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Optimisation of electrode dimensions of ERT for non-invasive measurement applied for static liquid–gas regime identification

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ABSTRACT

The non-invasive technique is one of the favourite methods applied in process plants, compared to other sensing techniques. Due to certain advantages, this technique is also implemented in process tomography such as in non-invasive ERT systems for multiphase mixtures. The purpose of this paper is to investigate the optimum size of the area of the electrode in terms of the width and height for the non-invasive ERT system that can be applied for a static liquid-gas regime. Based on a quasi-static electric field, a 2D simulation using finite element model software (COMSOL Multiphysics) was used to analyse the simulation results. As a result, by applying several widths and heights to the system, 18.5° and 200 mm in width and height, respectively, were chosen as the optimum dimensions to be applied for a 100 mm outer diameter and 2 mm thick acrylic pipe for the non-invasive ERT electrode. Later, experiments were conducted to obtain the tomogram for image verification. Thus, it is believed that the implementation of the optimised area of the electrode can allow the electricity to be emitted and significantly detected. The non-invasive ERT system will also give an alternative way for industry to monitor the performance of process plants.

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