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Understanding Variations in Flow-Accelerated Corrosion Wear Rates in HRSG Evaporator Tubes

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ABSTRACT

Very large differences in tube wall thinning rates by flow-accelerated corrosion (FAC), or in some cases fluid erosion, are observed in the low-pressure (LP) evaporator tubes of some HRSG designs. The tubes located near the duct wall and occasionally near the gaps between module bundles are most affected. The tubes in a given row nominally should have very similar process conditions, both on the gas-side and on the waterside. The varied tube thinning rates indicate that small differences in those conditions, based on tube location in the row have a significant effect.

Computational Fluid Dynamics (CFD) simulations are used to investigate gas-side process conditions in tube assemblies and to determine the impact of tube location in the row on heat transfer. The impact of differing tube heat fluxes on waterside process conditions is analysed by thermo-hydraulic simulations using a computer model of the tube assemblies. A correlation to estimate increased thinning rates as a function of tube position and LP evaporator process conditions is proposed.