

Analysis of Crude Palm Oil Composition in a Chemical Process Conveyor using Electrical Capacitance Tomography

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ABSTRACT

In this work, we aim to analyse the capability of using a 16-segmented Electrical Capacitance Tomography (ECT) sensor system to monitor the internal composition of a chemical process conveyor that carries crude palm oil (CPO) multiphase flow. The source used to excite the electrodes is a differential potential, instead of the conventional single potential source, in order to obtain an improved sensitivity of the sensor, especially in the central area of the pipe. This system aims to recognise the phase concentration of the flow. The attained concentration profile that is received from the capacitance measurements is capable of providing an image of the liquid and liquid mixture in the pipeline, making the separation process (between oil and liquid waste) much easier and the CPO's quality can be dependably monitored. Experimental results and analysis are presented, and the new excitation technique is shown to provide better sensor sensitivity in the central pipe area. The visualisation results deliver information regarding the flow regime and concentration distribution in a two-phase flow-rate measurement system incorporating a liquid flow-measuring device. The information obtained will assist the design of process equipment, and the verification of existing computational modelling and simulation techniques.

KEYWORDS: Electrical capacitance tomography; Liquid/liquid multiphase flow; Crude palm oil; Chemical process; Composition

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