

IOT BASED INTELLIGENT GAS LEAKAGE DETECTOR USING ARDUINO

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Abstract – Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system also be used in homes and offices. The main objective of the work is designing microcontroller based gas detecting and alerting system. The hazardous gases like LPG and propane were sensed and displayed each and every second in the LCD display. If these gases exceed the normal level then an alarm is generated immediately and also an alert message (SMS) is sent to the authorized person through the GSM. The advantage of this automated detection and alerting system over the manual method is that it offers quick response time and accurate detection of an emergency and in turn leading faster diffusion of the critical situation

Key Words: optics, photonics, light, lasers, templates, journals

1. INTRODUCTION

Many accidents occur in day to day life like explosion because of LPG leakage. Major harm is caused, if gas leakage is not detected early. But now we can detect the gas leakage using the MQ5 gas sensor. In this IOT gas leakage detector, device will get connected to WIFI, the minimum and maximum parameter can be set accordingly. Such IOT as well as Arduino based gas leakage detector systems can be installed in homes, hotels LPG gas storage areas. In this LPG gas detector system senses the LPG gas using MQ5 gas sensor. This device will continuously monitor the level of LPG gas present in the air. While monitoring, if the value of LPG gas in air is within the set limit then the RGBLED on the circuit will glow green giving a safe sign. And whenever the gas exceeds above the predefined limit than the RGB LED will glow red and simultaneously solenoid valve will turn off

and update it over IOT. This Arduino and IOT project will help in detecting gas leakage in the surrounding. With LED Led Glow To the Main Electricity Supply Off. Exhaust Fan ON. LPG is that the abbreviation or short kind for liquefied oil gas. Like all fossil fuels, it's a non-renewable supply of energy. It is extracted from fossil oil and gas. The most compositions of LPG square measure Hydrocarbons containing three or four carbon atoms. The conventional parts of LPG so, square measure gas (C₃H₈) and alkenes (C₄H₁₀). Tiny concentrations of alternative hydrocarbons may additionally be gift betting on the supply of the LPG and the way it's been created; parts apart from hydrocarbons may additionally be gift. LPG is extremely combustible and should thus be holding on off from sources of ignition and during a well-ventilated space, in order that any run will disperse safely. LPG vapors is heavier than air thus care ought to be taken throughout storage in order that any run won't sink to the bottom and find accumulated in a district that is low lying and tough to disperse. LPG gas is largely gas and alkenes and it's scentless in its state of nature. The smell that we tend to notice once there's a run is really of a wholly totally different agent, referred to as alkyl radical Mercaptan. This substance is additional to the gas once it leaves the most storage terminals. The prime aim of paper is to detect Gas leakage in home, hotels, schools and other domestic areas, and gives alert message to the surrounding people. Nowadays Gas sensors are being used globally in the field like safety, health, instrumentation etc. This paper is an implementation of the same using MQ-5 gas sensor and DHT11 temperature sensor. The MQ5 sensor is commonly used for detecting gas leakage for various applications and the DHTIL is used for measuring the humidity and temperature of surrounding area. The device also keeps displaying the leakage amount and humidity & temperature on an LCD display. The MQ6 gas sensor detects

the concentration of gas in ppm and outputs analog value which can be converted to a digital signal using inbuilt Analog to Digital Convertor of Arduino. The paper allows the user to set the low, medium and dangerous level for leakage based on the same digital measure. The intensity values are compared with two predetermined thresholds and based on that, it classifies it into three different classes of concentration of leakage. The prime aim of paper is to detect Gas leakage in home, hotels, schools and other domestic areas, and gives alert message to the surrounding people. Nowadays Gas sensors are being used globally in the field like safety, health, instrumentation etc. This paper is an implementation of the same using MQ-5 gas sensor and DHT11 temperature sensor. The MQ5 sensor is commonly used for detecting gas leakage for various applications and the DHT11 is used for measuring the humidity and temperature of surrounding area. The device also keeps displaying the leakage amount and humidity & temperature on an LCD display. The MQ6 gas sensor detects the concentration of gas in ppm and outputs analog value which can be converted to a digital signal using inbuilt Analog to Digital Convertor of Arduino. The paper allows the user to set the low, medium and dangerous level for leakage based on the same digital measure. The intensity values are compared with two predetermined thresholds and based on that, it classifies it into three different classes of concentration of leakage

2. METHODOLOGY

1. System Methodology V model

The V-model technique was used to acquire the project. This technique is very easy to apprehend and utilize. The simplicity of this technique also makes it simpler to accomplish. The V-Model is based on the relationship of a testing stage for each corresponding improvement level. This means that for every single segment in the improvement drive, there is a directly correlated testing phase. This is a highly-restricted model and the next stage starts only after the end of the previous phase.

2. Requirement Analysis

On this phase, the hardware requirement used in the project was discussed,

The Arduino Software which is an open source (IDE) makes it simple to create code and upload it to the Arduino Uno board.

It also needs a GSM module for the purpose of SMS alert, Buzzer or speaker for sound alarm, LCD module, and display, and Single relay to a triggered Solenoid valve for gas supply manipulation.

The actual writing of code in the system modules suggested in the design stage is taken up in the coding stage. The use of C++ programming language centered on the system and architectural obligations. The coding is presented based on the coding procedure and paradigms. The code goes through several code checks and is optimized for best execution before the final build is proved into the repository.

The Arduino IDE is a cross-program application created in Java and is originate from IDE for the deal with a programming language and the wiring project. It is proposed to establish programming to a performer and other new users unfamiliar with software enhancement. It includes code editor with feature such us syntax importance, automatic indentation, brace matching, and is also qualified of compiling and uploading a package to the board with a specific click.

The Arduino Uno is the microcontroller chip that is responsible for all function of our proposed project. It functions as the brain of this system. The microcontroller chip used is Arduino Uno manufactured by Arduino. The chip works to control the hardware and the interface with the transmitter part.

3. Validation Phases

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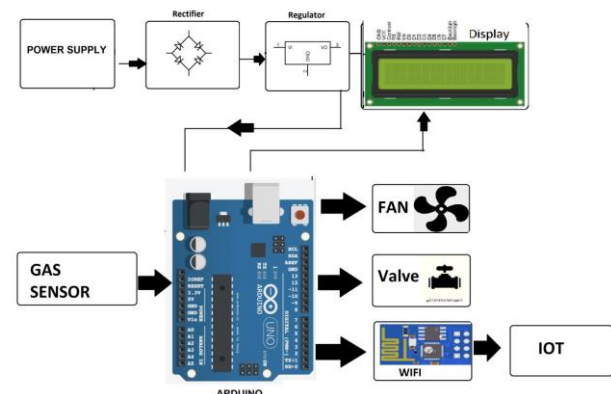
4. Architectural Design

The architectural requirement is comprehended and planned in this phase. Usually, more than one specialized approach is recommended and based on the specialized and financial feasibility when the final evaluation is taken. The system layout is broken down supplementary modules taking up functionality. This is also denoted to as High-Level Design (HLD).

5. Module Design

In this phase, the specified internal project design for all the system modules is stipulated, referred to as Low-Level Design (LLD). It is important that the project design is harmonious with the other modules in the scheme architecture and the other external scheme. The unit tests are an important part of any improvement process and help eliminate the maximum mistakes at a very early period. These unit tests can be planned at this stage established on the internal module project designs.. 4.1.5 A microcontroller board based on the ATmega328P is cord for datasheet or control with an AC-to-DC adapter or battery to get power on called as Adriano Uno. You can tinker with your UNO without disturbing too much about burden something erroneous. It has 14 digital enter/display pins (of which 6 can be used as PWM outputs), 6 analog enter, a 16 MHz quartz sparkler, a USB assembly, a power jack, an ICSP header, and a reset switch. It supports the microcontroller by any means, simply attaches it to a computer with a USB.

3. IOT BASED INTELLIGENT GAS LEAKAGE DETECTOR USING ARDUINO



3.1 Design

Here we have adapted new technology IOT (Internet of Things) to get fastest notification of gas leakage. We shall use a stepper motor to OFF the knob of cylinder regulator to avoid the accidental cases due to gas leakage. We will also use a website or application under the IOT technology to get fastest response from the module.

The other module and things which are used in this paper is GSM module, microcontroller, exhaust fan, LED for indication, a buzzer to notify local peoples. And MQ 5 or MQ 6 gas sensor module to sense the gas leakage. In this proposed model we want to achieve few aspects: To Design an Embedded System we need, modules. The main advantage of this paper is that it can determine the leakage and send the data over to a website, where it can be monitored and corrective actions can be taken. If appropriate measures are taken quickly after it is reported over the IOT, it can help in saving the loss of lives and property.

3.2LPG Gas

The gas measurement for methane (natural gas) is measured by volume in cubic feet or cubic meters. One cubic meter of natural gas is the volume of gas enclosed in a cubic meter at standard temperature and pressure. The gas measurement of gas reserves is measured in thousands or millions of cubic meters.

A gas meter is a purpose built flow meter. A gas meter measures the volume of natural gas or LPG – liquefied petroleum gas used. Gas meters are used by all gas utilities to

measure consumption in homes, industrial and commercial buildings.

The gas unit used in the sale of gas is based on the energy content or calorific value of the gas, not gas volume. The typical gas units for energy content are British Thermal Units – BTU – megajoules (MJ) or therms, not cubic metres or cubic feet.

The distinctive properties of LPG mean that it can be measured in a number of different ways. These include gaseous volume (meter), liquid volume, weight, energy content and pressure. For example, LPG for homes is frequently delivered in 45kg gas bottles.

4. HARDWARE DESCRIPTION

4.1. Arduino Nano



Fig: Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor.[1]

The Arduino Nano is equipped with 30 male I/O headers, in a DIP-30-like configuration, which can be programmed using the Arduino Software integrated development environment (IDE), which is common to all Arduino boards and running both online and offline. The board can be powered through a type-B mini-USB cable or from a 9 V battery.[2]

In 2019, Arduino released the Arduino Nano Every, a pin-equivalent evolution of the Nano. It features a more powerful ATmega4809 processor and twice the RAM.

4.2. SOLENOID VALVE



Fig: Solenoid Valve

Solenoid valves differ in the characteristics of the electric current they use, the strength of the magnetic field they generate, the mechanism they use to regulate the fluid, and the type and characteristics of fluid they control. The mechanism varies from linear action, plunger-type actuators to pivoted-armature actuators and rocker actuators. The valve can use a two-port design to regulate a flow or use a three or more port design to switch flows between ports. Multiple solenoid valves can be placed together on a manifold.

Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. They are found in many application areas.

Solenoids offer fast and safe switching, high-reliability, long service life, good medium compatibility of the materials used, low control power and compact design.

4.3 MQ-5/MQ-6

The Grove - Gas Sensor (MQ5) module is useful for gas leakage detection (in home and industry). It is suitable for detecting H₂, LPG, CH₄, CO, Alcohol. Due to its high sensitivity and fast response time, measurements can be taken as soon as possible. The sensitivity of the sensor can be adjusted by using the potentiometer.

The working principle behind the MQ-5 gas sensor is as follows: The sensor has a sensitive filament made of SnO₂. ... When a combustible gas such as LPG is introduced, the filament's conductivity rises, and the amount of change in its conductance/resistance can be used to indicate the equivalent gas concentration.

4.4. LM35 TEMPERATURE SENSOR



Fig LM35 TEMPERATURE SENSOR

LM35 is a temperature measuring device having an analog output voltage proportional to the temperature.

- ❑ It provides output voltage in Centigrade (Celsius). It does not require any external calibration circuitry.
- ❑ The sensitivity of LM35 is 10 mV/degree Celsius. As temperature increases, output voltage also increases.
E.g. 250 mV means 25°C.
- ❑ It is a 3-terminal sensor used to measure surrounding temperature ranging from -55 °C to 150 °C.
- ❑ LM35 gives temperature output which is more precise than thermostat output.

5. OBJECTIVES

1. To layout and acquire project that will perceive gas outflow like Methane leak, Butane leak, and LPG leak, Methane outflow or any such petroleum centered on gaseous substance that can be discovered using MQ5 device.
2. to layout and set up an SMS centered Alert method send SMS alert messages to restrict mobile number enter inside the Arduino program.
3. layout and acquire a project that will fabricate a sound alarm during gas outflow and reset the alarm once gas outflow is regulated.
4. show status in an LCD using a 16×2 LCD component and to reset the gas supply using Solenoid controller.

5. SCOPE

1. Notices Methane leak, Butane leak, and LPG leak, or any such petroleum centered gaseous material,
 2. Generate Sound Alarm when gas outflow is noticed,
 3. Transmit SMS Alert to consent person,
 4. Displaying gas outflow status that signifies if the gas is in normal stage or not,
 5. Automatic closure of gas source using solenoid controller.
- Limitation are portable gas cook top cannot be organized this proposed project. And LPG hand wheel cannot be controlled in this proposed project.

6. ADVANTAGES

Get real-time alerts about the gaseous presence in the atmosphere

1. Prevent fire hazards and explosions
2. Supervise gas concentration levels
3. Ensure worker's health

4. Real-time updates about leakages
5. Cost-effective installation
6. Data analytics for improved decisions
7. Measure oxygen level accuracy
8. Get immediate gas leak alerts

7. CONCLUSION

Gas escape could result in severe accidents which end in material losses and human injuries. Gas escape happens chiefly because of poor maintenance of apparatus and inadequate awareness of the individuals. Thus LPG escape detection is useful to stop accidents and to avoid wasting human lives. This paper presents a LPG escape detection and alert system. This technique triggers buzzer and displays the severity of the escape to alert individuals once LPG escape is detected. This technique is incredibly straightforward nevertheless reliable. It leaves with the additional scope of improvement. Battery utilized in this technique is of 5V and in future improvement a much bigger, reversible one could be used, which may sustain the gas detection module for an extended amount of time, with alert whenever battery runs out. With additional improvement like detection of Gas Concentration and changes in style the system will be handier and price effective for the users.

LPG is that the abbreviation or short kind for liquefied oil gas. Like all fossil fuels, it's a non-renewable supply of energy. It is extracted from fossil oil and gas. The most compositions of LPG square measure Hydrocarbons containing three or four carbon atoms. The conventional parts of LPG so, square measure gas (C₃H₈) and alkane (C₄H₁₀). Tiny concentrations of alternative hydrocarbons may additionally be gift betting on the supply of the LPG and the way it's been created, parts apart from hydrocarbons may additionally be gift. LPG is extremely combustible and should thus be hold on off from sources of ignition and during a well-ventilated space, in order that any run will disperse safely. LPG vapors is heavier than air thus care ought to be taken throughout storage in order that any run won't sink to the bottom and find accumulated in a district that is low lying and tough to disperse. LPG gas is largely gas and alkane and it's scentless in its state of nature. The smell that we tend to notice once there's a run is really of a wholly totally different agent, referred to as alkyl radical

mercaptan. This substance is additional to the gas once it leaves the most storage terminals.

7. ACKNOWLEDGEMENT

We feel great pleasure to present the dissertation entitled as "IOT BASED INTELLIGENT GAS LEAKAGE DETECTOR USING ARDUINO" but it would be unfair on our part if we do not acknowledge efforts of some of the people, without the support of whom this work would not have been a success.

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