Automatic Pollution Detector for Automobiles

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Abstract— Automobiles are the lifeline of today’s generation. To make the work process easier and faster, automobiles play a vital role. For an automobile to serve the purpose fuel is required and the preferred fuels are petrol and diesel. According to the functioning of an automobile, the injected fuel is burnt. The burning of fuel causes air pollution. Hence, automobile owners have to get pollution level checked from time to time but there are a number of people who show carelessness to get the pollution level checked. This project aims at designing such a device that will send a message to the automobile owner when the pollutants emitted by the automobile exceed the limit. With the help of this device, the routine of getting the pollution level checked can be avoided and the vehicle owner will be automatically notified.

Keywords: ATMEGA-16, A.P.D.A, Fire Sensor, Buzzer, DC power supply

I. INTRODUCTION

The process of burning of fuel causes emission of various pollutants such as carbon monoxide, Sulphur dioxide and nitrogen oxides in the atmosphere. This emission from the tailpipes of automobiles leads to air pollution which further results in hazards such as global warming, acid rain, and particulate contamination.[1]

There is no such technique in the present time which can completely avoid the emission of such pollutants but there, certainly, are techniques to control the emission of the pollutants. This is why, automobile owners are advised to get the pollution check done time to time but there are a number of people who fail to get the pollution level checked in the ideal time span and because of this reason their vehicles produce excessive pollution.[2]

As a solution to the above problem, this project aims to build such a device that will automatically notify the automobile owner by sending a message when emission of pollutants exceeds the pre-defined limit.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Pre-defined limit</th>
</tr>
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<tbody>
<tr>
<td>Nitrogen Oxide</td>
<td>60-80 gm⁻³</td>
</tr>
<tr>
<td>Carbon content</td>
<td>2-4 mg m⁻³</td>
</tr>
<tr>
<td>Sulphur dioxide</td>
<td>60-80 gm⁻³</td>
</tr>
</tbody>
</table>

Table 1: Permissible Pollutant Emission [2]

II. DESCRIPTION OF PARTS

A. Carbon Percentage Detector

It detects the carbon percentage in the smoke that is emitted by the vehicle. The basic parts of the detector are as follows:

1) Microchip
It sends the electronic charge to the other parts of the detector, which gives “what to do” signal.

2) Light Emitting Diodes (LEDs)
With the help of LEDs, user is notified how the unit is functioning and whether the battery needs to be replaced.

3) Detection Chamber
The main function of the detection chamber is to detect the carbon percentage. [3]

B. Sulphur Dioxide Detector

Sulphur dioxide is a colourless gas with pungent odor which is released on the combustion of fuels such as gasoline, petrol and diesel. Thus, automobiles emit Sulphur dioxide on combustion of gasoline. Sulphur dioxide detector detects the emission of Sulphur dioxide by the vehicles.

C. Nitrogen Oxide Detector

Nitrogen oxides are the byproducts of burning of hydrocarbons like gasoline. It is a primarily toxic component of vehicle exhaust. Thus nitrogen oxide detectors are installed in vehicles which detect the emission of nitrogen oxide.

D. Microcontroller (ATmega16)

Microcontroller is basically a small computer on a single integrated circuit containing a processor core, memory and programmable input and output peripherals. These are used in automatically controlled products and devices such as remote controls and embedded systems.

Atmega16 is an 8-bit high performance microcontroller of Atmel’s Mega AVR family with low power consumption. Atmega16 has 16kB programmable flash memory, static RAM of 1kB, and EPROM of 512 bytes. Atmega16 is a 40 pin microcontroller. There are 32 input output lines which are divided into four 8-bits port designated as PORTA, PORTB, PORTC, and PORTD.[4,7].
Global System for Mobile Communications (GSM) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second-generation (2G) digital cellular networks used by mobile phones, first deployed in Finland in July 1991. [6] In this system GSM is used for sending pollution alert message to the vehicle owner.

III. BLOCK DIAGRAM

Fig. 2. Schematic diagram of Pollution level Detection

IV. WORKING OF A.P.D.A

To design such a device that will automatically notify the automobile owner about the exceeding limit of pollutant emission, following steps will be required:

1) Step 01: In this step engine is started and the vehicle is used for the required purpose. Turning on the engine will automatically turn on the A.P.D.A. and it will start working accordingly.

2) Step 02: The sensor monitors the carbon content, nitrogen oxide, and Sulphur oxide emitted by the vehicle. The detected information is sent to the microcontroller ATmega16. Microcontroller analyzes the information and works accordingly.

3) Step 03: Microcontroller ATmega16 is programmed and pre-defined values for pollutant emission are set accordingly. If the vehicle exceeds the pre-defined limit of pollutant emission, then the microcontroller will detect the excessive pollutant emission and send a signal to the GSM.

4) Step 04: And with the help of GSM, a message will be given to the automobile owner that will notify the owner about the excessive pollution caused by their vehicle. If the pollution is under control then system will work normally without disturbing the owner.

Fig. 3: Flowchart of working of A.P.D.A.
V. RESULT

A device can hence be designed which will notify the automobile owner when the vehicle produces pollution in excess. As there are a number of people who are careless with the pollution emitted by their vehicles, thus with the help of such a device, pollutants emitted by the vehicle will be checked and the automobile owner will be notified at the same time.

REFERENCES