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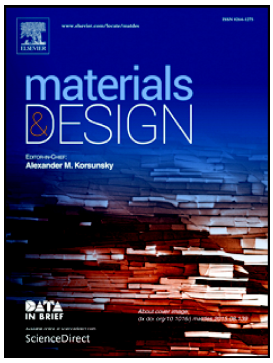

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Numerical Studies of Welding Residual Stresses in Tubular Joints and Experimental Validations by means of X-ray and Neutron Diffraction Analysis

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Abstract

The influence of residual stresses on the structural behavior of the material is of high importance for accurate integrity assessment of welded components and structures. In the absence of reliable information on magnitude and distribution of residual stresses, it is generally assumed that residual stresses are as high as the yield strength of the material which could lead to over-conservatism in the failure assessment and consequently economic problems. Accordingly, a growing need to the more realistic and reliable determination of welding residual stresses has been raised.

In this paper finite element approach is applied in order to calculate the welding residual stresses in a tube out of S355J2H steel using the commercial software package SYSWELD. For comparison with the numerical investigations x-ray and neutron diffraction measurements (XRD and ND) are carried out to determine the distribution of residual stresses in three orthogonal directions, on the surface and in the bulk of the material respectively. The numerical results are compared directly with the measured data. The overall aim is to evaluate the use of finite element approach in the accurate calculation of residual stress states for use in the integrity assessments.

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