Numerical studies on contact behaviour in polymer composite sprocket - Roller chain drive under dynamic conditions

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Abstract

The unique properties along with ease of manufacturing make short fibre reinforced polyamide 66 composites ideal for sprockets used in low positive power transmission. An explicit dynamic finite element simulation of short fibre reinforced polyamide 66 composite sprocket-roller chain drive was carried out. The sprocket was approximated as a plane stress body and roller was considered as a rigid circle. The contact force extracted from the numerical simulation was validated with the analytical results for a standard chain. The deviations in the pitch of the chain produced a varied dynamic contact behaviour in terms of a distinct contact width and pressure distribution pattern. The position of maximum contact shear stress altered from subsurface to surface due to low contact normal stress and associated slip. The variation in the chain pitch (up to 3%) affected the peak force of driver sprocket significantly (up to 41%). The increase of pretension of roller chain from 100 to 300 N induced the rise in contact force of driver sprocket up to 169% without changing the pattern.