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

E.J. Mohamad a,*, R.A. Rahim b, M.H.F. Rahiman c, H.L.M. Ameran a, Y.A. Wahab d, O.M.F. Marwah e
a Department of Mechatronic and Robotic, Faculty of Electrical & Electronics Engineering, Universiti Tun Hussein Onn Malaysia, Pt. Raja, Bt. Pahat, Johor 86400, Malaysia
b Process Tomography and Instrumentation Research Group, Infocomm Research Alliance, Faculty of Electrical Engineering, Universiti Teknologi Malaysia, Skudai 81310, Malaysia
c School of Mechatronic Engineering, Universiti Malaysia Perlis, Pauh Putra Campus, 02600 Pauh, Perlis, Malaysia
d Department of Instrumentation & Control Engineering (ICE), Faculty of Electrical & Electronics Engineering, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia
e Department of Manufacturing and Industrial, Faculty of Mechanical and Manufacturing, Universiti Tun Hussein Onn Malaysia, Pt. Raja, Bt. Pahat, Johor 86400, Malaysia

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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