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Acoustic sensor approaches for sand detection in sand–water two-phase flows

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Abstract The online measurement of the solid phase in sand–water two-phase flows is significant in industrial production processes, especially for oil production in old oilfields. To improve the existing limitations in the detection of dilute solid particles in solid–liquid conveying systems, an acoustic sensor approach for sand detection in sand–water flows is developed and evaluated. This paper reports the application of a special acoustic sensor device to quantitatively survey sand–water flows in a pipeline. In this work, an acoustic focusing component is designed to assist a condenser microphone in detecting the sand signals. A time–frequency analysis method and characteristic sand frequency multiband digital filter method are presented to enhance the sand detection in water flows with strong background noise. Additionally, the real-time sand mass flow rate is calculated to check the quantitative analysis results for the monitored sand information. Furthermore, the calibrated reference sand signals are used to reduce the uncertainty in each measurement. An experimental investigation considers sand–water flows with sand contents ranging from

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