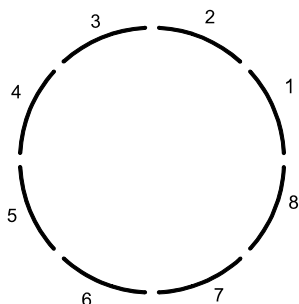
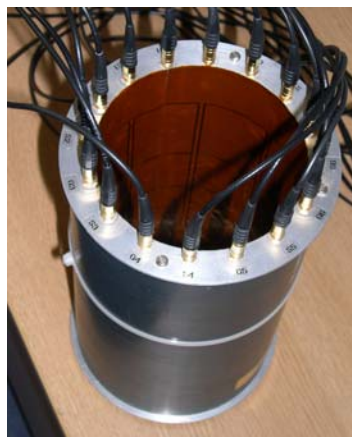


ELECTRICAL CAPACITANCE TOMOGRAPHY (ECT)

ECT is a technique for measuring and displaying the concentration distribution of a mixture of two insulating (dielectric) fluids, such as oil, gas, plastic, glass and some minerals, located inside a vessel. The measurement can be completely non-invasive if the vessel walls are non-conducting. The basic idea is to surround the vessel with a set of electrodes (metallic plates) and to take capacitance measurements between each unique pair of electrodes. From these measurements, the permittivity distribution of the mixture (which is related to the concentration of one of the fluids) can be deduced. In principle, vessels of any cross-section can be imaged and an example of a simple cylindrical 8-electrode sensor is shown below.

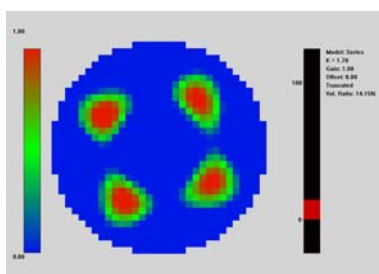


TYPICAL ELECTRODE ARRANGEMENT

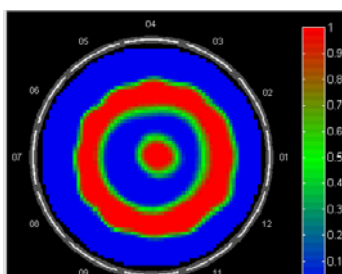


PRACTICAL ECT SENSOR

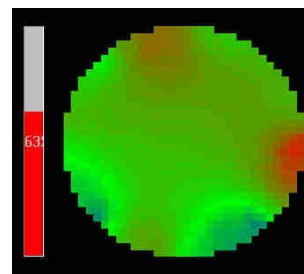
The concentration distribution is normally plotted on a fairly coarse pixel grid, because the relatively small number of available measurements limits the possible image resolution. In the sample images shown below, a red/green/blue colour scale shows areas of high concentration as red and areas of low concentration as blue.



(a) 4 plastic rods



(b) Plastic rod inside plastic tube



(c) fluidised sand

Sample ECT images

Although the resolution of ECT images is relatively low, they can be captured at high speeds, typically 200 frames (images) per second for an 8-electrode sensor. If the fluid is in motion and images are captured at 2 axial locations, correlation techniques can be used to calculate the velocity profile across the vessel cross-section as well as the concentration profile. This enables the flow profile and overall flow rate in two-phase flow systems to be calculated.

ECT can be used in a wide range of applications, including monitoring fluidised beds, flow rate measurement in pneumatic conveying systems, flame and combustion imaging, product uniformity monitoring and sensing, high-speed check-weighing and the monitoring of oil-gas flows. Further information on ECT and flow measurement applications can be found on the following web sites:

ECT imaging: www.tomography.com

Multiphase flow measurement: www.tomoflow.com