

Transient Analysis of an EMVD Using COMSOL Multiphysics

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Abstract

Due to the purpose of minimizing the pollution and the fuel consumption by vehicles the automotive industry is searching for new concepts. Most of this concepts focuses on technologies which may totally replace the conventional combustion engine in decades.

In order to cover this gap the conventional combustion engine is being improved. To reduce fuel consumption different mechanical or hydraulic systems are replaced by electrical engines, which are more flexible. Electrical pumps and steering systems are already on the market. Even tough this systems improve the efficiency of the vehicle they do not improve the engine.

To improve the combustion engine itself, a more flexible valve opening and closing is needed. This allows the control of the fuel-air mixture without the use of a throttle.

In most of the combustion engines the movement of the valves are fixed to the contour of the cams and the rotational speed of the crankshaft. So the cams are optimized for a specific working point. An improvement is the EMVD (Eletromechanical valve drive), which can control the opening and closing of the valves independently from the rotation of the crankshaft. COMSOL Multiphysics is used to compare different EMVD concepts. This includes rotational engines, lifting solenoids and linear actuators. In this paper the different COMSOL Multiphysics models are presented in detail.