

GAS LEAKAGE MONITORING AND CONTROL USING LabVIEW

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Abstract: The objective of this paper is to monitor the Liquid Petroleum Gas (LPG) leakage to avoid fire accidents providing house safety feature where security has been an important issue. The system detects the leakage of the LPG using gas sensor and controls the overall operation using LabVIEW software. When the system detects the LPG concentration in the air exceeds the certain level then it immediately alert the people by activating the alarm which includes the LED, buzzer simultaneously and shuts off the solenoid valve.

Keywords: LabVIEW, gas sensor, gas detection, gas leakage prevention

I. INTRODUCTION

The LPG which is flammable mixture of hydrocarbon gases used as fuel in many applications like homes, hostel, industries, automobiles, vehicles because of its desirable properties which include high calorific value, which produce the less smoke, produce less soot and does not cause much harm to the environment. Natural gas is another widely used fuel in homes. Both gases burns to produce clean energy, however there is a serious problem about their leakage in the air. The gases being heavier than air do not disperse easily and may lead to suffocation when inhaled also when gas leakage into the air may lead to explosion. Due to the explosion of LPG gas has been increased in recent years to avoid this problem there is a need for the system to detect and also prevent leakage of LPG. Gas leak detection is the process of identifying potentially hazardous gas leaks by means of various sensors. These sensors usually employ an audible alarm to alert people when a dangerous gas has been destroyed.

II SYSTEM STRUCTURE AND OPERATION

Below Fig (1).Shows the system block diagram and Fig (2).Shows the flow chart. The system mainly consists of LP gas leakage detection system, and pc with LabVIEW software. The main function of gas leakage detection module which consist of gas sensor to continuously detect the gas leakage in the air. For the gas leakage detection a solid state gas sensor MQ2 is used. MQ2 gas sensor which offers many advantages like long lifetime, low cost, reliable and high sensitive to LP gas. In gas sensors Tin dioxide is the most common material, when any specified gases leak in the air, the electrical resistance in the sensor decreases. MQ2 gas sensor less sensitivity to air but high sensitivity to combustible gases.

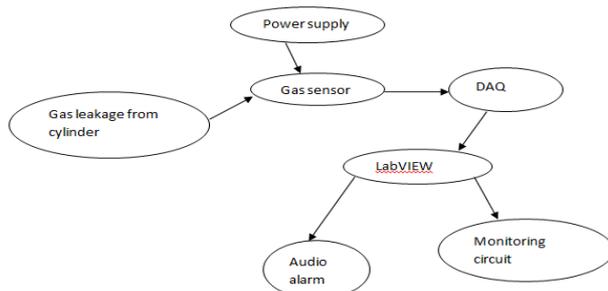


Fig: 1 Block Diagram for the system

When target LPG gas or combustible gases exist in the environment the conductivity of gas sensor increases and whose conductivity is less in the air. When using MQ2 gas sensor sensitivity is very necessary. We calibrate the detector for 1000ppm H2 and LPG concentration in air and use load resistance (RL) about 47KΩ. When the target combustible gas exists in the environment, the sensor's conductivity increases, and resistance of sensor changes with the concentration of combustible gases. A simple electronic circuit can be used to convert the change in resistance to change in terms of concentration of combustible gases. The sensor works with 5volt power supply.

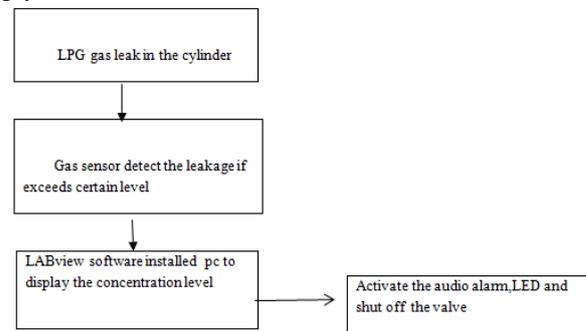


Fig 2: Flow Chart

When the concentration of gas in the air exceeds the certain level then activate the audio visual alarm which includes LED,Buzzer and shutoff the leakage using solenoid valve.

III DESIGN OF SYSTEM SOFTWARE

LabVIEW

LabVIEW is a highly productive development environment for creating custom applications that interact with real world data or signals in fields such as science and engineering. LabVIEW is unique because it makes this wide variety of tools available in single environment. LabVIEW is a development environment for problem solving accelerated productivity and continual innovation. LabVIEW itself is a software develop the environment that contains numerous components.

1. G Programming Language:

G Programming language is a central tool LabVIEW using it you can quickly tight it together data acquisition, analysis, and logic operations and understand how data is being modified. It is a high level data flow graphical programming language designed to develop application that are

- a. Interactive
- b. Executing parallel
- c. Multicore

LabVIEW contains powerful optimizing compiler that examines your block diagram and directly generates efficient machine codes.

2. Hardware Support

With labview you can use all of your hardware with single development environment.connectivity is made possible with driver software which serves as the communication layer between labview and your hardware.labview supports thousands of hardware device including scientific instruments, data acquisition device, sensors, cameras, motors and actuators, machine vision and image processing hardware, wireless sensors and field-programmable gate arrays (FPGAs). In the rare event a LABview driver doesn't already exist you can also import driver from other programming languages.

3. UI Components and Reporting Tools

UI tools are a set of reusable VIs that can help you create a better user interface experience. Interactive control such as graph, LED, and tables to view your acquire data. There are many tools to save a data to files are database, or automatically generate reports. Every LabVIEW block diagram also has an associated front panel which is user interface of your application. On the front panel you can place generic control and indicator such as string, buttons, number and indicators such as thermometer, and dials and scales.

4. Models of Computation

Simulation syntax, state chart, component-level IP codes, interrupt driven programming, ODE modeling, C code. When LabVIEW was first released, G was the only way to define the functionality needed.

5. Technology Abstraction

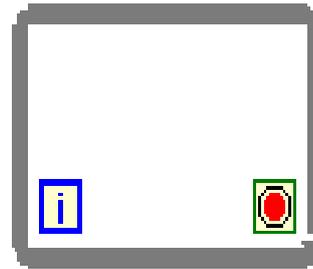
Harness emerging technologies such as FPGA's multicoreCPUs and virtualization without painful relearning and additional development effort.

IV TOOLS USED IN LabVIEW

The tools which used in this program are

1. While Loop

While loop is a control flow statement that allows the program to be repeatedly based upon the given condition. For building the while loop select the while loop from the structure palatte under the function palatte. Drag the selection rectangle around the selection of the block diagram you want to repeat.

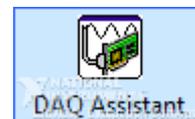


2. Case Structure

Case structure has one or more subdiagrams,orcases,exactly one of which executes when the structure executes.

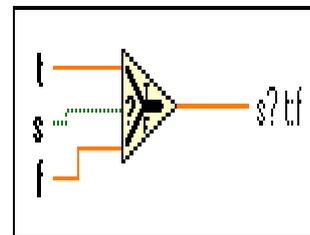
3. Data Acquisition Card

DAQ is used to interface the hardware and software.its used to acquire data from sensor, thermocouple, potentiometer etc. DAQ is used to measure voltage,current,resistance and temperature.



4. Select Function

Return the value wired to the T or F input,depending on the value of S.if S is true, this function returns the value wired to T. If S is false,this function returns the value wired to F. For building the select function select the select function under comparison palatte.



5. Comparison Tools

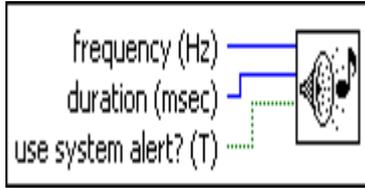
In this paper we are using greater than and less than functions , which will be used to compare the input values from the gas sensor with the given values. According to the result the further process will take place.



6. Front Panel Controls and Indicators

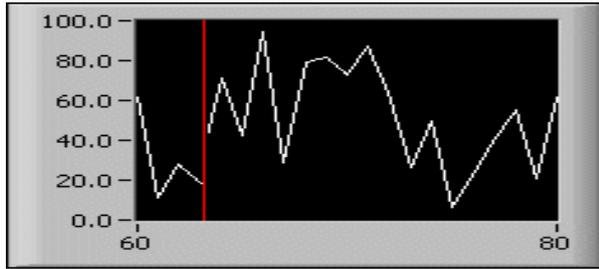
Controls and indicators are used to display the corresponding numeric value. When you right click the terminal and select the Create-Control or Create-indicator. We are using a toggle switch which is used to represent

the valve condition whether it is ON or OFF. A Buzzer is used that will be ON when the gas leakage exceeds a certain level.



7. Graphs

According to the output from the gas sensor, the values will be displayed in the form of graph.



8. Monitoring And Control Module

The gas sensor will be interfaced with the LabVIEW software. It will continuously monitor the gas leakage from the cylinder. If the concentration of the gas in the environment exceeds certain level, the sensor will sense the change. The output voltage will be applied to the DAQ. A program to indicate the different concentrations of the leaked gas is been designed in the software. If the concentration is below 4V, it will be displayed as LOW in the front panel. If the concentration is above 6V, it will be displayed as HIGH in the front panel and the valve will be shut off and the concentration level of the leaked gas will be represented as a Graph.

V RESULT

Overall system was designed and tested by introducing the small amount of LPGs near gas sensor module. The system detect the level of gas in the air if it exceeds the safety level the audio-visual alarm which includes LED, BUZZER to alert the user and the valve will shut off.

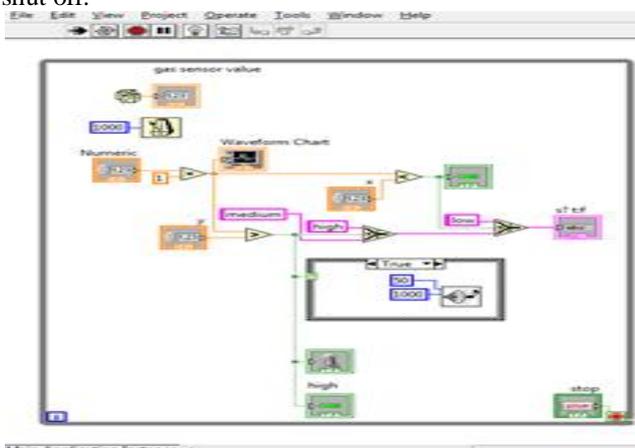


Fig:3 Block Diagram window for the process

Figure 3 shows the program for the gas detection and control system.

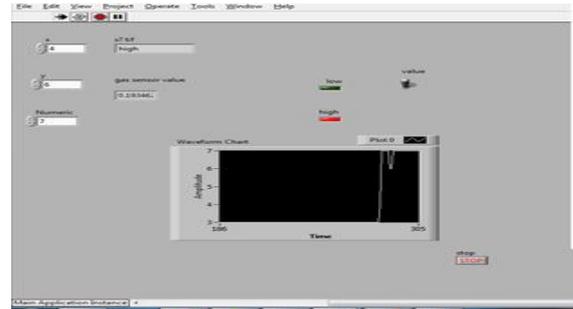


Fig:4 Front Panel window for the Process

Figure 4 shows the front panel window for the gas detection and control system

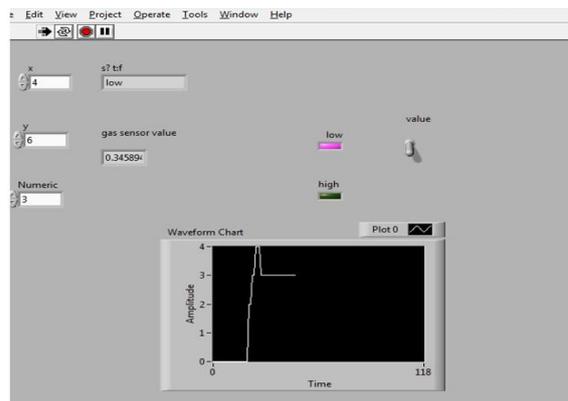


Fig:5 Acquired Signal and the output for the process

From the figure 5, it is shown that the amount of gas sensing in the system, two LEDs shown in the front panel which is to indicate the amount of gas from the sensor. In low concentration the solenoid valve will be in open position and low LED gets turned on. If the value of the gas concentration is exceed the limits, it indicate on the front panel window and the high LED gets turned on at that situation immediately it gets alarmed and solenoid valve goes to shut off. From this we can prevent from gas leakage. Hence the gas leakage is detected and it was controlled by LabVIEW software.

REFERENCES

1. Modelling and simulation of complex control systems using LabVIEW, P.srinivas, P. DurgaPrasadaRao, K. Vijaya Lakshmi
2. Hanwei Electronics Co.Ltd, MQ 2 sensor Datasheet.
3. Introduction to Real-time Control using LabVIEW, Ch.Salzmann, D. Gillert, P.Huguenin
4. Design and Implementation of Gas Leakage Security System, AshishShrivastava, Raghulveerma, Rajesh kumar, RatneshPrabhaker.
5. Current Teaching and Research Projects using LabviewControl Design and Simulation, Kim Lankford, National Instruments, VIP 2005.
6. N.NithyaRani“Implementation of OPC-Based Communication Between Temperature Process and DCS on LabVIEW Platform” in the “BEST: International Journal of Management, Information Technology and Engineering (BEST: IJMITE)” Vol. 1, Issue 1, Oct 2013.
7. N.NithyaRani and S.Ranganathan“Advances in Control Techniques and Process Analysis with LabVIEW and DCS” in the “International Journal of Electronics, Communication & Instrumentation Engineering Research and Development (IJECIERD)” June 2013; Volume : 3; Issue : 2; June 2013.
8. N.NithyaRani“Advanced Process Analysis on LabVIEW” in the “International Journal of Advanced Research in Electrical and Electronics Engineering (IJAREEICE)” Vol.1, No.1 November 2013.