

Experimental Study of Complete Loss of Coolant Flow (CLOF) Test by System-Integrated Modular Advanced Reactor Integral Test Loop (SMART-ITL) with Passive Residual Heat Removal System (PRHRS)

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Abstract : Experimental studies using a large-scale thermal-hydraulic integral test facility, System-integrated Modular Advanced Reactor Integral Test Loop (SMART-ITL), have been carried out to validate the performance of the prototype, SMART. After Fukushima accident, the passive safety systems have been dealt as important designs for retaining of nuclear safety. One of the concerned scenarios for evaluating the passive safety system is a Complete Loss of Coolant Flow (CLOF). The flowrate of coolant in the primary system is maintained by Reactor Coolant Pump (RCP). When the supply of electric power of RCP is shut off, the flowrate of coolant decreases sharply, and the temperature of the coolant increases rapidly. Therefore, the reactor trip signal is activated to prevent the over-heating of the core. In this situation, Passive Residual Heat Removal System (PRHRS) plays a significant role to assure the soundness of the SMART. The PRHRS using a two-phase natural circulation is a passive safety system in the SMART to eliminate the heat of steam generator in the secondary system with heat exchanger submarined in the Emergency Cooling Tank (ECT). As the RCPs continue to coast down, inherent natural circulation in the primary system transfers heat to the secondary system. The transferred heat is removed by PRHRS in the secondary system. In this paper, the progress of the CLOF accident is described with experimental data of transient condition performed by SMART-ITL. Finally, the capability of passive safety system and inherent natural circulation will be evaluated.

Keywords : CLOF, natural circulation, PRHRS, SMART-ITL

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