Analysis of steam line break of SMART using RETRAN-3D/INT

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Abstract

RETRAN-3D has been modified to be suitable to safety analysis for integral type marine reactor with modular helical-coiled steam generator cassettes. The modified RETRAN-3D, RETRAN-3D/INT, has helical coil heat conductor model and heat transfer coefficient models for tube and shell sides of helical-coiled steam generator. In addition, moving models are added to simulate the effect of ship motions such as inclination, heaving, rolling and so on. RETRAN-3D/INT has been verified with natural circulation experiment conducted in Seoul National University and the analysis results for the first Japanese nuclear ship, MUTSU.

In this study, the safety analysis for SMART, which has been developed by Korea Atomic Energy Research Institute, is performed to examine the applicability of RETRAN-3D/INT to the safety analysis of SMART. The steam line break is selected as a reference case. The break type is assumed to the guillotine break. The loss of offsite power is considered as a coincident event and the failure of single train of passive residual heat removal system is assumed as single failure. From the results, it is found that RETRAN-3D/INT can appropriately simulate the transient of SMART and the improvement of non-condensable gas model is required.