

Automated Control System for Air Pollution Detection in Vehicles

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Abstract: Now a days vehicle is an important part of everyone life. vehicle is needed to save a time. As the vehicle good aspects, it's having a emission but it becomes problem when is cross the threshold level. Due to the improper maintenance vehicle causes the partial combustion of fuel & it causes the pollution. This emission can be control by the automated control system for pollution detection in vehicle. This emission of hazards gases can be control by the sensor system sensors in the system detect the level of pollution & indicate it on the display. If the pollution level goes beyond the threshold level there will be buzz which indicates that vehicle will stop after some time & certain time is given for driver to park the vehicle. During this time GPS start locating nearest service station. After the time run out vehicle stop & has to be force to service station. This all process is control & executed by the microcontroller. If this paper when implemented in particle will benefit to the people & help to reduce air pollution.

Keywords: Automated, Air pollution, Sensor, GPS, GSM, Microcontroller, threshold level.

I. INTRODUCTION

In recent era air pollution is important problem in society which harm to the human health & environment. This is the great problem faced in the urban area. Increase in pollution by the private vehicles. Air pollution contributes to the green house gases, which causes the green house effects, whose side effects are well known to all of us. The main pollution to form the vehicle is oxide of carbon, which can be easily sense by the semiconductor gas sensors. These pollutants are having sensors which impact on the human health affecting lungs & respiratory system. These pollutants are also deposited on soil plants & water etc.

This paper consists of various sensors like MQ7 and Alcohol sensor which detects the concentration of CO gas and Alcohol. If this concentration is beyond the referred value then this sensor gives the input to the microcontroller. This Microcontroller displays the result on the LCD and sends the trigger pulse to motor to stop the injection of fuel.

In this paper the standard value of emission are referred as given in [1].The sensing of gas emitted is done by the various sensor.

Therefore this paper is an idea suggested which help to reduce the pollution form vehicle. Section concludes the paper which on idea to implement the same as a real time project.

II. LITERATURE REVIEW

In last few decade government made a rules and regulation for the vehicles. Central pollution control board set the emission standard under the ministry of Environment and this are first introduced in India in 1991 and 1992 for petrol and diesel respectively.

Many of the people research on the air pollution detection in vehicles. In the 2002 author chosen gas sensors and compared them.

In 2006 author told about the cabin safety. He used various sensors for the toxic gases like CO, HC, and VOC in the car cabin [2].

In 2010 Author said that the metal oxide semiconductor gas sensor are utilised in variety of different roles in industries. Metal oxide semiconductor gas sensors are inexpensive, robust, lightweight and long lasting than other sensors technologies and benefit from high material sensitivity and quick response times [3].

In 2012 Author described an embedded system for vehicle cabin toxic Gas detection and Alerting. A system is developed using GSM and GPS for detecting toxic gases [4].

In 2013 automated control system for air pollution detection is developed for vehicles. A relay circuit is used for the control of ON and OFF position of the fuel pump [5].

Automated air pollution detection system is developed in 2014 for vehicles. In this technique various sensors are used for hazardous gas detection. GSM and GPS system are used for sending and receiving data and locating nearest work station [6]. In 2014 an Author described about various vehicle sensors like sensor for safety, distance sensor, Night vision sensors, Speed sensor etc.[7].

III. BLOCK DAIGRAM AND DESIGN ASPECTS

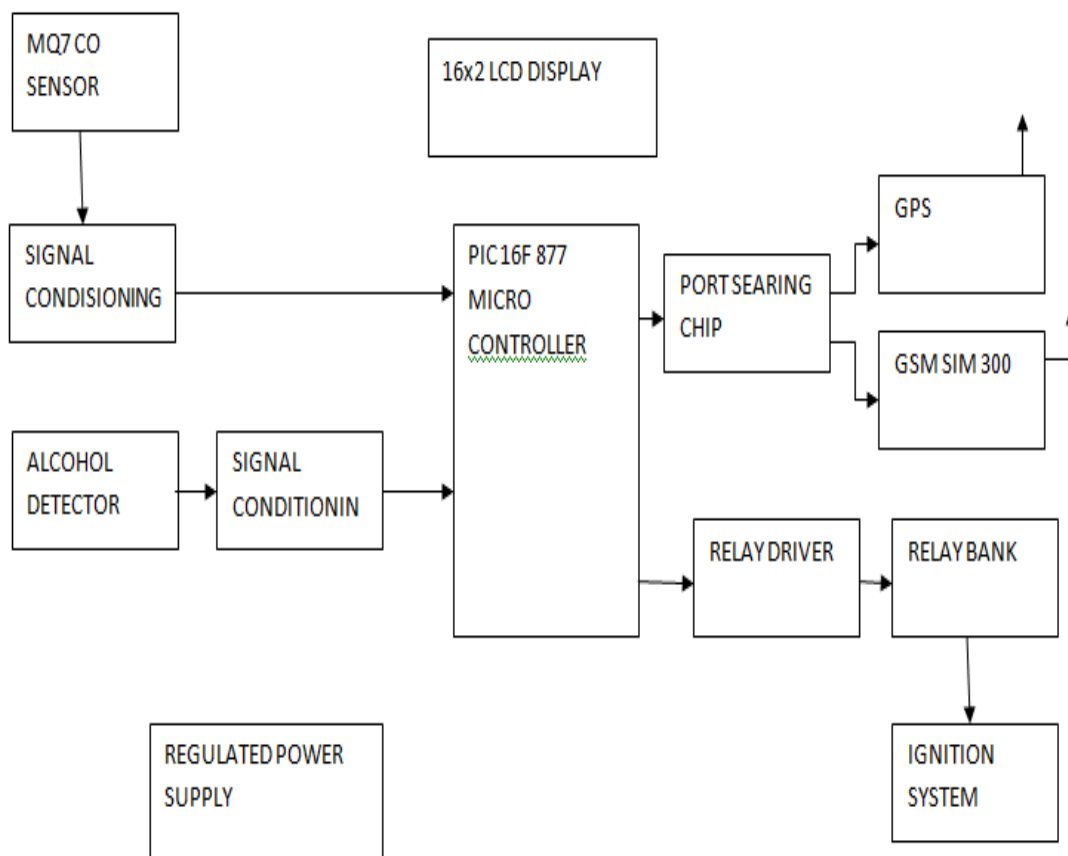
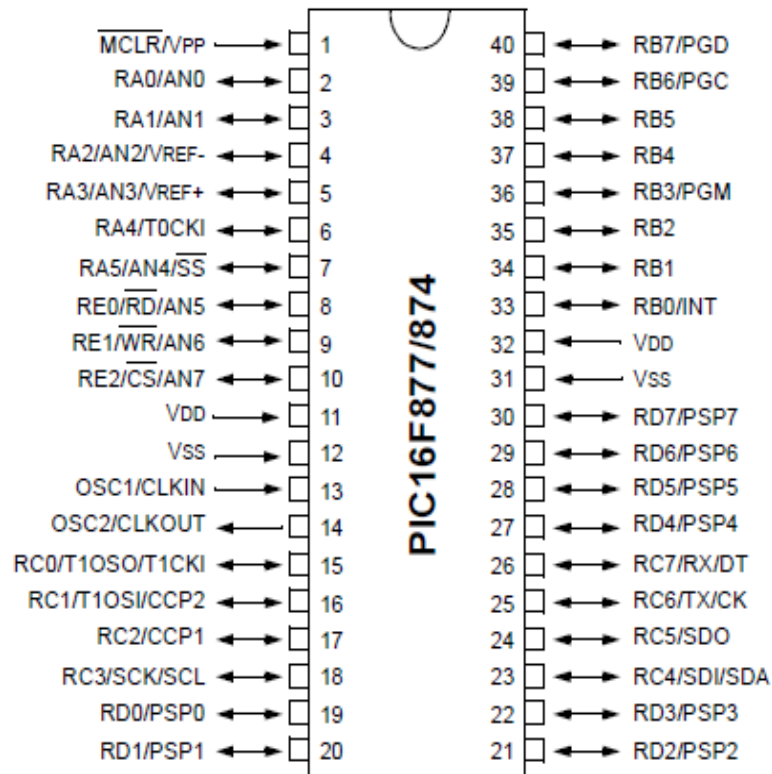


Fig.1: Block diagram of control system for air pollution detection

The block diagram of control system consist of PIC16F877 microcontroller for the interfacing sensors, LCD display GSM, GPS, and Ignition system. The specification of the component is as follows.

A. Microcontroller PIC 16F-877:

PIC 16F877 is a 40-pin 8-Bit CMOS FLASH Microcontroller from microchip. The core architecture is high-performance RISC CPU with only 35 single word instructions. Since it follow the RISC architecture, all single cycle instruction take only one instruction cycle except for program branches which take two cycles. 16F877 comes with 3 operating speeds with 4, 8, or 20 MHz clock input.



Features:

High performance RISC CPU

Power-On Reset (POR)

Power-Up Timer (PWRT)

Programmable code protection

Power saving SLEEP mode

B. Alcohol Detector:

Alcohol detector also called as MQ3 sensor is made up off SnO₂. Initially conductivity of sensor is low. As the alcohol gas rises, the concentration of sensor also increase. MQ3 is highly sensitive to the alcohol and has good resistance to disturb of gasoline smoke and vapour. It is with low cost and suitable for different applications.

C. Combustible gas sensor(MQ7):

The MQ7 is the carbon monoxide sensor which detects the concentration o the CO in the air.

The sensor measure the CO concentration from 10 to 10000 ppm and it operate at the temperature 10 to 50 degree C. It consumes less than 150 mA at 5v.

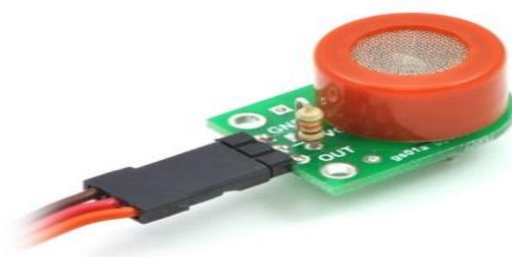


Fig.2 MQ7 co sensor

Design of MQ7 sensor is

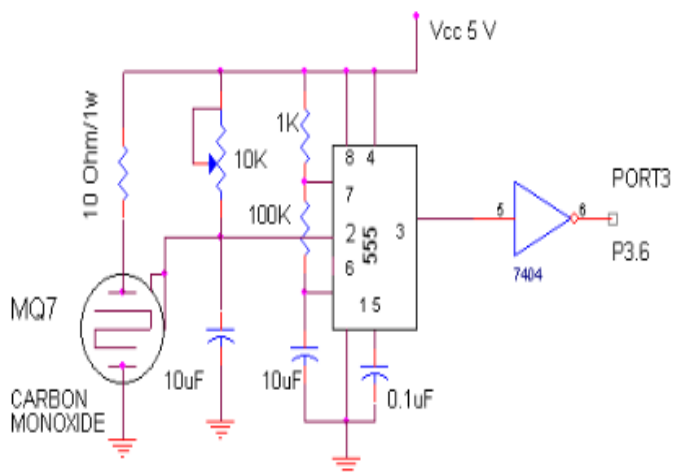


Fig 1: circuit diagram of co sensor.

Features:

High sensitivity

Response time < 150s

Detection Range: 10-1000rpmCO

Heater Voltage: 5.0 v[4]

D. Fuel Injector:

The main function of the fuel injector is to cut the fuel supply when the pollution level crosses the threshold value.

The relay circuit shown in fig is used to control on and off position of the fuel pump [8].

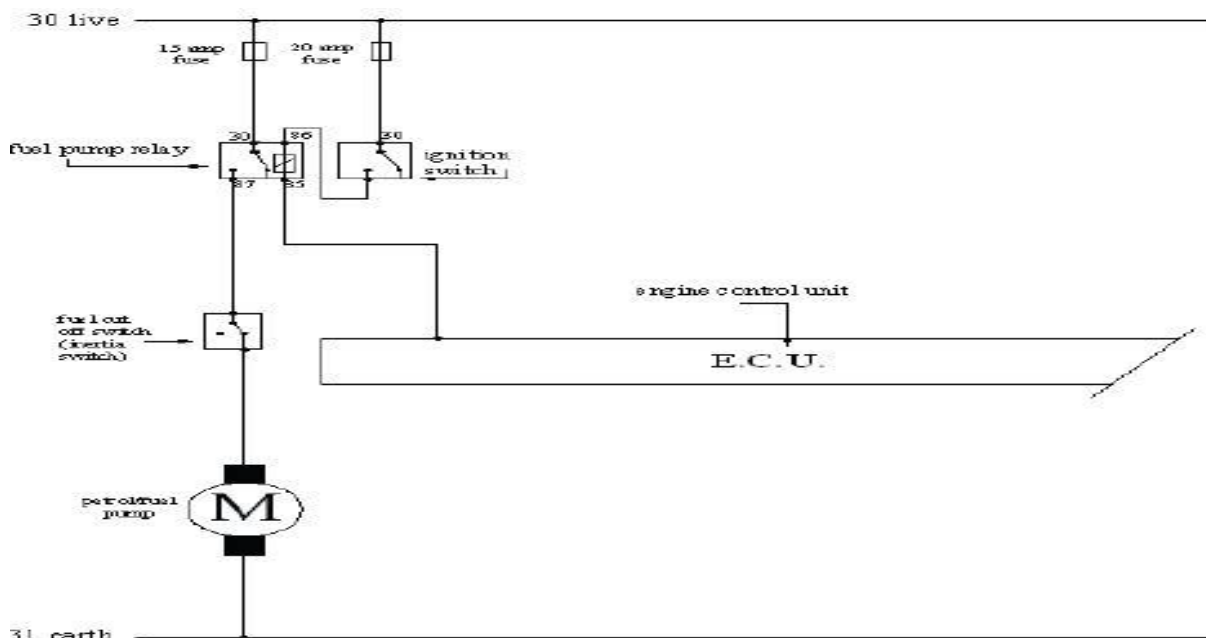


Fig. 4 Fuel pumps wiring circuit [5]

In fuel injector system input is connected to the microcontroller and output is given to the motor. In the initial stage ignition switch is in ON condition when pollution level is in control. As the pollution level crosses the threshold value pump relay get excited. Microcontroller sends the trigger pulse after timer run out. Relay get back to the original position i.e. it cut the fuel supply and fuel supply from the pump will be stopped.

E. GPS and GSM:

GSM is used for the communication between vehicle user and RTO officer. If the pollution level crosses the threshold level then GSM send message.

The GPS is Global Positioning System used to locate the position. If the pollution exceed beyond the threshold level GPS locate the nearest service station for the vehicle repair.

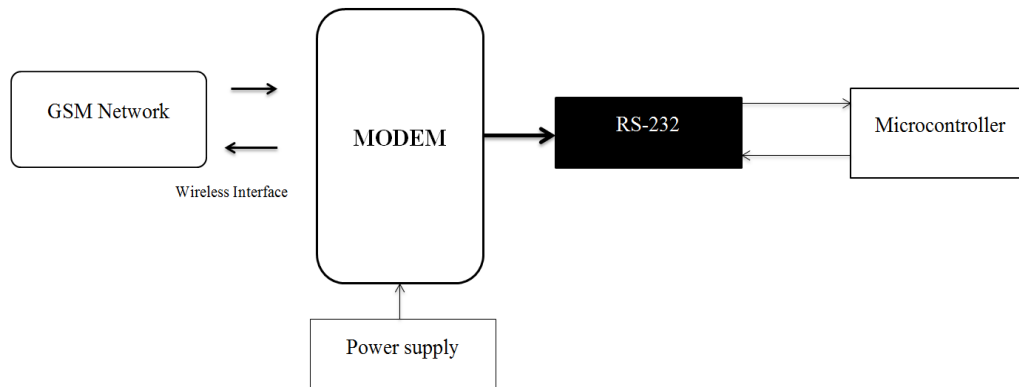


Fig. 5: GSM modem connection [9]

IV. CONCLUSIONS

The concept of detecting the level of pollution and indicating to the driver is implemented in this paper. There is an increase in the level of pollution over the last few decades, leading to several environmental problems. There will be a huge population, who do not take care of the pollution from their vehicles seriously, which has already resulted in several environmental problem such as ozone layer depletion and human health problem and so on. Hence the system will be highly beneficial in curbing this problem.

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