

Transient Analysis of Central Region Void Fraction in a 3x3 Rod Bundle under Bubbly and Cap/Slug Flows

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Abstract : This study analyzed the transient signals of central region void fraction of air-water two-phase flow in a 3x3 rod bundle. Experimental tests were carried out utilizing a vertical rod bundle test section along with a set of air-water supply/flow control system, and the transient signals of the central region void fraction were collected through the electrical conductivity sensors as well as visualized via high speed photography. By converting the electric signals, transient void fraction can be obtained through the voltage ratios. With a fixed superficial water velocity ($J_{_f}=0.094$ m/s), two different superficial air velocities ($J_{_g}=0.094$ m/s and 0.236 m/s) were tested and presented, which were corresponding to the flow conditions of bubbly flows and cap/slug flows, respectively. The time averaged central region void fraction was obtained as 0.109-0.122 with 0.028 standard deviation for the selected bubbly flow and 0.188-0.221 with 0.101 standard deviation for the selected cap/slug flow, respectively. Through Fast Fourier Transform (FFT) analysis, no clear frequency peak was found in bubbly flow, while two dominant frequencies were identified around 1.6 Hz and 2.5 Hz in the present cap/slug flow.

Keywords : central region, rod bundles, transient void fraction, two-phase flow

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