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Swirl decay in the gas-liquid two-phase swirling flow inside a circular straight pipe

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ABSTRACT: A complete knowledge of the decay in the gas-liquid two-phase swirling flow is of significant importance for the study on the flow patterns. The decay of the swirl has long been investigated in the single phase swirling flow. However, the decay in the gas-liquid two phase flow is not well understood; no specific models or even no parameters are available to describe the decay. In the present study a visualization experiment on the gas-liquid two phase decaying swirl flow was carried out. The visualization section consisted of transparent circular pipes with total length of 11m and an inner diameter (D) of 62mm. The experimental results showed that the gas-liquid two-phase swirling flow transformed to the straight flow as the swirl decayed along the flow. The swirl decayed more rapidly with increasing gas velocities or decreasing liquid velocities. Based on the momentum theorem, a simplified model of the decay in the gas-liquid two phase swirling flow was established to describe the decay. The proposed model was verified both qualitatively and quantitatively. The present model performs well in predicting the axial position of the transition from the swirling flow to the straight flow. This work helps understand the swirl decay in the gas-liquid two-phase flow which is essential for the application of the gas-liquid two phase decaying swirl flow in the industry.

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