RESIDUAL STRESS ANALYSIS IN THERMAL SPRAY COATED ROLLING ELEMENTS

Abstract

The full potential of rolling element bearings operating in specialised conditions such as high speed and corrosive environments are realised using surface coatings. Tungsten Carbide coating by thermal spray HVOF and D-Gun processes are considered for these applications. An experimental approach using a modified four-ball machine simulates the tribological conditions within a rolling element bearing. The fatigue failure modes of the tungsten carbide coating in rolling contact with steel and silicon nitride are examined using conventional surface analysis techniques. The stress fields within the coating are examined using traditional contact theory and residual stress measurement by X-ray diffraction. The residual stress measurements of the pre-test coating, the contacting surface and the fatigue failures are described. Results of residual stress relating to orientation, failure depth, coating thickness are discussed along with the fatigue failure mode.