Theoretical and experimental investigation of a bistabil electrohydraulc linear drive

Summary

The constant connection between crankshaft and camshaft of convetional combustion engines is always leading to compromises in the design layout, which is making a negative impact on the system effectiveness. This is particularly true for the gas exchange of spark ignition engines, where the rate control is made by the throttle valve. Variable valve trains offer the possibility to control the incoming volume directly by the poppet valve.

This survey was focussing on the investigation of the driving power of an electrohydraulic linear drive, which is conceived to be used as a variable valve train for combustion engines, and in addition, to find ways how to optimize the amount of driving power.

Therefore first the different parts of the driving power where analyzed in theorie. As a result of this, three different basic causes could be identified: During the movement incurring friction of different manner, conversion losses from potential to kinetic energy and hydraulic leackage flows in particular phases of the movement.

Each of this three areas under investigation was first of all theoretically analyzed by mathematical models, to permit the later interpretation of experimental results. Afterwords the existence of the different parts of the driving power was proved and quantified in specific experiments. Thereby also the validation of the theoretical model was performed.

Finally the results of the theoretical and experimental investigations were combined in a complete approach for an energetic optimized design of this specific drive. With this approach a reduction of the afforded driving power of more than 65% could be proved.

As result of this survey the different parts of the afforded driving power are noew completely known. The experimentally proved theoretical models in combination with the developed approach are are making possible a well directed optimization of the afforded driving power in the layout phase.