

XRD STRESS ANALYSES ON SURFACES WITH CURVATURE RADIUS BELOW 1 MM, A NEW CHALLENGE!

Alfried Haase*, Matthias Klatt, Achim Schafmeister, Rainer Stabenow
GE Sensing & Inspection Technologies GmbH
SEIFERT *Analytical X-ray*, Bogenstrasse 41, 22926 Ahrensburg, Germany
Matthias.klatt@ge.com

New industrial requirements for XRD stress analyzers have arisen to address the needs of assessing residual stress on next generation fuel injectors. Due to new fuel emission standards for diesel engines and high oil prices, fuel injector technology has moved towards thinner injector channels that operate at more than 50% higher pressure. Manufacturing the injector channels introduces residual stresses that are key to the functionality of these parts.

Thus, it is critical to optimize not only the components of the XRD stress analyzer, e.g. the x-ray source, primary beam optics, sample manipulator, optical CCD microscope, and x-ray detector, but also the interaction of the components to meet the analysis demands of the new technology. All stress analyzer components are aligned so precisely with the sample measuring point that effective spot sizes on the sample as small as 20 μm have been realized. Additionally, the long-term stability of the alignment and small spot size has been demonstrated in a standard three-shift operation industrial environment.

The sensitivity of stress measurements on surfaces with radii of curvature below 1mm will be presented along with the calibration and standards for such residual stress measurements. These results have been achieved with a SEIFERT XRD μBeam Diffractometer.