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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.

General information
State: Published
Organisations: Department of Mechanical Engineering, Fluid Mechanics
Contributors: Kjaersgaard-Rasmussen, J., Meyer, K. E.
Pages: 104-109
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Flow Measurement and Instrumentation
Volume: 22
Issue number: 2
ISSN (Print): 0955-5986
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.68 SJR 0.489 SNIP 1.2
Web of Science (2017): Impact factor 1.407
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.45 SJR 0.526 SNIP 1.369
Web of Science (2016): Impact factor 1.203
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.67 SJR 0.521 SNIP 1.662
Web of Science (2015): Impact factor 1.152
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 1.52 SJR 0.51 SNIP 1.617
Web of Science (2014): Impact factor 1.04
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 1.6 SJR 0.554 SNIP 1.897
Web of Science (2013): Impact factor 1.03
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 1.35 SJR 0.485 SNIP 1.712
Web of Science (2012): Impact factor 0.971
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 1.38 SJR 0.589 SNIP 1.716
Web of Science (2011): Impact factor 0.8
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.572 SNIP 1.62
Web of Science (2010): Impact factor 0.808
Web of Science (2010): Indexed yes