Issue 1 vol 4 ISSN: 2321-8134

IJFEAT

INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

REVIEW ON CAMLESS ENGINE

V. B. ASKAR[1], J. V. RASEKAR[2], Y. B. WANDHARE[3], N. H. BANDURKAR[4]

[1]UG Student, Mechanical Engineering, JDIET Yavatmal, Maharashtra, India**, vinitaskar00@gmail.com**
[2]UG Student, Mechanical Engineering, JDIET Yavatmal, Maharashtra, India, **jaggurasekar105@gmail.com**
[3]UG Student, Mechanical Engineering, JDIET Yavatmal, Maharashtra, India, **yogeshwarwandhare@gmail.com**
[4]UG Student, Mechanical Engineering, JDIET Yavatmal, Maharashtra, India, **nitinbandurkar5647@gmail.com**

Abstract

The internal combustion engine (ICE) finds its place in the market with latest design modifications in various components to improve efficiency, economy and overall performance. However, one component has remained unchanged in the internal combustion engine development i.e., the camshaft, has been the primary means of controlling the valve actuation and timing, and therefore, influencing the overall performance of the vehicle. But if we look in the approach to increase the efficiency of the engine any further, the progress must be done in the alternate option to the cam that is in the way of the camless engine. Cam operates the opening and closing of the intake of air/fuel mixture and exhaust gases removing from the combustion chamber of the engine. Cam performs the actuation of the push rod to supply the charge as well for the exhaust gases removal. The timing of cam is important factor in the valve timing of the engine but if the time taken by the cam is further reduced then the efficiency of the engine will surely increase. This paper also implies the loses due to cam which may be reduced by the application of solenoid circuit, a PID controller is used to track the valve motion trajectory during steady state operation and transient state operation of the engine advanced robust controllers can be used to improve the performance of the system considering the electromechanical and electrohydraulic actuators as the important types of actuating valves in camless engines. The mechatronics circuits plays important role in the time saving of the system that send electrical impulses in the form of wave signal in microseconds and all the data is stored in the microcontroller so no need to adjust the valve timing as it will be saved for further events of the engine.

Index Terms: *Cam, pushrod, engine, microcontroller, camshaft etc.*

---------- *** ----------

1. INTRODUCTION

The recent trend of replacing the traditional mechanical systems in the automotive internal combustion (IC) engine with mechatronic systems has been primarily motivated by the decreasing supply of fossil fuels and the increasing concerns about the environment. The engines powering today's vehicles, whether they burn gasoline or diesel fuel, rely on a system of valves to admit fuel and air to the cylinders and let exhaust gases escape after combustion. Rotating steel camshafts with precision-machined egg-shaped lobes, or cams, are the hard-tooled "brains" of the system. The removal of the camshaft and the use of individual actuators for opening and closing the engine valves will enable the ultimate flexibility in the air-management system of an IC engine. They push open the valves at the proper time and guide their closure, typically through an arrangement of pushrods, rocker arms, and other hardware. One commonly adopted approach is to sacrifice the ability to fully influence the shape of the valve motion profile to simplify the control requirements A single overhead camshaft (SOHC) design uses one camshaft to move rockers that open both inlet and exhaust valves. The double overhead camshaft (DOHC), or twin-cam, setup does away with the rockers and devotes one camshaft to the inlet.

2. LITERATURE REVIEW

Camless internal combustion engines offer major improvements over traditional engines in terms of efficiency, maximum torque and power, pollutant emissions. Electromechanical valve actuators are very promising in this context, but still present significant control problems. Low valve seating velocity, small transition time for valve opening and closing, unavailability of position sensor are the main objectives to be considered in the design of the valve control system.

M.S. Ashhab et al. [1] This work presented an aluminium in micro-EDM by varying gap voltage, capacitance and feed rate. They concluded that more variation in MRR was observed due to capacitance compared to others. They used ANN and SA as optimization techniques. This work presented an innovative actuator consisting of a piezo, a

displacement ratio, a mechanical servo and a hydraulic valve piston for motion control in camless engine applications

Nowadays the proposed configuration of the EMVA, in camless engine, consists of the electromechanical device, valve springs, the armature, and position sensor. As an application for internal combustion engine, the specific requirements such as moving speed, accepted noise, and minimized volume space are primary concerned.

The British company Camcon Technology is developing a camless engine for passenger vehicles based on their proprietary Intelligent Valve Actuation (IVA) system. Camcon has collaborated with Jaguar Land Rover to fit IVA onto an Ingenium 2.0l 4 cylinder petrol engine and they jointly published results at the 2017 Aachen Kolloquium; their paper is available on the Camcon website. Camcon also discussed features and benefits in an article and video that was published in Autocar magazine. "New Valve Technology gives Petrols the Efficiency of Diesels"

3. WORKING OF PUSH ROD ENGINE

Pushrod engines have been installed in cars since the dawn of the horseless carriage. A pushrod is exactly what its name implies. It is a rod that goes from the camshaft to the top of the cylinder head which push open the valves for the passage of fuel air mixture and exhaust gases. Each cylinder of a pushrod engine has one arm (rocker arm) that operates the valves to bring the fuel air mixture and another arm to control the valve that lets exhaust gas escape after the engine fires. There are several valve train arrangements for a pushrod.

4.1 CRANKSHAFT

Crankshaft is the component that is connected to the piston though the piston rod. It transfers the power from the piston to the transmission. It is able tp perform conversion between reciprocation motion and rotational motion. It is typically connected to a flywheel to reduce the pulsation characteristics of the four stroke cycle.

4.2CAMSHAFT

The camshaft provides a means of actuating the opening and controlling the period before closing, both for the inlet as well as the exhaust valves, it also provides a drive for the ignition distributor and the movement and in the sequence according to the selected firing order. The relationship between the camshaft and the crankshaft is of critical importance. The valves control the flow of air/fuel mixture intake and exhaust gases, which must be operated at the appropriate timing. For this reason camshaft is connected the crankshaft.

5. OVERVIEW OF CAMLESS ENGINE

6. ADVANTAGES

1. The better breathing that a camless valve train promotes at low engine speeds can yield 10% to 15% more torque. Camless engines can slash nitrogen oxide, or NO_x, pollution by about 30% by trapping some of the exhaust gases in the cylinders before they can escape. Substantially reduced exhaust gas HC emissions during cold start and warm-up operation.
2. In a cam less engine, any engine valve can be opened at any time to any lift position and held for any duration, optimizing engine performance. The valve timing and lift is controlled 100% by a microprocessor.

7. CONCLUSION

Towards a complete engine optimization, further research and development are needed to take full advantage of this system exceptional flexibility.

REFERENCES

[1]. Shakira Koya, Rijin Raju, "Control of a Camless Engine Valve Actuation System", INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY, Volume 5, Special Issue 5, April 2016.

[2]. Mr. Ajinkya S.Lande, Mr. Shubham S. Palwe, Mr. Mayur R. Deshmukh, Mr. Pawan D. Hage , Mr. Nikhil M. Awatade, "AN OVERVIEW OF CAMLESS ENGINE", International Journal of Research in Advent Technology, Special Issue National Conference "CONVERGENCE 2017", 09th April 2017.

[3]. Ashish Pal, Avinash Sahani, Krishna Shukla, Swapnil Shinde, Ashiwini Mate, "DESIGN AND MODIFICATION OF CAMLESS ENGINE: A

REVIEW", International Journal of Scientific & Engineering Research, Volume 9, Issue 5, May-2018.