GAS Pipe Leakage Detector Robot

G.Santhanayagi, K.Vijayakumar, S.Sankar

Research scholar, Sri ram engineering college, veppampattu,
Assistant professor, Sri ram engineering college, veppampattu.
Professor, Sri ram engineering college, veppampattu.

Abstract:

Melted Petroleum Gas (LPG) is a principle wellspring of fuel particularly in urban areas because it is clean contrasted with kindling and charcoal. There is dependably a risk of the gas spillage thus of carelessness or disappointment on the controlling valve on the gas barrel which represent an incredible peril because of exceptionally combustible nature of the gas. Instances of gas related fire has been on the ascent and this can be abstained from utilizing a gas spillage discovery framework and in this way the need for advancement of a microcontroller based cooking gas locator. The utilization of microcontroller empowers advancement of a high exact and quick reaction recognition system. The identifier consolidate MQ-6 sensor (with gas discovery scope of 300-10000ppm) as the LPG gas sensor, PIC16F690 microcontroller as the control unit, LCD for showing gas fixation, a ringer as a caution and various LEDs to show the gas spillage status. The microcontroller faculties the nearness of a gas when the voltages motion from the MQ-6 sensor goes past a specific level and gives a varying media alert. The microcontroller is customized utilizing PIC low level computing construct and every one of the peripherals associated with it through it pins. At the point when the framework is fuelled on the microcontroller lit a green Prompted demonstrate the non attendance of a gas spillage.

LPG gas is discharged and the sensor voltage flag observed utilizing a computerized multi meter. Underneath 2.0V, the green LED is kept lit and when the voltage is increasingly or equivalent to 2.0V, the microcontroller squints a red LED and set off a caution to demonstrate the nearness of a gas. The locator has a catch with which the caution can be recognized. The sensor as a high opposition in clean air. Within the sight of LPG gas, the sensor conductivity increments and the normal for the sensor is that at 2.0V yield from the sensor, the gas fixation is 300ppm, in this way the trigger level is 2.0V. Subsequently, the microcontroller constructed gas spillage finder based with respect to PIC16F690 microcontroller and MQ-6 sensor can identify gas spillage focus from 300ppm and give a varying media flag.

Keywords: LPG Liquid Petroleum Gas,LNG Liquefied Natural Gas,MCU Microcontroller,(ppm) Parts per Million, PIC16F8870.

INTRODUCTION

Gas is a leading source of energy used for cooking and heating in our homes. It provide an economical and clean source of energy compared to other source of energy like firewood. It is also used as a source of energy in industry and fuelling our cars. The two major type of gas used are Natural Gas and Liquefied Petroleum Gas(LPG) both of which are hydrocarbons gas. Natural Gas is basically methane gas () while LPG gas is a mixture of butane () and propane gas () or purely butane or propane gas. Natural gas is extracted from under ground while LPG gas is a by-product of Natural Gas and crude oil processing. These gases have a characteristic of being highly flammable and can cause suffocation in high concentration. It is because of this, the usage of gases should be done with great care and safety standards are put in place to ensure everyone using the gas is safe.

Gas used for cooking is supplied in gas cylinders which have a regulating valve. After using the gas you are supposed to turn off the gas. The supplier of the gas should make sure the valve are working well and not leaking the gas .Observation of the safety standards would avoid the dangers posed by the gas. However, systems made by human being are bound to fail at one point due to wearing out, accident or by intention .Also by accident, we might forget to turn off the gas. This poses an immediate danger to life and property due to the flammable and intoxicating nature of the gas. As an engineer, it is a life saving task to design a LPG gas detector capable of raising an alarm and showing the concentration of the gas leakage. Thus we are going to design a microcontroller based cooking gas detector.

BLOCK DIAGRAM:
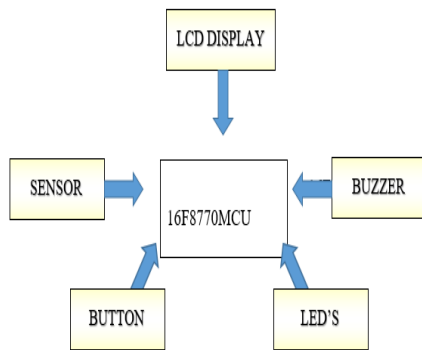
MQ-6 GAS SENSOR:

The MQ6 (LPG Gas Sensor) is a simple-to-use liquefied petroleum gas (LPG) sensor. It can be used in gas leakage detecting equipment in consumer and industry applications, this sensor is suitable for detecting LPG, iso-butane, propane, LNG. The MQ-6 can detect gas concentrations anywhere from 200 to 10000ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.
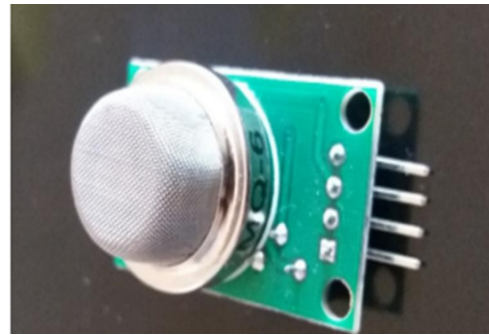

The sensor detects the gas concentration from a range of 300-10,000PPM. The sensitivity curve of the sensor form the basis for setting the alarm trigger level and the amount of gas concentration for a given voltage. From the curve, the sensor has an output voltage of 2.0V at 300 PPM and thus the trigger level is 2.0V. At the point when the information voltage to the MCU is equivalent to or more than 2.0V, the MCU begins the varying media caution. In spite of the fact that the connection between gas fixation and sensor voltage isn't direct, there are scopes of sensor yield voltage with steady angle i.e. somewhere in the range of 2.0V and 2.5V, for each expansion of 20 PPM in gas focus there is an expansion of 0.1V. In this manner gas focus for some other voltage is through extrapolation from the known estimations of sensor voltage and gas fixation.

PIC-MICROCONTROLLER-16F8770

A microcontroller (MCU) is a microchip with memory, information and yield (I/O) pins and other extra fringe highlights, for example, Clocks/Counters on one chip contingent upon the kind of the microcontroller. The PIC16F690 MCU is mid-run microcontroller of the PIC group of microcontrollers created by Microchip Innovation Consolidation. It is a 8-bit, streak memory based, 20 pins CMOS MCU with nano Watt innovation. It has a RISC CPU with 35 directions. The extra peripherals on the PIC16F8770. MCU, incorporate; ADC Module, simple Comparator Module, Clocks/Counters, In-circuit Sequential Programming, Improved Catch, Think about, PWM+ module and Synchronous Sequential Port (SSP). It has Low power highlights and other unique highlights, for example, Exactness Inside Oscillator (with a

greatest speed of 8MHz), Power Sparing Rest mode, Extensive variety of Working Voltage (2.5V-5.5V), Power On Reset, Streak memory with 100,000 composes among different highlights.
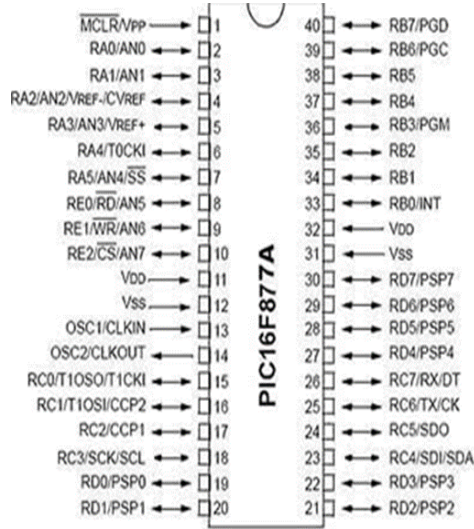
Pin diagram of pic16F8770

The MCU utilizes Harvard Architecture, information and program are gotten to by means of discrete information transport. The inside equipment of the MCU is appeared in Figure B.1 in Appendix B. The MCU can be partitioned into two section; the program execution area and the enlist preparing section [12]. The program execution area comprises of the program memory, guidance enlist and the control rationale. PIC16F8770 has a 13 bits program counter in this way 8K * 14 of program memory yet just the first 4K of memory is implemented [12]. PIC16F8770 utilizes 14 bits guidance. In this manner the code composed ought not surpass 4K.The enlist preparing segment comprises of the static RAM and the Arithmetic and Logic Unit (ALU). The ALU utilizes an enlist called the Working Register which is utilized to transitory store information amid execution [13]. All other enlist utilized by the CPU are put away in the RAM which is organized in 4

Banks every one of 128 enroll every 8 bits. There two sort of registers; Special Capacity Register (SFR) and General Purpose Register (GPR). The SFR are utilized for controlling processor activities and demonstrating the status of the processor. These SFR are mapped in the initial 32 areas of every bank. Such SFR are STATUS, INTCON, OPTION_REG, TRIS and the PORT registers. The GPR space holds the client characterized variable. [12].

The PIC utilizes the port registers (PORTA, PORTB and PORTC) to get information from the peripherals appended to it and to yield information to the peripherals connected to it [12]. The PIC has 18 general reason I/O sticks however one stick is an information stick as it were. The stick out of PIC16F8770 is appeared in Figure 2.4 [11]

The stick usefulness as a Broadly useful I/O relies upon whether a fringe highlight on that stick has been enabled [11]. A stick designed as contribution for the comparator module can't be utilized a computerized input stick.

HITACHI'S HD44780 LCD DISPLAY

The Hitachi HD44780 controlled 16*2 LCD will be utilized for presentation of the gas focus. This LCD shows alphanumeric characters (letters, numbers and images) which can be utilized to pass on sufficient data concerning the gas fixation status. The way that it is manufactured around the Hitachi HD44780 controller makes the LCD a brilliant device [14].The LCD has controls lines and information lines which makes it conceivable to send data for showing on the LCD by putting the controls lines and information lines high or low [15]. Consequently, the LCD can be interfaced to the microcontroller pins and data be sent to the LCD by controlling the microcontroller.
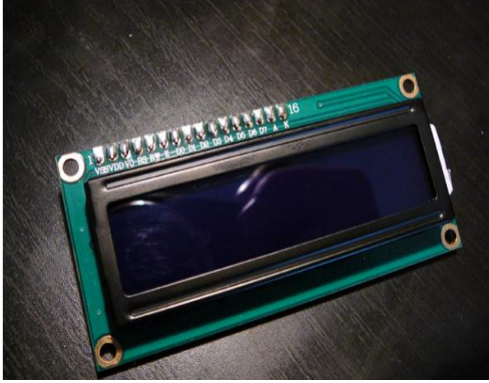
Hitachi's HD44780 LCD pin out

The control lines are RS, R/W and EN and information lines (D0-D7) whose capacities are portrayed in Table 2.1 .The 16*2 presentation implies that just 2 lines of 16 characters can fit on the LCD show screen [16].

The Hitachi HD44780 LCD has a coordinated 80 characters show information support (DDRAM Data Show Smash) and an incorporated character generator (CGROM-Character Generator ROM). It has additionally CGRAM-Character Generator Smash for client characterized characters. The LCD is gotten to through the guidance enroll or the information enlist. When sending directions such killing the presentation, the order is sent to the guidance enlist through the information lines while when sending information, the information is passed to the information enlist through the information lines.

The two are separated with the RS control line. Whenever RS=0 and R/W=0, the controller sees the information set on the datalines as an order and when RS=1 as the information to be shown on the LCD. Whenever information or direction esteem is put on the information lines it sent to the LCD when an Empower beat flag is sent the LCD. An Empower beat flag is sent when EN stick is pulled HIGH and after that LOW with a little postponement of about 500ns between. In any case, a microcontroller running at an guidance cycle of 1MHz will give the important postponement between putting EN HIGH and LOW [15]. The characters are shown by sending their ASCII's an incentive to a DDRAM address area through the information enroll and the

CGROM creates the predetermined character to be shown at that location [15]. The LCD is utilized in 8 bit mode and all the 8 information lines (D0-D7) are associated with PORTC pins. The LCD can be utilized in 4 bit mode where just D4-D7 pins are utilized to exchange information and directions. In spite of the fact that this safes the MCU pins for different peripherals, information must be sent in snack along these lines requiring more lines of code and sets aside greater opportunity to executes contrasted with the 8 bit mode where information is sent in bytes [15].

BUZZER:

The buzzer used is Piezoelectric Active Buzzer. It uses the inverse relationship of piezoelectricity. When an alternating current is applied to piezoelectric material such as Piezoceramic, they stretch and compress depending on the frequency of the signal producing a sound. The active Buzzer has a built in oscillator circuit and when applied with DC voltage will produce a consistent sound. [17]

POWER SUPPLY UNIT

The sensor, Signal and the MCU are require a 5V D.C voltage for fueling up. Such a power supply is configuration utilizing a 5V voltage regulator. The 5V control supply can be accomplished utilizing the circuit.
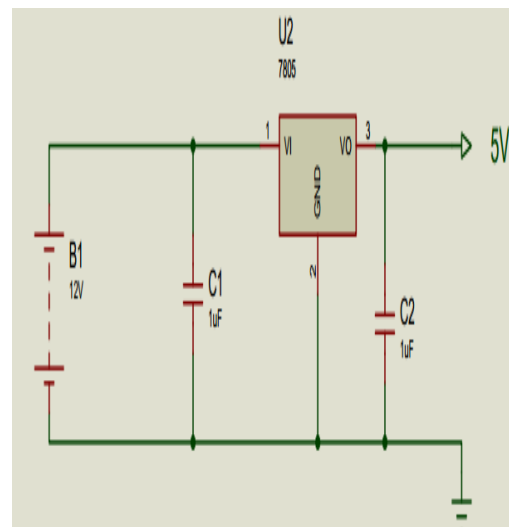
The sensor, Signal and the MCU are require a 5V D.C voltage for fuelling up. Such a power supply is configuration utilizing a 5V voltage regulator. The 5V control supply can be accomplished utilizing thecircuit .

DESIGN METHODOLOGY

The determinations of the cooking gas spillage finder are being to distinguish a LPG gas spillage and give a varying media cautioning. The location framework likewise has a caution affirmation catch. The gadget is controlled from a 5V supply from a 9V battery. Subsequently, the accompanying segments are required to make the gas finder; MQ-6 Sensor, PIC16F690 MCU, LCD Show, Ringer, RED Driven, GREEN LED, BLUE Drove, a Catch and current restricting resistors.

MQ-6 GAS SENSOR

The sensor is utilized to identify when there is a gas spillage and the measure of the gas fixation by giving out a voltage yield contingent upon the gas spillage fixation.

(i)   Interfacing the sensor to the MCU:

The sensor gives a simple voltage contribution to the MCU. The sensor is associated with simple channel 1 of the ADC on stick RA0 as appeared . A potentiometer is utilized to mimic the simple voltage from the sensor. The simple flag is changed over to a gas focus an incentive with reference to the bend.

PIC16F8770 MCU:

The microcontroller is the control unit. All the peripherals, Sensor, alarm, LEDs, LCD and button are connected to it through the interfacing pins. It monitors the input signal from the sensor. When the signal get above the trigger level, the MCU set off the alarm, blinks a red LED and display the concentration of the gas leakage on the LCD. When the signal is below the trigger level, a green LED is lit. When the device is powered up the MCU light a blue LED to show Power ON status.
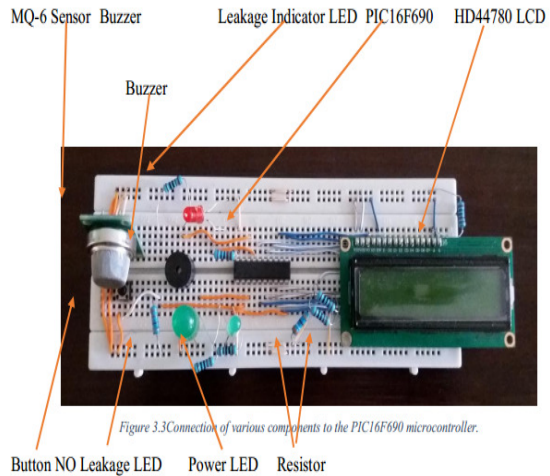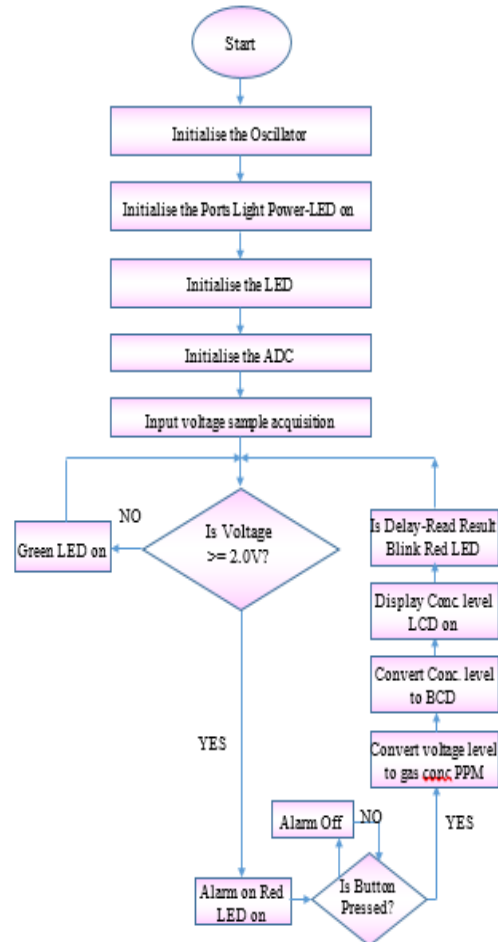

Figure 3.3Connection of various components to the PIC16F690 microcontroller.

SOFTWARE DESIGN :

CONCLUSION:

The target of the undertaking was to plan and actualize a cooking gas locator prepared to do giving a varying media cautioning when there is a gas leakage. The locator has been planned that utilizes a PIC16F690 microcontroller and a MQ-6 gas sensor. The locator demonstrates a green LED to demonstrate that there is no gas spillage. At the point when there is a gas spillage the locator flashes a red and sound an alert. The identifier has a caution affirmation catch that can be utilized to put off the alert when fundamental. The identifier utilized a LCD to demonstrate the grouping of the gas spillage. The sensor is equipped for demonstrating a gas focus from 300ppm to 10,000ppm. The utilization of a microcontroller makes the finder to have high precision in showing the gas focus as per the relationship that exist between the sensor voltage and gas focus. The indicator is ease. The segments that goes into making the finder does not surpass 1600KShs. On the off chance that this is finished with large scale manufacturing, the finder can go at a cost of 1500ksh which would effectively moderate and focused in the market. The target of structuring a exceedingly exact ease a microcontroller based cooking gas spillage identifier has been well accomplished.

REFERENCES:

[1]   E. T. Goerge, Fuels and Lubricants handbook: technology, properties, performance and testing, 2nd Edition. West Conshohocken, Pa : ASTM International, 2003.

[2]   E. Hahn, "LPG Gas Blog," LPG Gas Blog, 2016.

[3]   "Lower-(LEL)-&-Upper-(UEL)-Explosive-Limits-.pdf." .

[4]   X. Liu, S. Cheng, H. Liu, S. Hu, D. Zhang, and H. Ning, "A Survey on Gas Sensing Technology," Sensors, vol. 12, no. 12, pp. 9635–9665, Jul. 2012.

[5]   Great Britain and Health and Safety Commission, Dangerous substances and explosive atmospheres: Dangerous Substances and Explosive Atmospheres Regulations 2002. Sudbury Suffolk [England]: HSE Books, 2003.

[6]   Zhengzhou Winsen Electronics Technology Co., Ltd "Flammable Gas Sensor (MQ-6 MODEL) MANUAL," no. VERSION 1.3, p. 7, May 2014.

[7]   C. Sansone, S. Manfredi, E. Di Tucci, S. De Vito, G. Fattoruso, and F. Tortorella, "A novel approach for detecting alerts in urban pollution monitoring with low cost sensors," in Measurements and Networking Proceedings (M&N), 2013 IEEE International Workshop on, 2013, pp. 89–93.

[8]   U. B. Reddy, "Detection of LPG Gas leakage Sensor and Alert System."

[9]   "Zenith systems limited."

[10]   "Droplex Industrial System Ltd."

[11]   Microchip Inc., "PIC16F631/677/685/687/689/690 Data Sheet," no. DS41262C, p. 294, 2006.

[12]   M. Bates and M. Bates, PIC microcontrollers: an introduction tomicroelectronics, 3rd ed. Amsterdam ; Boston: Elsevier, Newnes, 2011.

[13]   Michael A. Covington, PIC Assembly Language for the Complete Beginner. The University of Georgia Athens, Georgia 30602-7415: Gernsback Publications, Inc., 1999.

[14]   "How to Use Character LCD Module," 01-Dec-2010.

[15]   Risckey's World, "LCD Interfacing Tutorial:," 2014.

[16]   Electronics Engineering Herald, "LCD interface to a microcontroller covering basics," LCD interface to a microcontroller covering basics, 2006. .

[17]   Arpit Jain, "Insight - How Piezo Buzzer works," 2012.

[18]   Learning about Electronics, "How to Connect a Voltage Regulator in the circuit," How to Connect a Voltage Regulator in the circuit.