

# Detection and Prevention of High Carbon Monoxide Emission in Vehicles

Mr. P. Karthikeyan, M. Tech., Assistant Professor  
UG Students- John Einstein Brown M, Sathishkumar L, Sudharsan L  
Department of Electronics and Communication Engineering,  
Velammal College of Engineering and Technology, Madurai, Tamilnadu, India

**Abstract** - The objective of this project is to detect the high Carbon monoxide emission in the vehicles. This project will be using the smoke sensor for detecting the presence of CO with the help of microcontroller with interfacing circuits. When the CO emission exceeds the threshold level, suddenly turn on the buzzer and the vehicle information will be send to RTO office database using GSM modem. Each time the penalty updated in database when the CO emission exceeds the threshold level. In database we have included vehicle number, date, vehicleowner name and date. First day, the vehicle exceed threshold limit. The information store in database table. If the same vehicle exceeds continuously, the penalty will be doubled as well as the warning message will be send to corresponding vehicle owner mobile number.

**Keywords** - Microcontroller (Atmel89C51), MQ2 smoke sensor, MQ5 gas sensor, GSM module

## I. INTRODUCTION

Air pollution is the most hazardous problem faced by the society. The main sources of air pollution are passenger vehicles and Heavy-Duty trucks. Passenger vehicles emits Carbon monoxide, Carbon-di-oxide, Nitrogen oxide etc. The CO blocks supply of oxygen to the brain and heart which leads to severe impact on human body. Similarly, CO causes global climatic changes and results in Global warming and Acid rain. Gas leakage causes vehicle accidents. Vehicle emission occurs due to the improper maintenance of vehicles and problems in combustion of fuels. This vehicle emission cannot be entirely avoided but it definitely be controlled by taking strict measures. For that, we have proposed an excellent system which detects the pollution in vehicles and transmits the information to the RTO office database. The emitted smoke from the vehicle while exceeding the threshold level will be sensed by the MQ2 sensor. Then the GSM will send the corresponding messages which are programmed in the microcontroller to the database created for the RTO office. In the database tables, we are maintaining the Vehicle number, Date, Fine amount, Name of the vehicle owner. If the vehicle pollutes continuously for a month or more then further actions will be taken by the RTO office. So by these measures, polluting vehicles can be reduced and the vehicle owners will become more aware of their vehicle emissions in future. In our project, The RS232 is a serial communication cable used to communicate between PC and GSM which is used for the interface between hardware and software. In this paper we have proposed a system useful in reducing the amount of pollution which is emitted from the vehicles through stringent measures taken by the RTO office helped by the data transmitted to the database through GSM. The proposed project involves embedded systems, GSM module, Database Management System.

## II. LITERATURE SURVEY

In the last few decades, the government has made many rules and regulations for controlling the vehicles. Central pollution control board has set up the emission standard levels under the ministry of Environment and this was first introduced in India in 1991 and 1992 for petrol and diesel vehicles respectively. In 2015, in a paper published the author has described an embedded system for vehicles carbon toxic gas detection with the help of GPS. A relay circuit is used for the control of ON and OFF position of the fuel pump. With the help of GPS system to find the location of the polluting vehicles are tracked. In this system the semiconductor sensors have been used to detect the pollutant level of the vehicles. The smoke detector detects the pollutants (CO, NO<sub>x</sub>, etc.) continuously. The microcontroller compares the level of pollutants with the stipulated level allowed by the government which is programmed in the Microcontroller. When the pollutant level exceeds the standardized limit, it sends a signal to the fuel injector. On receiving a signal from the microcontroller, the fuel injector stops the fuel supply to the vehicle engine after a particular period of time which results in the stoppage of the car abruptly on the roadside which is one of the drawbacks of the existing method.

## III. SYSTEM RESOURCES

In this section we describe the hardware components that we mainly used in our proposed system shown in figure 1.

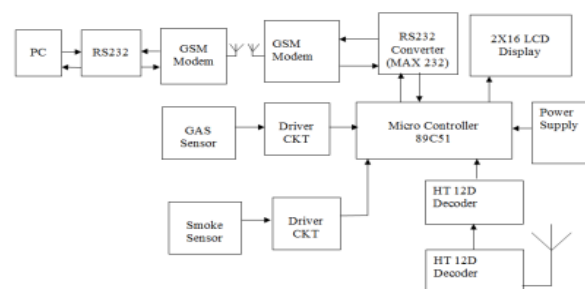
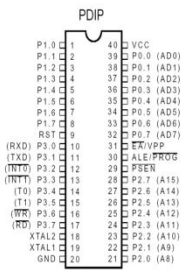


Fig1: Block diagram for proposed method

Atmel 89C51

At the heart of the project is flash-based micro controller IC AT89c51 shown in figure 2. AT 89c51 is a low power high performance CMOS 8-bit micro controller with 8KB of flash programmable and erasable read-only memory (PEROM). The on chip flash allow the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. This Microcontroller is used to detect the gas leakage and detect the high CO in this



vehicle by any dangerous or Accident condition. This embedded system will be using gas leakage sensor for detect the presence of flammable gas with the help of Micro controller with interfacing circuits. If Gas leakage was found that inside of the vehicle then it suddenly turns on the buzzer for to indicate the flow of gases leakage and send the SMS to Corresponding

Mobile number using GSM modem. If this CO level can be increases then it automatically sends data to RTO office Database using GSM modem. It also tracking the vehicle location and using GSM modem.

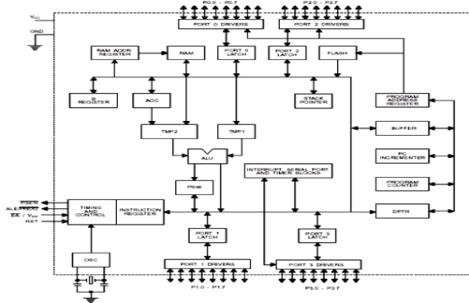


Fig2.Microcontroller block diagram

LCD Display

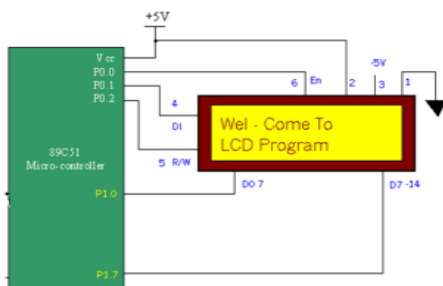


Fig 3.LCD display interface

This robotic each function is display on that LCD screen. It will be connected to this micro controller unit. When the microcontroller send the command to this unit. Then it ready to display the Alpha Numeric data sequentially depends on its input data .In this section we examine an intelligent LCD display of two lines, 16 characters per line, which is interfaced to the 89c51. The display have two internal byte registers, one is commands (RS=0) and the second for characters to be displayed (RS=1). It also have a user programmed RAM area (the character RAM)

that can be programmed to generate any desired character that can be formed by using dot matrix. To distinguish between these two data areas the hex command byte 80 will be used to signify that the display RAM address 00h is chosen. The purpose of Port 1 is used to furnish the command or data byte, and ports 3.2 to 3.4 furnish register select and read/write levels. LCD bit 7 is monitored for logic high (busy) to ensure the display is not overwritten. A slightly more complicated LCD display (4linesx40 characters) is currently being used in medical diagnostic systems to run a very similar Program shown in figure 3.

SMOKE SENSOR(MQ2)

Carbon monoxide sensor is suitable for sensing CO concentrations in the air. This sensor has high sensitivity and fast response time. Here we are using MQ-2 sensor which is shown in figure 4. In this paper, carbon monoxide sensor (MQ-2) 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 main advantage of the MQ-2 gas sensor is that it has high sensitivity to Carbon-di-oxide. Additionally, it has a very long life time and is available at low cost. Also it can be used for a wide range of applications.

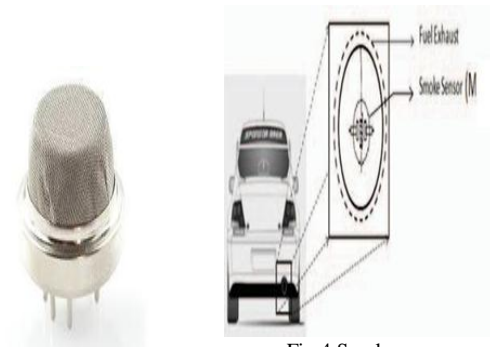
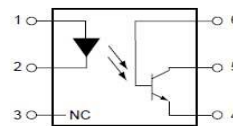


Fig 4.Smoke sensor

OPTOCOUPLER CIRCUITS

Functional Block Diagram



- PIN 1. ANODE
- 2. CATHODE
- 3. NO CONNECTION
- 4. EMITTER
- 5. COLLECTOR
- 6. BASE

Fig5: Optocoupler circuit diagram

This Optocoupler circuit is providing the electrical isolation between the two signals. It prevents the electrical short and electrical damages to this micro controller. Circuit diagram for opto coupler shown in figure 5.

**BUZZER INDICATOR**

Buzzer indicator was used to indicate sound alert for to indicate leakage of gas to that particular area. Transistor driver circuit is used to drive Buzzer indicator. It made up of one NPN transistor (BC 547) switching circuits.

**MAX 232 POWER SUPPLY SECTION**

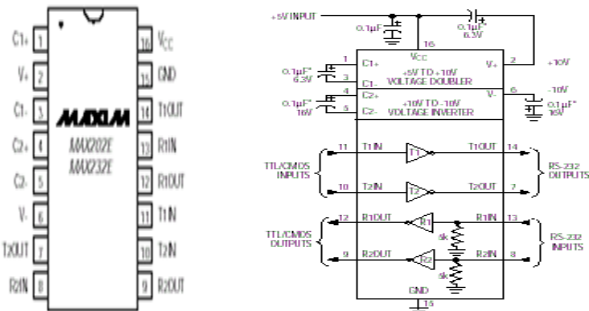


Fig 6.RS232 Circuit diagram

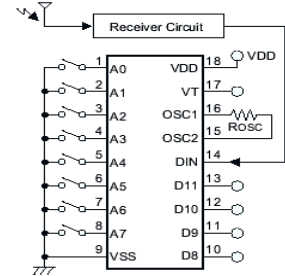
The MAX232 power supply section has four capacitor. It has 2 charge pumps. The use of first charge pump the external capacitors C1 to double the +5V input to +10V with input impedance of approximately 200Ω. The second charge pump used to the external capacitor to invert +10V to -10V with an overall output impedance of 45Ω. The best circuit uses 22µF capacitors for C1 and C4 . Generally these capacitors are low cost aluminum electrolyte capacitors and these size are critical. Increasing the value of C1 and C2 to 47µF will lower the output impedance of +5V to +10V Doubles the impedance 5Ω and +10V to -10V inverter by 10Ω. Increasing the value of C3 and C4 lowers the ripple on the power supplies thereby lowering the 16 KHz ripple on the RS232 output. The value of C1 and C4 can be lowered to 1µF in systems where size is critical at the expense of an additional 20Ω impedance +10V output and 40Ω additional impedance at -10V input.RS232 circuit diagram shown in figure6.

**GSM SIM900A MODULE**

GSM Modem-RS232 is built with Dual Band GSM engine-SIM900A, works on frequencies 900/ 1800 MHz The Modem is used to interface with RS232, which allows you connect PC as well as microcontroller with RS232 Chip(MAX232). The baud rate level from 9600-115200 through AT command. The GSM Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in machine to machine interface. The onboard Regulated Power supply allows you to connect wide range unregulated power supply. Using this GSM SIM900A modem, you can make audio calls, SMS; Read SMS attend the incoming calls and internet through simple AT commands.

**HT12D Decoder**

The 212series of decoders provides different combinations of addresses and data pins in various packages to pair with the 212series of encoders. The decoders receive data that are transmitted by an encoder and interpret the first K bits of code period as addresses and the last 12 K bits as data, where K is the address code number. A signal on the D<sub>IN</sub> pin activates the oscillator. The oscillator decodes the incoming address and data. The decoders will then check the received address three times continuously. If the received address codes all match the contents of the decoders local address, the 12 K bits of data are decoded to activate the output pins and the V<sub>T</sub> pin is set high to indicate a valid transmission. If the address code is incorrect or no signal is received, then it will be lost. The output of the V<sub>T</sub> pin is high when the transmission is valid. Otherwise it is always low. Output type of the 212series of decoders, the HT12E has no data output pin but its V<sub>T</sub> pin can be used as a momentary data output. The HT12D provides 4 latch type data pins whose data remain unchanged until new data is received.



**CREATION OF DATABASE**

Microsoft Access is a Database Management System (DBMS) from Microsoft that adds the relational Microsoft Jet Database Engine with a graphical user interface and software development tools. It is included in MicrosoftOffice applications, included in the professional and higher editions. Using the MS ACCESS, the database table is created and the record is maintained for reference. In the database tables, we are maintaining the Vehicle number, Date, Fine amount, Name of the vehicle Owner. When the CO level exceeds the threshold level, GSM sends corresponding details to database.

**GRAPHICAL USER INTERFACE**

We have used the visual basic technology to show the database table which is created for maintaining the details of the polluting vehicle. Visual Basic is used to develop Windows applications and to interface with database systems. Dialog boxes have less functionality can be used to provide pop-up capabilities. The controls provide the basic functionality of the application, while programmers can insert additional logic within the appropriate event handlers. For example, a drop-down combination box automatically displays a list. When the user selects an element, an event handler is called that executes code to perform the action for that list. Alternatively, a Visual Basic component can have no user interface, and instead provide ActiveX objects to other programs by Component Object Model (COM). This allows for server-side processing or an add-in module.

IV.RESULTS AND DISCUSSIONS

Database output

The output shown below is depicted about data's of the database table. If we hit the View RTO database button we can see the information of the polluting vehicle.

In the database, we have included three conditions. For example, in first day the vehicle smoke exceed the threshold level Vehicle number, Name of the vehicle owner, Date, Fine will be stored in database table. If the same vehicle exhausted smoke which is above threshold level on second day the fine will be automatically increased in database table. Suppose, new vehicle exhausted smoke which is above threshold level will have the new entry in the database table as we described above. If the same vehicle did the same continuously (consider 30days), then that vehicle is undertaken to further actions by RTO office. The figure 7 and 8 shows the transmitter and receiver parts of the proposed system.

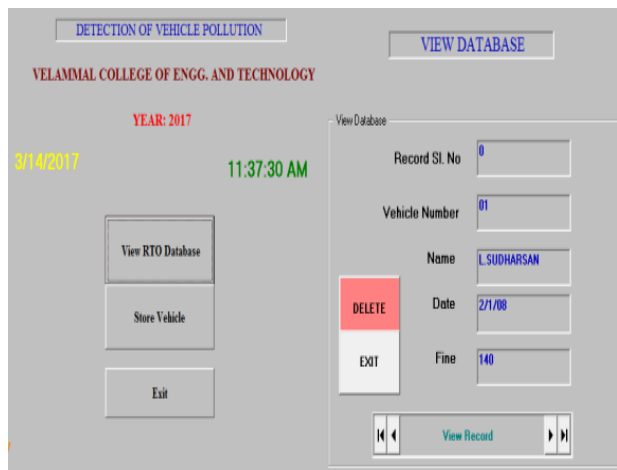


Fig 7. Transmitter part of the proposed system

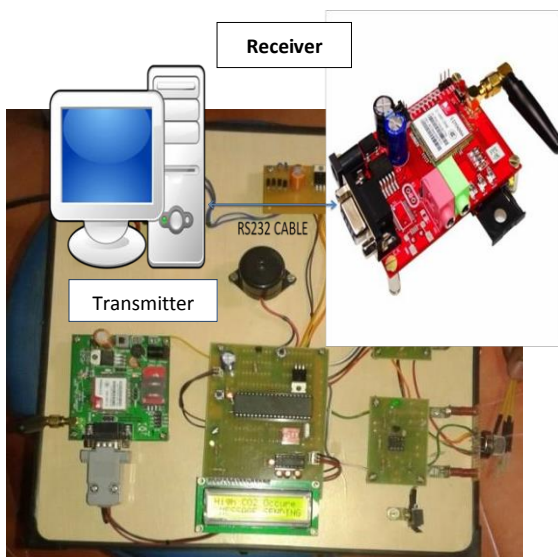


Fig8. Receiver part of the proposed system

And also we will be displaying the results in the LED display.

The updated vehicle information will be stored in MS-Access database system. It will be shown in below table.

Status	Output
If CO exceeds the level of threshold, then corresponding message will be shown in LCD Display.	
The polluting vehicle location can be identified by the message which will be shown in LCD display.	

RollNumber	Name	Date	Time
01	L.SUDHARSAN	2/1/08	140
02	L.SATHISH	2/1/08	180
03	M.JOHN EINST	2/1/08	120
04	student 4	2/1/08	20
05	student 5	2/2/2008	40
06	student 6	2/1/08	20
07	student 7	2/4/08	40
08	student 8	2/2/2008	140
09	student 9	2/5/08	40
10	student 10	2/5/08	40
11	student 11	2/6/08	40
12	student 12	2/6/08	20
13	student 13	2/1/08	40
14	student 14	2/6/08	20
15	student 15	2/1/08	60

Table-View the high polluting vehicle

VI.CONCLUSION

Air pollution is the most important problem that we face in our day-to-day life which has a major impact on our ecosystem. The Ozone layer mainly gets affected by the effects of air pollution which in turn will affect the human race in the longer run in years to come. This problem cannot be entirely solved but can be reduced by our proposed project introducing strict measures by the government through RTO by maintaining a database for the offenders and enforcing fines on the vehicles which will have an major impact on the reduction of over polluting vehicles. The hardware part is used for detecting the polluting vehicle and the software part which is interfaced to the hardware part is used to maintain the details of the polluting vehicle in a database as discussed in detail above. Due to this system, the vehicle owners will get the awareness of their vehicles pollution and will be forced to stop polluting the environment. Our system is proposed to give solution to control the air pollution by identifying the vehicles. Our system can be implemented in vehicles without affecting its actual working and will have an major impact in the drastic reduction of vehicles contributing to air pollution and reduces the risk of global climate change and global warming.

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