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延展表面凝结液膜的动量积分方法

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摘要 采用动量积分方法分析压水堆发生失水事故时在安全壳的内表面上的液膜凝结、再浸润和蒸发过程。由凝结液膜的质量和动量守恒方程导出了凝结液膜在延展表面的子午线方向平均速度的积分微分方程。假设液膜以层流的方式流动,把导出的积分微分方程变成容易进行数值积分的液膜速度的一阶常微分方程,由此求得液膜厚度分布。液膜能量守恒方程的解给出了安全壳内壁面的温度分布。

关键词 [凝结液膜](#) [动量积分](#) [失水事故](#)

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Numerical Simulation of Liquid Film Flow on Revolution Surfaces With Momentum Integral Method

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Abstract The momentum integral method is applied in the frame of safety analysis of pressure water reactors under hypothetical loss of coolant accident(LOCA) conditions to simulate numerically film condensation, rewetting and vaporization on the inner surface of a pressure water reactor containment. From the conservation equations of mass and momentum of a liquid film arising from condensation of steam upon the inner of the containment during a LOCA in a pressure water reactor plant, an integro-differential equation is derived, referring to an arbitrary axisymmetric surface of revolution. This equation describes the velocity distribution of the liquid film along a meridian of a surface of revolution. From the integro-differential equation an ordinary differential equation of first order for the film velocity is derived and integrated numerically. From the velocity distribution the film thickness distribution is obtained. The solution of the enthalpy equation for the liquid film yields the temperature distribution on the inner surface of the containment.

Key words [film condensation](#) [momentum integral](#) [loss of coolant accident](#)

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