反应堆工程

一体化压水堆非能动余热排出系统运行特性影响因素分析

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摘要　　根据一体化压水堆额定状态下的运行参数对其非能动余热排出系统进行设计计算，运用RELAP5/MOD3.4程序对该系统的运行特性及影响因素进行仿真计算和分析，通过分析不同换热器设计参数下系统的运行特性，对系统进行优化。计算结果表明：余热换热器换热面积越大、冷热芯位差越大，于自然循环的建立有利，但同时二回路压力峰值也越大。通过合理延长主蒸汽阀门关闭的延迟时间和在余热换热器上设置并联补水箱，可在不影响自然循环能力的前提下解决压力峰值过大的问题，从而优化了余热排出系统的设计。采用以上两种措施可使非能动余热排出系统在满足结构和安全的前提下具有较大的余热排出能力。

关键词　　一体化压水堆　非能动余热排出系统　RELAP5/MOD3.4程序

分类号

Thermal-Hydraulic Characteristics Effect Factors Analysis for Passive Residual Heat Removal System of Integral Pressurized Water Reactor

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Abstract　The configuration parameters of the passive residual heat removal system (PRHRS) were designed according to natural condition of integral pressurized water reactors (IPWRs). By means of the RELAP5/MOD3.4 code, the thermal-hydraulic behaviors effect factors of the system were analyzed and the system was optimized. The numerical results show that the larger the residual heat exchanger (RHE) heat transfer area is, and the higher the height difference between the steam generator and the residual heat exchanger is, the easier the establishment of the natural circulation in the third loop is, but at the same time the higher the peak value of the secondary loop pressure is. According to delaying the steam valve closure time and setting the compensating water tank, which is parallel connected to the RHE, the higher peak value of the secondary loop pressure can be lightened. In the case of satisfying configuration and safety, PRHRS has stronger condensation capability.

Key words　integral pressurized water reactor 　 passive residual heat removal system 　 RELAP5/MOD3.4 code

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