

Effect of disc brake squeal with respect to thickness variation: Experimental Modal Analysis

ABSTRACT

Disc brake or rotor squeal is an ongoing problem that occurs in the automotive industry. An undesirable disc brake noise problem can arise after a period of time of usage. The purpose of this paper is to investigate the structural dynamic behaviour of disc brakes with different wear thickness by using Experimental Modal Analysis. The wear thickness of disc brake rotors are 0.5 mm, 1.0 mm and 1.5 mm from the original thickness of 15.8 mm and 3.2234 kg weight. The modal parameters such as natural frequency, damping ratio, and mode shape are obtained in a free-free condition by using an impact hammer test. For original thickness of disc brake rotor, the first eight natural frequencies are 1256.4 Hz, 2486.9 Hz, 2654.9 Hz, 3092.1 Hz, 3348.7 Hz, 3407.0 Hz, 4130.0 Hz, and 5709.6 Hz. The results show that the natural frequency decreases when the thickness reduction increased at the same mode. It can be concluded that the wear effect of the disc brake rotor is one of the factors which may lead to the brake squeal problem due to the reduction of the natural frequency of the disc brake rotor.

Keyword: Experimental Modal Analysis; Disc brake; Disc thickness variation