EXPERIMENTAL INVESTIGATION OF HOT JUDDER CHARACTERISTICS IN PASSENGER CARS

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ABSTRACT

Hot judder is a forced, brake-induced, wheel rotational speed-dependent vibration, typically occurs during light to moderate brake applications at high speeds (1). It is mainly a driving comfort influencing factor caused by brake system, which is usually perceived by the driver as minor to severe vibrations transferred through the chassis during braking. Currently, most of the hot judder researches are executed on test bench, the discrepancies and correlations between bench test and vehicle test as well as the characteristics and transfer behaviors of hot judder in passenger cars are still not well known.

In order to explore these issues, preliminary driving tests are carried out, and hot judder is mainly identified and investigated with accelerometers. This test method is firstly validated by coherence analysis among acceleration at brake caliper carrier bracket, acceleration at brake caliper, brake torque variation (BTV), brake pressure variation (BPV), disk thickness variation (DTV) and disk waviness acquired with dynamometer tests. The validation test results from dynamometer are also applied as comparison analysis with driving test.

It is found by driving tests that hot judder is strongly amplified by some resonance frequencies in the car. By further analysis of dynamometer test results, amplification effect of resonance frequency on hot judder is also detected. Current test results show that the higher dominant order found in drag braking is mainly caused by the resonance frequency and hot judder increase rates for those orders that pass through the resonance frequency are greatly raised in stopping brake applications. However, this conclusion needs to be further examined with specific tests.

Besides, reproducibility of hot judder in driving tests and influences of braking deceleration, initial braking temperature and speed on the occurrence and intensity of hot judder are roughly studies. Transfer behaviors of hot judder from wheel brake to car body and the influences of higher hot judder orders on driving comfort are preliminarily discussed.