

Single-Phase Natural Circulation in a PWR during a Loss of Coolant Accident

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Abstract - In all light water reactors (LWRs), natural circulation is an important passive heat removal mechanism. To explain the effects of diminished primary coolant inventory on natural circulation, an analytical model is derived. The analysis is based on a one-dimensional model and the quasi-steady hypothesis in which the continuity, momentum, and energy equations are solved. Expressions for mass flow rate, and temperature distributions are derived, and the effect of the core power is investigated. The model covers the mode of a single-phase natural circulation. Comparisons with the experimental results of a previous work are presented and show reasonable agreement with the analytical results.

Keywords: natural circulation; PWR; single-phase; LOCA