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# Design and Analysis of GSM Based LPG Detector Using Atmega328p

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***Abstract:*** *The use of gas as fuel for cooking in households has become prominent nowadays because of being pollution-free, environment-friendly and cheap. However, there are dangerous hazards that can be caused by gas leakages which includes fire outbreak and suffocation. So, using the GSM technology a projected has been implemented to detect gas leakages, alerts nearby people through sounding of the buzzer and the concerned person through sending of a message and a call. Gas leakages are also controlled by an exhaust fan that blows it out through windows and ventilators.*

**Keywords:** ATMEGA328P, Buzzer, Exhaust Fan, GSM, LCD, LPG, MQ-2

## 1. Problem statement-

Liquefied petroleum gas is a mixture of hydrocarbon gases used as a fuel in heating appliances and vehicles. Households use LPG as cooking fuel which is supplied to homes either in pressurized cylinders or through pipes. LPG can be used as a power source for combined heat and power technologies. This technology has allowed LPG to be used not just as fuel for heating and cooking, but also for decentralized generation of electricity. However, unlike natural gas, LPG is heavier than air and thus in case of any LPG leakage, it can flow along floors and tend to settle in lower spots, such as basements which may lead to suffocation and fire outbreaks where people lose their lives this is due to less awareness about gas leakages.

### 1.1 Introduction-

It is generally perceived that gaseous fuels came about in the hard times of World War II when shortages of petrol were commonplace. Interestingly and perhaps surprisingly, LPG was first used as motor fuel long before the outbreak of the war. The first mention of propane and butane mixture comes from as early as 1910. It was then that Walter O. Snelling, an American chemist researching properties of petrol, separated gaseous fractions from liquid ones, thus discovering the existence of propane. Two years later, in 1912, he started his first domestic propane installation, and in 1913 he patented producing propane on an industrial scale. Later that year the patent was bought by Frank Philips, the founder of the Conoco Philips oil company. Even so, LPG consumption did not grow considerably.

Information concerning the practical use of LPG dates to 1918, when the fuel was utilized for brazing lamps and metal-cutting blowtorches. However, commercial production did not begin until the 1920s. LPG sales in the US topped 223 thousand gallons in 1922, while within the next 3 years the figure grew to 400 thousand gallons. In 1928, LPG was first used as motor fuel (in a truck) and the first LPG refrigerator was made. In 1929, the level of sales of the fuel was as much as 10 million gallons in the US.

LPG was gaining momentum rapidly. In 1932, it was used for cooking and water heating during the Olympic Games in Los Angeles. The propane-butane industry was growing stronger by the year and managed to produce and sell 56 million gallons of LPG in 1934. In the few following years, demand for liquefied petroleum gas was further boosted by the popularity of airships, regularly travelling between Europe and the US. The then latest-generation Zeppelin series airships were propelled by engines fueled with the so-called Blau gas, itself very much alike butane – one of LPG's ingredients. Using gaseous fuel with roughly the same mass as the air was actually very convenient for airships as it did not alter a zeppelin's overall weight the way liquid fuels did, unfortunately when the Hindenburg – the largest airship ever built was destroyed in a disaster in 1937, killing 36 people, the zeppelin era ended

Luckily, the LPG era did not end with it. On the contrary, it actually bloomed as there were large numbers of gas bottles left in airfields where airships operated from. For example, 6000 of them became useless in Rio de Janeiro alone, which led entrepreneur Ernesto Igel to the idea of buying them and promoting gas as excellent cooking fuel. This is how the Brazilian company later known as Ultra-gas came to be. By 1939, the company had three distribution trucks and 166 customers. Eleven years later, in 1950, there were over 70 thousand customers and today Ultra-gas is one of the biggest LPG operators in the world.

When World War II was over and industrial production rose again, LPG sales in the USA topped 1 billion gallons. Nearly 62% of all-American households had LPG installations at the time. By 1947, the first liquefied gas tanker was built and entered service. In 1950, Chicago Transit Authority, a public transport operator from Chicago, ordered 1000 LPG-powered buses, while in Milwaukee 270 taxis were converted in the same year. In 1958, LPG sales reached 7 billion gallons and in 1965 Chevrolet introduced 4 new LPG-powered engines for commercial vehicles. The first LPG-powered buses for the Chicago Transit Authority were delivered in 1950-51

Initial international export contracts were not made until the 1950s. However, the amount of exported LPG was still low in the 1960's – below 1 million tons were shipped outside of the US. Within the next 20 years, export had grown to 17 million tons and reached 48 million tons in the year 2000.

LPG first appeared in Europe when it was imported from the USA and introduced in France in mid-1930. It was bottled and came from an East Coast refinery. In 1938, the Italian company Liquid gas started filling bottles with LPG in a facility near Venice. The outbreak of World War II hampered further development for a few years on the Old Continent.

**1.2 Literature survey**

In 2013 Ashish Srivastava proposed a project in which two types of gases namely LPG and CNG are detected, which is used for home safety as well for vehicles. R. Padmapriya proposed the system which uses ARM7 processor and simulates using "Keil" software to alert the user by sending SMS. V. Ramya proposed the project that uses two different sensors for detecting the leakage.

In 2014 Menasha Vaidya proposed the gas leakage detection and real-time gas monitoring system. In this system, the gas leakage is detected and controlled by means of an exhaust fan. The level of LPG in the cylinder is also continuously monitored.

In 2017 Mr Mahesh S. Kholgade proposed a system that detects gas leakage and controls it automatically after the detection of LPG leakage. Buzzer starts beeping to indicate the LPG leakage. LCD displays that there is LPG leakage. The message is sent to the owner and fire station by using GSM module and the exhaust fan gets switched to blow out the gas. He used the gas sensor which is highly sensitive to gas like butane and propane.

In 2018 Mr Arijit Banik, Bodhayan Aich, Suman Ghosh presented a microcontroller-based low-cost gas leakage detector with SMS alert that detects gas leakage and controls it automatically after the detection of LPG leakage. Buzzer starts beeping to indicate the LPG leakage. LCD displays that there is LPG leakage. The message is sent to the owner and fire station by using GSM module and the exhaust fan gets switched to blow out the gas.

There are two remedial measures i.e. when the gas leakage is detected, the message is sent to the owner by using GSM module and the exhaust fan is switched on. In the existing system, there is only text no call.

**1.3 Proposed system**

The project uses an MQ-2 gas detection sensor. If the LPG sensor senses LPG gas leakage from storage, the gas sensor sends a signal that is monitored by using the microcontroller and it perceives the gasoline leakage. Now the microcontroller displays on an LCD display that "GAS LEAKAGE DETECTED" and turns on LED and buzzer. After few milliseconds elapse, microcontroller activates a relay to turn the fan on to release the gas outdoor from the room and to activate a GSM module to send a text message and calls to the concerned personnel. In our design, the microcontroller is programmed by using c language. It is for the complete control of the task. It controls the Exhaust fan, LED, Buzzer and GSM module when LPG leakage takes place.

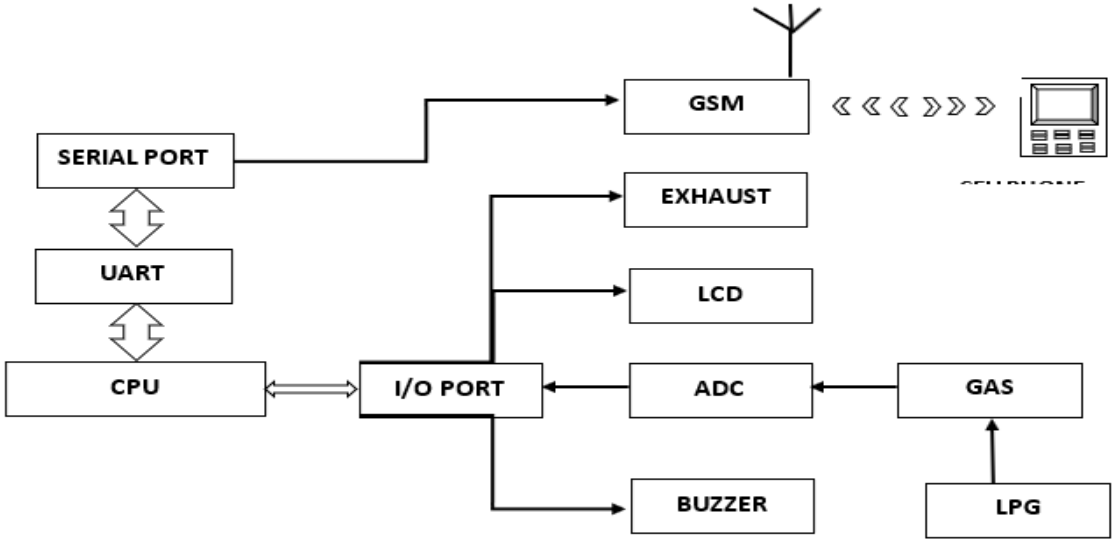


Fig 1: Block diagram of the proposed system

All these functions were coordinated by a C code running in an Integrated Development Environment called ATMEL STUDIO. This software uses a programming board called POLORU AVR PROGRAMMER which programs AVR microcontrollers like ATMEGA32. The figure below shows the flow of the program.

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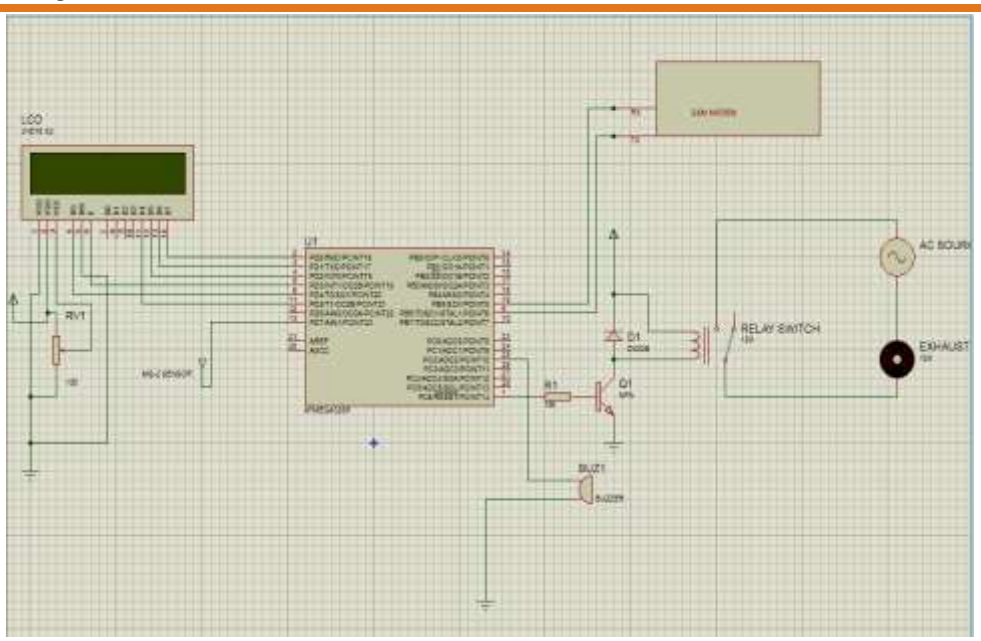


Fig 2: Circuit diagram of the proposed system

### 1.4 Flow chart

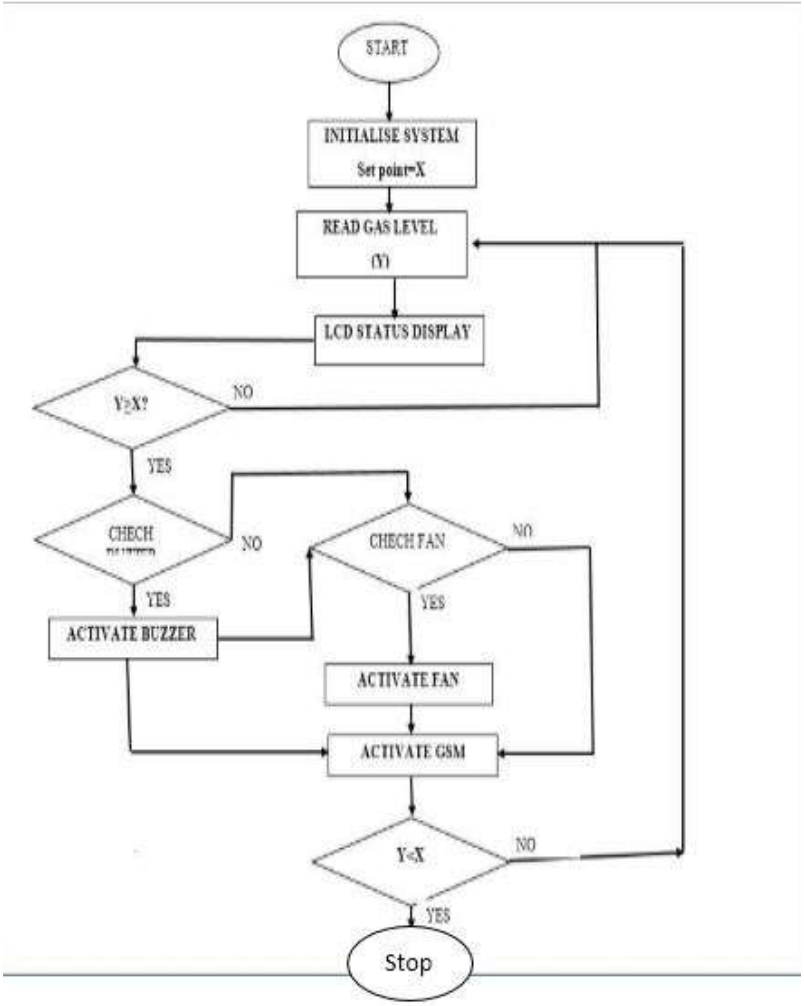


Fig 3: Flow chart of the proposed system

### 1.5 Results

A successful continuity test gave a go forward to power the circuit and hence all components successfully performed as anticipated and the figures A and B show the results after soldering on PCB and powering the device.

### 1.6 Conclusion

In this project, a system which will help to detect a leakage of liquefied petroleum gas and call, send a text message to the number programmed on the microcontroller has been successfully made. On the receiver side, the concerned personnel receive the message and at the same time receive the call alert. This system is far much better than the existing one

### 1.7 Recommendations

The project is recommend to be people should stop using the previous version of the system and use the developed new improved version of the system.

Future scope.

The following features can be added to this project design in the future.

1. The possibility of the project being able to talk should be studied and/or implemented
2. Also, mouthpiece and speakers can be integrated to allow voice communication enhancements so that the device is adopted across all other business entities. An inbuilt battery to offer more power supply options
3. The possibility of incorporating GPS and the number of firefighting units in the police should also be tried.

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