Simulation of frequency selection for invasive approach of electrical capacitance tomography for conducting pipe application using oil-gas regimes

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ABSTRACT

Electrical capacitance tomography (ECT) is a common imaging technique in process tomography that has been used in various applications especially in pipe applications. It works by measuring the dielectric permittivity distribution in the interior of pipe using capacitive sensors. Based on the principle of ECT, signals are generated from transmitter and delivered to the right receiver using certain frequency. Assuming random selection of frequency could affect the wanted signal at the receivers, this paper will analyse the frequency selection ranged from 100 to 500 kHz with increment of 50 kHz thoroughly. The objective of this paper is to select the right frequency for the invasive approach of ECT for the conducting pipe applications using common parameter in ECT and oil-gas regimes as a medium. The frequency selection is observed using the voltage reading at each of the receivers and simulated using COMSOL Multiphysics software. Based on the results, the optimal frequency selection is 400 kHz where the best coverage area of sensor is 90%. This selection has the highest value of electrical voltage among other range proposed while the least electrical voltage produce is at frequency 300 kHz and coverage area of 50%.

KEYWORDS

ECT; Frequency; Invasive; Conducting pipe; Oil-gas

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