

Ultrasonic tomography: non-invasive techniques for flow measurement

Synopsis:

Real-time process monitoring plays a dominant role in many areas of industry and scientific research concerning liquid/gas two-phase flow. It is proven that the operation efficiency of a process is closely related to accurate measurement and control of hydrodynamic parameters such as flow regime and flow rate. Ultrasonic tomography has the potential for imaging liquid/gas flows. One of the advantages of ultrasonic tomography includes having the capability of performing non-invasive measurement.

This book presents a detailed study on ultrasonic tomography, including the principle, design and development. The ultrasonic tomography system comprises 16-pairs of ultrasonic transducers, the electronic measurement circuits, the data-acquisition system and several image reconstruction algorithms. The measurement of the flows was conducted in real-time. The system was capable of visualizing the internal characteristics of liquid and gas flow and provides the concentration profile for the corresponding flows. The results obtained are useful for online monitoring of liquid/gas flows for flow regime identification, chemical mixture transportation or fluid transportation at sub-sea oil fields.

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