

Damage analysis and residual stress studies in mechanical components

Análisis de daño y estudio de tensiones residuales en componentes mecánicos

Joseph F Kelleher

ISIS, Rutherford Appleton Laboratory, Didcot, Oxfordshire OX11 0QX, UK

Understanding the effect of residual stresses is critical for the structural integrity of railway and other mechanical components [1–3]. The most important methods for residual stress measurements are introduced, together with their main advantages and disadvantages [4]. Neutron and synchrotron strain measurements performed in European Synchrotron Radiation Facility (France) [5], Institut Laue Langevin (France) [1], Diamond Light Source (UK) [6,7] and ISIS Neutron and Muon Source (UK) are described. They allow the in-plane components of the stress tensor acting in cross-sectional rail slices to be mapped [8–10]. Alternative techniques such as laboratory X-rays and magnetic measurement systems MAPS are also depicted, showing coarser detail but similar trends than previous methods. Stress balancing appears to be worst in zones where significant plastic deformation takes place [11,12]. In addition, the measurements are complemented with contour method analysis to map the longitudinal stress components.

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