Simulation and design of hydraulic hybrid vehicle

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ABSTRACT

With the expectation of a short-term resolution to improve fuel efficiency and to reduce pollutant emissions of automobiles, Hydraulic Hybrid Vehicles (HHVs) have been increasingly aroused the attention of the research institutions and automotive manufacturers all over the world. The series hydraulic hybrid possesses a high potential of fuel economy improvement and pollutant emission reduction. This thesis is purposed as a collection of relevant knowledge to act as an incentive and basis for HHV design and development. The main content of this thesis is the background and current status of HHV technology. Mathematic models of system key components are established. The influence and determination process of important parameters are also analyzed analytically. Based on MATLAB/Simulink environment and SimScape toolbox a model of a new configuration has been established to assess the merit and potential of a full series hybrid hydraulic vehicle. The system components were configured to simulate a 2.5 ton class HHV truck. The performance of proposed system has been evaluated by discrete operation modes. The capable of braking energy recovery of the system has been evaluated through a simple drive cycle. The simulation results indicate that more than 86% of kinetic energy can be captured and more than 72% of that energy can return to the vehicle motion. The proposed system configuration and simulation program provide a development tool to quickly simulate the expensive real hybrid system with different parameter sets. There remains many problems of hydraulic hybrid vehicle system such as component model validation, system identification, power management strategies, mileage ratings, safety issues, release costs, and so on need to be further explored.

Keywords : Hydraulic Hybrid、IC Engine、Accumulator、Pump/Motor、Simulation

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