

Abstract

Establishment of safety margins and the corresponding operating condition limits will ensure achievement of a safe operation of nuclear installations. For this purpose, several critical phenomena have been analyzed theoretically and experimentally and a great number of models and correlations are made available. Among these critical issues the well-known flow instability has been intensively investigated by several authors especially for nuclear power plants' (NPPs) operating conditions. However, limited published work is available for research reactor operation conditions. In general, the Whittle and Forgan correlation is widely used to define the margin to static flow instabilities in narrow parallel heated channels for research reactors. In the framework of verification and assessment of the capabilities of the RELAP5/Mod 3 system code to determine the onset of flow instability in research reactor conditions, a simple model based on steady-state equations adjusted with drift-flux correlations has been developed. The program is used to draw the pressure drop characteristic curves and to establish the conditions of the Ledinegg instability in a uniformly heated channel subject to constant outlet pressure. The model is assessed by using experimental data from a thermal hydraulic test loop by Siman-Tov and numerical results from RELAP5/Mod 3. The model presents acceptable estimation of the target mass flow that would induce flow instability and the latter could be then used to establish a conservative margin to the Ledinegg instability