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A REVIEW ON ADVANCED ENGINES TECHNOLOGY

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ABSTRACT

This paper highlights the technical aspects and the working of the advanced technologies used in the present or can be used in the future automobiles. The technologies that are discussed in this paper are variable valvetiming, Valvetronic Engines, Downsizing and Turbocharging, volt systems, Advanced combustion modes. A critical analysis with the advantages and disadvantages of these technologies are made in the paper. A final conclusion is drawn that once these technologies are in the market they will not only help in providing better modes of transport but will also help in reducing our dependence on conventional fuels.

Keywords: Advanced Combustion, Downsizing, Turbocharging, Variablevalve Timing, Valvetronic Engines, Volt Systems,

I. INTRODUCTION

The factors for improvementin engine technology are changing customer expectations, new environmental regulations & noise, increased fuel costs, availability of alternate fuels, new emerging markets and cut throat competition. These drivers are causing researchers to think in the direction of more efficient and economical technologies.The above mentioned objectives were obtained by bringing changes in the engines or by fitting it with improved parts in the automobile. This not only improves market value of a vehicle but opens new areas
Of researches. Working along with advantages and disadvantages of some of the technologies are discussed in the paper.

II. VARIABLE VALVE TIMING

Variable Valve Timing (VVT) is a generic term for an automobile piston engine technology. VVT allows the lift or duration or timing (some or all) of the intake or exhaust valves (or both) to be changed while the engine is in operation.Two stroke engines use a power valve system to get similar results to VVT.The VVT-i system is designed to control the intake camshaft with in a range of 50°(of Crankshaft Angle) to provide valve timing i.e. optimally suited to the engine condition .This improves the torque in all the speed ranges as well as fuel economy ,and reducing exhaust emissions.This system controls the intake camshaft valve timing so as to obtain balance between the engine output, fuel consumption & emission control performance. The actual intake side valve timing is feedback by means of the camshaft position sensor for constant control to the target valve timing.modern engines with VVT allow for example the default low RPM range of the engine to have more economical timing,and the higher RPM range to go max power.This allows a smaller displacement engine to produce more peak power,so it allows for downsizing and fuel savings.VVTL-I allows continuously varies the timing of the intake and exhaust valves by switching between two different sets of cam lobes.

2.1 Advantages

- Improved torque & output
- Battery & fuel economy
- Reduced nitrogen oxide & hydrocarbon emissions

III. VALVETRONIC ENGINES

Compared with conventional twin-cam engines with finger followers,Valvetronicemploys an additional eccentric shaft, an electric motor andseveral intermediate rocker arms, whichin turn activates the opening and closingof valves. If the rocker arms push deeper, the

intake valves will have a higher lift, and vice-versa. Thus,Valvetronic has the ability to get deep,long ventilation (large valve lift) and flat, short ventilation (short valve lift),depending on the demands placed on the engine. intake valve with valvetronic . the fuel/air mixture is controlled by a variable valve lift, without a throttle plate.Cylinder heads with Valvetronic use an extra set of rocker arms, called intermediate arms (lift scaler.)positioned between the valve stem and the camshaft. These intermediate arms are able to pivot on a central point, by means of an extra, electroniclyactuated camshaft. This movement alone, without any movement of the intake camshaft, can open or close the intake valves.The Valvetronic system is based on BMW's established double VANOS system, which steplessly varies the timing of both the inlet and exhaust cams. However, the Valvetronic system adds variable valve lift to the inlet cam, achieved by the use of a lever positioned between the camshaft and the inlet valves. Valvetronic varies the timing and the lift of the intake valves. TheValvetronic system has a conventional intake cam, but it also uses a secondary eccentric shaft with a series of levers and roller followers, activated by a stepper motor. Based on signals formerly taken mechanically from the accelerator pedal, the stepper motor changes the phase of the eccentric cam, modifying the action of the intake valves. An additional eccentric shaft alters the lever's distance from the camshaft, with the eccentric's position determined by a worm drive from an electric motor. The position of the lever converts the cam action into a smaller or larger valve lift, as requested by the engine management system. Intake vale lift can be altered from a minimum of 0.25mmto a maximum of 9.7mm, with the electric motor adjusting the eccentric shaft in 0.3seconds.Because the intake valves now have the ability to move from fully closed to fully open positions, and everywhere in between, the primary means of engine load control istransferred from the throttle plate to the intake valve train. By eliminating the throttle plate's "bottleneck" in the intake track, pumping losses are reduced, fuel economy and responsiveness are improved.

Advantages

- Fuel economy increased
- Perfectly suited for all fuel grades
- Anti-knock control for running on all fuel grades between 87 and 99 octane.
- Maintenance-free ignition systemwith individual coils.

Disadvantages

Facing such a high standard of software and hardware complexity, a manufacturer obviously also runs a greater risk of making mistakes. It is essential to acquire a sufficient stock of data under all kinds of operating conditions in order to understand how such a new system behaves. However, such data cannot be provided by the usual sequential test runs. All-round, general use of the latest direct-injection technology, in turn, faces some significant drawbacks such as costs, the need to make the combustion process very robust and the potentials in exhaust emissions treatment.

IV. DOWNSIZING AND TURBOCHARGING

4.1Downsizing

Downsizing forces the engine into higher load operation with better mechanical efficiency andreducedpumping losses. This permits the engine's power and torque to increase (thus responding to newmarket demand or compensating for increased vehicle weight) without increasing cylinder capacity. As an alternative, engine capacity may be reduced whileproducing the same power. Reducing engine capacitywith the same power permits reducing fuel consumptionthanks to three factors: a) Reducedpumping losses (i.e. less volume is swept on each engine revolution, higher average load on driving cycle, higher average intake pressure); b) Reduced gas-to-wall heat transfer (i.e. reduced internal surface area as well as shorter flame travel distance and faster combustion resulting in reduced gases-wall heat exchange duration); and c) Reduced friction losses and smaller moving parts. The technologies available vary considerably as do theirCosts and associated CO2 emission reductions (see Tables 3 and 4). While they are already available on them market, these technologies still have considerable innovation potential in the short to medium term.

4.2Turbocharging

Novel turbocharging systems allow downsized diesel engines to provide improved fuel efficiency and a similar (or better) performance than conventional larger engines. A good example is the twin sequential turbocharging system that is being used by major car manufacturers. It consists of two differently sized turbochargers operating at different engine speeds. They enhance fuel efficiency, and improve the generation of lean fuel/air mixtures in the engine, as well as the vehicle drivability.. Manufacturers are starting to deploy the novel turbocharging systemsA downsized and turbocharged engine has the potential to have the same or better performance as a non-downsized, normally aspirated engine, with the advantage of a significant increase of fuel efficiency.

V. CYLINDER DEACTIVATION

By deactivating half of the cylinders, the remaining active cylinders operate at twice the load that the engine would normally operate at if all cylinders were active. This reduces the pumping losses and improves fuel consumption. Engines with cylinder deactivation can be found in several vehicles under various trade names such as Multiple Displacement System (MDS) and Active Fuel Management (AFM). To date, cylinder deactivation has been applied to V6, V8, and V12 engines. Mitsubishi applies cylinder deactivation to a 4-cylinder engine (MIVEC system), while Mercedes applies the technology to its V8 and V12 engines.

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VI. VOLT SYSTEMS

All mechanical control system will be electrically controlled in near future. This includes air conditioning systems, steering, suspension systems water pumps, alternators and windshields. start- stop engines are also in the phase of development. There are even projects in place for the implementation of heated catalysts to further reduce vehicle emissions. Conversion of these mechanical systems will allow for further vehicle weight reduction and increased fuel efficiency as well as provide highly desirable and profitable consumer features.Latest next generation Chevrolet volt combines stunning design and incredible efficiency,offering up to 85 km on electric on a single charge fig.(1).While themajority of hybrid-electric vehicles (HEVs) on the road today use nickelmetal hydride (NiMH) battery technology, the Chevrolet Volt extended-range electric vehicle (E-REV) will be powered by a 16kWh lithium-ion battery packmanufactured by GMand comprising more than 200 lithium-ion cells. Lithium-ion batteries provide nearly two to three times the power of a NiMH battery in amuch smaller package.The new volt is quicker.0-96km/h in 8.4 seconds.weighing 104 kg(230 lb.) less than the first generation volt helps improve performance and reduce energy consumption.

Fig.(1)

VII. HOMOGENEOUS CHARGE COMPRESSION IGNITION

(HCCI) – In the HCCI systems the fuel-air mixture is ignited simultaneously throughout the entire volume of the cylinder, rather than being centralized at the fuel injector. HCCI combustion occurs much faster than conventional combustion. This leads to significantly higher peak pressure and a relatively lower peak temperature inside the combustion chamber. The lower temperature reduces NOx emissions, and the higher peak pressure allows a leaner fuel-air mixture (less fuel) to be used to obtain higher efficiency. As a consequence, emissions of CO2 can be reduced by 18- 21% while CO and various unburned hydrocarbons are produced in amounts comparable to a conventional gasoline vehicle and may be considerably reduced using ordinary exhaust treatment methods. Currently, no HCCI engines are being produced commercially. A number of motor manufacturers, including General Motors, Volkswagen, Honda, and Mercedes-Benz are all believed to have fully operating prototypes. While some estimate that this technology is close to commercial application it may not be until about 2015before it is commercially available.fig.(2) shows combustion in HCCI engine with respect to disel and petrol engine.

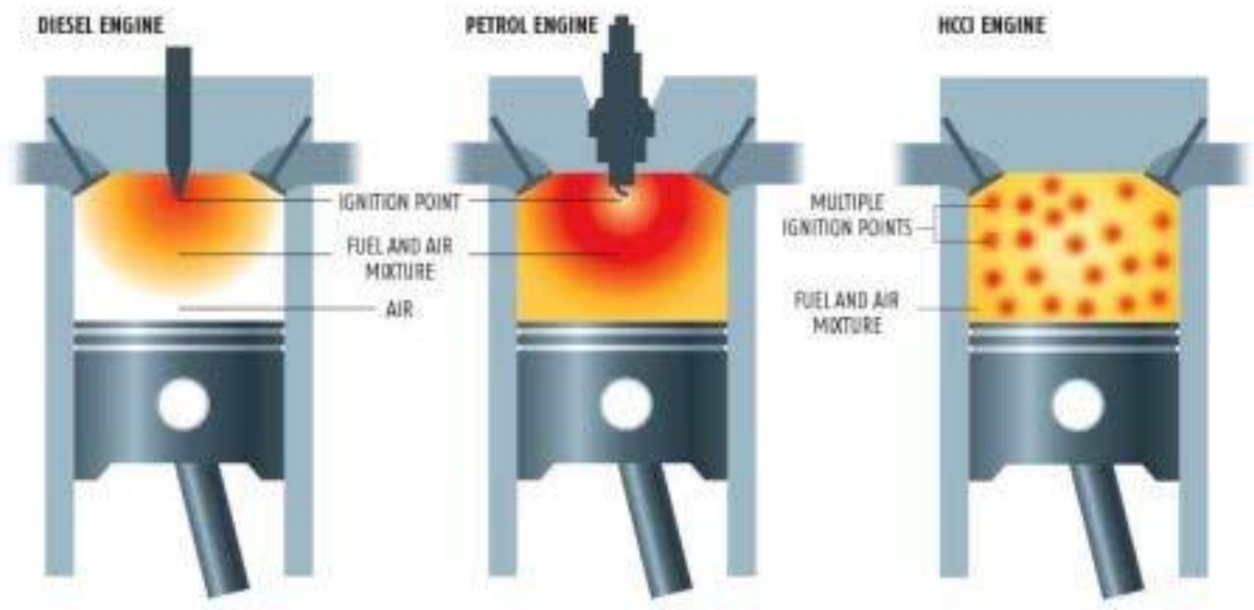

Fig.(2)

VIII. CONCLUSION

Different advanced technologies were studies and there benefits were presented along with their working. Technologies like VVT, valvetronic Engines,advanced combustion mode likeHCCI engine allows better combustion and power with savings in fuel. Downsizing and turbocharging,volt systems makes engine lightweight and powerful.This all new technologies make advanced engine with better fuel economy ,reduces our time, cost and dependence on conventional fuels.

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