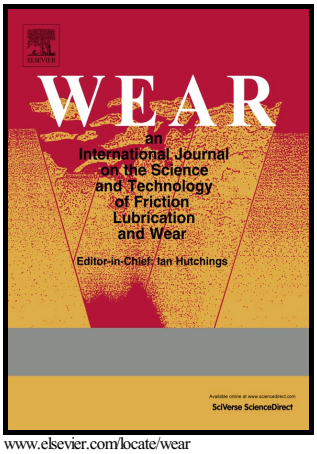

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Mingyuan Zhang, Liantao Lu, Wenjian Wang, Dongfang Zeng

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The roles of thread wear on self-loosening behavior of bolted joints under transverse cyclic loading

Mingyuan Zhang[a], Liantao Lu[a], Wenjian Wang[b], Dongfang Zeng[a]*

[a]State Key Laboratory of Traction Power, Southwest Jiaotong University, Chengdu 610031, China;

[b]CRRC Qishuyan Institute Co., Ltd., Changzhou 213000, China

*Corresponding author. Tel.: +86 28 86466025; fax: +86 28 87600868. zengdongfang@swjtu.cn

Abstract

The objective of this paper is to investigate the roles of thread wear on self-loosening behavior of bolted joints subjected to transverse cyclic loading. A fatigue test machine was used to apply the transverse displacement to the bolted joints during the self-loosening test. Finite element analysis was conducted to investigate the influence of preload and thread locker on the self-loosening from the perspective of thread wear. The investigations show that the self-loosening can be caused by the fretting wear occurring at the thread without the rotation of the nut. The fretting wear becomes more and more severe as the number of loading cycles is increased. This leads to a gradual reduction of clamping force. The increment of preload alleviates the thread wear through reducing the relative slip between the threads of the bolt and the nut. Thereby, the anti-loosening ability of bolted joints is improved. The bolted joints using the thread locker exhibit the best anti-loosening ability since the thread locker can inhibit the thread wear through preventing the relative slip and separating the threads of the bolt and the nut.

Keywords

Bolted joints; Self-loosening; Fretting; Transverse cyclic loading; Finite element modelling

1. Introduction

Bolted joints are widely used in mechanical structures due to their relative ease of assembly and disassembly. After fatigue, self-loosening is the most widespread failure mode for the bolted joints subjected to cyclic loading. It may lead to the reduction of structural stiffness or the separation of clamped members. Additionally, fatigue is often initiated by partial loosening.