Speaker 9

Swansea University
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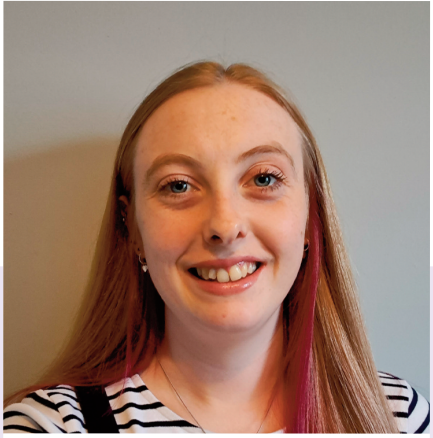
A computational approach towards proactive scale management for steel pipelines



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ABSTRACT:
Conveyance tube manufacturing via a hot-finished, welded route is an energy-intensive process which promotes surface oxidation. During normalisation to homogenise the post-weld microstructure, an oxide mill scale layer grows on tube outer surfaces. Following further thermomechanical processing, there is significant yield loss and surface degradation. Delaminated scale is also liable to contaminate and damage plant tooling. The computational thermochemistry software, Thermo-Calc, and its diffusion module, DICTRA, was explored for its potential to investigate oxidation kinetics on curved geometries representative of conveyance tubes. A model was developed using the Stefan problem, bespoke thermochemical databases, and a numerical solution to the diffusion equation. Oxide thickness predictions, and subsequent mechanical analysis, for representative curved surfaces revealed the significance of the radial term in the diffusion equation and that the effects of a cylindrical coordi nate system on oxidation cannot be neglected if oxidation on curved surfaces is to be fully understood and controlled.