

Two-phase Flow Measurement in an Upward Pipe Flow Using Wire-Mesh Sensor Technology

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Abstract: Two sets of three layers wire-mesh sensor technology were used to measure the air/water flows development in an upward vertical pipe with the length of 4m and the inner diameter of 58mm. The intrusive effect of the WMS was also discussed in the paper.

Keywords : two-phase, pipe flow, wire mesh sensor, void fraction

1. Introduction

In Japan Atomic Energy Agency, several detailed two-phase flow analysis codes have been developed to simulate and evaluate two-phase flow characteristics in nuclear energy systems [1]. As to validate these codes, wire mesh sensor technology (WMS) is used to measure the air-water two-phase flow development in an upward pipe flow.

2. Experiments

2-1. Experimental setting

Two sets of three layers wire-mesh sensor technology was used to measure the air/water flows development in an upward vertical pipe with 4m in length and 58mm in inner diameter at separately 0.9m and 1.4m height from the air injection position.

2-2. Experimental results

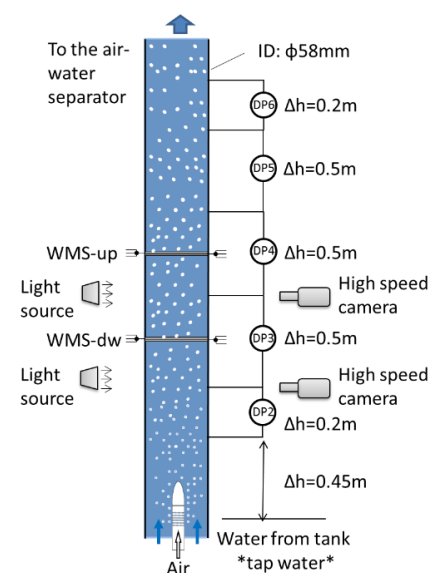


Fig. 1 the sketch of the test section

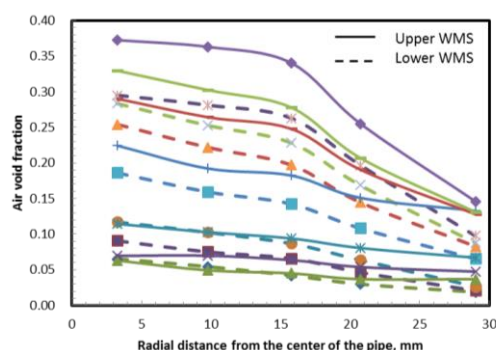


Fig. 2 Void fraction development in the flow direction

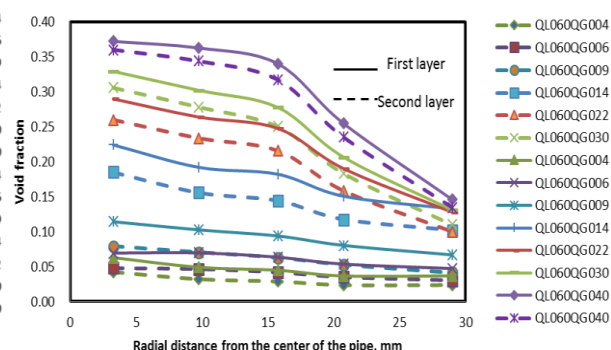


Fig. 3 The estimation of the intrusive effect of WMS

The slip flow was successfully recorded, which expressed as the increase of the time averaged void fractions in the flow direction especially in high air flow rate conditions as shown in Fig. 2. The intrusive effect is estimated by comparing the measured results of the first layer and the second layer WMS of the upper WMS setting. With the increase of the bubble size, such as slug bubbles cases, the intrusive influence can be relatively reduced.

3. Conclusion

WMS successfully measured the void fraction development in the flow direction. And the intrusive effect is estimated

References

[1] Yoshida H. et al., 2008. J. Power and Energy Systems, Vol. 2, pp. 250-261

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