

Establishment of the Regression Uncertainty of the Critical Heat Flux Power Correlation for an Advanced Fuel Bundle

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Abstract : A new regression uncertainty analysis methodology was applied to determine the uncertainties of the critical heat flux (CHF) power correlation for an advanced 43-element bundle design, which was developed by Canadian Nuclear Laboratories (CNL) to achieve improved economics, resource utilization and energy sustainability. The new methodology is considered more appropriate than the traditional methodology in the assessment of the experimental uncertainty associated with regressions. The methodology was first assessed using both the Monte Carlo Method (MCM) and the Taylor Series Method (TSM) for a simple linear regression model, and then extended successfully to a non-linear CHF power regression model (CHF power as a function of inlet temperature, outlet pressure and mass flow rate). The regression uncertainty assessed by MCM agrees well with that by TSM. An equation to evaluate the CHF power regression uncertainty was developed and expressed as a function of independent variables that determine the CHF power.

Keywords : CHF experiment, CHF correlation, regression uncertainty, Monte Carlo Method, Taylor Series Method

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