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ABSTRACT

Spiral welded pipes are produced from forming and welding of plate or strip material with seam running its entire length in a spiral form. The relative structural weakness of these pipes is due to high residual stress developed during welding, which depends on various parameters and their interaction. Finite element method (FEM) was used to predict the temperature and stress fields in a 56 inch spirally welded steel pipe. Temperature-dependent thermal and mechanical properties of steel were incorporated in the model. Arc welding was modelled as a 3-D volumetric moving heat source. The residual stresses produced after the completion of the welding process were investigated. For validation, the numerically predicted residual stress was compared with measured values using split-ring and hole-drilling methods. It was found that von Mises stress attained high values in the cooling cycle after the solidification of the molten zones. Moreover, the effect of welding speed on the level of residual stress was studied. Increasing the welding speed with constant power resulted in reduction of the width of the high stress zone.

Keywords: Spiral Welded Pipe, SWP, Residual Stress, Submerged Arc Welding, Pipe Failure.