Modeling of Air –Water Flow in a Rock&Roll Flow Loop

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1 Introduction

Gas-liquid flow dynamics in pipes is a complex phenomenon encountered in many industrial spheres. Particularly, in petroleum production and transportation the design of the facilities, safety, and efficiency of the industrial operations strongly depend on accurate prediction of flow behavior. Since the seventies, two-phase flow models and correlations predicting the liquid holdup and pressure drop, have been actively developed [1][2]. However, there are still mismatches between model predictions and experimental results. These discrepancies may be attributed to the benchtop limitations in length, complexity of the gas-liquid interface, and accuracy of empirical correlations used within a model.

2 Results

In order to overcome this problem, current work presents an experimental study of air-water flow patterns in an in-house made Ring flow loop called Rock&Roll (Figure 1). The Rock&Roll Loop is an innovative, compact, easy-to-build, and endless flow testing loop similar to a rocking cell. It consists of a ring-tube installed on a disk, that tilts sequentially to 4 sides to induce the circular motion of the fluid. By varying the inclination angle, the rotation speed, and initial liquid volume, different flow structures were classified. On the basis of qualitative observations of the air-water flow, a flow regime map was produced. Considering that the solution of the system will be the one that minimizes the total energy, a two-phase flow model predicting liquid holdup and pressure drop is under development.

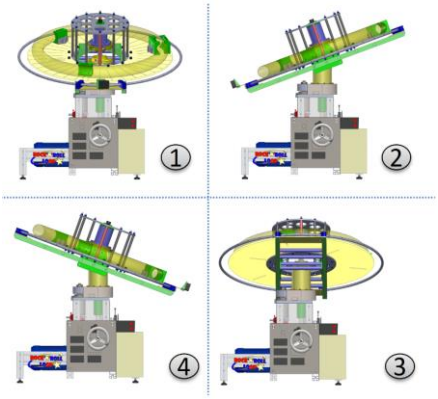

Figure 1 - *3D model of Rock&Roll Ring Flow Loop inclined in four positions.*

Mots clés : gas-liquid flow, two-phase flow pattern, rock&roll ring flow loop, energetic approach

References

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