Smart PUC Monitoring System

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Abstract: *PUC Measurement system is used to check Concentration of Carbon mono-oxide in vehicle. When person visit PUC center to gen PUC certificate, he has to check concentration of CO in vehicle. First he swap RFID card in front of RFID reader, this 12 digit unique code along with concentration of CO in % is sent to RTO office using GSM modem. GSM modem connected to central PC station receives this SMS. Vehicle information is saved in access database against unique RFID card. If concentration exceed above limit auto SMS will be send to PUC center that servicing required for vehicle. Do not allow to PUC certificate. In this line of thought, the proposed PUC measurement system is implemented using micro-controller using GSM & RFID.*

Background: 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 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. Previously a mobile PUC system in which a PUC measurement device was connected to a vehicle itself which was giving an alert to a driver about CO proportion in the vehicle. But driver may ignore those warnings which will again cause a reason for pollution. In our system were trying to avoid all such things to make this process transparent.

Materials and Methods: In this Smart PUC Monitoring system designed & implemented through three different blocks i.e. RTO Server Center, PUC Center and Non PUC Vehicle Identity System. And these three blocks are dependently each other & workout with expected/targeted goal, also using different material/ devices to design this system as complete solution. Microcontroller, RFID, GSM Modem, LCD and many others.

Results: Smart PUC monitoring system reached to designed problem statement, implemented & all this process i.e. from reading taken to validation, checking respective vehicle has valid PUC certificate or not. It gives all perspective benefited like human being, RTO regulation & transparency and main is global warming perspectives.

Conclusion: This system is capable to measure the value of pollutant CO emitted by the vehicle continuously and sends report to RTO using GSM .RTO will check the concentration of CO and accordingly allow the PUC certificate. RFID reader is used to display owner's information on 16x2 LCD by reading serial number.

Key Word: *MQ-7 Sensor, GSM Module, RFID, PUC, Carbon Monoxide, RFID, NPVIS*

I. Introduction

The imperfect (incomplete) combustion in the engine of a vehicle leads to emission of different harmful gases leading to increase in the pollution and unfavorably affecting the environment. Detection and control of these gases emission source in the environment is an important area of work. Emission of these gases from vehicles cannot be completely avoided but, it definitely can be controlled. As a solution to the above problems, the system is proposed for emission level control of vehicle. The system is provided with the sensors, data from the sensors is used to make check the pollution level and accordingly the control action is carried out to control the pollution of the vehicle.

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 MQ7 sensor which is economical and capable of detecting Carbon Monoxide gas emitted from the vehicle. The sensed percentage or proportion is send to RTO office who will check whether CO proportion is more than limit or within a limit. If it is less than the limit or within a limit then it will send a message to PUC office as well as to owner of vehicle which includes whether certificate is granted or not. This is done with the help of GSM at PUC office. The Micro controller is used to transfer the information to the GSM system from the MQ7 sensor. There are two GSM modems involved one at PUC office and one at RTO office for communication. An RFID is used to collect the information of vehicle and owner with a particular serial number. This information will be displayed

on an information portal which nothing but a 16x2 LCD. The aim of this system is that to make PUC measurement process easy with various functions like information portal, RFID techniques & communication through GSM and to make this process transparent.

II. Material And Methods

In Smart PUC Monitoring System while working on different section for achieving the expected result as well as complete solution design for real time system for PUC monitoring & controlling the emission, so it will beneficial for human being in day to day life.

In this system major three main blocks in this research discovered as below in Generalize block diagram and these are namely as follows.
I] PUC Center
II] RTO Server Section
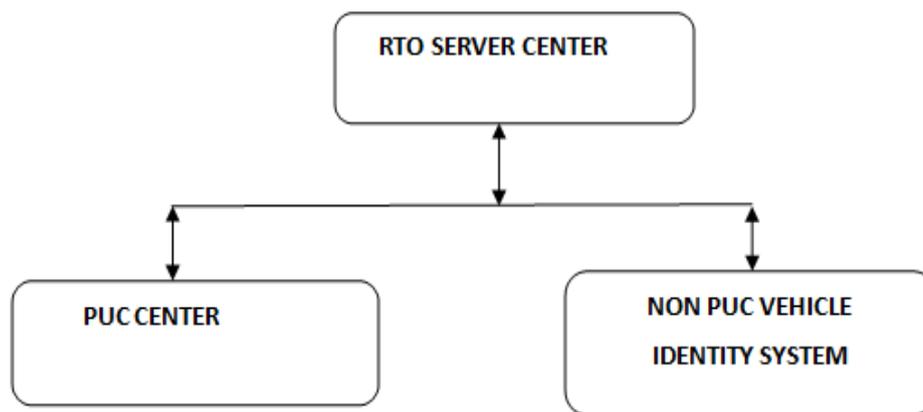III] Non PUC Vehicle Identity System

Fig1: Generalize Block Diagram

In More details going through the individual block diagram with working operation in brief one by one, so first will going through the PUC Center

I] PUC Center:
In PUC Center following steps are following for checking & validate the CO% in terms on reading as follows.
This unit is placed at authorized PUC checking center.
The RFID card is placed on vehicle
At PUC center, when vehicle is come for PUC certificate then RFID reader detect the vehicle number
Next step will be placing the carbon monoxide (co) sensor in the silencer, which detect the CO%
If Co% is in the specified limit, then the vehicle number will send to RTO server to update data through GSM modem.
If CO% is not in the specified limit then it will display rejected message on LCD display
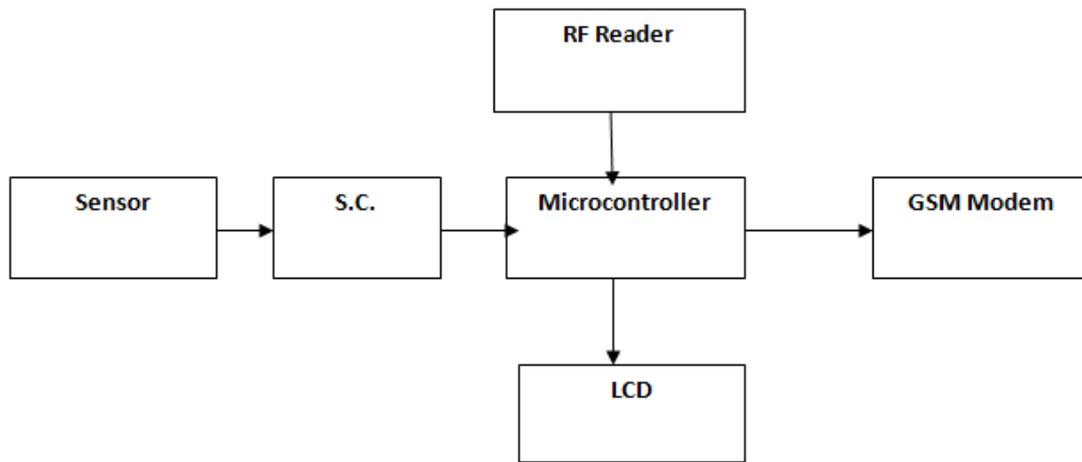
Fig2: PUC Center

II] RTO Server Section:
This unit is placed at RTO
When Data coming from PUC Center is stored in computer
Here updating of PUC certificate for particular vehicle is done
In computer, vehicle number with its carbon monoxide% and PUC validation period is stored
When data is coming from Non PUC unit, computer checks for PUC validation
If it is not updated, then vehicle number is send back to Non PUC unit using GSM

Fig3: RTO Server Section

III] Non PUC Vehicle Identity System (NPVIS):
Non PUC vehicle Identification System is nothing but the instrument that will be carried by Traffic Police
At signal when vehicle stops, this device will read the vehicle number and it will send it to RTO server for checking whether corresponding vehicle have valid PUC certificate or not.
If not then this unit received the number of those vehicles
So, Traffic Police easily catch then on signal itself and they do it necessary action on the respective vehicle owner
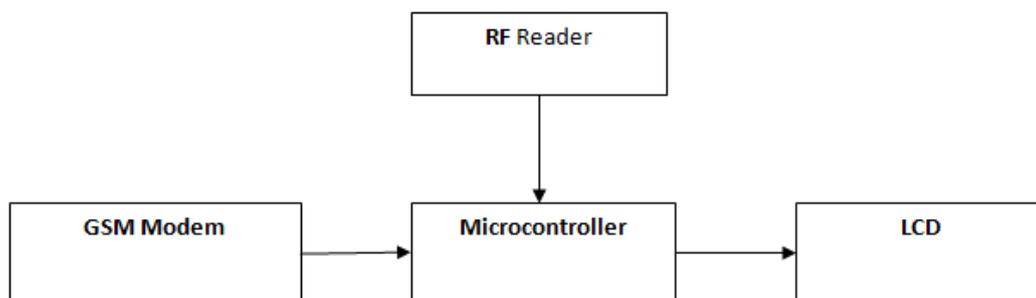Once Traffic police complete necessary action that data also captured in RTO server for future tracking purpose

Fig4: Hand Held Device (Non PUC)

In this system we are going to sense Carbon monoxide which comes out of vehicle . MQ7 is the CO sensor which will be used by us to detect concentration of CO in vehicle. First owner will swipe his RFID card which will let his display on 16x2 LCD. PIC16F877A is a microcontroller which are going to use to control all the parts of the system. Using MQ7 sensor concentration of is CO is get recorded and report will be sent to centre office or RTO using GSM. Concentration of CO will be checked by office, if it exceeds limit then certificate of PUC will not be allocated to that vehicle else allocated. The report of allocation or disallocation of PUC certificate will be sent PUC centre through GSM .SIM 900_RS232 is a GSM Modem interfaced to a micro controller. Carbon mono-oxide sensor is MQ7 sensor is interfaced to a micro controller to sense CO coming out from a vehicle.16x2 LCD is interfaced to a micro controller which going to be used as an Information Portal ,which will display the information of a vehicle, information of a owner and some other if needed. EM18 Reader module is going to be used in this system for reading a number from RFID card.

III. Result

Smart PUC monitoring system reached to designed problem statement, implemented & all this process i.e. from reading taken to validation, checking respective vehicle has valid PUC certificate or not. It gives all perspective benefited like human being, RTO regulation & transparency and main is global warming perspectives.

IV. Discussion

Pollution and especially air pollution has always been serious threat to the environment. One of the very important factors responsible for air pollution is the emission of gases from the vehicles such as CO which degrades the environment. A really important need here is to curtail the amount of harmful gases which are emitted from the vehicles. This can be done with the help of regular PUC checks of the vehicles but this method has proved to be a failure when undertaken by government authorities. Nowadays we see that the regular PUC checking system is not that accurate. Except at the petrol pumps, PUC checks at all other places are done at random basis. Sometimes PUC are issued merely on the basis of number of the vehicle without actual diagnostics of the vehicle. Besides this nowadays the tendency of keeping the vehicles maintained by regular services has disappeared. With the help of this system the random PUC checking, less awareness about PUC can be avoided and process could transparent means no one can interfere with the process in any way.

The display module is developed to provide the user interface, where the users of the system are capable of interacting with the system either through LCD display or through different applications for the vehicle owner and for the police control room. The LCD display displays the amount of pollution level of different polluting factors that are Carbon-monoxide, temperature and humidity. The sensed data of these factors is continuously displayed on the LCD display , which is kept inside the vehicle and in front of the driver. One application is developed for the user, which displays all pollutants information; in addition to this it will also displays the status of sending SMS to ensure that the message is sent successfully. One more application is developed at the police control room that retrieves data from the database and displays only one record for a day which indicates that one day of time is given to the vehicle owner for making the tuning of the engine. And It is the database maintaining module, which stores the information regarding the vehicle conditions by including the concentration of Carbon-monoxide, temperature and humidity. Along with this the vehicle id is also included in the database which acts as the primary key for the table; that can be uniquely identified. This key will also help to retrieve the data from the police application to take the necessary action. This database is capable of holding only those entries that do not exist for the same day; which indicates that for each day only one set of values for concentration of carbon-monoxide, temperature and humidity are stored for the vehicle of a particular vehicle id.

In the near future every vehicle will have its own PUC system which will be beneficial for both owner as well as the pollution control department

V. Conclusion

This system is capable to measure the value of pollutant CO emitted by the vehicle continuously and sends report to RTO using GSM .RTO will check the concentration of CO and accordingly allow the PUC certificate. RFID reader is used to display owner's information on 16x2 LCD by reading serial number.

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