Industrial Safety System with Protection & Announcements

Miss. Neha Sunil Wani

Department of Electronics and Telecommunication

Abstract- **Today industrials safety is a very advanced concept in electronics. Everywhere industrial safety is needed it is from large industries, homes, restaurants etc. Basic idea of the system is to make industry safe. Various applications are developed by using single microcontroller. The software is written in assembly language which will give the interface between the hardware and microcontroller. In this system hardware section includes the various sensors, buzzer, LCD, relay, Ventilation fan, etc. which driven by the software. If any danger occurs in industry then indications are given and control actions are also take to avoid damage with the help of microcontroller. If smoke / LPG is detected by MQ6 / MQ2 sensor then microcontroller switch to ventilation fan and announced by sound card. If flame / fire is detected by flame sensor then microcontroller switches to sprinkler unit. Power source is disconnected during sprinkler unit is working and alert by buzzer / announcement. If under or over voltage is sensed then the relay circuit cut-off mains and alert with the help of buzzer. All process which is detected by microcontroller is shown on LCD display. 12V DC power source is used to drive safety system. The safety system protects industry from damage. It secures the life of workers. It prevents the damage of machines. Therefore it is very "Important as well as useful" for industry safety.**

1. INTRODUCTION

Now a days electronics plays an important role in day to day life. Average people are related to electronics as there profession or hobby. This is the system of "industrial safety system with protection and announcement". As the name indicates this is a system which is designed for providing safety for industry. Industrial safety system with protection and announcement is a monitoring and controlling tool intended for caretaking of workers and plants (including instruments and system). The main objective of this system is to provide workers with safe work environments, to protect the health of workers and machineries. This is the system which is using microcontroller IC 89C51 for controlling purpose. Power supply of 5V, 2Amp is provided to this system.

This system is composed of four units:
1. Fire Sensor.
2. Smoke Sensor.
3. LPG Sensor.
4. Over/Under Voltage Protection.

That means this system is detecting hazards like fire, smoke, LPG and over/under voltage to prevent the machineries and humans from injury/damage. The system consist of sensors as well as primary level protection. For fire IR receiver is the sensor and protection is sprinkler. As the sprinkler turns ON, microcontroller turns OFF ac mains. Also there is one additional circuitry of water level indicator which will indicates that if there is water in the tank of sprinkler or not. For smoke sensing MQ2 is the sensor and for LPG sensing MQ6 is the sensor and protection for both is ventilation fan which will reduce the amount of smoke/LPG in the room. For over/under voltage detection dual Op-Amp IC LM358 is used as a window comparator and protection for both is relay unit which cuts OFF ac mains.

Addition to this it consists of an altering system which includes soundcard with speaker that announces which hazard is sensed and the same message is displayed on the LCD. As well as for altering buzzer is continuously ON if there is any hazard.

Objectives of the system:
1. To sense fire in the room and provide safety (sprinkler).
2. To sense smoke in the room and provide safety (ventilation fan).

3. To sense LPG in the room and provide safety (ventilation fan).
4. To detect over/under voltage and provide safety (relay unit).
5. To detect level of water in the tank.

II. SYSTEM DEVELOPMENT
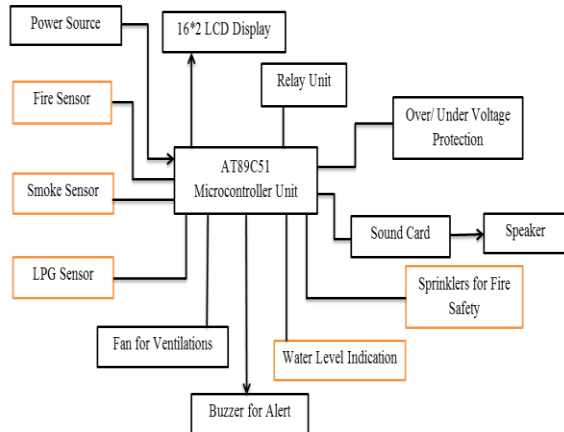
If It consist of microcontroller AT89C51, 16*2 LCD Display, power source, fire sensor, smoke sensor, LPG sensor, over/under voltage protection, water level indicator, sprinkler ventilation fan, relay, buzzer and sound card with speaker.

In this system the fire sensor senses the fire and provide trigger to the microcontroller unit. Then microcontroller provides trigger to sprinkler which is the protection against fire. Also it provides trigger to buzzer and plays sound card clip and display the message "Fire is sensed" on LCD. The smoke sensor senses the presence of smoke and provide trigger to the microcontroller. Then microcontroller gives trigger to the ventilation fan which is the protection against the smoke. Also it provides trigger to buzzer and plays sound card clips and displays the message" Smoke is sensed" on LCD. Similarly LPG sensor senses the presence of LPG (Liquefied Petroleum Gas) and provide trigger to the microcontroller. Then microcontroller gives trigger to the ventilation fan which is the protection against the LPG gas also. Then it provides trigger to buzzer and plays sound card clip and display the message "LPG is sensed" on LCD. In this circuit Op-amp as a comparator is used. It compares incoming voltage with the reference voltage. If incoming voltage is less than reference voltage, then under voltage is sensed and trigger provided to microcontroller. Then microcontroller

provides trigger to relay circuit which is the protection for under voltage detection and relay cut off ac mains. Microcontroller also provides trigger to buzzer and plays sound card clip and displays the message "Under voltage is sensed" on LCD. Another condition if incoming voltage is greater than reference voltage, then over voltage is sensed and trigger is provided to microcontroller. Then microcontroller provides trigger to relay circuit which is the protection for over voltage detection and relay cut off ac mains. Microcontroller also provides trigger to buzzer and plays sound card clip and display the message "Over voltage is sensed" on LCD. The water level indicator is used to indicate the level of water in sprinkler tank. When water in the tank is finished, it gives trigger to microcontroller. Then microcontroller gives trigger to buzzer and plays the sound card clip "Water is finished" and display the message "Fill the water tank" on LCD.

III. IMPLEMENTATION

Step 1: Connect power supply cable to switch board.
Step 2: Press start and reset switch respectively.
Step 3: Give the fire to IR sensor.
Step 4: Keep sprinkler and wires of water level indicator in the water tank.
Step 5: "Fire is sensed" message is displayed on the LCD and same message is announced. Buzzer also turns ON with sprinkler turns ON and ac mains turns OFF.
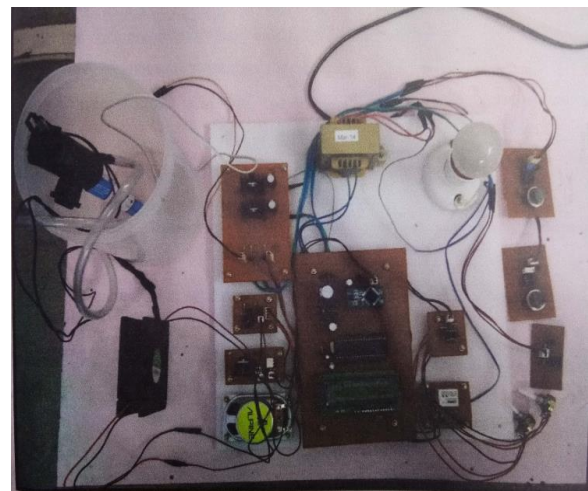
Step 6: Give smoke to MQ2.
Step 7: "Smoke is sensed" message is displayed on the LCD and same message is announced. Ventilation fan turns ON and Buzzer turns ON.
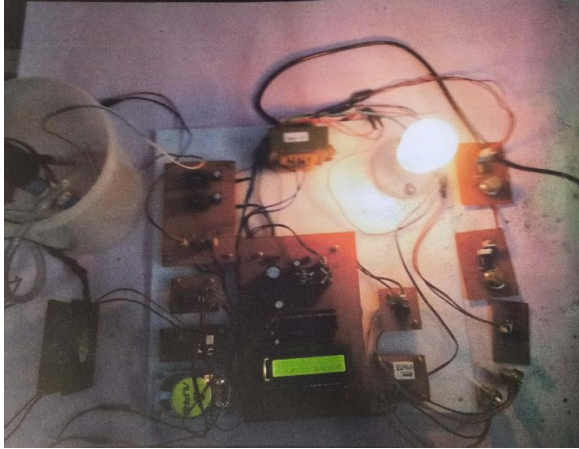
Step 8: Give LPG to MQ6.

Step 9: "LPG is sensed" message is displayed on LCD and same message is announced. Ventilation fan turns ON and Buzzer turns ON.

Step 10: Vary potentiometer in clock wise direction.

Step 11: "Over voltage is sensed" message is displayed on LCD and same message is announced.

Step 12: Relay unit becomes normally open and AC mains cut OFF.

Step 13: Vary potentiometer in anticlockwise direction.

Step 14: "Under voltage is sensed" message is displayed on LCD and same message is announced.

Step 15: Relay unit becomes normally open and AC mains cut OFF.

Step 16: Make the water level lower to the reference level.

Step 17: The message "Fill water tank" is sensed and same message is announced by soundcard.

IV. SYSTEM REQUIRMENTS

Selection of software:
- Express PCB
- Embedded C

Selection of hardware:
- Microcontroller AT89C51
- 16*2 LCD display
- LPG sensor MQ6
- Smoke sensor MQ2
- Op-Amp IC LM741/LM358
- Sprinkler
- Buzzer
- Heat Sink PI49
- Power Supply

V. CONCLUSION

We have successfully implemented a safety system which saves the machineries and human life from danger. The main component in this system are describe along with working which is useful to understand the system better and helps to analysing the scope and working. We have seen the working and output of the system and discussed in detail. It gives an overview of the implemented system and hardware and software tools used in the system. By doing this system, it was very helpful to us to gain a better insight on the vast field of embedded system. This system does not consume much power and the components used in this system are familiar to many people.

REFERENCES

[1] R.A1-ALI,member,IEEE, Imran Zualkeman, and FadiAloul, senior member, IEEE AMobile GPRS-sensor array for Air Pollutution Monitoring vol.6pp.410-422,oct 2010

[2] "The 8051 Microcontroller and Embedded system", by Muhammad Ali Mazidi & Janice Gillispie Mazidi.

[3] http://www.electronicshub.org/electronics-project-ideas/.