Gas Leak Detection, Monitoring and Safety System using IOT

P.Kalpana, R. Vignesh, R. Sakthi Vignesh, K. R. Saanjeev kumar

Abstract: Smart gas leak is based upon controlling gas leak and actuating some smart notifications so that we are still in safety. Microcontroller with Wi-Fi module is used for communication with mobile phone. Using Arduino IDE program, we pass a command to the microcontroller, then the microcontroller converts the given value into digital output which can be observed and analyzed. In this project, connected to Wi-Fi module using smartphone will help us to communicate with the LPG solenoid valve to cut the supply of gas when a leak is detected. When the gas leak is detected by the gas sensor the controller actuates the LPG valve to cut the supply of gas also notifying the operator, owner and mails it to the gas company for immediate action

Keywords : Gas Leak,Wi-Fi Communication,LPG valve,notify

I. INTRODUCTION

Gas Leak is a serious problem that has caused major accidents and disturbs normal work. Gas is an essential Fuel used in almost all Commercial and residential areas for cooking, it also has industrial significance in Melting, cutting and various operations. The leakage of gas can be detected by smell which is installed in gas. Generally, if the system is being monitored then it can be detected and informed to the concern authorities and proper action can be taken but it leads to a great loss of production time and Work. If proper Monitoring is not observed in the Gas Flow or supply area, then detection is very difficult and the gas leaks to form a Flammable atmosphere that leads to accidents, thus a Safety method should be implemented to stop such Loss and accidents.

II. PROBLEM DEFINITION

Several gas leak tragedies have occurred in the past which have shocking impact of the people's life. In these several accidents the cause of the problem was found to be failure of safety devices and difficulty in detection of the leak. Several millions of people have died and Injured due to this issue. A lot of property and Income has been wasted on this issue and Compensation after the accident. Thus providing a simple solution that solves such a huge problem will be beneficial to the society. Heavy Gas Leakages also have after incident effects on our bodies and plants.

III. METHODOLOGY

The methodology remains simple as represented in the diagram the sensor detects the presence of any leak and the Controller responds to the leak by notifying the gas station, cloud and Solenoid valves. Microcontroller with Wi-Fi module is used for communication with mobile phone. The microcontroller converts the given value into digital output which can be observed and analyzed which is connected to Wi-Fi module using smartphone will help us to communicate with the LPG[1] solenoid valve to cut the supply of gas when a leak is detected. The Following flow chart gives an illustration of the methodology.

Fig -1: Methodology Flowchart

The sensor detects the gas level in the atmosphere and delivers the readings to the microcontroller. The microcontroller is a Wi-Fi enabled device that runs the program and compares the readings as per the condition in the program and sends notification to cloud and various connected devices. The microcontroller is also fed with a program where it actuates the LPG Solenoid Valve, thus cutting the supply of gas in the atmosphere until the required safety measure is taken. Thus this process guarantees full safety without any manual hindrance. The concern person can view the virtual leak and area of action in the cloud or in his device.

IV. PROCESS STUDY

IOT devices have become a locality of the thought of planned systems which includes sensible devices into the lives of individuals quicker than ever. Growing want for period observance, following and automation plus favorable government initiatives has driven web of Things (IOT)[9] market in Republic of India. Growth within the market is anticipated on account of in progress technological developments in web of Things technology for providing higher property and coverage likewise as period observance & following of services and systems across numerous business verticals to scale back operational and personnel prices. instrumentality utilized in the project are simply obtainable in market with in an exceedingly human budget.

the most elements within the planned paper are sensors like Gas Sensors with correct vary and Quality checked, Microcontroller that is Node MCU psychic phenomenon 8266[2] with Wi-Fi module constitutional, Actuators like coil Valve, relay, buzzer, software package and technical support members like information Management devices through Cloud, Servers and show diode, some miscellaneous things like Resistors, diodes, Capacitors, Inductors, wires and therefore the most significant star Powering Device with battery. of these elements are assembled into a little box which may be known as Gas Safety kit. The coil Valve remains external to the beginning purpose of the Gas Pipe which may perform necessary safety actions once needed.

V. SENSORS

MQ2, MQ4, MQ5, MQ6 and MQ9 sensor can be used based on the gas which has to be detected, the sensor has a doom shaped projection that consist of zinc Nano rod which expands when it feels gas changes, thus both the ends of the rod are fixed such that when the rod tries to expand it is resisted and so it starts vibrating. One of the end is fixed to a Piezo-electric oscillator such that if the vibration is fed on the Y axis, the current pulse is generated in the X axis. Different Nano rods are fit in order to measure the level of different gases. The gas sensors are very effective and they can detect the levels of observing gas accurately. The Gas sensor has generally 4 pins of which VCC and GND[3][5] remains common in Board, generally 3V is all sensors which is the input of voltage and ground from the provided from the microcontroller for the better functionality. The other pins are A0 and B0 which are based on the user choice to obtain either the Digital output or the Analog reading. The Analog reading is generally preferred, as it helps in mapping the severity of gas leak to understand the rise and fall, the reading can also be studied to bring out various predictions.

VI. MICROCONTROLLER

Node MCU is academic degree open provide IOT platform. It consists of code that runs on the ESP 8266 Wi-Fi SOC if systems and hardware that adopt on the ESP-12 module. The term "NODE MCU"[4] by default refers to the code rather than the dev kits the code uses the LUA scripting language. Wi-Fi is that the first communication module for this project. Through this choice the project could also be enabled by connecting the hotspot of the users to the sensors connections. The Microcontroller can multiple work as a

result of it sends the data to the cloud and put together controls the coil valve. The Microcontroller is that the Brain and Communication member UN[6] agency can establish affiliation between the user and additionally the project. The Microcontroller and additionally the cloud are connected so we tend to are able to observe the readings at intervals the cloud.

VII. CLOUD ARCHITECTURE

The cloud architecture plays an important role in this project. The cloud receives time to time update from the Microcontroller with the MQTT algorithm[7] where the data of the sensor is transferred as a message with a pre chosen delay timing that indicates the frequency of the data received per minute as per our monitoring. These data can be plotted in a graph and table for keen observation. These data can also be downloaded in Excel Sheets and Various Data Science Operations can be performed like Mean, Average and Variance. These studies can prove effective in the improvement of Quality and increases Safety. The cloud can be linked to a personal or Professional mail account which can provide access to numerous members. Thus cloud forms an important component of this project.

Fig -2: Cloud Data Base Sample

VIII. IMPLEMENTATION

The smallcontroller and also the circuit as seen within the diagram are steam-powered by Associate in Nursing External Power supply that has Micro USB port. The coil Valve has 2 pins (VCC and Ground) that is connected to a Relay Switch which has 3 pins – NO, American state and COM wherever the voltage is drawn from the external provide whereas the bottom is controlled by the Microcontroller. A electricity buzzer is additionally connected to the circuit to apprise the closest surroundings, that has 2 pins (Voltage and Ground) wherever Voltage is connected to Digital Pins of the Microcontroller (D0,D1..) and also the Ground is connected to the GND pin. The sensing element has

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the pin configuration as mentioned within the paragraph a pair of.1 that is connected as, A0 pin of the sensing element is connected with the A0 pin of the Microcontroller and also the Voltage and Ground Pins are Connected to the 3V and GND. tiny elements like junction transistor and MOSFET are connected to govern Voltage for swish functioning of the circuit.
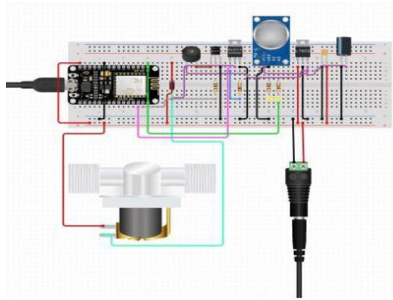

Fig-3: Circuit Diagram

IX. RESULT

The Implementation of this particular circuit is very easy. Once installed the circuit remains permanent for always. The components while installation are a gas safety Kit that can be installed near any power source and a Solenoid Valve[8] which has to be installed properly at the start of the Gas nozzle with

proper fit. The circuit is powered by direct adapter which in turn responds to the sensor signals by doing the following:

a. It makes the buzzer high to create a disturbing and alarming sound.

b. It notifies the cloud about the raise in reading of the sensor and displays a Warning message on the display(if Necessary).

c. It turns on the Solenoid Valve to cut the supply of gas to prevent the gas from spreading and trying to cut the source. The cloud receives the readings from the Microcontroller and is programmed to send a Notification by Mail to the user in case of gas Leak. In industrial applications the Continuous readings of the plotted graph can be studied and downloaded time to time to get the analytical report of the day to day activities and the buzzer makes it simple for the user to track and stop the leak.

Thus proper actions are taken by necessary authorities at the right time which prevents huge accidents. The data collected can also give idea on the total amount of gas added to the environment and Hazard level. Different areas and machines can be monitored by the charts.
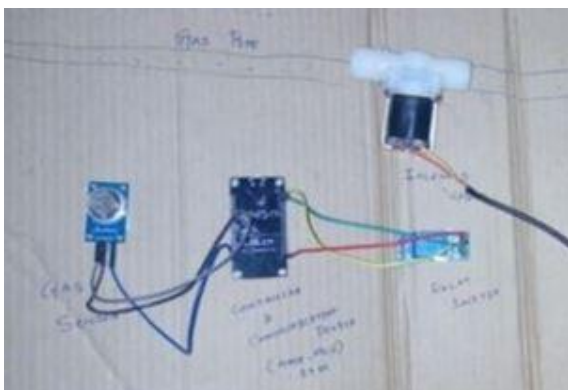

Fig -3: Sample Implementation Circuit

X. CONCLUSION

The project has varied applications. It are often employed in Home Kitchens and cook spots to stop accidents thanks to gas leak and procure safety. It are often employed in gas agencies and gas transport corporations to stop major accidents and disasters with sensible buzzer indications. It may also be wont to monitor weather (Hazard by dangerous gas) and pollution levels for healthy and higher setting. It are often wont to mechanically ON chimneys in industries and kitchens for higher automation and stop smoke.

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