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Heat Transfer Performance Test for a Sodium-to-Air Heat Exchanger with an Inclined Finned-Tube Banks

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A separate effect test facility called SELFA (Sodium thermal-hydraulic Experiment Loop for Finned-tube sodium-to-Air heat exchanger) using liquid sodium and air as operating fluids has been developed. SELFA is one of the requisite sodium thermal-hydraulic test facilities within the framework of STELLA (Sodium Test Loop for Safety Simulation and Assessment) program, which is indispensable for the support of PG-SFR (Prototype Gen IV Sodium-cooled Fast Reactor) development. The model heat exchanger (M-FHX) of SELFA was designed for performance demonstration of FHX (Forced-draft sodium-to-air Heat eXchanger) in PG-SFR, which has three-row inclined finned-tube banks with staggered arrangement. Using this dedicated sodium heat exchanger test facility, several sets of heat transfer performance test have been conducted for validation of computational codes such as the heat exchanger thermal-sizing code (FHXS) and the safety analysis code (MARS-LMR). In this study, we carried out performance tests for the M-FHX at the design point (i.e., thermal duty of 320 kWt). The test results obtained from this test have been used for its heat transfer performance evaluation through comparisons with the computational analyses results obtained from both a commercial CFD analyses as well as in-house thermal design and analysis computational codes developed by KAERI. Finally, it was confirmed that we have got reasonable experimental datasets through this work.

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