World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:16, No:10, 2022

Dynamic Analysis and Vibration Response of Thermoplastic Rolling Elements in a Rotor Bearing System

Authors : Nesrine Gaaliche

Abstract : This study provides a finite element dynamic model for analyzing rolling bearing system vibration response. The vibration responses of polypropylene bearings with and without defects are studied using FE analysis and compared to experimental data. The viscoelastic behavior of thermoplastic is investigated in this work to evaluate the influence of material flexibility and damping viscosity. The vibrations are detected using 3D dynamic analysis. Peak vibrations are more noticeable in an inner ring defect than in an outer ring defect, according to test data. The performance of thermoplastic bearings is compared to that of metal parts using vibration signals. Both the test and numerical results show that Polypropylene bearings exhibit less vibration than steel counterparts. Unlike bearings made from metal, polypropylene bearings absorb vibrations and handle shaft misalignments. Following validation of the overall vibration spectrum data, Von Mises stresses inside the rings are assessed under high loads. Stress is significantly high under the balls, according to the simulation findings. For the test cases, the computational findings correspond closely to the experimental results.

Keywords : viscoelastic, FE analysis, polypropylene, bearings
Conference Title : ICME 2022 : International Conference on Mechanical Engineering
Conference Location : Baku, Azerbaijan
Conference Dates : October 06-07, 2022