Multiphase Flow Component Volume Fraction Measurement: Experimental Evaluation of Entropic Thresholding Methods Using an Electrical Capacitance Tomography System.

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Abstract

A laboratory experiment to measure component volume fractions in a multiphase flow of an oil/gas/water mixture, where water is the discontinuous phase, has been conducted using a measurement system based on electrical capacitance tomography. The image reconstruction algorithm of the electrical capacitance tomography system has been modified to incorporate entropic thresholding methods, which facilitate accurate information extraction from the tomograms. Evaluation results show that this approach, using only one thresholding method, fails to meet the desired requirements over the full component volume fraction range, is flow regime dependent and is highly dependent on the concentration of the components in the mixture. However, some of the algorithms developed are complementary with the conventional algorithms over the full component volume fraction range. Integration of complementary algorithms improves the overall measurement results to within the desired requirements for operational purposes in the oil industry.