

Segmented capacitance tomography electrodes: A design and experimental verifications

Abstract

A segmented capacitance tomography system for real-time imaging of multiphase flows is developed and presented in this work. The earlier research shows that the electrical tomography (ECT) system is applicable in flow visualization (image reconstruction). The acquired concentration profile obtained from capacitance measurements able to imaged liquid and gas mixture in pipelines meanwhile the system development is designed to attach on a vessel. The electrode plates which act as the sensor previously has been assembled and fixed on the pipeline, thus it causes obscurity for the production to have any new process installation in the future. Therefore, a segmented electrode sensor offers a new design and idea on ECT system which is portable to be assembled in different diameter sizes of pipeline, and it is flexible to apply in any number due to different size of pipeline without the need of redesigning the sensing module. The new approach of this sensing module contains the integration intelligent electrode sensing circuit on every each of electrode sensors. A microcontroller unit and data acquisition (DAQ) system has been integrated on the electrode sensing circuit and USB technology was applied into the data acquisition system making the sensor able to work independently. Other than that the driven guard that usually placed between adjacent measuring electrodes and earth screen has been embedded on the segmented electrode sensor plates. This eliminates the cable noise and the electrode, so the signal conditioning board can be expanded according to pipe diameter.