ICCES, 2024, vol.29, no.3
DOI: 10.32604/icces.2024.011421

PROCEEDINGS

Dynamic Friction Loading Experimental Techniques Based on Split Hopkinson Bar

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ABSTRACT

High-speed friction and wear are usually occurring in the service life of advanced equipment, and their behavior even influences service safety. However, there is still technique gap in accurately obtaining the parameters during dynamic friction induced by high-speed equipment. This gap is primarily stemmed from the available dynamic friction loading techniques with poor controllability. In this work, a novel dynamic friction apparatus is designed based on split Hopkinson bar technique. The loading principle is from stress wave generated by striker bar hitting the incident bar, which forces the sandwiched friction pair to slide with a designed velocity. The loading speed and stress wave width are controlled via one-dimensional stress wave theory, and the sliding displacement is consequently determined by them. The loading stress wave and generated waves are detected by strain gauges cemented on bars. Meanwhile, the normal pressure on friction pairs is designed to be monitored real- time by strain gauge on a specific designed fixture device. Series of dynamic friction experiments with different normal pressure and velocities are carried out for different materials. Their friction and wear characteristics are obtained, and the coupling characteristics of pressure-velocity-friction coefficient are obtained and analyzed. As a result, the induced wear loss and mechanism are obtained under high pressure and high velocity coupling condition. Finally, as an extended method, the system can be modified to realize fretting under impact loading based on the accurately guiding stress wave propagation.

KEYWORDS

Dynamic friction; hopkinson; stress wave

Funding Statement: The authors received no specific funding for this study.

Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.