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"Pollution Controlling System for Vehicles Using Atmega-328 and MQ-135 Sensor"

Deepak Bansal, Nivesh Baliyan, Sushil Kumar Pandey
Department of Electronics & Communication Engineering, Shri Ram Murti Smarak College of Engineering and Technology, Bareilly

ABSTRACT:

This project is to develop a compact system to detect the pollutants in the vehicle which could be assembled in the vehicle itself. Tremendous innovations have been made in the technology and manufacturing of cars as well as in the pollution control department but still nothing significant achieved of it. This idea employs an MQ307 sensor which is economical and capable of detecting Carbon Monoxide gas emitted from the vehicle. An initial warning is given to the driver regarding the amount of CO gas with the help of LCD display and later the same information is transferred to the Pollution Control Board in case of negligence. This is done with the help of GSM system incorporated in the vehicle. The AVR Microcontroller is used to transfer the information to the GSM system from the MQ135 sensor. The aim of this project is to develop a mobile PUC checking system.

KEYWORDS:

1. Carbon Monoxide Gas
2. Global System for Mobile Communication (GSM)
3. Pollution under Control (PUC)
4. Liquid Crystal Display (LCD)
5. Nitrogen Oxides
6. Arithmetic Logic Unit (ALU)

I. INTRODUCTION:

Pollution has always been a major concern on Earth. Several measures have been adopted in ancient times until now to reduce the impact of this pollution. But none of the methods has proven to be fully efficient to eradicate this problem completely. This project proposes an integral approach to real time detection of pollutants from the vehicle especially CO[4] gas. It deals with the same issue (Air pollution) as it tries to take some advance steps to solve the problem. It includes utilization of Gas Analyser to detect the pollution of Motor Vehicles.

The effluents from the combustion engine of a vehicle are detected to obtain an idea of the amount of pollution caused by the Vehicles. This is nowhere different from the general P.U.C checks carried out by the concerned Pollution Control Board. But an extra feature is added itself in the vehicle which allows the vehicle to examine the amount of pollutants in its engine by itself without going for any scheduled P.U.C checks. In order to limit pollution caused by road vehicles. In order to limit as much as possible the negative impact of road vehicles on the environment and health, the Regulation covers a wide range of pollutant emissions: carbon monoxide (CO), non-methane hydrocarbons and total hydrocarbons, nitrogen oxides (NO) and particulates (PM). It covers tailpipe emissions, evaporative emissions and crankcase emissions. There are emission limits for each category of pollutant emissions. The above discussion describes the advantage of this project.

This project enables the driver to individually look after his/her vehicle, its pros and cons without any help from the Pollution Control Department.

II. LITERATURE SURVEY:

Discussions about air pollution often begin with the composition of the atmosphere. In particular, the discussion often focuses on how a particular part of the troposphere or stratosphere deviates in quality from a norm.Popular perceptions of air pollution are driven largely by fear.Inspection and maintenance measures to control emissions from in-use vehicles are an essential complement to emission standard for new vehicles. Although difficult to implement, an effective inspection and maintenance program can significantly reduce emissions from uncontrolled vehicles I/M programs are also needed to ensure that the benefits of new vehicle controlled technologies are not lost through poor maintenance and tampering with emission controls. I/M programs for Gasoline Vehicles, commonly include measurement of hydrocarbon and carbon monoxide concentrations in the exhaust.Here this paper comes to picture as it focuses on the idea of eradicating the existing PUC[3] system totally and the above discussed are some of the research papers relating to the area of interest of our paper. 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.

III. PROPOSED IDEA:

The main source of pollution in cities is due to vehicles. The increase use of vehicles in cities results in vital increase in the emission load of various toxins into air. As a result increase in environmental problems which will affect the human health in urban places [1]. Air pollutants from taxies, cars and buses result in the damage of ground level ozone and other respiratory problem like asthma attacks. Transportation is main source for generating carbon monoxide that contributes 72% of total pollution in the metropolitan cities like Calcutta, Mumbai, and Delhi. At present, the Indian pollution control board has made the fitness certificate as compulsory for public and commercial vehicles once in a year to control the pollution. Pollution Under Control (PUC) certificate for every three months is mandatory for all group vehicles from the date of registration [2]. In order to control the air pollution, the amount of air pollution needs to be monitored and controlled in vehicles.

The basic element concerned here is the MQ-135] sensor which detects the Carbon Monoxide gas. This sensor is capable of detecting the gas by sensing the heat of the gas. It ranges the output in the range of 20-20000 ppm. The sensor is economical and quite accurate. It provides an analog output to the AVR. The AVR has got an inbuilt analog to digital converter which converts the acquired signal into digital form as needed by the Microcontroller system. The Microcontroller used here is Atmega 328 microcontroller and this microcontroller acts as the brain of the process.It calculates the exact amount of Carbon Monoxide (CO) and display it on a 16x2 Alphanumerical Display with the unit of ppm (parts per million).Alphanumeric LCD[2] display displays works as a screen to give continues output of the data which it receives from Microcontroller. It is considered as a passive device and in other words it helps in monitoring the exact position of the effluents from the vehicle. A USB to TTL Logic is placed between the microcontroller and PC. This logic converts the signal into a desired one which can be given to the PC to pass it to the GSM system. GSM (Global System for Mobile Communication) is the one which is responsible to transfer the data to the concerned authorities. Also as an controlling function it switch ON the relay which will result in the closing of the valve and cutting the fuel supply. GSM is an excused step which occurs only if the ever increasing amount of pollutants is neglected. It helps to take a step in reducing air pollution which is a major issue to the environment. To easily understand all this here is a flow chart :

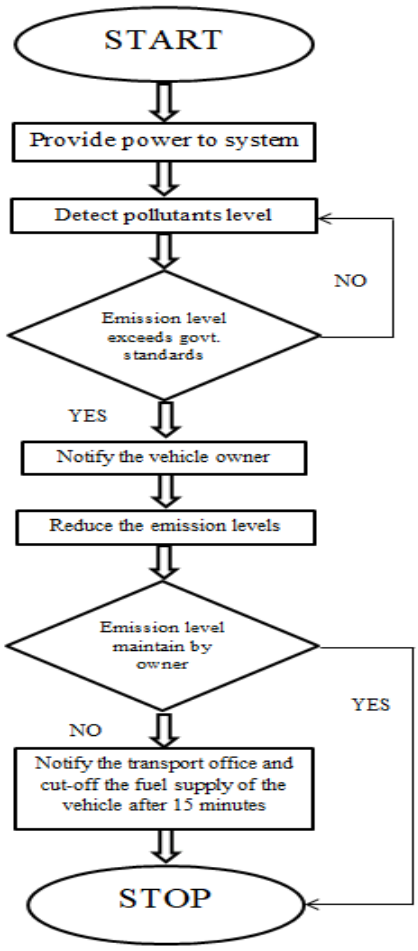

Fig. 3.1 Flow Chart

IV. HARDWARE

Main Components used in this project were:

1. ATMEGA328 AVR Microcontroller
2. MQ-135 Sensor
3. 16x2 Alphanumeric LCD Display
4. GSM Module: SIM 900
5. 12V Relay
6. Solenoid Valve
7. Light Emitting Diode

V. SYSTEM DESCRIPTION

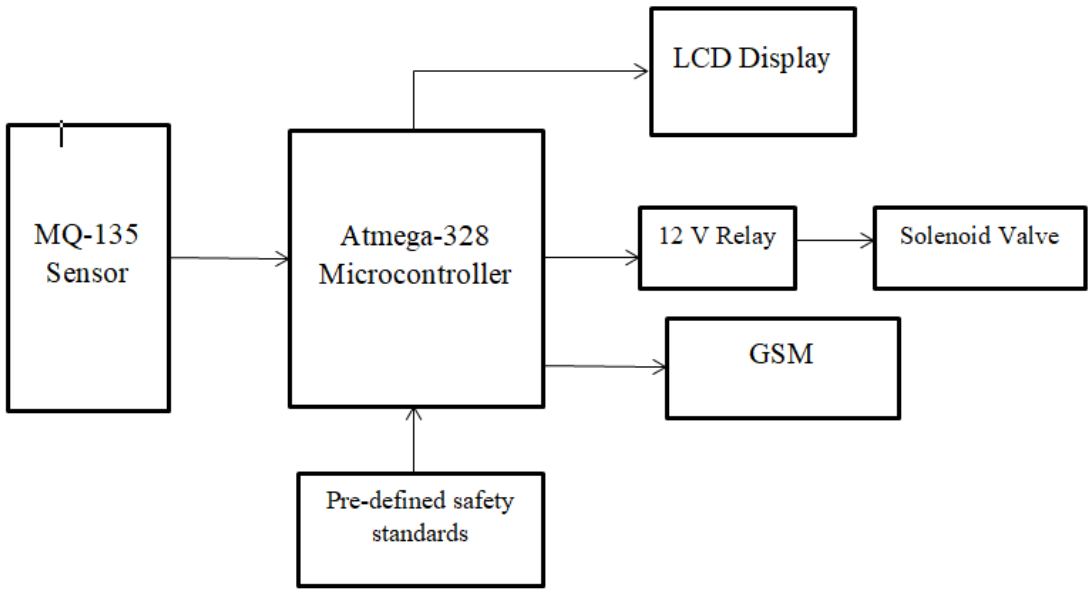

Fig. 5.1 Block Diagram

VI. WORKING

The system works by firstly collecting data from the sensor when the vehicle is on the move. Then this data is sent to the microcontroller. Basically microcontroller has three tasks : comparison, timer, triggering . First it compares the data from the sensor to the safety standards provided by the government. After checking this data if the pollution level is exceeding a certain threshold then it displays the data on the LCD display and warns the user. If the user ignores the message it starts a timer which again warns the user three times, after that it triggers the GSM and sends an automatic generated message to the pre-defined number stored in the memory. The microcontroller also triggers the relay which after a certain time interval closes the solenoid valve and thus stopping the fuel supply to engine.

VII. CONCLUSION

The concept of detecting the level of pollution and displaying it to the user is implemented. This project is capable to measure the value of pollutants emitted by the vehicle continuously and display it on 16x2 alphanumeric LCD display. Also if the pollutant level exceeds the prescribed value, then a SMS will be sent to the respective authority to take necessary disciplinary action.

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