

Polluted Fuel Detecting System for Global Environmental Protection

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Abstract: Every vehicle will have emission but the problem occurs when it is beyond the standardized values. The primary reason for this breach of emission level being the incomplete combustion of fuel supplied to engine, which is due to the improper maintenance of vehicles. As a coin has two sides, this has its own effects, one of the main side effects being air pollution. This emission from vehicles cannot be completely avoided but, it definitely can be controlled. With the evolution of semi-conductor sensors for detecting the various gases, this paper aims at using those semi-conductor sensors at the emission outlets of vehicles which detects the level of pollutants and also indicates this level with a meter. When the pollution/emission level shoots beyond the already set threshold level, there will be a buzz in the vehicle to indicate that the limit has been breached and the vehicle will stop after a certain period of time, a cushion time given for the driver to park his/her vehicle. During this time period, the GPS starts locating the nearest service stations. After the timer runs out, the fuel supplied to the engine will be cut-off and the vehicle has to be towed to the mechanic or to the nearest service station. The purpose of the paper is to monitor vehicle parameters. When they exceed threshold intimation is given to the nearby RTA including readings of parameters and location of the vehicle and sends the SMS to the nearby service centers through GSM.

Keywords: Air Pollution, Sensors, threshold level, GPS, Micro Controller.

1. Introduction

Over the years, there have been several regulations made by the Government to control the emission from vehicles; most of them being unsuccessful at the same. The standards and the timeline for implementation are set by the Central Pollution Control Board under the Ministry of Environment & Forests. Bharat stage emission standards are emission standards instituted by the Government of India to regulate the output of air pollutants from internal combustion engine equipment, including motor vehicles. The first emission norms were introduced in India in 1991 for petrol and 1992 for diesel vehicles. These were followed by making the Catalytic converter mandatory for petrol vehicles and the introduction of unleaded petrol in the market. On April 29, 1999 the Supreme Court of India ruled that all vehicles in India have to meet Euro I or India 2000 norms by June 1, 1999 and Euro II will be mandatory in the NCR by April 2000. Car makers were not prepared for this transition and in a subsequent judgment the implementation date for Euro II was not enforced. The standards, based on European regulations were first introduced in 2000. Progressively stringent norms have been rolled out since then. All new vehicles manufactured after the implementation of the norms have to be compliant with the regulations. Since October 2010, Bharat stage III norms have been enforced across the country. In 13 major cities, Bharat stage IV emission norms are in place since April 2010.

The beginning of the 21st century was the time when importance for Environmental awareness was instigated. One of the major concerns regarding the environment is air pollution. Air pollution contributes to the green house gases, which causes the greenhouse effect, whose side effects are now well known to all of us after the findings about the hole in the ozone layer. Air pollution is not only harmful to the environment but, also to all other

living beings on earth. Air pollutants that are inhaled have serious impact on human health affecting the lungs and the respiratory system; they are also taken up by the blood and pumped all-round the body. These pollutants are also deposited on soil, plants, and in the water, further contributing to human exposure and also affecting the sealife. Vehicles are one of the major contributors to air pollution apart from industries. The main pollutants from vehicles are the oxides of carbon and nitrogen, which can be easily detected these days with the help of semiconductor gas sensors. Therefore, in this paper an idea is suggested, which would be very helpful in reducing the amount of pollution from vehicles.

2. System Design Model

The purpose of the paper is to monitor vehicle parameters. When they exceed threshold intimation is given to the nearby RTA including readings of parameters and location of the vehicle and sends the SMS to the nearby service centers through gsm. Vehicles have become an integral part of every one's life. Situations and circumstances demand the usage of vehicles in this fast paced urban life. As a coin has two sides, this has its own effects, one of the main side effects being air pollution. Every vehicle will have emission but the problem occurs when it is beyond the standardized values. The primary reason for this breach of emission level being the incomplete combustion of fuel supplied to engine, which is due to the improper maintenance of vehicles. This emission from vehicles cannot be completely avoided but, it definitely can be controlled. With the evolution of semi-conductor sensors for detecting the various gases, this project aims at using those semi-conductor sensors at the emission outlets of vehicles which detects the level of pollutants and also indicates this level with a meter. When the pollution/ emission level shoots beyond the already set threshold level, there will be a buzz in the vehicle to indicate

that the limit has been breached and the vehicle will stop after a certain period of time, a cushion time given for the driver to park his/her vehicle.

A. Hardware implementation

The overall block diagram of the proposed system is given in figure 1. The detector consists of three sub-blocks namely smoke sensor, transducer and ADC. The smoke sensor is the main component of the detector block which is embedded onto the exhaust of the vehicle. The sensor senses the amount of emission from the vehicle and feeds the data to the microcontroller through the transducer and the analog to digital converter at regular intervals of time. The transducer is used to convert the output of the sensor into an electrical signal. The analog electrical signal is then converted into a digital signal using an ADC, so that, it can be compared with the predefined values, in the microcontroller.

In this paper, carbon monoxide sensor (MQ-7) which can measure CO concentrations ranging from 10 to 10,000 ppm is considered. This sensor, basically finds usage in sensing carbon monoxide concentrations (ppm), in the exhaust of cars as shown in figure. and gives an analog output. The MQ-7 gas sensor is mainly made up of SnO₂, whose conductivity varies with the cleanliness of air i.e. it has a lower conductivity in clean air and vice versa. A simple circuit as shown in figure is used to map the changes in conductivity to the corresponding output signal of the gas concentration. The main advantage of the MQ-7 gas sensor is that it has high sensitivity to Carbon Monoxide. Additionally, it has a very long life time and is available at a low cost. Also it can be used for a wide range of applications.

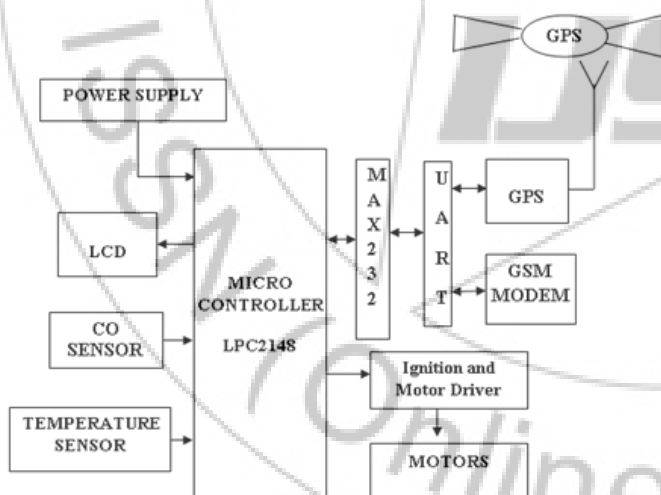


Figure 1: Block diagram

The main function of the fuel injector is to cut the supply of fuel to the engine, when the pollution limit is breached. The relay circuit shown in the figure.3.4 is used to control the on and off position of the fuel pump [4]. In this paper, the engine control unit is programmed in such a way that, when the microcontroller sends a trigger pulse after the timer runs out, relay should get back to its original position, that is the fuel cut off switch, is on. Then the fuel supply from the pump will be stopped. The microcontroller is programmed to do three functions namely comparison, timer and triggering

circuit. The microcontroller takes in two inputs; one from the smoke sensor's output and another being the predefined threshold value specified by the government. When the smoke sensor output is more than the threshold value, the microcontroller triggers the timer circuit and an alarm [5] is set off to inform the driver of the vehicle, about the same and also indicate that the vehicle will come to a halt as soon as the timer runs out. Apart from the timer being triggered, a trigger is also given to the GPS, which helps in locating the nearest service station.

B. Firmware implementation

This is an Operating System (OS) on which all the software applications required for our design are going to be run. This OS is flexible to any user to operate and easy to understand. Accessing the soft wares and using them is very convenient to user. The μ Vision development platform is easy-to-use and it helps you quickly create embedded programs that work. The μ Vision IDE (Integrated Development Environment) from Keil combines design management, source code editing, program debugging, and complete simulation in one powerful environment. Code written in 'EMBEDDED C'. The μ Vision3 IDE is a Windows-based software development platform that combines a robust editor, design manager, and makes facility. μ Vision3 integrates all tools including the C compiler, macro assembler, linker/locator, and HEX file generator.

3. Experimental Results

The main pollutants from vehicles are the oxides of carbon and nitrogen, which can be easily detected these days with the help of semiconductor gas sensors. Therefore, in this paper an idea is suggested, which would be very helpful in reducing the amount of pollution from vehicles. The process of working of this project is explained as follows. The total equipment of this project is placed inside a vehicle. Here we have GPS (Global Positioning System) module by which we can get the location of the vehicle, the location values are displayed on the LCD (Liquid Crystal Display). In this project we have two sensors which are interfaced to the micro controller.



Figure 2: The Microcontroller Lpc 2148 using experimental kit

Those are temperature sensor and CO sensor through which we can measure the temperature and amount of CO released from the vehicle. These values are also displayed on LCD. Here ADC is used to convert the analog data from the sensors to digital form. Whenever these values exceed the threshold then intimation is given to the RTA including vehicle's exact position.

4. Conclusion

This whole paper mainly focuses on two things. The first thing is the concept of detecting the level of pollution and indicating it to the driver. There is an increase in the level of pollution over the last couple of decades, leading to several environmental problems. The second reason is that this system will be one of the greatest improvements in technology to keep the environment free from vehicular emission and bring it to a halt if the pollution level is more than the standards mentioned by the government. The fact that this system is just an add-on, as it does not change the configuration of the engine by any means, will make it easier to employ this system in the existing vehicles.

References

- [1] http://wikipedia.org/wiki/Bharat_Stage_emission_standards
- [2] George F. Fine, Leon M. Cavanagh, Ayo Afonja and Russell Binions "Metal Oxide Semi-Conductor Gas Sensors in Environmental Monitoring", Sensors 2010, 10, 5469-5502; doi:10.3390/s100605469
- [3] K. Galatsis, W. Wlodarsla, K. Kalantar-Zadeh and A. Trinchi, "Investigation of gas sensors for vehicle cabin air quality monitoring," vol. 42, pp. 167-175, 2002.
- [4] "Trade of Motor Mechanic"; Module 5; Unit 2 Electronic Fuel Injection; Phase 2 by FÁS Learning Innovation Unit with Martin McMahon & CDX Global; Curriculum Revision 2.2 16-01-07.
- [5] LIU Zhen-ya, WANG Zhen-dong, CHEN Rong, "Intelligent Residential Security Alarm and Remote Control System Based On Single Chip Computer," vol. 42, pp. 143-166, 2008.

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