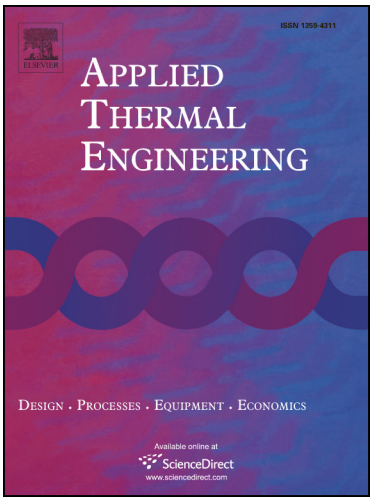

Research of multiple refined degree simulating and modeling for high pressure feed water heat exchanger in nuclear power plant

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Research of multiple refined degree simulating and modeling for high pressure feed water heat exchanger in nuclear power plant

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Highlights

1. A refined simulation model for high pressure feed water heat exchanger is developed.
2. Large number of control volumes based on the detailed structure with tube bundles and partition plates.
3. Dynamic thermal and flow calculation in the high pressure feed water heat exchanger.
4. Parameter distribution and tendency by the simulation model.

Abstract

High pressure feed water heat exchangers (HPFWHX) are essential equipments in the nuclear power plant (NPP) secondary loop. Because of the different requirements for the HPFWHX, there are the multiple degrees of refined simulation model developed in this work. The high fidelity simulation model is based on the practical physical structure with the tube bundle and partition plates. Large number of control volumes are divided by partition plates and tube bundles in the steam condensing zone and drain water cooling zone. To test and verify the simulation model, we utilized the main design parameters of No.7 HPFWHX in Qinshan II NPP. The steady state parameters are suitable for limiting model error and increasing its accuracy. Two dynamic conditions are chosen to verify the characteristics of the simulation model. Verification result shows that the dynamic processes are consistent with the theoretical basis used for the analysis. Also, the simulation model provides the parameter distribution and the dynamic state of the major HPFWHX parameters in the normal operation. The simulation model could assist researchers to determine and analyze the thermal features of the HPFWHX with fast calculation speed. The simulation model is also useful for the simulation of similar tube and shell heat exchangers in different conditions.

Key words:

High pressure feed water heat exchanger (HPFWHX); Structure refinement; Dynamic process; Parameter distribution.