

The Failure of Threaded Fasteners Due to Vibration

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Abstract

The main objective of this paper is to study the loosening tendency of a threaded fastener. To achieve the objective, the threaded fastener looseness model is constructed through the following procedures. Firstly, static and dynamic threaded fastener models are derived to find the static and dynamic interior forces respectively. Secondly, for investigating the bolt loosening behaviour, the effects of thread lead angle, initial preload, vibration frequency, and the nature of material on the bolt looseness, the threaded fastener looseness model is constructed by combining the above models with a Karnopp frictional model. The proposed approach not only analyses both the static and the dynamic behaviours of the bolt as well as the bolt loosening but also detects whether the bolt is within the elastic range or not. The approach can serve as a guide for designing a thread fastening procedure to avoid the failure of threaded fasteners due to vibration.

Keyword : static threaded fastener model, dynamic threaded fastener model, threaded fastener looseness model, Karnopp frictional model