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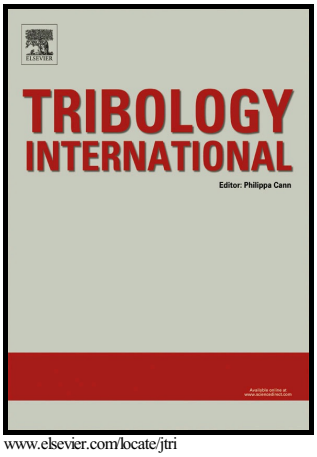

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The effect of the grooved elastic damping component in reducing friction-induced vibration

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Abstract:

In this work, the effect of the grooved elastic damping component on the friction-induced vibration is investigated by using both experimental and numerical analysis. Experimental results show that the Styrene Butadiene Rubber (SBR) with grooves on its surface can reduce the vibration level, suppress the generation of vibration frequency and alleviate the effect of disc surface run-out. To reveal the role of the grooves in modifying friction-induced vibration, three SBR components with grooves distributed on three different regions are tested. The results show the grooves in the middle region can reduce the vibration amplitude, while the grooves in both the leading and trailing regions can eliminate higher vibration frequency. Numerical analysis is performed to provide reasonable explanations on experimental phenomenon.

Key words: Friction-induced vibration; Damping; Grooves; Numerical analysis.

1. Introduction

Friction-induced vibration is a typical self-excited vibration phenomenon, which can be commonly observed in many mechanical applications, such as powertrains, automobile clutches, vehicle brake systems, lead screw drives, frictional belts and mechanical gear systems [1-7]. This vibration generated from the contact interface will cause wear and damage of the contact interface and even failure of mechanical systems. It is reported that more than three quarters of failure events of machine parts are caused by friction-induced vibration and its related problems [1]. Therefore, a thorough comprehension of friction-induced vibration and consequent seeking of an effective method to reduce and eliminate it is extremely significant.

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