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Report on modification of I.C.Engines

[1] Shivaprasad Reddy. K, [2] M. Devaiah, [3] N. Satya Guha
[1,3] Students IV Year B.Tech, Department of Mechanical Engineering, Geethanjali College of Engineering and Technology, Hyderabad, India.
[2] Professor Departments of Mechanical Engineering, Geethanjali College of Engineering and Technology, Hyderabad, India.

Abstract: **-- Depleting Natural resources and Global warming has become a very huge challenge for mankind and one of the reasons for environmental degradation is emission of harmful gases due to incomplete combustion or over combustion of the fuel. The problem is becoming severe day by day because of increase in the vehicular density. Numerous solutions have been proposed till date to overcome this challenge. In this paper, the effects of engine on nature how it acts under the manipulation of strokes (internal combustion engine convertible from two-stroke to four strokes or vice-versa). With this mechanism air charged from high pressure receiver charges the engine through the electric valve independently of the fuel and enables, due to a great difference in pressures, fast performance of the process eliminating the intake and compression strokes which results in a two-stroke cycle operation. This downsizing leads to a 30% reduction in fuel consumption and correspondingly lowered emissions. Replacing the mechanical exhaust valve with the electric valve enables switching from two-stroke to four-stroke mode of operation and vice versa only by the electronic instruction which is either by manual operated command or by pre-installed electronic device with the valve timing commands similar to E.C.U. Location of the fuel nozzle directly in the compression chamber and its operation independently from the electric air valve enable use of the petrol, diesel, gas and oil. Thereby, Increases the overall performance of the engine..**

Keywords **- I.C. Engine, two-stroke, four-stroke, E.C.U, Valves, mechanism, convertible.**

I. INTRODUCTION

In today's world, there are more number of vehicles on road than before. On an average, every house in developed and developing country has at least one two or four-wheeler at their home. Cost escalation and increase in demand of the crude petroleum and failure to invent an alternative source of fuel are the current day problems. Added to this, petrol products when burned in an engine emit harmful effluents as exhaust. Numerous researchers around the world are involved in the field of developing alternate fuels and to reduce emission by external means like use of catalytic convertors and engine modifications. In this present research worka solution enabling the engine designed as a four-stroke engine to operate both as a two-stroke and a four-stroke engine. This means that the respective mode of operation, powerful or economic, can be chosen depending on the situation in the traffic. This engine can also operate either on petrol or Diesel as well as on the atmospheric or compressed air pressure or compressed natural gas.

II. THEORY ON STROKES OF ENGINE

A four-stroke engine (also known as four-cycle) is an internal combustion engine in which the piston completes four separate strokes which comprise a single thermodynamic cycle. A stroke refers to the full travel of the piston along the cylinder, in either direction. The four separate strokes are termed:

INTAKE: this stroke of the piston begins at top dead centre. The piston descends from the top of the cylinder to the bottom of the cylinder, increasing the volume of the cylinder. A mixture of fuel and air is forced by atmospheric (or greater) pressure into the cylinder through the intake port.

COMPRESSION: with both intake and exhaust valves closed, the piston returns to the top of the cylinder compressing the air or fuel-air mixture into the cylinder head.

POWER: this is the start of the second revolution of the cycle. While the piston is close to Top Dead Centre (TDC), the compressed air–fuel mixture in a gasoline engine is ignited, by a spark plug in gasoline engines, or which ignites due to the heat generated by compression in a diesel engine. The resulting pressure from the combustion of the compressed fuel-air mixture forces the piston back down toward Bottom Dead Centre (BDC).

EXHAUST: during the exhaust stroke, the piston once again returns to top dead centre while the exhaust valve is open. This action expels the spent fuel-air mixture through the exhaust valve(s).

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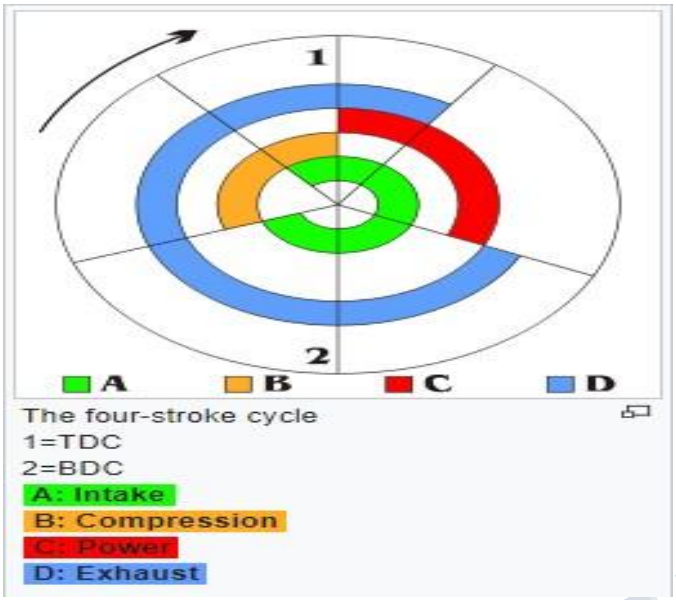
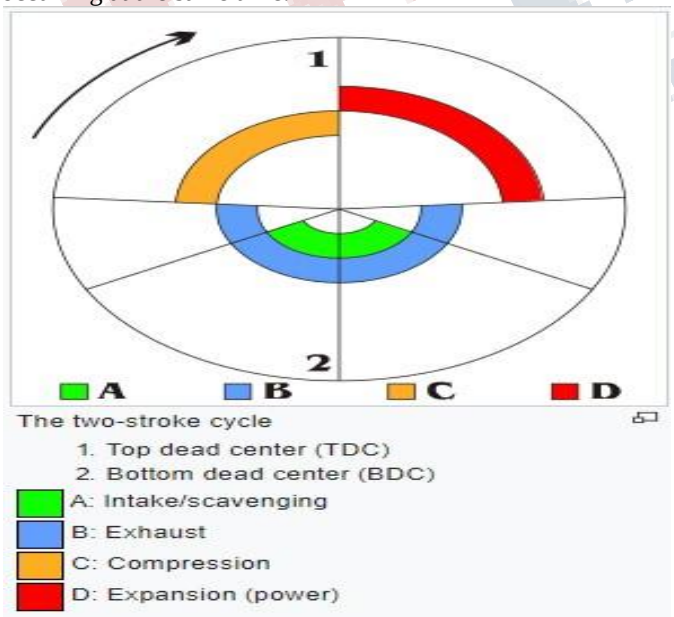


A two-stroke (or two-cycle) engine is a type of internal combustion engine which completes a power cycle with two strokes (up and down movements) of the piston during only one crankshaft revolution. This is in contrast to a "four-stroke engine", which requires four strokes of the piston to complete a power cycle during two crankshaft revolutions. In a two-stroke engine, the end of the combustion stroke and the beginning of the compression stroke happen simultaneously, with the intake and exhaust (or scavenging) functions occurring at the same time.



III. EXPERIMENTAL METHODOLOGY

Novelties in the design of this engine are: its air compartment receiver under the pressure of several tens of bars; its air charger; use of the electric valve (instead of the mechanical intake valve) not only for the passage of air but for the pressure reduction as well; the exhaust valve which can be executed in several versions. Such changes enable the essential feature of this invention i.e. elimination of two strokes in the working cycle: intake and compression. The result is operation in a two-stroke mode in a completely new way. Whether the engine is going to operate in a two-stroke or a in a four-stroke mode depends on the exhaust valve; when it is a classic, camshaft driven valve, the engine operates exclusively as a two-stroke engine but if it is an electric valve, with the orifice or a classic electrically driven valve (computer controlled in both cases), the engine can operate both as a two-stroke and as a four-stroke engine. Electronic process control enables choice of the mode of operation during the drive: powerful-two-stroke cycle or economic-four-stroke cycle. The air pressure of several tens of bars which is charged to the engine from the air compartment receiver and computer controlled quantity and pressure of the air portion which is charged to the cylinder enable the engine to behave as a compressed air engine i.e. enable increase of its power output for more than two times. Separate air and fuel nozzles enable use of all types of fuels which are currently in use for ICE. The essence of this invention is the principle of engine operation, performance of the processes in a way which has not been applied, yet. This requires introduction of new solutions in its design. They comprise: high pressure air compartment receiver which is air charged from the compressor K; electric air intake valve which acts as a pressure reducer as well; electric exhaust valve (which can replace the camshaft driven mechanical valve), executed in two versions: version a which is executed as a classic type mechanical valve with the electric drive and version b executed as the electric valve with orifice. The description of the process shows theoretic features e.g. the spark plug sparks in the top dead centre, the exhaust valve opens in the bottom dead centre and closes in the top dead centre. In practice, all this is displaced and depends on what the engine is intended for. Then, all the explanations refer to the engine on petrol while when Diesel fuel is used, some differences in design are required but the principle of operation remains the same. Electronic chip also controls the air pressure in the cylinder in accordance with the instructions so that the engine can behave either as the atmospheric and as a turbocharged engine or super charged.

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The design with separated air and fuel nozzles controlled by the electronic chip enables application of this principle in all ICE which operate on the fuels known by now: petrol, gas and oil. And with the help of an effective catalytic converter coupled up with this electronic chip can result in much lowered or zero emissions and create an eco-friendly environment which is quite suggestible to implement in developing countries like India.

IV. RESULTS AND DISCUSSIONS

Prototype engine configuration, the research prototype engine is based on a single bank of a 2.1 litre V6, which in 6 cylinder 2/4SIGHT configuration is intended to deliver levels of performance and driveability more usually associated with a 3-4 litre V8 gasoline engine. In order to enable the project team to assess control strategies in a completely unrestricted manner, an electro-hydraulic valve (EHV) actuation system was used for the prototype development rig. The air handling system of the 2/4SIGHT concept is based on two-stage boosting and intercooling using a Vortex supercharger and Honeywell turbocharger. For simplicity in the initial test bed prototype configuration however, boosting is provided by an external compressed air supply. The engine control system of the prototype is a DENSO rapid prototyping system working with DENSO gasoline direct injection and ignition components. The prototype engine was built at the Ricardo Shoreham Technical Centre and installed for testing at the Sir Harry Ricardo Laboratories of the University of Brighton. Development test results, Testing of the prototype 2/4SIGHT engine has enabled development and validation of the combustion system which has been optimised for operation in both two and four-stroke modes. The flexibility of the advanced control system – developed jointly by DENSO and Ricardo – allows rapid changes to high level code which, coupled with the flexibility of the EHV valvetrain, has enabled the project team to develop and optimise a new control strategy for the 2/4SIGHT engine, including the management of two-four-stroke switching.

Highlights of the development test results include:

* Smooth and reliable switching between two- and four-stroke modes under both constant torque conditions and transient operation.
* Control strategies amenable to implementation in cost-effective mechanical valvetrain hardware.
* Extremely high two-stroke specific torque demonstrated of 150 Nm/L at 1000 rev/min and 230 Nm/L at 2500 rev/min, opening the prospect of highly aggressive engine downsizing using the2/4SIGHT engine concept.The baseline vehicle for the study was an 1800 kg passenger car sold in the European market with a 3.5 litre naturally aspirated V6 gasoline engine and 5 speed conventional automatic transmission with torque converter. To verify the validity of the models and input data, the baseline vehicle fuel consumption results were compared with published data, which were reproduced by the model to an acceptable accuracy of 1%.

The simulation results indicate that vehicle acceleration performance, including launch from rest, can be maintained with a 2.0 litre V6 2/4SIGHT gasoline engine replacing the 3.5 litre baseline powerplant. This would deliver fuel savings of 27% over the New European Drive Cycle (NEDC) and would reduce the vehicle CO2 emissions of the baseline from 260 g/km to 190 g/km.

V. CONCLUSION

In context to the paper, I consider with the intake manifold fuel injector directly placed in to the combustion chamber various fuel(petrol/gasoline, diesel, CNG/LPG) can be used rather than being limited to just one sort of fuel. With the additional component, catalytic converters lessen the amount of flue released in to atmosphere and better functioning of the mechanism of turbocharging or supercharging. The co2 emissions of the baseline can be reduced from 190gm/km to even less by 10-40gm/km. and the fuel consumption rate reduced to 30% of the regular existing conditions of engines, that is 3% more than what has been achieved till now by the Ricardo testing& create an eco-friendly environment which is quite suggestible to implement in developing countries like India.

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