

Viscous Fluid Motion Simulation by MARS 3D Module

Sung Won Bae, Jae-Jun Jeong, Bub Dong Chung
Korea Atomic Energy Research Institute
150 Dukjin-dong, Yuseong-gu
Daejun 305-353, Korea

Abstract

The MARS code is a best-estimation program which is based on the RELAP5 and COBRA-TF codes. The dominant usage of MARS code is to analyze the transient behavior of the thermal-hydraulic systems. MARS code provides the multi-dimensional modeling capabilities by means of COBRA-TF based 3D module. MARS 3D Module shows appropriate applications when it is used to model a vertical flow dominant channel flows, especially. In spite of this reliability, one weak point of MARS 3D module is that there is no way to represent any viscous fluid flow interpretations. For the viscous fluid flow interpretations, MARS code has been modified so that it can accept zero-perimeter channel input. It is also modified to include dynamic and turbulent shear stress term in the directional momentum conservation equation sets. The turbulent viscosity is calculated by Prandtl's Mixing Length assumption. For the assessment, an expanding vertical pipe flow and a short square channel flow are selected. The results are compared to FLUENT analysis obtained with standard $k-\epsilon$ turbulent model. The viscous motion effect of single phase water is simulated. In the simulation view points, the bulk flow induced by viscosity is reasonably included.