Effects of sliding velocity and clamp load on the coefficient of friction in the study of self-exited vibrations (judder) in automotive clutches

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ABSTRACT

Self-exited vibrations or judder are torsional vibrations of the driveline which occur during clutch engagement. In dry automotive clutches clutch judder has been attributed to loss of clamp load in hurried clutch engagement and/or falling coefficient of friction with increasing clutch-face slip speed (Centea, 1999). Therefore, the main influential parameter in clutch judder is the friction lining material characteristics with load and sliding speed. It is known that during clutch engagement, COF of the clutch lining can vary with the sliding velocity (i.e. μ-v characteristic curve) (Centea et al. 1999; Centea et al. 2001).

In the current study, an in-house specifically-designed pin-on-disc tribometer is used for measuring the COF of the clutch lining material at different sliding speeds and clamping loads representing *in situ* isothermal clutch conditions (Fig.1). The operating conditions in the tribometer are set to mimic the sliding speed and loading conditions in real clutch applications during the clutch engagement process.

A 4-degree of freedom lumped parameter dynamic model is developed to simulate clutch engagement with take-up judder. The experimentally measured COFs from the test rig under various sliding speeds and clamping loads are used as input to the dynamic model.

This paper presents a combination of experimental and numerical investigations of the dependence friction lining material on clamp load, sliding speed and its take-up judder performance.

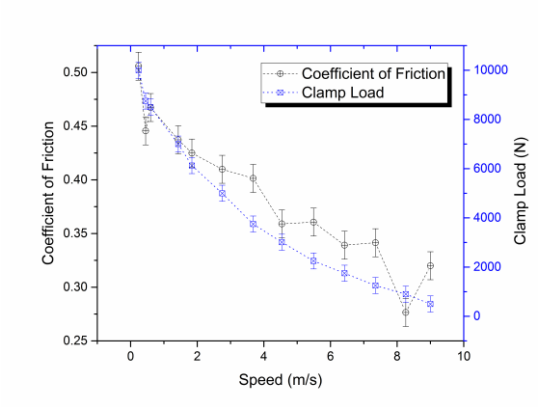

Fig. 1 COF against sliding speed and clamp load during clutch engagement

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