

Simple Analytical Model for Predicting Onset of Helical OTSG Instability

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Abstract

A simple model to analyze helical once-through steam generators (OTSG) instability has been developed. The model is formulated with control volumes having moving boundaries. The constant pressure drop boundary condition is applied to both ends of coiled tube and the homogeneous equilibrium flow model is used for the two-phase region. Shell-side energy conservation is also considered and heat fluxes in the each region are treated as variables.

The governing equations were nondimensionalized and perturbed after some manipulation. The helical OTSG stability criterion was then developed through application of general stability criterion to the first order perturbed equations. The steady-state results were obtained using the developed model. The results and Nariais experimental data were found in good agreement. The calculated threshold inlet throttling coefficients with heat flux variation show similar trends with the experimental data. The result shows that a large amount of inlet throttling coefficients is needed if feedwater flow rate is low.