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Scaling and Experimental Studies of Condensation Oscillation in Subcooled Water of the In-containment Refueling Water Storage Tank

Jun Hyung Lee and Hee Cheon No
Korea Advanced Institute of Science and Technology

Abstract

Condensation oscillation by jetting the steam into subcooled water through spargers is studied. To provide the suitable guideline for the verification experiment of the IRWST in the next generation reactor, scaling methodology has been introduced and is verified by experiments within the possible range of operating and physical parameters. The dominant scaling parameters related to its pressure oscillation are also verified. The volumetric effects of the system and the different dynamic characteristics between the shell side and the bottom plate are also investigated. Two types of condensation oscillations are identified. The test facility has been set up according to the scaling methodology. The test results show that the pressure amplitudes are dependent on the mass flux, the shapes of spargers, the subcooling, and the volume of the system as shown in the scaling methodology. It is concluded that the well-designed spargers greatly reduce the pressure amplitudes, that by the scaling methodology the effects of the system volume can be estimated, and that the bottom plate is apt to be a weak spot under the pressure pulsation due to condensation oscillation.