

Automatic PUC detection System

¹M. T. Kanawade (ME ELEX), ²Gundal S.S, (ME ELEX), ³Katariya S.S. (ME ELEX)

Assistant Professor, Electronics Dept., AVCOE, Sangamner.
Email ID : manjukanawade@gmail.com

Abstract: PUC System i.e. Pollution Under Control System is intended to check emission from in-use vehicles. If PUC is not regularly done, then it leads to incomplete combustion of fuel. This in turn leads to environmental pollution. The condition and roadworthiness of many on-road vehicles are highly unsatisfactory leading to higher exhaust emissions and road accidents. The application of PUC detection system is to detect and regulate emission of on road vehicles using communication technologies like GSM.

This paper aims to give a perspective of the present inspection and maintenance practices in India outlining the gaps and scope for improvement in the system.

Keywords: GSM, Regulatory check of pollution

I. INTRODUCTION

An efficient and transparent registration system is the backbone of an effective I&M system. Registration when inter-locked with periodic I&M system in a way compels the users to go for I&M on their own otherwise the users try to ignore I&M saying that I&M is cumbersome. Countries like India have a one-time registration procedure where the owner has to get his vehicle registered at the time of purchase of a new vehicle. Registration plays an important role not only in identifying a vehicle but also encourages I&M by making I&M a pre-requisite for it and also gives necessary statistics for designing the I&M system. Registrations when followed give a realistic data of the in-use vehicles thereby helping the planners to design an effective I&M based on actual figures of various vehicles running on road.

Periodic inspection is a practice where in-use vehicles are subjected to mandatory inspection at an approved test station at regular fixed time intervals. As is the case with India, vehicle owners in many countries try to avoid these tests due to the complications like lack of approved test stations, very time consuming tests, etc. and more importantly the system may not be very effective if it does not have a very good procedure of identifying the violators who still runs without getting the inspection done.

So this paper describes the system which would overcome the lacunae of the existing system.

Need of Project

Pollution Under Control (PUC) is the existing system of periodic I&M in India which is a mandatory requirement

for all categories of on-road vehicles including two wheelers. Under this system a PUC certificate is issued for a vehicle upon conformity to emissions based on idle test for Gasoline vehicles and free acceleration smoke test for diesel vehicles.

The present Pollution Under Control (PUC) system has number of lacunae owing to which the system is not effective in reducing emissions from on-road vehicles. Some of the associated problems with the system are:

- The test procedures currently used do not represent typical driving conditions, and hence the emissions levels measurement cannot be used to generate an emission profile of in-use vehicles.
- PUC center operators are not sufficiently trained.
- No auditing and quality assurance is carried out at the test centers and as a result the measurements are not reproducible from center to center.
- Scope for false passes exists in this system.

Over here we are trying to implement a new concept whereby we will be implementing the CO sensor in the vehicle itself and whenever the CO emission goes above a certain level an SMS will be directly sent to the RTO department and a fine will be levied.

II. LITERATURE REVIEW

Literature Survey

Emission Checking System Proposed by SIAM

The Society of Indian Automobile Manufacturers (SIAM) has proposed a computerized emission checking system to replace the existing PUC system in India. The main aim of the system is to bring accountability and reduce false passes in the process. The proposed system infact intends to reduce the human touch involved in the current PUC system and thus reduce malpractices which otherwise exist in the current system.

Testing Layout

The testing procedure still remains based on idle tests only. The general layout of the computerized testing system is given in Figure-2.1. In this system the gas analyzer is connected to a computer, which has a printer and a web camera attached to it. The emission values from the gas analyzer are directly sent to the computer

and simultaneously photograph of the number plate as identification of the vehicle is captured by the web camera. This emission data are to be stored in the computer and sent to the required departments on-line.

This computerized emission checking system is expected to achieve the following objectives:

- Eliminate/minimize malpractices currently in vogue with respect to issue of PUC certificates and minimize human intervention by computerizing the process.
- Improve credibility and acceptance of emission certification process, thereby establishing discipline on periodic maintenance and certification of in-use vehicles. This would help in keeping emissions from in-use vehicles under control.
- Establish a strong database of vehicles tested, which can be made use of by the government authorities for taking policy decisions.

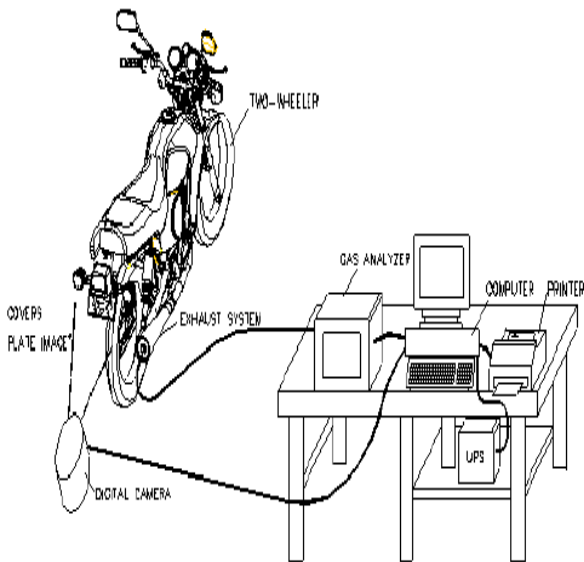


Fig 2.1. General Layout of the Computerized Testing System

Model Projects by SIAM

SIAM has set up model-computerized emission checking centers in five major cities as demonstration projects and is in the process of setting up few more centers. The state transport departments are closely monitoring these centers and cities like Delhi and Bangalore have shown interest in preparing a road map for converting all the existing PUC centers to computerized one. A typical emission test certificate from a computerized test center is shown in Figure-2.2

Automatic PUC Detection System



Fig 2.2. A Typical Test Emission Centre

I&M System Proposed by ARAI

The Automotive Research Association of India (ARAI) friendly software developed for continuous data acquisition from the analyzer and the mass emissions will be calculated based on the pre-determined software algorithms, specific to the vehicle model.

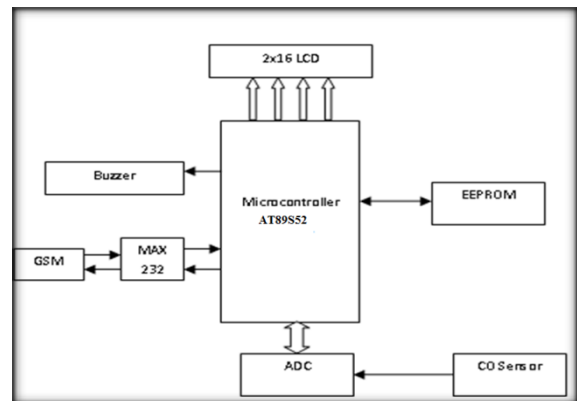


Fig 3.1. Block Diagram of PUC detection system has also proposed a system of Inspection & Maintenance of in-use vehicles as given in Figure-2.3.

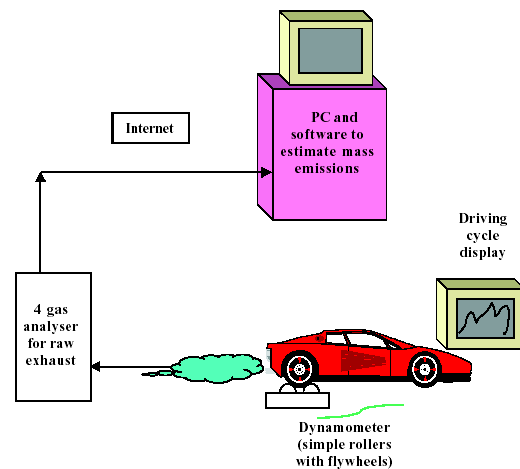


Fig. 2.3: ARAI Proposed I&M System

The system consists of a pair of rollers attached with mechanical flywheels, a 4-gas analyzer and a PC. The vehicle will be driven on the rollers as per the prescribed driving pattern and raw emissions will be measured using the 4-gas analyzer and the data will be transferred to PC continuously through the RS 232 port. There will be user The initial experiments carried out at ARAI have shown good correlation with the emissions measured by this system and the certification mass emission test system. However, more experiments need to be under taken to establish this correlation.

III. BLOCK DIAGRAM

Block diagram description

The basic block diagram of PUC detection system is shown in above figure. It consists of following important blocks.

1. **Microcontroller**
The microcontroller used here is AT 89S52 because it is easily available. The controller interfaces with the E2PROM using I2C protocol. I2C is a two wire protocol. When microcontroller receives signal from ADC about the emission level
2. **CO sensor**
CO sensor is used to sense the amount of carbon mon- oxide emission of vehicle. It is kept in the exhaust pipe of the vehicle.
3. **ADC**
MCP3201 is a single channel 12 bit ADC. The communication between ADC and microcontroller takes place using SPI protocol. The output of CO sensor is given to ADC which then converts the analog output of sensor into its digital value for the controller.
4. **EEPROM**
EEPROM, 24C02 has 2kb memory which is sufficient for storing the vehicle number, set

points and the master number i.e. the RTO department's number to which the sms has to be sent.

5. **16 X 2 LCD**
16 X 2 alphanumeric LCD displays sixteen characters in two lines each. It displays the CO emission level.
6. **Buzzer**
It is used to indicate a warning that the CO emission level is high.
7. **MAX 232**
MAX 232 is used for converting controllers 0 & 5 volts into RS 232 protocol's voltage level for communicating with GSM module.
8. **GSM module**
GSM module SIM 300 is used for cellular communication i.e. in this case it is used for sending sms to the master number.

REFERENCES

- [1] <http://cpcbenviis.nic.in/newsletter/Inspection/contents0503.htm>
- [2] http://www.epa.gov/reg5oair/mobile/auto_emis.html
- [3] <http://en.wikipedia.org/wiki/Pollution>
<http://www.pollutionissues.com/Ve-Z/Vehicular-Pollution.html>
- [4] http://en.wikipedia.org/wiki/Vehicle_emissions_control
- [5] <http://www.esskayinstitute.com/?page=complete-projects>
- [6] <http://www.hbeonlabs.com/projectsguidance.htm>
- [7] <http://www.efxkits.com/>

s◆◆◆