Evaluation of Direct Contact Condensation Models for Sonic Flow Regime using MARS 2.0

Doo-Yong Lee, Un-Chul Lee
Seoul ational University
San 56-1 Shilim-dong Kwanak-gu
Seoul, 151-742

Won-Jae Lee, Seok Cho
Korea Atomic Energy Research Institute

Abstract

Direct Contact Condensation (DCC) of discharged steam in In-containment Refueling Water Storage Tank (IRWST) is of most important phenomenon affecting the temperature of Safety Injection (SI) flow and subsequent reactor safety of advanced reactors such as APR-1400. Even with such importance, current system codes are not equipped with proper DCC model. Since steam is discharged into the IRWST by sonic flow, DCC models for sonic flow regime proposed by Cumo, Liang and Kerney were investigated and implemented into the MARS 2.0, a multi-dimensional thermal-hydraulic system code. For the evaluation of original and new DCC models, MARS code was assessed using test results of a unit cell test being in progress at KAERI. Assessment results show that the interfacial heat transfer coefficients calculated by new model reach to the order of 10^6 W/m^2/K, while original MARS model results in the order of 10^1 W/m^2/K. Increase in condensation by new DCC model influences temperature distribution in quenching tank and it is shown that the calculated temperature distribution approaches closer to the experimental results by new model than by original model. Thus, we can conclude that implementation of proper DCC model for sonic flow regime should enhance the MARS capability for IRWST temperature transients.