

**A Parametric Study of Air-Water Countercurrent Flow Limitation
in a Horizontal Pipe Connected to an Inclined Riser**

Seong-Kwon Kang, In-Cheol Chu, Hee Cheon NO, and Moon-Hyun Chun

Korea Advanced Institute of Science and Technology

373-1, Kusong-Dong, Yusong-Gu, Taejon, 305-701, Korea

Chang-Kyung Sung and Sang-Jun Ha

Korea Electric Power Research Institute

103-16, Moonji-dong, Yusong-Gu, Taejon, 305-380, Korea

ABSTRACT

An experimental investigation has been performed to examine the effects of various geometrical parameters on the air-water countercurrent flow limitation (CCFL) in a simulated PWR hot leg. A total of 103 experimental data for the onset of CCFL and zero liquid penetration have been obtained for various combinations of test parameters. It is observed that the CCFL can be classified into three different categories: ① the onset of CCFL, ② the partial liquid delivery, and ③ the zero liquid penetration. The observed mechanisms of CCFL were different depending on the inlet water flow rate. The effect of pipe diameter on the onset of CCFL for short horizontal pipes is not evident. For longer horizontal pipes with a small pipe diameter, however, air flow rates to initiate the onset of CCFL are much smaller than those with a larger pipe diameter when the inlet water flow rate is fixed. The effects of horizontal pipe length and that of horizontal pipe length-to-diameter (L/D) ratio on CCFL are about the same, and a longer horizontal pipe length (or a larger L/D ratio) leads to lower velocities of air and water for the onset of air-water CCFL