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CONAT20041073

MODELING AND SIMULATION OF FRICTION DISC CLUTCH OPERATION IN AUTOMATIC TRANSMISSION

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KEYWORDS: friction disc clutches, mathematical model, simulation.

ABSTRACT:

Friction disc clutches and brakes have very important role in quality of gear shifting. Thus, it is necessary that they have electric-hydraulic control and stable characteristics, which depend on a type of a friction material. Also, it is necessary that they have sufficient heat capacitance in order to be able to resist high operation temperatures during gear shifting. By application of friction disc clutches and brakes in automatic transmissions, gear shifting under load is achieved without power flow interruption. Gear shifting time is considerably reduced, driver's load is decreased and the task of gear shifting is simplified.

In the last ten years, a large number of authors have presented plenty of models for simulation of gearshift in automatic transmissions of the vehicles. Friction disc clutches and brakes are controlled during gearshift. Before corresponding model is developed, it is necessary to set differential equations of clutches behavior during their lock and unlock (stick-slip effect). Application of friction clutches and brakes in automatic transmissions as devices for gear change enables minimal duration of transient process, reduction of dynamic loads of elements and of reduction of driver effort. At the same time, they considerably simplify the automation task and enable gear change under load.

One of the heaviest and the most important tasks of the system for gearbox automatic control are to provide continuous engagement of friction clutches and brakes. If this task is not successfully resolved, there are some interruptions in vehicle's operation and it makes its exploitation more difficult and causes dynamic loads of vehicle's transmission and engine.

This paper presents a mathematical model of engagement of disc clutches and brakes during gear shifting from higher to lower level, as well as the results of simulation performed by MATLAB-Simulink computer program.