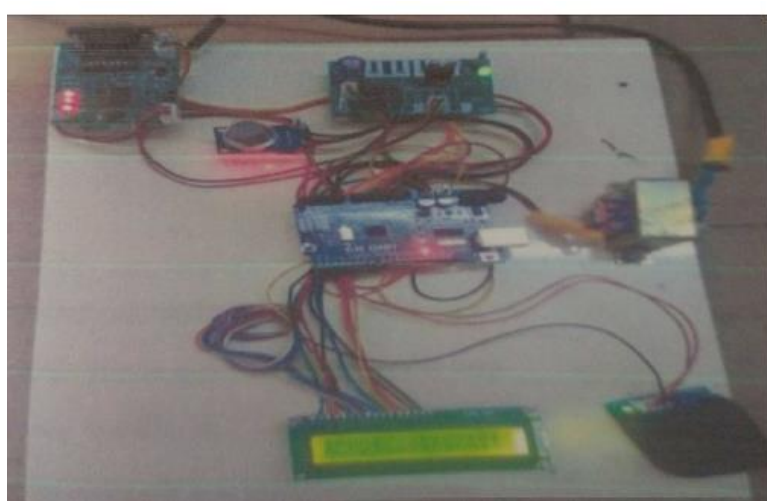


Fig 6:ASK Receiver

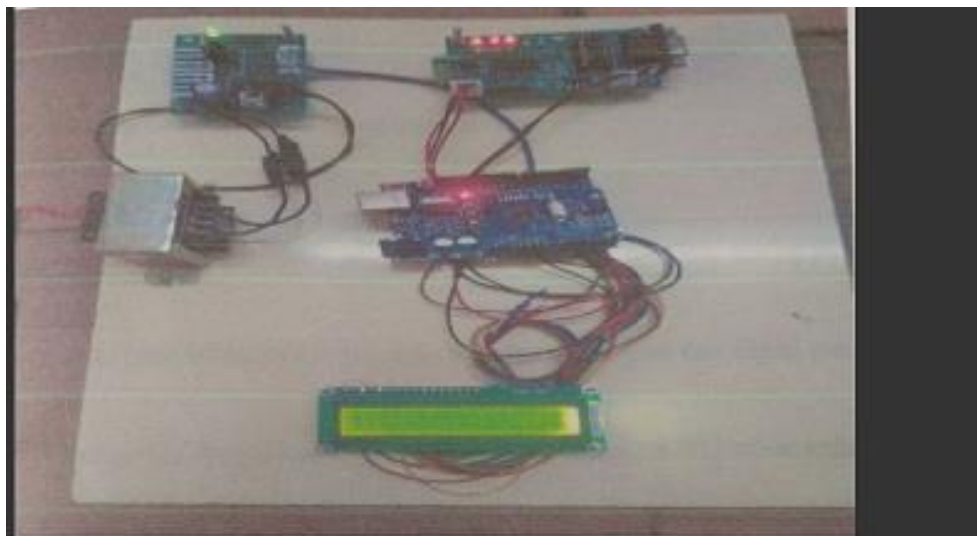


## 5 RESULT.

Connection diagram of Transmission



Connection diagram of receiver



## CONCLUSION

A real time monitoring system is developed to provide clearer and more point to point perspective of the under ground mine .This system is displaying the parameters on the monitoring unit. It will be helpful to all miners present inside the mine to save their life before



any casualty occurs. Alarm triggers when sensor values cross the threshold level. This system also stores all the data in the computer for future inspection.

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