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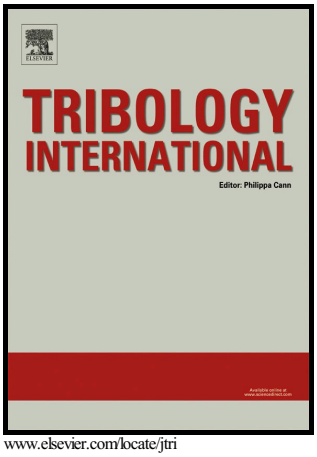

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Noise performance improvements and tribological consequences of a pad-on-disc system through groove-textured disc surface

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Abstract:

In this work, disc surfaces with two kinds of groove configurations are tested in a pad-on-disc system. The experimental results show that cutting 45° grooves on the disc surface can significantly reduce the friction noise. The main reasons are believed to be that the groove-textured surface can trap wear debris and redistribute the contact pressure and thus modify the friction shear stress. Moreover, numerical analysis is performed to simulate the experimental process and a possible mechanism is provided to explain the effect of grooved disc surface on the tribological properties and squeal generation. The groove-textured surface can significantly affect the contact pressure distribution of the pad surface and the transportation of wear debris at interface, and consequently reduce the squeal.

Key words: Texture; Brake; Acoustic; Numerical analysis.

1. Introduction

Bodies in sliding frictional contact are very common in engineering, for example, between meshing gear teeth, inside bearings and joints, in engines and power trains, and in all machines involving moving parts. Friction causes wear and in long term surface damage at the contact interface, which is often where further damage and even cracks would occur. Surface treatment, such as surface texturing is a major means of improving mechanical properties of contact interfaces. It is a challenge to maintain a sufficient friction level without excessive wear.

Friction causes wear and often also generates vibration at the contact interface which spreads throughout the bodies in contact. This vibration is capable of evolving into different noises [1-4]. In general, the friction noise caused by the unstable frictional vibrations has been divided into three categories related to the frequency of noise: (a) low frequency noise, (b) low frequency squeal, and (c) high frequency squeal [5]. Although a precise classification of the friction noise seems unreasonable, considering the wide diversity of noise [1-3], it is widely accepted that squeal noise is characterised by a high frequency noise resulting from