

Creeping Control Strategy for Direct Shift Gearbox Based on the Investigation of Temperature Variation of the Wet Clutch

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Abstract : Proposing an appropriate control strategy is an effective and practical way to address the overheat problems of the wet multi-plate clutch in Direct Shift Gearbox under the long-time creeping condition. To do so, the temperature variation of the wet multi-plate clutch is investigated firstly by establishing a thermal resistance model for the gearbox cooling system. To calculate the generated heat flux and predict the clutch temperature precisely, the friction torque model is optimized by introducing an improved friction coefficient, which is related to the pressure, the relative speed and the temperature. After that, the heat transfer model and the reasonable friction torque model are employed by the vehicle powertrain model to construct a comprehensive co-simulation model for the Direct Shift Gearbox (DSG) vehicle. A creeping control strategy is then proposed and, to evaluate the vehicle performance, the safety temperature (250 °C) is particularly adopted as an important metric. During the creeping process, the temperature of two clutches is always under the safety value (250 °C), which demonstrates the effectiveness of the proposed control strategy in avoiding the thermal failures of clutches.

Keywords : creeping control strategy, direct shift gearbox, temperature variation, wet clutch

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