Prediction of Bubbly Plume Characteristics Using the Self-Similarity Model

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Abstract : Gas releasing into water can be found in for many industrial situations. This process results in the formation of bubbles and acoustic emission which depends upon the bubble characteristics. If the bubble creation rates (bubble volume flow rate) are of interest, an inverse method has to be used based on the measurement of acoustic emission. However, there will be sound attenuation through the bubbly plume which will influence the measurement and should be taken into consideration in the model. The sound transmission through the bubbly plume depends on the characteristics of the bubbly plume, such as the shape and the bubble distributions. In this study, the bubbly plume shape is modelled using a self-similarity model, which has been normally applied for a single phase buoyant plume. The prediction is compared with the experimental data. It has been found the model can be applied to a buoyant plume of gas-liquid mixture. The influence of the gas flow rate and discharge nozzle size is studied.