

Smart LPG Stove

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Abstract—

LPG gas leakage and its detection is a major problem in the day to day lives. At present, wastage of gas is a major issue that needs to be encountered. By the rapid advancements taking place in the field of gas automation, the risks caused by these problems can be reduced. The proposed system focuses on a timer-based control for cooking purposes. It also features gas leakage detection and notification along with the provision for gas booking. IR sensor is used for detection of vessel which turns ON the system. Continuous monitoring is achieved using sensors like MQ6 gas sensor for LPG gas detection, temperature sensor for sensing overheat, a load sensor for continuous measurement of the gas available in the cylinder. When the readings of these sensors reach above the threshold value, the system automatically shuts down the gas valve, exhaust fan turns ON and SMS notification is sent to the user using GSM. The proposed system provides a safer environment for

cooking activities. Safety measures are provided using sensors for the automatic closure of gas valve in order to avoid dangerous situations. An additional safety knob feature is also introduced for this purpose. It offers quick response time and accurate detection. This add-on feature in the work modifies the existing safe model installed in households.

Keyword- *Sensor, MQ6, temperature, load cell, gas leakage, gas detection*

I. INTRODUCTION

Liquefied Petroleum Gas (LPG) is currently the most commonly used fuel in the households for cooking purposes. LPG gases are highly inflammable and is very dangerous if it leaks. The number of deaths due to explosion of gas cylinders has been increasing in recent years [1]. Therefore, it should be used in safe handling manner and additional care has to be taken in order to prevent any leakage possible. LPG gases are heavier than air and do not disperse easily and can cause suffocation when inhaled. The leaked gases when

ignited, can lead to explosion. Nowadays, people are having very busy schedule and hence sometimes forget or don't get enough time for booking the gas from the gas agency. Also, a major amount of gas is being wasted due to the lack of care of the consumer. The proposed system is programmable gas stove, which rectifies the above problems. It features a timer-controlled cooking system to avoid wastage of gas, gas leakage detection and automatic gas booking and overheat sensing. SMS based gas leakage alert system is also provided.

II. LITERATURE SURVEY

In the year 2011, proposed a project [1] —Design and Implementation of an Economic Gas Leakage Detector. This paper provides an audio-visual solution for LPG leakage detection in homes and commercial buildings and audibly alert the users of those premises in case of a hazardous situation and provide warning signals in case of low risk scenarios. The drawback of these techniques is that they are very much dependent on the noise of pressure or temperature measurements.

[2]—Development of wireless sensor network system for LPG gas leakage detection system.in 2015. The designed system monitors the gas leakage detection using an Arduino microcontroller depending on the GSM network. The leakage is detected with the help of MQ-2 gas sensor, GSM Based Gas Leakage Detection System, published in 2013. The most important factor is that the mobile phone does not require any special application or hardware to be used in this system, and any mobile phone supporting the SMS service could be used in the system.

[3] Gas level alert and automatic cut-off in a stove. where an Arduino UNO module controls all the components attached to it in a network connected with the gas supply cylinder. It is also possible to detect whistles, count them and then shut the supply off. IOT based smart gas monitoring system. which provides home safety by detecting the leakage of the LPG and alerts the consumer about the leak by a notification using an android app through Internet Of Things (IOT) and the consumer can turn off the gas valve, from anywhere in the world. Other stove safety rules involve the appliance itself. Over time, all appliances, like electric stoves and induction stoves, can experience downtime and malfunctioning. Knowing how to properly repair the stove can mean the difference between a fire or other hazard and a restored appliance.

[4] It is also possible that the heat on an electric stove could be turned on higher than you meant if the knob or other temperature controls are malfunctioning. This could cause a fire. It can be difficult to know whether this is occurring, though some stoves have error codes that will alert you to overheating. Familiarize yourself with the alerts specific to your appliance to prepare for such an error, should one occur.

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In the year 2016 [6] proposed —Arduino based LPG gas monitoring & automatic cylinder booking with. A infrared sensor as shown in fig.1 is an electronic device, that emits radiations in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. When a vessel is placed on the stove, the IR sensor senses the presence of the vessel and turns on the system. The emitter of an IR sensor is an IR LED (Light Emitting Diode) and the detector of this sensor is also an IR photodiode which is sensitive to IR light of the same wavelength which is emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages change in proportion to the magnitude of the IR light received.

[7] The thermoelectric generator was placed outside the fireplace. A device was extended inside the fire or heat to collect the heat and transfer to the generator produce electricity

[8] LPG leakage alert system was studied by many researchers. An LPG gas leakage detection and alarm system was designed by using IC 7805, bridge rectifier with capacitor filter and MQ-6 was operated with 5v ac or dc.

[9] explained various aspects that are blended together in the IOT and their day to Dy utilization, innovation, advantage and necessity. proposed a system capable of remote monitoring and remote administration of gas pipe lines on client side thought about the consistant object localaization and

boundary detection methods regarding unpredictability energy uses and estimation accuracy. .

[10] used IOT to detect the leakage in gas cylinder and give information to the user via calling, text message and email

Components

GAS SENSOR

MQ-6 is a Sensor for Natural Gases Sensitive material. Gas sensor (MQ6) module is useful for gas leakage detection in home and industry. It is suitable for detecting H₂, LPG, CH₄, CO, alcohol, smoke or propane. It can detect gas concentrations anywhere from 200 to 10000ppm. Fig.2 shows an MQ-6 gas sensor. Due to its high sensitivity and fast response time, measurements can be taken as soon as possible. The sensitivity of this sensor can be adjusted by using a potentiometer.

LOAD CELL

Load cell is a weight measurement device necessary for electronic scales that display weights in digits. However, load cell is not restricted to weight measurement in electronic scales. Load cell as shown in fig.3 is a passive transducer or sensor which converts applied force into electrical signals. They are also referred to as —Load transducersl, The load cells commonly used work on the principle of strain gauges.

TEMPERATURE SENSOR

An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion. Fig.4 shows MLX90614 Non-contact thermometer.

The temperature sensor used here has a range which varies from -70 to 380 degree Celsius. It has got a high accuracy of 0.5 degree Celsius. Fig.5 shows the position of the temperature sensor in the proposed system.

SOLENOIDAL VALVE-UD08E5

UD08E5 is the type of solenoidal valve used in this model. LPG liquid (or vapour) or low pressure natural gas vapour is the type of fuel used. It has an operating temperature range of -40 to 121 degree Celsius with an inlet pressure of 315 Psi (21.72 Bar) at 12V. Fig.6 shows a solenoidal valve.

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