



# Automatic System for Checking and Controlling Air Pollution in Vehicles

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## ABSTRACT

*Each vehicle has its own emission of the gases, but the problem occurs when emissions are higher than standardized standards. The main reason for this violation is the incomplete combustion of the fuel supplied to the engine, due to improper maintenance of vehicles. This emission cannot be completely stopped in vehicles, but it can definitely be controlled.*

*The main objective of this project is to monitor and control the pollution of the vehicle using pollution control circuits. There are many sensors in this pollution control circuit, such as smoking sensors, temperature sensors, GSM, GPS and all of these are connected to a controller. This is a real-time job where a demo application has been used in which ATMEGA 16 microcontroller is used and a controlling board is created Where all these devices are collected and act accordingly. The vehicle is controlled by this circuit when the engine automatically closes when a vehicle goes above the threshold pollution level. And an SMS is generated and sent to the pre-defined number stored in the memory through the GSM module. GPS module is used to find the vehicle position where it is stopped. This letter shows an effective use of technology by which we can save the environment by controlling the pollution of vehicles.*

**Key Words:** Microcontroller, Sensors, GSM (SIM 900A), GPS.

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## 1. INTRODUCTION

With the increase in technical, industrial and agricultural advancement, with the increase in population growth, quality of the environment has declined around the world. Due to the rapid growth of roads, roads, energy consumption, upstream production, and the lack of strict implementation of environmental regulation, the pollutants are flowing into the air, water, and soil. Apart from industries, the vehicle is one of the major contributors to air pollution, not only the air pollutants have affected health conditions, Rather, the release of greenhouse gases (GHG) has affected the global problem of global climate change. In the emission of the vehicle, pollutants are known to damage lung tissues and can increase respiratory diseases such as asthma.

The smoke detector is used to detect the carbon percentage in the smoke released by the vehicle. Smoke Detector detects carbon and gives it to the microcontroller to check the maximum carbon percentage in the smoke released by

the vehicles. The temperature sensor is used to measure the temperature in the vehicle. And the controller examines the percentage of carbon and temperature, if this threshold gets higher than the star then the system is triggered and the engine stops and then he sends the message to the pollution control office through GSM.

## 2. LITERARY WORK

Over the years, many rules have been made by the government to control emissions from vehicles, but most of them have failed. Standards and standards of implementation are determined by the Central Pollution Control Board under the Ministry of Environment and Forests, which includes automobiles. The first emission norm was introduced in India in 1991 for petrol and diesel vehicles in 1992. After this, the catalytic converter for the petrol vehicles was compulsory and it was followed after the introduction of unleaded petrol in the market.

On April 29th, 1999, the Supreme Court of India ruled that every vehicle in India will have to meet the Euro I or India 2000 norms by June 1, 1999, and Euro II will be compulsory in the NCR by April 2000. Car makers were not ready for this transition and the latter decision was not implemented on the date of implementation for Euro II. On the basis of European rules, standards were introduced for the first time in 2000. Since then strict norms have been started. All new vehicles manufactured after the execution of norms should be in line with the rules. From October 2010, the rules of Bharat Stage III have been implemented in the entire country. In 13 major cities, Bharat Stage IV emission norms are taking place from April 2010.

## 3. BLOCK DIAGRAM

Block diagram of the Automatic system for checking and controlling air pollution in vehicles.

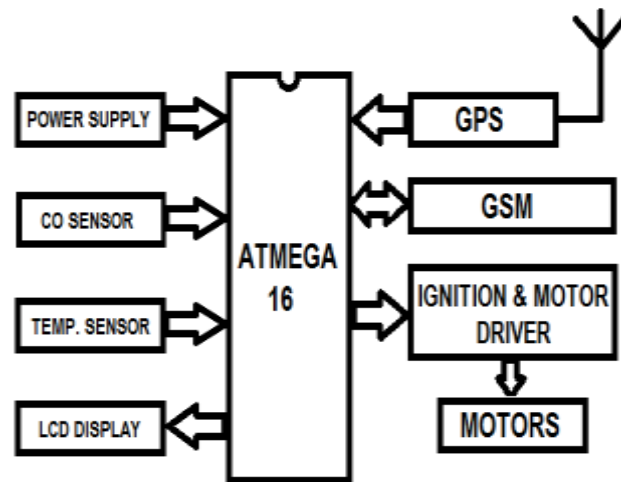


Figure 1: Block diagram of pollution monitoring

## 4. METHODOLOGY

### 4.1. POWER SUPPLY

The power supply segment is significant. It provides continuous output regulated power supply for the successful operation of the system. For this purpose, 0-12V / 500 mA transformer is used. This is connected to the main supply through the on / off switch and fuse to avoid the primary overload of the transformer and short circuit protection. The

secondary is connected to the diodes to change 12V AC to 12V DC voltage and filtered by the capacitors, which are further regulated to +5v, by using IC 7805.

#### 4.2. CO & TEMPERATURE SENSORS

CO and temperature sensors are the main components on input and are embedded on the emissions of vehicles. This sensor understands the amount of emission on the outlet and temperature from the engine and gives information to the microcontroller at regular intervals of time. Inside the sensor, there is a transducer that converts the sensor output into an electric signal. Substituted analog to digital converter (ADC) in the microcontroller, turns analog electrical signals into digital signals again. In this paper, carbon monoxide (CO) sensor is used to measure the concentration of CO from 10 to 10,000 PPM and the equivalent circuit of CO sensor is shown in fig.2.

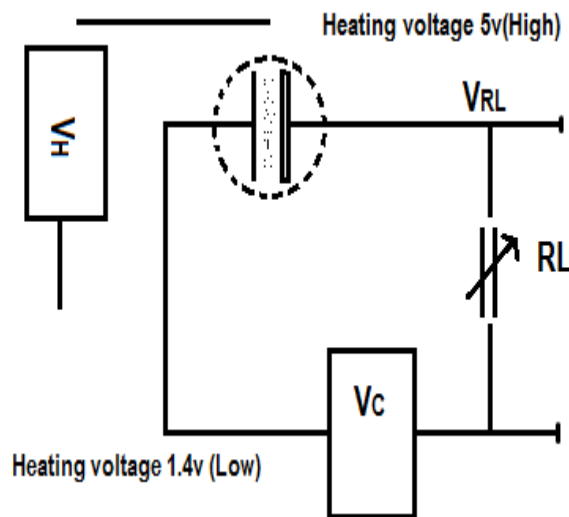


Figure 2: Equivalent circuit of CO sensor

#### 4.3. ATMEGA16 MICROCONTROLLER

In this thesis we used ATmega16L controller, it is an 8-bit microcontroller developed with low power CMOS technology support on the AVR improved RISC structural design with the high performance of 32\*8 general function registers. It is manufactured by Atmel with high compactness non-volatile memory slices. In-System, the on-chip Self-Programmable Flash memory of 16KB, EEPROM of 512KB moreover internal SRAM of 1KB. This microcontroller consists of 40 pins, 32 pins are programmable for input-output lines (4 ports each port has 8 pins), has four Pulse Width Modulation Channels, eight channels of ADC with 10 bit, 32 input-output lines are used for programmable, 3 pins used for dc power supply (5V), 2 pins used for crystal oscillator (XTAL2, XTAL1) more over 3 pins used for AREF, AVCC and RESET. This microcontroller operates under 2.7V - 5.5V along with the power of 1.1mA in Active mode 0.35mA at the idle condition with a speed grade of 0 – 8MHz. It has few special features that are internal and external interrupt sources, power on rest and sleep modes are of six types: Idle, ADC Noise Reduction, Power saves, Power down, extended standby and Standby. Atmega16L is a most commonly used microcontroller with effective cost and easily implement the embedded application. It supports the coding like Embedded C, Assembles.

#### 4.4. LCD DISPLAY

Liquid Crystal Display (LCD) is a flat panel display based on liquid crystal technology. In this system, the LCD display device (LM 016L) is interfaced with the microcontroller unit. The LM016L data pin (DB0-DB7) is from ATMEGA16 to port B. Data is written on PORT B. Reset (RS), read/write (R/W) and enable (EN) pins are linked to PORT C pins for corresponding operations. This LCD is used to display CO and temperature drivers when the system warns warning when threshold level violation occurs. When triggering pulse is activated by the microcontroller, the timer will be activated and displayed on the LCD screen.

#### 4.5. IGNITION & MOTOR DRIVER

The main task of ignition and motors is to stop the engine when the pollution limit is breached. It is used to control the on and off position of the motor as shown in fig.3. 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, the relay should get back to its original position, that is the ignition cut off switch, is on. Then the motor will be stopped.

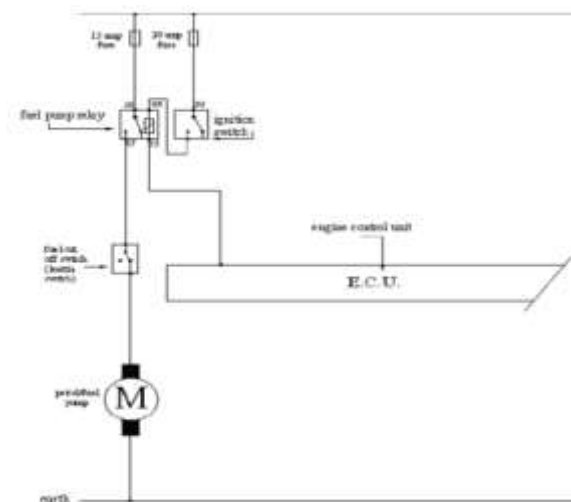


Figure 3: Ignition & Motor Driver circuit

#### 4.6. GLOBAL POSITIONING SYSTEM (GPS)

When the pollution height reaches the highest limit, a trigger pulse is given to GPS by the microcontroller. The GPS is programmed in such a way that, when it receives a trigger pulse, it shows the nearest service stations where the vehicle can be taken for maintenance. The signals obtained by GPS receivers are used to compute the accurate position, speed and time at the location of the vehicle.

#### 4.7. GSM MODULE (SIM900A)

There is a way for information about TX / RX through GSM messaging with AVR, and besides this, we can get incoming calls and with the help of a SIM, the system can create outgoing calls in line with a cellular phone. To perform this we attach the GSM model pin with the AVR circuit, to facilitate the GPRS signal at that time, we can easily communicate this model using the GSM AT command at the time of Slotting SIM from Network Operator. These GSM libraries have organized various modes of communication through the modalities. This GSM modem is capable of attempting with each GSM network operator SIM card is similar to a cellular phone with its individual exclusive cellular number. The advantage of using this modem can be to provide its RS 232 port facility and be able to

build embedded applications. Applications coming via SMS direct, data transfer, remote direct and classification can be easily developed using it. In addition, this model can be directly connected to a PC serial port or from any microcontroller to Max 232. It can be used to forward / accept SMS / outgoing / incoming voice calls. In addition, it is used in GPRS mode to unite with the Internet and runs many applications for information classification and control. In GPRS mode, we can contact any remote FTP server and upload files for notification classification.



**Figure 4: GSM module (SIM 900A)**

## 5. EFFICIENT COMMUNICATION

The microcontroller has been programmed to perform a maximum of three tasks: comparison, Timer, and Trigger. It takes two inputs from a smoke sensor and the second is the predefined threshold value specified by the government. When smoking sensor output is higher than the threshold value, then the microcontroller triggers the timer circuit and an alarm is set to inform the driver of the pollution in the vehicle and it will come in a halt condition. Semiconductor sensor is used to detect smoking, which ranges from 300 PPM to 1000 PPM. The sensor is associated with an ATMEGA16 microcontroller who has less conductivity in a clean environment.

When this sensor comes into contact with the pollutant, its conductivity generates an indication in the circuit that disables the motor. An automated SMS is also prepared by GSM module which is connected to the circuit. The GPS module can detect the location of the vehicle and the predetermined number stored in the space memory is sent.

## 6. RESULT AND DISCUSSION

The signals received from the smoke sensor are composed by the user defined point. When pollution level crosses threshold level then it appears in LCD and when it exceeds a certain point. Then it gives a buzzer sign when the motor is closed.

The table - 1 shows the sample results obtained from the system.

**Table 1: Monitoring the pollution levels**

Pollution levels	Output voltage	Motor condition
300 PPM	0V	ON
350 PPM	0.5V	ON
400 PPM	0.94V	ON
450 PPM	1.37V	ON
500 PPM	1.75V	ON
550 PPM	2.26V	ON
600 PPM	3.0V	ON
650 PPM	3.5V	ON
700 PPM	3.87V	ON
750 PPM	4.45V	ON
800 PPM	4.98V	OFF
850 PPM	5.21V	OFF
900 PPM	5.96V	OFF
950 PPM	6.49V	OFF
1000 PPM	7.89V	OFF

## 7. CONCLUSION

The concept of finding the level of pollution and pointing it to the driver is applicable. In the past few decades, the level of pollution has increased, which causes many environmental problems. There will be a big population, who do not take pollution sincerely from their vehicles, which has many environmental problems such as lack of ozone layer. Therefore, this system is extremely helpful in preventing this problem.

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