Development of a System Code by Extending the Capability of COBRA-TF

Sang Yong Lee, Byoung Sub Han and Chul Jin Choi
Korea Power Engineering Company, Inc.

Abstract

The computer program, COBRA-TF, has been developed mainly for the application to the analysis of the two phase core thermal-hydraulics of the vertical configuration. In this paper, an attempt is made to extend the capability of the COBRA-TF code so that it can be applied to the system analysis. The noteworthy improvement is to introduce the connection between the gap face and the channel end face. This introduction makes it possible for code users to have the horizontal one-dimensional channel and the capability to connect the horizontal channel with the vertical channel. The other improvements are the incorporations of several models such as, pump model, critical flow model, valve model, accumulator model, high pressure injection system model and steam generator separator model. A variable dimensioning capability is also working in this version.

The system analysis capability is evaluated by applying the code to the analysis of Loss of Coolant Accident (LOCA) for the typical pressurized water reactor with direct vessel injection configuration. The analysis results are compared with those of RELAP5 for several important system parameters. This comparison shows that the new code can be applied to the system analysis.

....

A detailed derivation of the Two-Fluid Two-Phase Hydraulic Solver

Sang Yong Lee
Korea Power Engineering Company, Inc.

Abstarct

A computer program, GUARD, semi-implicit multi-dimensional two-fluid three equations hydraulic solver, is formulated and coded. The essential steps of the formulation are presented. Numerical tests are performed to confirm its applicability and/or to identify any potential problems. Some suggestions are made to improve the convergence and stability of the scheme.