Application of an Integral Scaling Methodology to an Off-take Phenomenon at the Pressurizer Surge Line and its Validation Using RELAP5/MOD3.2

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Abstract

RELAP5/MOD3.2 code calculations of an off-take phenomenon at the pressurizer surge line are conducted for the validation of the integral scaling methodology. Two scaled-down models are designed based on the present method and Ishii's scaling method given length and area scales of 1/5 and 1/100, respectively. RELAP5/MOD3.2 calculations show that the scaled-down model based on the present scaling method well maintains the similarity of the discharge quality by off-take into a surge line. It was also found that the scale effects are not observed for the surge line diameter due to the lack of the information from the experimental correlations implemented in the RELAP5/MOD3.2.

Critical Pressure Ratio and Critical Flow Rate in a Safety Valve

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Abstract

Subcooled water critical flow phenomena in a safety valve were investigated experimentally at various subcoolings with 3 different disk lifts. The valve inlet test condition is about 10 bar and subcoolings are between 10℃ and 125℃. Flow patterns are picturized at the critical status and pressure/flow characteristics in the test section are also reviewed. It turns out that critical flowrate and critical pressure ratio are considerably affected by different subcoolings while the effect of disk lifts on them are relatively small. Non-dimensional disk lift, subcooling and pressure are selected to develop the correlation on critical pressure ratio, non-equilibrium factor, and critical mass flux. The non-equilibrium critical flow correlation for the safety valve is developed based on Fauske's non-equilibrium model and the present experimental data. Its root-mean-square error is within 5% compared with the experimental data.