عنوان مقاله:

Numerical Analysis on Flow Characteristics of Gas-liquid Two-phase Flow in a Vertical Pipe with Downward Stream

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خلاصه مقاله:

Through this paper, a ۳D simulation together with experimental observation was conducted to study two-phase flow in a vertical tube. OpenFOAM software was employed to analyze air and water. Main flow stream was downward which was considered to be within a vertical pipe of ۱۰ mm in diameter. Study included two inputs for flows: upper input for water and side input for air. Several states with various mass fluxes for both water and air were studied. Based on physics of the issue, numerical simulation was considered to be time-dependent. Obtained results showed that when air velocity occupied lower values, air momentum cannot overcome water momentum leading in small slugs. When airflow velocity was more than water flow rate, it dominated water flow and consequently could affect mainstream direction. Also, velocity graphs on centerline represented that going forward in time, velocity magnitude experiences a significant value of fluctuations and large oscillations occur next to outlet. Comparing experimental and numerical results, approximately ۹% differences can be found which showed suitable agreement. Results showed that at initial steps, void fraction faces a significant jump in values. Intensity of this change in void fraction values was higher in lower water velocity. Indeed, by increment of water velocity, inertial forces associated with liquid phase find a dominant role in overall hydrodynamics of the gas-liquid flow. Also, it is obvious that flowing manner in cases ۱, ۲, and ۳ are similar but after case ۴, flow pattern varies. These changes are more considerable in cases ۵ and ۶.

کلمات کلیدی:

Two-phase flow, Downward flow, numerical simulation, Level Set Method

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