



Research Paper

# ARM7 BASED AUTOMATED HIGH PERFORMANCE SYSTEM FOR LPG REFILL BOOKING & LEAKAGE DETECTION

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Technologies are not same this year as past. The need of automation in the area of security and communication has increased every year. Taking this into thought there are many technologies have raised in the area of automatic LPG booking system in and around India. This paper aims to design and develop an ARM7 based automated high performance system for LPG refill booking & leakage detection which uses LPC2148 and GSM technology to book the LPG cylinder and also to alert the consumers when the gas starts leaking by just sending SMS. Here we have also developed new application software for agency side data processing.

**Keywords:** LPG, ARM7- LPC2148, GSM technology

## INTRODUCTION

In India the supply of LPG through pipelines is not possible due to shortage of LPG production (S Darby, 2006). As technology being improved many gas agencies or distributors have implemented IVRS these days although due to daily busy schedules, customer finds very difficult to book new cylinder, and also it is very dangerous when a LPG gas leakage occurs in any domestic usage, chemical industry or in any other applications. This paper provides automatic booking of LPG cylinder and to overcome the problem of LPG leakage.

IVRS system was borne from general complaints of consumers that landline phones of their distributors were either busy or no one answered the call promptly. With this system, a consumer can approach the gas agency by

dialing a toll-free number and later will have to follow the interactive directions. Finally, the system will announce the customer number and confirms the customer number and also confirms the refill of cylinder by pressing 1. Here with most people who are illiterate find it difficult in handling call or unable to use the higher end technology. So our proposal is to completely automate the process of refill booking without human intervention that accordingly will help consumer against foul play. Our system is also intended to help consumers to upgrade their safety standards, act in accordance with statutory requirements on environmental commitments and most importantly the basic function being prevented by accidents and protect life and property from disasters. The primary objective of our paper is to measure the gas present in the cylinder when weight of the cylinder reached

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below the fixed load, using the pervasive sensors. The gas retailer gets the order for a new cylinder and the house owner receives the message about the same and the details about the booking proceedings. And the secondary objective is to provide any malfunction in gas system in order to prevent damage or explosion of LPG.

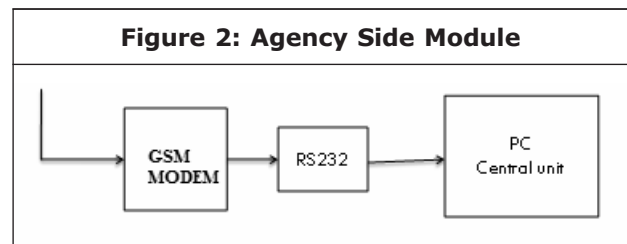
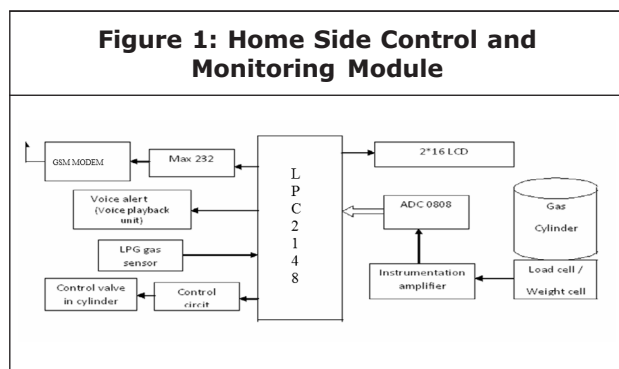
### LITERATURE REVIEW

Automatic LPG leakage detection and hazard prevention for home security by P. Meenakshi Vidya, S.Abinaya using an alarm and exhaust fan. Design of a wireless LPG leakage monitoring system was proposed by Yogita Kshirsagar, Pratiksha Moze using RFID and PIC16f877a microcontroller. Mahalingam et al has said Gas leakage is a major concern with residential, commercial premises and gas powered transportation vehicles. One of the preventive measures to avoid the danger associated with gas leakage is to install a gas leakage detector at vulnerable locations.

### EXISTING SYSTEM

- No automatic LPG cylinder empty detection
- The consumers have the task of booking for replacement.
- Many a time, the users are unaware of the level of gas in the cylinder so they fail to book in time, resulting in inconvenience.
- No automated leak control

### PROPOSED ARCHITECTURE DIAGRAM



### SYSTEM OPERATION

The paper is designed based on modular approach which is easy to analyze as LPG cylinder booking unit, gas leakage monitoring unit at the consumer end and server system unit at the distributor side. MQ6 placed in the vicinity of the gas cylinder. In the advent of leakage, the resistance of the sensor decreases increasing its conductivity. Corresponding pulse is fed to microcontroller and simultaneously switches on the buzzer and exhaust fan. Microcontroller sends a message “EMERGENCY ALERT: LPG gas leakage found in your home” to required cell numbers via GSM module and the same will be displayed on LCD.

In automatic Gas booking system, LCD continuously monitors the weight of the gas in cylinder and displays it on seven segment display. When the weight of the gas is less than or equal to 2 Kg, a logic high pulse is fed to a port pin of microcontroller. As this pin goes high, microcontroller will send a booking message to distributor of format, "AA01-RAJA-05-B". At the same time, the message will be displayed on LCD as “Cylinder Booking”.

### A. Hardware and Software Requirements

- Load cell
- Instrumentation amplifier
- 2\*16 LCD
- LPG sensor
- GSM modem
- PC
- Keil uvision4
- Visual studio2008
- Pro-load software

## B. GSM Module

Gas sensor detects the presence of gas, weight sensor gives the gas level in cylinder, and microcontroller will take corrective or necessary actions. The status of all these happening has to be conveyed to the owner of system or housemates.

The technology making it very easy to send and receive messages using GSM module works on simple AT commands which can be implemented by interfacing it to the microcontroller Rx and Tx pins. The GSM module used is SIMCOM 300 which uses SIM memory to store the number of system owner or housemates and distributor or to whoever the messages have to be forwarded. It requires very less memory to send and receive text messages and operates on simple 12 Volt adapter.

## LOAD CELL OPERATION AND MECHANICAL MODEL

A load cell is a transducer that is used to convert a force into electrical signal. The most common use of this sensor is in weighing machine. Every weighing machine which shows weight has a load cell as sensing element. This conversion is indirect and happens in two stages. Through a mechanical arrangement, the force being sensed deforms a strain gauge.

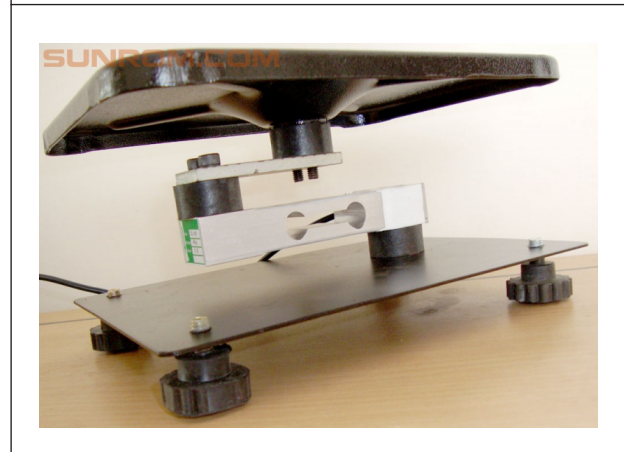
The strain gauge measures the deformation (strain) as an electrical signal, because the strain changes the effective electrical resistance of the wire. A load cell usually consists of four strain gauges in a Wheatstone bridge configuration. Load cells of one strain gauge (Quarter Bridge) or two strain gauges (half bridge) are also available.

The electrical signal output is typically in the order of a few milli-volts and requires amplification by an instrumentation amplifier before it can be used. The output of the transducer is plugged into an algorithm to calculate the force applied to the transducer. Load cells are used in several types of measuring instruments such as weighing scales, universal testing machines.

Figure 3: Load Cell



Figure 4: Load Cell Mechanical Setup



## C. Advantages and Applications

Automatic LPG cylinder Booking and Leakage Management system will ensure a safe, secured, and provisioned and comfort services for the consumers of LPG. It can display weight of the gas on an indicator. The machine can caution housewives through its beep.

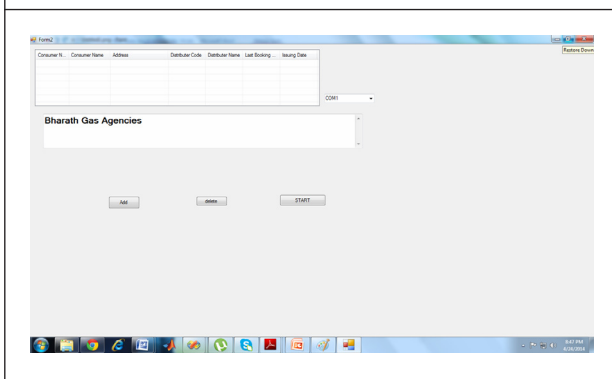
The machine can also be used by LPG agencies. It can be applied in the following areas,

- Domestic (home)
- Industries
- Water plant

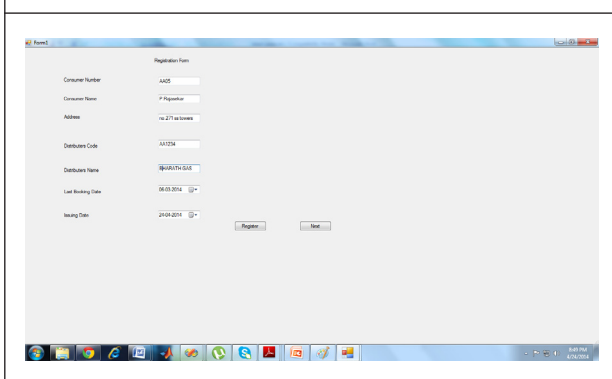
- Energy consumption side
- Gas agencies

## RESULTS OF PROPOSED SYSTEM

**Figure 5: Software Screens (Home Page)**



**Figure 6: Software Screens (Add New Customer)**



## CONCLUSION

The gas leakage detection system was proposed, designed and successfully implemented in this paper for home safety and industrial applications. This system detects the leakage of the LPG and alerts the consumer about the leak by SMS and as an emergency measure the system will turn off the power supply, while activating the alarm.

Along with gas leakage detection, this system gives a fully automated approach towards the gas booking. Real time weight measurement of the gas and its display on LCD makes it an efficient home security system and also can be used in industries and other places to detect gas leaks. This project is implemented using the ARM 7

processor and simulated using the Keil software. The cost involved in developing the system is significantly low and is much less than the cost of gas detectors commercially available in the market.

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