CERTIFICATION OF APPROVAL

Residual Stress Measurement Using X-Ray Diffraction

by

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ABSTRACT

The project was carried out to study the use of X-ray diffraction (XRD) technique for residual stress measurement. This project used mild steel as the material for study. An annealed sample of mild steel was used as the reference. Residual stresses were then introduced to the samples by mechanical means via cold-working and by thermal process through welding. The cold-worked sample was prepared by cold-rolling the mild steel plate in the roll machine. For the welded sample, two mild steel plates were welded together in a butt joint. The cold-worked and welded samples were scanned in the X-ray diffractometer, and the results were then compared to the baseline reference of the annealed sample. Residual stress measurements were made from deviations measured from measurements of XRD peaks. From the results obtained, the diffraction peaks shifted to lower angles (increasing interplanar spacing *d*) for the welded sample while for the cold-worked sample, the diffraction peaks shifted to higher angles (decreasing *d*). An increase in *d* indicates tensile stress while a decrease in *d* indicates a compressive stress. Residual stress for the cold-rolled sample was determined to be 906MPa in compression, while the welded sample yielded a tensile residual stress of 338MPa.

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