GAS LEAKAGE & FIRE DETECTION WITH AUTOMATIC FIRE EXTINGUISHING SAFETY SYSTEM

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ABSTRACT

Most nations across the globe have experienced prodigious growth throughout the last several decades in the number of fatalities and hazards caused by gas leakage. The advancements typically exhibited as a fix for all worldly tribulations couldn't stop many adversities – chief amid which would be gas leakage. Various gases are used in our daily lives for various purposes but could cause destruction when not taken care of. For example, Liquid Petroleum Gas (LPG) which has components as propane and butane, at present has a significant purpose concerning individuals who are part of a family and business sector. In any case, we can find numerous matters those need to be thought about whilst utilizing LPG regarding our well-being. It could be because the gas can be unstable well as furthermore, there is a chance of leaking that is inclined to trigger blast or possibly fire hazards. Gas leakage accidents have led to heavy losses over the years, whether it is a small-scale industry or a large-scale industry, or the places where gases are associated with, even in our home. The gas leakage early detection device is an extremely fitting effort in managing early recognition of LPG leakage to minimize the occurrence. To prevent those several hazardous accidents, it is of great importance to detect the leakage of gases, LPG to be specific. The basic objective of the project is to provide a security system to detect leakage of gases and prevent the fire outbreaks caused. When the leakage of gas is detected through the sensor the Arduino assimilates this information and buzzer alerts the surrounding regarding gas leakage, at the same time the notification will be sent to authentic person/authorities via Bluetooth. In case, fire is detected the relay prompts the pumping motor to extinguish the fire.

KEYWORDS--fire detection system; gas leakage detection; fire extinguishing system; Bluetooth; Arduino; IOT;

I. INTRODUCTION

Gas leakage happens to be a challenging issue, plus these days this can be witnessed at several sites including households, industrial establishments, along with automobiles including jitney, cars, etc. It can be observed that as a result of gas leakage, hazardous mishaps happen. The LPG is a combustible concoction of hydrocarbon gases used as fuel for various purposes including houses, hostels, companies, and vehicles merely since it has appealing attributes that come with significant calorific advantages, reduced fume, reduced soot, as well as measly damages towards our surroundings. Liquid petroleum gas (LPG) is extremely inflammable as well as could easily burn even within a certain range from the origin associated with leakage. It is comprised of propane and butane that tend to be very combustible synthetic materials. Such gases could spread fire quickly. In domiciles, LPG is put to use primarily when it comes to preparing food.

Whenever leakage takes place, some of the released gases may contribute to the blast. Gas leakage results in a variety of calamities causing both material damages as well as human fatalities. Residence fires were happening frequently while the risk to mankind plus properties has been increasing lately. Each hazard like an explosion, fire, asphyxiation is dependent on their physical characteristics such as pernicousness, combustibility, and so on. The mortality rate associated with the burst of gas cylinders is still growing over the years. Typically, the Bhopal gas disaster happens to be an instance relating to mishaps because of gas leakage. The exact cause for these types of explosions is improper cylinders, obsolete valves and regulators, no frequent examining of gas cylinders, and insufficient cognizance of dealing with gas cylinders. That is why the gas leakage must be noticed and monitored to safeguard people from peril. An odorant particularly ethanethiol is incorporated into LPG, to create a distinct
smell. Then again, there are a few users who might not have the ability to count on this safety measure. A gas leakage detecting electronic equipment ends up being essential as well as aids to guard everyone against the hazards of gas leakage. In this paper, a minimal-expense state-of-the-art sensor-based gas leakage detector and fire detection, and an extinguishing system with alert are proposed and discussed. The model is extremely streamlined, consumer-friendly, and cost-effective.

II. OBJECTIVE OF PROJECT

The main objective of the proposed Gas Leakage plus Fire Detection with Automatic Fire Extinguishing Safety System is to provide a solution by designing an automatic system that can sense the leakage of gas as well as in case of fire, it works as a fire extinguisher. At the same time, an SMS alert will be sent to the owner of the house/concerned authorities using the Bluetooth module.

In short, the main objectives of our project are to provide an autonomous multi-sensor model which is able:

1) to track the presence of gas and its discharge nib of the pipeline,
2) To detect fire using a temperature sensor
3) To extinguish the fire
4) To alert people when there is gas leakage
5) To inform the concerned authorities/person with regards to gas leakage and fire through SMS

III. GAS LEAKAGE & FIRE DETECTION AND EXTINGUISING SYSTEM

Major components of the system are listed below:

I. Power Supply: A power supply of 12V/5V is used for the various parts of the setup.

II. MQ5 sensor: The MQ5 sensor finds the existence of various gases such as hydrogen, carbon monoxide, methane as well as LPG of varying range from 100ppm to 3,000ppm. This is made by a micro AL203 porcelain tube as well as contains SnO2 (Tin Dioxide) layer, which is fundamentally computing electrode and heater covered by plastic and stainless steel.

III. Temperature sensor: The LM35 line is accuracy incorporated heat range sensors and its yield voltage will be directly correspondent towards the Celsius temperature. It, therefore, offers a benefit more than linear temperature sensors calibrated in § Kelvin, since a person is never compelled to deduct a huge voltage from that produced to acquire temperature reading in Celsius.

IV. LM324: LM324 is one 14pin IC involving 4 distinct op-amps. Op-amps tend to be large gain electronic voltage amplifiers having differential input as well as a one-ended output.

V. Arduino UNO: The Arduino Uno, a microcontroller board structured upon the ATmega328 offers fourteen digital input/output pins (involving six utilized as PWM outputs), six analog inputs, a sixteen-megahertz ceramic resonator, a Universal serial bus connection, a power port, an ICSP header, and also a reset key. It covers every aspect necessary to assist the microcontroller; merely link it to a pc using a USB cable or perhaps power it using an AC to DC adapter and alternatively battery to begin.

VI. Relay: A relay is an electrically powered switch. Current running throughout the relay coil brings about a magnetic field that in turn lures a lever as well as alters the connections. The coil current might get on or off hence relays possess 2 switch positions, as well as most, provide dual throw switch connections.

VII. LED: A light-emitting diode (LED) is a 2-lead semiconductor illumination source. This, PN junction diode produces light once triggered.

VIII. Bluetooth HC-05 module: It is a simplified Bluetooth SPP module that is manufactured for wireless serial connection apparatus.

IX. Buzzer: It is a good sound signaling unit that can convert electrical signals from microcontroller directly to the audio signal, using the operating voltage of under 5V.
X. Arduino IDE: ATMEL provides a programming setting for their Micro Controllers, AVR Studio as well as the more recent Atmel Studio. The Arduino project offers the Arduino IDE, which is a cross-platform application penned in the coding language C and C++.

XI. Motor Pump: A Motor pump is a mechanical device, utilized to shift the fluids/gases out of one location to another through mechanical action.

IV. SYSTEM OPERATION

The system operation is divided into two main parts -

1) Gas Leakage Detection & Alerting System

We use 12 AC Voltage from the power supply. We use a bridge rectifier to convert the AC into DC. In the positive phase, diodes D2, D4 can conduct. In the negative phase, diodes D1, D3 will conduct. Both half-cycles will convert the AC to DC. The capacitor filters the ripple current. A voltage regulator is used to convert the 12 VDC current to 5 VDC. We use a gas sensor MQ5 to detect the leakage of gas. The output from the gas sensor is analog and should be converted to digital. So, it is connected to a comparator. A particular voltage can be set in the inverting terminal by using a multimeter. While output from the gas sensor will be supplied to the non-inverting terminal. If the inverting voltage is greater compared to the non-inverting voltage, the output is 0. Which shows that there is no gas leak. But when the non-inverting is greater compared to the inverting voltage, the output is 1. Which indicates gas leakage. Then the information will be assimilated and processed by Arduino, it will trigger the buzzer and the buzzer is ON. Otherwise, the buzzer will be OFF. Through Bluetooth, an SMS goes to the person's mobile saying “DANGER ALERT! GAS LEAKAGE DETECTED”. We use an Android app for this purpose.

2) Fire Detection & Extinguishing system

We use a temperature sensor LM35 to detect fire. The output from the temperature sensor is analog and should be converted to digital. So, it is connected to a comparator. A particular voltage can be set in the inverting terminal by using a multimeter. While output from the temperature sensor will be applied to the non-inverting terminal. If the inverting voltage is greater compared to the non-inverting voltage, the output is 0. Which shows that there is no fire. But when the non-inverting is greater compared to the inverting voltage, the output is 1. Which indicates fire. When this information is sent to Arduino Uno, it will trigger the buzzer and the buzzer is ON. Otherwise, the buzzer will be OFF. Through Bluetooth, an SMS goes to the person's mobile saying “DANGER ALERT! FIRE DETECTED”. Relay is used as a switch to prompt the motor. It works as an automatic switch and prompt the motor to pump to extinguish the fire.
In this project, the gas leakage and fire detection model with its practical trial show its high precision and robustness of the proposed method. The proposed gas leakage spotter is promising for the welfare of people. The attempt whilst building this framework has been to contribute to an improvement in the field of safety while combating the discharge of hazardous and noxious gases to minimize, thus neutralize whatever big or perhaps small risk being induced by them. Finally, starting at the usage of the cylinder as part of domestic purposes to the utilization of petroleum pipelines, the most challenging is the security issue, and our project will help to get a grip on this issue.

We, therefore, propose to assemble a framework utilizing the gas sensor, and temperature sensor and afterward interface it with ARDUINO UNO with a cautioning system through SMS and buzzer. In case, fire is detected the relay prompts the pumping motor to extinguish the fire. Also, the concerned authorities are informed about the gas leakage. In the present scenario, the usage of LPG and other gases is taking a toll. Our very own project will prove to be a boon for domiciliary and business sectors.

V. CONCLUSION

REFERENCE

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