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In this work we demonstrate the construction of an ‘inside-out’ sensor geometry for electrical capacitance tomography (ECT). The inside-out geometry has the electrodes placed around a tube, as usual, but measuring ‘outwards’. The flow between the electrodes and an outer tube is reconstructed; allowing the inside-out sensor to move inside the outer tube. A test sensor was constructed and capacitances were measured using the charge transfer technique. Sensitivity matrices for the inside-out sensor were calculated with a finite element approach and some special issues with the sensitivity matrices are discussed. An adaptation of the Landweber algorithm, which works very well for the inside-out geometry, is presented and a definition of the spatial resolution of an ECT sensor is suggested. Tomograms from a test run of an inside-out sensor are presented and measurements of watercut are compared with images obtained by a camera and a simple direct result based on the capacitance vector.

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