Prediction of wear of short glass fiber polymer composite sprocket at the initial stage

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Abstract

The high specific strength, stiffness, and corrosion properties make the short glass fiber Polyamide 66 composite sprockets suitable for low power transmission systems. However, the wear of the polymer composite sprocket is unavoidable while operating with the steel chain. In this study, the wear depth of polymer composite sprocket is determined at its initial stages, where the geometry evolution and contact pressure variation were not dominant. Pin on disc test is carried out to determine the friction and wear coefficient of the material under different normal loads of 10 to 40 N and sliding speed of 1 to 3 m/s. ABAQUS was used to model the interaction of standard and 3% elongated chains with sprockets. The contact pressure and sliding distance at the sprocket/roller contact interface were estimated using ABAQUS Explicit module. The wear coefficient and contact parameters determined from experimental and numerical procedures were used in the Archard wear model to calculate the wear depth of the sprocket tooth space. The elongation in chain length from 0% to 3% increases the peak contact pressure and wear of the polymer composite by 46 % and 84 %, respectively.