ELIMINATION OF AIR-CORE VORTEX IN A CYLINDRICAL TANK BY DUAL PORTS

P.J. Joshy, C.S. Sanjid, Nimal Baby
Department of Mechanical Engineering
Cochin University of Science and Technology
Cochin-682 022, Kerala, India
Email : pjjoshy1969@gmail.com

Abin Jacob
Division of Mechanical Engineering
Carmel College of Engineering and Technology
Alappuzha-688 004, Kerala, India

Abstract

The liquid drain from a cylindrical tank subjected to rotation forms a depression on the free surface of the liquid. This depression transforms into an air-core vortex which subsequently enters the drain port. The reduced cross-sectional area of the drain port thus lowers the discharge of the fluid. This phenomenon is of practical interest, especially in the case of space vehicles as similar flow patterns exists in the storage tank during draining of liquid propellants. The current study focuses to extirpate such vortex generation using dual port cylindrical tank. In the present work, the effect of initial rotation and center to center distance between the ports on the air-core vortex is studied by keeping the initial height of liquid layer, drain port diameter and tank diameter are constant.It may be noted that complete suppression of vortex with reduced drain time is the remarkable feature of this analysis.