

# Electrical Resistance Tomography as a Process Analytical Technology in the pharmaceutical industry

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The monitoring of reactors is crucial in the pharmaceutical industry to ensure product quality. By utilizing sensors and process analytical technologies (PAT), manufacturers can detect deviations promptly and make necessary adjustments, thereby preventing the production of substandard products. In this work the resuspension monitoring of solids in liquid-phase reactors is studied, which is critical for optimizing the mixing stage within the pharmaceutical industry. Proper resuspension prevents concentration gradients in the solution, which can lead to final products with inconsistent concentrations. Additionally, it enhances overall process efficiency. This research aims to develop a non-intrusive, real-time monitoring tool for solid-liquid reactors using Electrical Resistance Tomography (ERT). The methodology focuses on tracking the resuspension and suspension of fine solids. For experimental purposes, a mimic solid, hydrous magnesium silicate, was employed. This material was selected due to its similar nominal density and particle size distribution to the commercial aluminium adjuvant commonly used in vaccine manufacturing. Experiments were conducted across various solid concentrations and vessel scales. Two probe configurations were evaluated: circular and linear (as shown in Figure 1). The circular probe configuration was used to assess the range of measurability in terms of solid concentration. In contrast, a custom-designed linear probe mounted at the vessel's bottom was employed to monitor solid sedimentation dynamics. The application of ERT proves effective in monitoring both suspension and deposition phenomena. In fact, the two probe configurations provide complementary data, offering distinct insights into the behaviour of solids within the vessel, and demonstrating the strong potential of ERT as a tool for advanced process control in pharmaceutical manufacturing.

**Keywords:** PAT, ERT, online-monitoring, suspension dynamics, Multiphase Reactors.

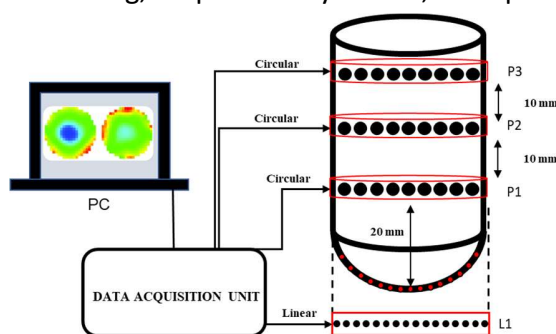


Figure 1: Schematic representation of stirred tank and ERT system and electrodes position.