

反应堆工程

核电厂管线中的热分层现象

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摘要 由于阀门渗漏使核电厂安注系统冷水注入到充满热水的连接安注系统与主管道的支管中, 而发生的热分层和温度振荡现象的研究对于确保核电厂的安全和可靠运行具有重要意义。运用计算流体力学软件CFX, 采用 $k-\varepsilon$ 湍流模型, 以研究某核电厂安注系统支管中热分层现象的实验为对象, 模拟了阀门渗漏冷水进入含有高温水的支管以后所发生的热分层现象, 数值模拟的结果与实验测量结果吻合。在此基础上, 通过改变阀门渗漏冷水的流量、支管的结构等参数, 进一步研究支管中热分层现象与这些参数的内在关系, 从而得出了影响热分层现象的主要原因及热分层现象发生的一些规律。

关键词 [热分层](#) [安注系统支管](#) [湍流模型](#) [数值模拟](#) [核电厂](#)

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Thermal Stratification Phenomenon in Pipelines of Nuclear Power Plant

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Abstract It is very important for the safety operation of a nuclear power plant to research the thermal stratification and temperature fluctuation phenomena which are caused by the cold water injecting into the branch pipe connected the emergency core cooling system (ECCS) with the main pipe. The thermal stratification phenomena in the ECCS branch pipe was simulated using the CFD code CFX with $k-\varepsilon$ model. The numerical results are in good agreement with the experimental ones. By changing the flow rate of the leaked cold water and the structure of the branch pipe, the inherent relations between these parameters and the thermal stratification phenomena were further researched. Therefore, the main cause and some characteristics of the phenomena were obtained.

Key words [thermal stratification](#); [ECCS branch pipe](#); [turbulence model](#); [numerical simulation](#); [nuclear power plant](#)

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