MM 21: HV Nierlich

Time: Wednesday 14:00–14:30 Location: H16

Invited Talk MM 21.1 Wed 14:00 H16

XRD residual stress analysis: one of the few advanced physical measuring techniques that have established themselves for routine application in industry — •Wolfgang Nierlich and Jürgen Gegner — SKF GmbH, Department of Material Physics, Ernst-Sachs-Str. 5, D-97424 Schweinfurt, Germany

X-ray diffraction (XRD) provides a powerful testing tool for material response and failure analysis of Hertzian-loaded machine parts, like rolling bearings, camshafts or cogwheels, based on residual stress, martensite {211} line broadening, and retained austenite content. The conventional measuring procedure is improved by means of an iterative technique including a pre-analysis of the near-peak line-profile in order to substantially reduce the recording time. These achieved short measuring periods of 3 to 5 and around 10 min per residual stress value and retained austenite content, respectively, serve as precondition for routine industrial applications of XRD residual stress analysis over the last three decades within SKF. The adapted method is described in detail. The XRD line width represents a measure of material ageing within the lifetime cycle of a rolling bearing: calibration curves for the predominant (near-) surface and the classical sub-surface failure mode are available for material response analysis. A selection of concrete examples is given that describes different damage mechanisms.