

Potential applications

Conventional Internal Combustion Engines:

- Improve overall engine efficiency and reduce emissions.
- Reduce fuel consumption.
- Facilitate engine cold startup.
- Throttle-less engine torque control.
- Internal EGR.
- Realize Homogenous Charge Compression Ignition (HCCI) Strategy.
- Cylinder Deactivation.

Air Hybrid Engines:

- Realizing different modes of operation (CB, AM).

Reference

8810-7316

Inventor(s)

Amir Khajepour, PhD
Mohammad Pournazeri

Patent status

Issued U.S. patent 9,194,264 and
PCT patent application filed in
Canada

Contact

Scott Inwood
Director of Commercialization
Waterloo Commercialization Office
519-888-4567, ext. 33728
sinwood@uwaterloo.ca
uwaterloo.ca/research

New Fully Flexible Variable Valve Actuation System

Description of the invention

The University of Waterloo is actively seeking automotive suppliers and manufacturers interested in commercializing a new Fully Flexible Variable Valve Actuation (VVA) system. For several years, camshaft has been the primary solution for valve actuation and timing. Although these systems offer a reliable and accurate valve operation, the engine cannot be operated efficiently over a wide range of engine operating conditions. Many studies have shown that significant improvement in power density, volumetric efficiency, emission, and fuel consumption could be achieved using the variable valve actuation systems (VVA).

The new valvetrain technology developed by University of Waterloo researchers is capable of controlling the valve opening and closing events along with valve lift flexibly and precisely using a novel hydraulic mechanism. This valve system has several advantages over the existing cam-based and camless mechanisms including its high level of flexibility and reliability and low level of complexity and cost. This new fail-safe and flexible actuation can be used both in air hybrid engines and conventional internal combustion engines to improve efficiency and reduce the engine emissions.

Advantages

- Comparable flexibility in valve timings and valve lift as camless valvetrains such as electro-hydraulic VVA system.
- Fail-safe mechanism in the event of electric power failure.
- Less cost and complexity compared with existing flexible valvetrains.

