

ROLLING CONTACT FATIGUE OF THERMAL SPRAY COATED CONES

The use of advanced materials for rolling element bearings shown some practical advantages. It may be possible to reach the full potential of ceramic hybrid bearings and increase the performance of bearing steels by using thermal spray coatings. Thermal spray tungsten carbide coating on a steel substrate is considered as a suitable material for this purpose.

An experimental approach using a modified four ball machine is used to examine the coating performance and failure mode. This machine simulates rolling element bearing contact conditions. A coated cone replaces the upper ball that contacts with three lower balls. The rolling fatigue tests are performed under immersed lubricated conditions.

HVOF and detonation spray processes are employed to produce the coatings on the surface of the cone. Residual stresses of the coating due to rolling contact, and change in surface configuration due to partial delamination are measured. Fatigue failure modes are observed using a scanning electron microscope.

The results show the requirement for significant optimisation of the coating before use in rolling element bearing applications. The coating is fractured by delamination between the coating and substrate. A combination of ceramic balls and races coated with WC-Co may however provide a maintenance free bearing, under the operating condition of light load and poor lubrication such as in a vacuum.

Keywords: thermal spray, tungsten carbide, fatigue.