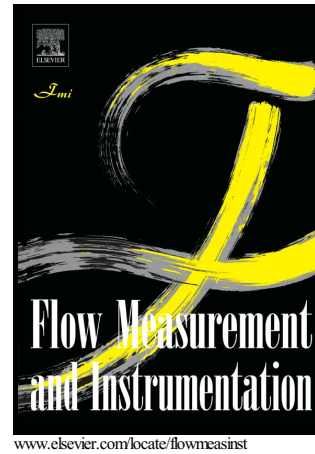


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Gas-liquid two-phase flow measurements by the electromagnetic flowmeter combined with a phase-isolation method

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Abstract

The electromagnetic flowmeter has presented excellent performance in single-phase flow. However, there are many fundamental difficulties when it is applied in two-phase flow. The presence of the insulating phase at various positions in two-phase flow strongly influences the distribution of the weight function, consequently resulting in the uncertainty and instability of the electromagnetic flowmeter's output. When the insulating phase contact with the electrode, it even leads to wrong alarm. In this paper, at the upstream of the electromagnetic flowmeter a phase-isolation method was used to change the inlet flow pattern into a uniform and symmetrical swirling core-annular flow, in which gas-liquid mixture was isolated to gas core and liquid annular flows flowing concurrently in the transmission pipe with a clear smooth interface between them. Then we analysed the behavior of the electromagnetic flowmeter performed in this specific flow pattern, and built the liquid flow rate measurement model. Besides, the void fraction was measured by image processing technique. Owing to the clear smooth interface, the difficulty of image processing and the measurement error of the void fraction can be reduced. The experimental results showed that, the combination of the phase-isolation method could improve the measurement accuracy and successfully make the electromagnetic flowmeter available for the gas-liquid two-phase flow where the original phase distribution is not uniform.

Keywords: two-phase flow; electromagnetic flowmeter; phase-isolation; flow measurement

1. Introduction

Gas-liquid two-phase flow is commonly encountered in industrial applications, such as power plants, transportation and chemical reactions. Although two-phase flow measurement has been studied by many researchers in the last few decades, it is still a challenge due to difficulties caused by the presence of many flow patterns and complicated flow mechanism.

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