

원전 부분충수 운전중 잔열제거상실사고 종합효과 실증실험  
An Integral Effects Test of Loss of Residual Heat Removal  
during Mid-loop Operation

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요 약

국내외의 많은 가압경수형 원전에서 부분충수 운전중에 잔열제거상실사고가 발생하였다. 부분충수 운전중 잔열제거상실사고시 열수력적 현상을 조사하기 위해 한국형 표준원전을 모델로 한 종합효과 실증실험장치를 건설하여 여러 가지 발전소 배열상태에 따라 실험을 수행하였다. 실험 결과 1 차 계통에 있는 작업자 출입구의 개폐상태에 따라 계통내 질량 감소율 및 노심 가열시간은 크게 달라짐을 보여주었다. 또한 노즐댐 파손이 노심 가열시간에 미치는 영향과 증기발생기 u-tube 내의 역류응축냉각이 효과적인 냉각수단임을 알 수 있었다.

Safety Analysis of Loss of RHR Event  
During Mid-Loop Operation for Younggwang Units 1&2

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Abstract

The thermal hydraulic analysis of the loss of RHR event during mid-loop operation for Younggwang Units 1&2 nuclear power plant was performed using the RELAP5/MOD3.2.2beta code. The six cases of loss of RHR events that could occur during mid-loop operation were classified according to the opening configurations in the RCS. The time to boiling in the core, the core uncover time, the maximum pressure in the RCS, the behavior of liquid level in the reactor vessel, and the fuel heatup time were obtained based on the analysis results for event. The boiling time for the events that occurred during mid-loop operation was about 800 seconds. Also, the event with the pressurizer manway opening under installation of nozzle dam during mid-loop operation and the event with the SG inlet plenum manway opening during mid-loop operation showed the earliest core uncover time and core heat-up time than the other events. According to the results, it was found that the time to boiling in core was dependent on the initial conditions such the amount of reactor coolant in and above core. Also the time to core uncover and the time core heatup were strongly dependent on the RCS opening size and location.