



Air pocket removal from downward sloping pipes

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ABSTRACT

Air-water flow is an undesired condition in water pipelines and hydropower tunnels. Water pipelines and wastewater pressure mains in particular are subject to air pocket accumulation in downward sloping reaches, such as inverted siphons or terrain slopes. Air pockets cause energy losses and an associated capacity reduction. Despite its practical relevance, many phenomena associated with air-water flow in downward sloping pipe reaches are still poorly understood. Deltares and Delft University of Technology have investigated the co-current flow of air and water in twelve different large-scale facilities. Pothof and Clemens have recently developed a numerical model for the total air discharge by flowing water in downward sloping pipes. The model has been validated against the experimental data on co-current air-water flow and available literature. This paper presents new experimental data on the breakdown and removal of large air pockets. The experimental results are compared with the numerical model. The observed disagreement is analysed and discussed. The main conclusion is that the numerical model predicts the air pocket breakdown rate with reasonable accuracy.

KEYWORDS

air discharge, air pockets, downward pipe angle, pipe flow, two-phase flow, wastewater.