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Study of the Influence of Nozzle Length and Jet Angles on the Air Entrainment by Plunging Water Jets

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Abstract : When a vertical liquid jet plunges into a liquid surface, after passing through a surrounding gas phase, it entrains a large amount of gas bubbles into the receiving pool, and it forms a large submerged two-phase region with a considerable interfacial area. At the intersection of the plunging jet and the liquid surface, free-surface instabilities are developed, and gas entrainment may be observed. If the jet impact velocity exceeds an inception velocity that is a function of the plunging flow conditions, the gas entrainment takes place. The general goal of this work is to study the effect of nozzle parameters (length-to-diameter ratio (lN/dN), jet angle (α) with the free water surface) and the jet operating conditions (initial jet diameters dN, initial jet velocity VN, and jet length x1) on the flow characteristics such as: inception velocity of the gas entrainment Ve, bubble penetration depth Hp, gas entrainment rate, Qa, centerline jet velocity Vc, and the axial jet velocity distribution Vx below the free water surface in a plunging liquid jet system.

Keywords : inclined plunging water jets, entrainment, two phase flow, nozzle length
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