

Experiments on supercritical flow instability in two vertical parallel channels

Inderjit Singh¹, Vijay Chatoorgoon²

¹University of Manitoba

18 Kenneth street, Winnipeg, Canada

Singhi2@myumanitoba.ca ; Vijay.chatoorgoon@umanitoba.ca

²University of Manitoba

E1-408 75A Chancellor Circle ca, Winnipeg, Canada

Abstract - Very limited experimental data on supercritical flow instability is present in the literature. To enrich this limited database and to further the understanding of supercritical flow instability, an experimental study was conducted using two vertical parallel channels with supercritical CO₂. A total of 7 experimental cases were performed with a system pressure range of 8.25 – 9.1MPa and inlet temperatures 0.5 – 10.05 °C. The channel inlet temperature and system pressure were held constant and the input power was increased gradually until mass flow oscillations commenced. The distribution of mass flow rate in the channels with input power increase was examined. Initially, at low input power, the flow rate in the channels was almost equal, with an increase in input power, it got distributed in channels and become asymmetric, and with the further input power increase, it started oscillating 180 °out-of-phase. The results for seven experimental cases are presented and these would be useful for code validation purposes.

Keywords: Parallel channel super-critical flow instability, SCWR (super-critical water reactor), Supercritical CO₂, Thermal hydraulic instability.