Development of a Three-Dimensional Thermal-Hydraulic Analysis Code for Thermally Stratified Flow in a Curved Piping System

Jong Chull Jo

Korea Institute of Nuclear Safety
19 Kusung-dong, Yusung-ku, Taejon 305-338, Korea

Seok Ki Choi

Korea Atomic Energy Research Institute
150 Dukjin-dong, Yusung-ku, Taejon 305-353, Korea

Abstract

A three-dimensional thermal-hydraulic code for analyzing the thermally stratified flows in a curved piping system has been developed by using body-fitted non-orthogonal curvilinear coordinates. The transient behaviors of stratified fluid flow are simulated using the finite volume approach. The convection term is approximated by a higher-order bounded scheme named COPLA, which is known as a high-resolution and bounded discretization scheme. The cell-centered, non-staggered grid arrangement is adopted and the resulting checkerboard pressure oscillation is prevented by the application of modified momentum interpolation scheme. The SIMPLE algorithm is employed for the pressure and velocity coupling. The thermal-hydraulic code developed in this study has been validated by the comparison of the predicted results with the available experimental data. As a result, the predictions with the code developed in the present study have shown to be in good agreement with the experimental results.