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Modernisation of Pollution Control in Automobiles for Smart City using IC 922/920

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Abstract

All these vehicular populations are increasing exhaust pollution and particularly in metro smart cities as density of these vehicles is very high. The biggest threat of 21st century is the Global warming which have their source in vehicular and industrial emissions mainly like CO, CO2, black carbon, Sox, Noxetc. The spark plug which is the main part of our smart engine helps in combustion of fuel. Super air filter placed at the output of the silencer filters out and recognizes CO2 and CO emitted by the vehicles. Variations of these will be detected by CO sensors which sends information to the installed IC. This paper describes a new paradigm of pollution controlling using CO sensors and IC's particularly 922 or 920.

Keywords: *CO, Super air filter, IC 922|920, CO sensor*

INTRODUCTION

With the increasing population, vehicular population is also increasing. Vehicular emissions include a number of biologically active substances such as carbon monoxide, Sox, NOx. Certain air pollutants especially black carbon contributes not only to the global warming but also to regional climates. These air pollutants are responsible for number of adverse environmental effects such as photochemical smog, rising mercury, acid rain, death of rain forests, health hazards and reduced atmospheric visibility. The world wide concern over environmental air pollution with respect to smart engine

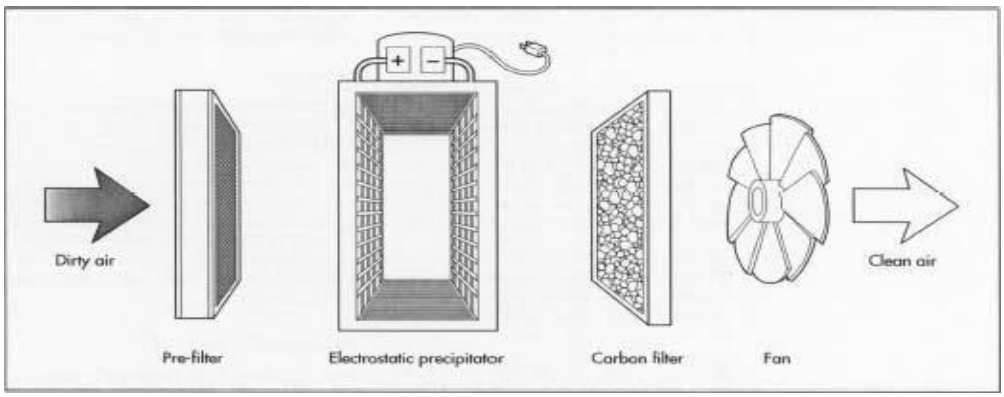
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begun by awaring about an atmospheric phenomenon known as photochemical smog formed due to reaction between nitrogen oxides and hydrocarbons producing harmful lachrymatory compounds. Initial progress was made in the field of emission control catalysts by the way of changes in combustion chamber and filter design coatings. But here we are concentrating on effective automation technologies just by concentrating on the heart of the smart engine system-spark plug.

Spark plug which is helpful in igniting air/fuel mixture is used in case of petrol engine. If in case of diesel engine air intake valve is used. But here we are focussing on the prototype of petrol engine by using spark plug. At the output of the silencer of the vehicle super air filter is placed. Super air filter is made up of fibrous materials which removes solid particulates such as dust,pollen,gaseous impurities from the atmospheric air. The amount of CO and CO2 emitted by vehicle is recognized and filtered out by this super air filter. If the CO and CO2 level increases it is detected by the CO sensor. It helps to sense carbon monoxide gas and prevents CO poisoning. Further this sensor sends the information to the installed IC 920/922.



Figure 1: CO sensor



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Figure 2: Super air filter

Description of IC:

The IC-920 and IC-922 are state-of-the-art capacitive discharge ignition system controllers especially designed for spark-ignited engines used in gas compression, electric power generation, and other industrial applications. The IC-920 controller provides standard-strike energy for up to 20 ignition coils, with an option for up to 24 coils available. The IC-922 controller provides "big-strike" energy for up to 20 (or optionally 24) coils. The IC-920 and IC-922 are ultra-high-energy ignition system controllers featuring user-controlled energy levels, advanced diagnostics, and an RS-232 ServLink interface for easy programming with a Windows® -based service tool. The controller system consists of a 16-bit CPU, sensor signal conditioning circuitry, a high-voltage power supply. and 20 (or optionally 24) outputs. The system can be configured from two cylinders to 20 (or 24) cylinders. The unit software can be configured for any type of industrial engine. There is never a requirement for factory reprogramming of software. All user programming/configuring is accomplished via a Windows-based computer program. The IC-920/IC-922 uses information provided by three timing sensors (position of crankshaft and camshaft and speed of the engine) to precisely determine when and which cylinder should fire. The ignition timing of the engine is controlled by operator inputs, such as two manual timing potentiometers, a 4–20 mA signal, a 0–5 Vdc signal, or a five-point speed curve. Engine operators can adjust spark energy levels for precise spark control and to optimize spark plug life. And to assure good combustion in lean-burn and other misfire-prone applications, the IC-920 and IC-922 controllers are capable of providing very high levels of energy output. The single-strike IC-920 controller is adjustable up to 170 mJ of stored energy, the big-strike IC-922 model is adjustable up to 340 mJ of stored energy. While the IC-920/IC-922 is operating, the unit continuously monitors the status of the ignition system by verifying proper information from all timing sensors and proper operation of the primary ignition circuit. Depending on the severity of the fault, the unit will either shut down or warn the operator. In both cases, a message is transmitted via a serial link to a PC. Some faults are also annunciated via an auxiliary output. In addition to protecting the engine from ignition faults, the IC-920/IC-922 also has a user programmableover speed set-point shutdown. The 20-cylinder versions are

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suitable for four-stroke engines having rated speeds up to 1800 rpm, and two-stroke engines rated up to 900 rpm. The 24-cylinder versions are suitable for 1500 rpm (four-stroke) or 750 rpm (two-stroke) operation.



Figure 3: Diagram of IC 922/920

Features:

The IC-920/-922 is a versatile ignition control that is user configurable for a variety of engine installations. A single IC-920/-922 ignition control can be configured to fit numerous engine makes, models, and sizes. The IC-920 family of ignition controls derive their power from a 24 Vdc battery power distribution system with a steady state range of 18–32 Vdc. The IC-920 family accepts three magnetic pick-up signals. Typically two of the sensors are variable reluctance type (passive), and the third sensor is an active proximity or Hall effect sensor. These pick-up sensors indicate the position of the camshaft, the position of the crankshaft, and the speed of the engine. Using pre-programmed timing sequences, the CPU in the IC-920 family controls the ignition timing of up to 24 ignition outputs. The ignition outputs are connected to the primary windings of industrystandard CD ignition coils. The IC-920 family ignition drivers are designed to work with industrial engines that require between 2 and 24 separate CD ignition coil outputs. A CD ignition coil output is intended to connect to the primary side of a CD ignition coil. The firing sequences are user programmable.

Timing Control:

Ignition timing of the IC-920 family can be biased (advanced or retarded) in real time based on a potentiometer setting, a 4–20 mA or 0–5 Vdc signal, or a 5-point speed map. The speed map allows the ignition timing to be varied relative to the CPU-calculated engine speed. The global timing can be set for a maximum span of 60° crankshaft. The most advanced timing is limited to 10° less than the distance from the reset location to cylinder one. Universal timing limit values are programmed for the earliest (most advanced) and latest (most retarded) timing points. The universal timing limits override any combination of the timing

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variation inputs that exceed these limits. Individual Cylinder Timing Offsets: Because of the unique circumstances for each engine configuration, the IC-920/-922 allows run-time energy adjustment for each (odd and even) primary output. It is possible to adjust the individual cylinders within a range of +/- 3° crankshaft.

Accuracy The IC

The 920 family timing accuracy is ±0.17° crankshaft at rated engine speed up to 1800 rpm (four-stroke) or 900 rpm (twostroke). A deviation of ±1.0° crankshaft is not be exceeded throughout the entire speed range (50–2200 rpm). In the event that a trigger signal coincides simultaneously with the output of a firing pulse, an accuracy of ±0.17 ° crankshaft is maintained.

When the carbon monoxide level increases this IC detects and blocks ignition by controlling sparkplug. If the emission reaches 75% and more than it, the information is sent to owner of the vehicle alerting him/her to undergo emission test.Even after the alerting the owner doesn't turned up then; the vehicle stops functioning. If the vehicle passes the emission test automatically the collection of CO and CO2 in the filter will be reduced and again the IC senses and sends the information to the installed IC 920/922. And the spark plug works for ignition of fuel.

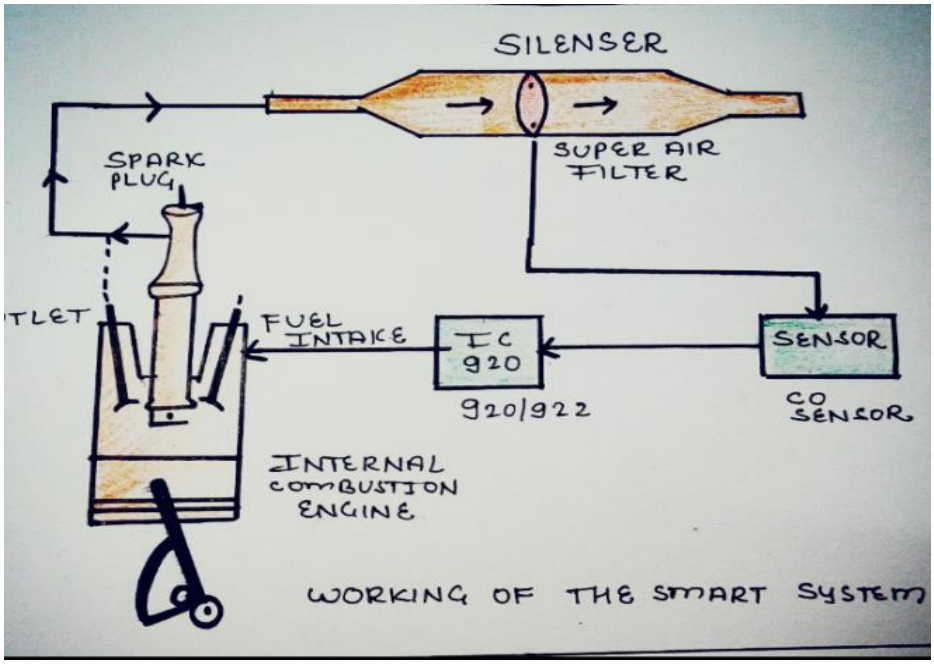


Figure 4: Schematic presentation of working of smart system

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CONCLUSION

Global warming is one of the serious environmental concerns in the urban Indian smart cities, where majority of population are exposed to poor air quality. The health related problems such as respiratory diseases ,risk of developing cancers and other serious ailments,etc are known due to this and well documented.

The pollution level can be minimized by use of technical and innovative methodologies and one is the this, which is an eco-friendly methodology helps to control pollution from vehicles to major extent. Its cost is very economical. It can be implemented in vehicles so that the owner can recurrently understand his/her vehicle condition and go for an emission test. If this is the scenario we can prevent global warming in our smart city.

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