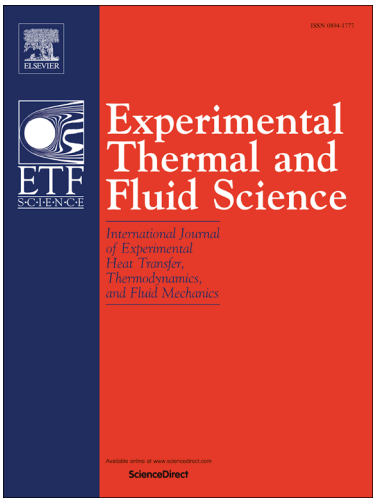

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Abstract. An experimental study of the flow disturbances induced by an orifice plate in an air-water slug flow is carried on a horizontal test section with 0.026 m and 1009 pipe diameters long. Three orifices with distinct area contraction ratios are tested at three axial positions along the test section. The instantaneous orifice pressure difference as well as the absolute pressure and void fraction along the test section are measured. The data is further processed to get the bubble nose velocities and the slug frequency. The pressure difference at the orifice and the absolute pressure along the test section reveal a pulsatile pressure behavior due the intermittent passage liquid slugs and elongated bubble through the orifice. The spectral analyses disclose a match between the frequency of passage of slugs through the orifice and the frequency of the orifice pressure fluctuations. The orifice disturbances on the void fraction, bubble nose velocity and frequency of passage exhibits a dependency on the orifice size and to the distance from the mixer.

Keywords: orifice plate; gas-liquid; pressure difference; slug flow; pulsatile flow;

1. INTRODUCTION

The two-phase flow behavior of a gas-liquid mixture through orifices is important for control and operation of commonly known processes found in power generation plants, refrigeration units, chemical reactors and in petroleum production lines. The industrial processes often require the estimation of the orifice's pressure drop for a given flow rate or else the flow rate as a function of the orifice's pressure drop. The two-phase flow close to the orifice challenges the modeling efforts to capture the flow contraction and expansion which continuously deforms the interfaces exhibiting an ever-changing void fraction near the singularity.

The early works focused on the pressure drop with the use of two-phase multiplier without addressing to a specific flow pattern. The modeling efforts were focused on the development of analytical expressions to the two-phase multipliers employing hypotheses such as: homogeneous flow, separated phases flow, mixture with slip, compressibility effects and choked flow. A comprehensive review of these models is on Chisholm (1983). For low quality mixtures the liquid two-phase multiplier is defined as:

$$\phi_L^2 = \Delta P_{two-phase} / \Delta P_{liquid} , \quad (1)$$

where ΔP represents the orifice average pressure drop for the two-phase mixture and for the liquid phase, respectively. The liquid two-phase multipliers are analytical expressions based on a single or multiple variables such as: the phases'