Optimization Based Energy Efficient Power Transmission Design Methodology Applied to a Compact Excavator

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Résumé

This paper introduces a method to compute the optimal hydraulic flow distribution for multi-actuated machines such as excavators based on a formulation which aims at defining the best control strategy to be applied and its capacity to improve the energetic performance. The formulation of the optimization problem can be extended to any type of topology considering different control architectures. To begin with a graphical representation of a generic actuator is used to identify the possible flow distributions and their associated constraints reducing the combinatorial complexity of the optimization problem. In addition to the optimal hydraulic flow distribution this method provides the associated command signal of the valves and/or pumps of the considered hydraulic transmission system. Then, an application is performed to compare 2 individual metering systems variants with or without a bypass valve and it will be shown that it results in almost identical capacity in improving the excavator energetic performance.

Mots-Clés: Excavators, Power transmission design, Energy optimization

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