

Ultrasonic Tomography Imaging Simulation Of Two-Phase Homogeneous Flow

Abstract

Purpose - The purpose of this paper is to present an implementation of ultrasonic tomography simulation to investigate the laminar flow of stratified liquid between water and oil. **Design/methodology/approach** - The velocity of ultrasonic waves varies in water, oil, and different composition of water and oil. The composition of water and oil can be determined from the measurement of this propagation time. Sixteen pairs of ultrasonic sensors are mounted non-invasively around the periphery of an acrylic pipe. The grease is used as the coupling material to mount these ultrasonic sensors. Different compositions of water and oil are used and the propagation times of the ultrasonic waves through the medium are measured. The composition of the water and oil of the flow is determined from the reconstructed images. **Findings** - The paper finds that information about the distribution of the components within the sensing zone is obtained from the sensors' measurements. These measurements are then used to reconstruct the cross-sectional image which can be analyzed to provide information, such as concentration of the flow components, the flow condition, velocity, mass flow rate, and identification of the distribution of mixing zones in stirred reactors and interface measurement in complex separation processes. The image can also be analyzed quantitatively for subsequent use to improve process control or develop models to describe individual process. **Originality/value** - The paper shows that industries which may benefit from this technique could be the raw material processing industry, large-scale and intermediate chemical production, and food biotechnology.