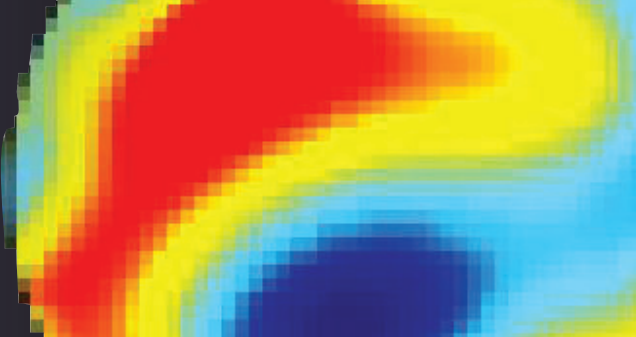


See **inside** your process

We provide electrical tomography instrumentation, software, sensors and technical support to enable you to continuously scan a volume and determine the distribution of electrical properties over time.



Industrial Tomography Systems

Industrial Tomography Systems plc (ITS) is a world leader in process tomography. The company provides a range of electrical and acoustic-based tomography systems for research and process applications. These are unique - designed around patented technologies, expertise and in-depth knowledge built up over more than 10 years of numerous industrial applications.

Instrumentation, software and sensors from ITS are used to characterise a wide range of multi phase processes including mixing, separation, flow and reactions.

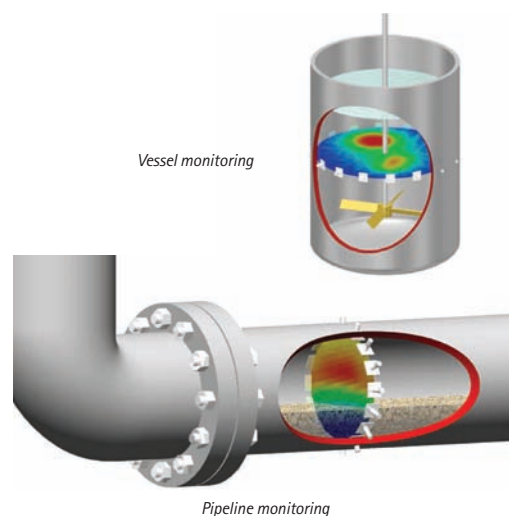
Our systems are widely used in the pharmaceutical, food and household products, oil and gas, nuclear and mineral processing industries - providing data to enable our customers to improve efficiency, monitor and improve quality, shorten cycle times, improve yields, characterise particle size distribution, investigate multi component flow rate and develop new or improved mixing technologies.

What is Process Tomography?

Tomography involves taking measurements around the periphery of an object (e.g. process vessel or patient) to determine what is going on inside. The best known technique is CAT scanning in medicine, however process tomography instrumentation is cheaper, faster and more robust.

Industrial Process Tomography involves the use of non-intrusive sensors to acquire two- or three-dimensional images of the internal contents of process vessels, reactors, separators or pipelines.

ITS has commercialised tomography instrumentation from world-leading research carried out at leading UK universities.



Measurement Principles

The multi-disciplinary technology has been developed by combining academics with maths, electronics, process engineering and computing with major process users including GlaxoSmithKline, Petrobras and Procter & Gamble.

The basic principles of the technology are to combine multiple measurements at the periphery of a process vessel or pipeline and combine these to provide information on electrical properties through the cross-section.

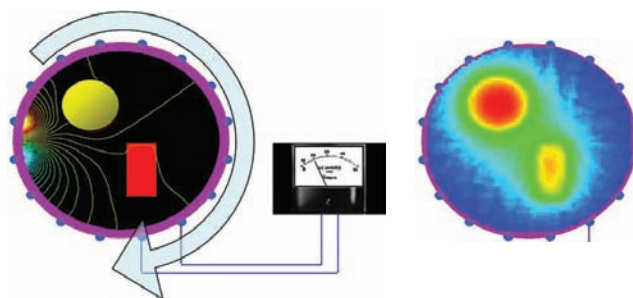
This information can be related to phase concentration, flow characteristics, homogeneity, temperature and a wide range of other characteristics. A single data set (over 200 measurements) can be taken in less than 1 millisecond.

The ITS p2000 Tomography instrument operates in contact with the process media. Sensors are either mounted on a baffle/dip-pipe or around the circumference of the pipe or vessel.

With the p2000 and a standard 16-electrode sensor, 104 voltage measurements are taken every 20 milliseconds using an ac current and 4-electrode measurement technique.

A reconstruction algorithm converts the peripheral measurements to vessel conditions. This is an "ill-posed" problem and there are many techniques of addressing it. ITS offers two techniques, one for on-line operation, and another (more accurate) which requires post-processing.

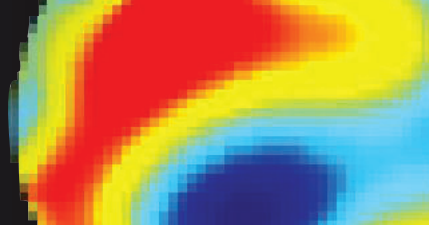
From data to process information



Typically, tomography data is presented as a colour coded image: red for conducting to blue for non-conducting. However each image (tomogram) is composed of an array of derived conductivity measurements.

Data can be analysed statistically (e.g. variance to determine extent of homogeneity or average to give representative data through a volume) and dynamically (e.g. to determine rate of change of a feature).

See **inside** your process



Who uses Tomography?

Industrial Process Tomography is used in pharmaceutical, oil and gas, chemical, minerals, food, environmental, utilities and other process sectors. It is applied to map the distribution of components within a vessel, pipe or other process equipment with diameters typically ranging from a few millimetres up to 4m.



Industries

- Pharmaceuticals
- Chemicals
- Oil & Gas
- Nuclear
- Biotech
- FMCG
- Mining
- Environmental
- Pulp & Paper
- Others...

Applications:

Electrical Tomography provides real-time on-line information across a volume for processes & reactions going through conductivity/permittivity changes.

- Mixing
- Flow
- Multiphase Flow
- Filtration & Drying
- Polymerisation
- Crystallisation
- Scale Up
- Bubble columns
- Packed beds
- Continuous reactors
- Level detection
- CFD Validation
- Hydrocyclones

"Overall it has been demonstrated that the ERT system can provide very valuable information for the monitoring and control of multiphase processes".

Dr F.X. Ricard GlaxoSmithKline

"Tomographic imaging provides feedback for improved operation".

Dr D.M. Scott, Du Pont

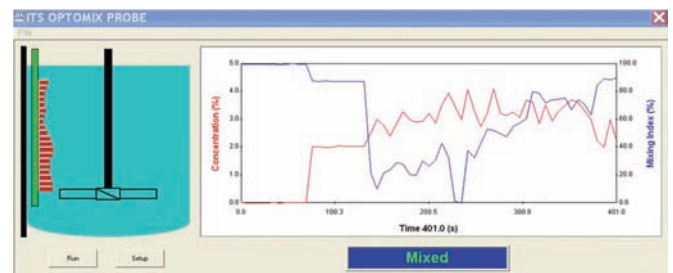
"Tomography is one of the few tools that gives information about what is actually happening inside".

The Chemical Engineer

Benefits

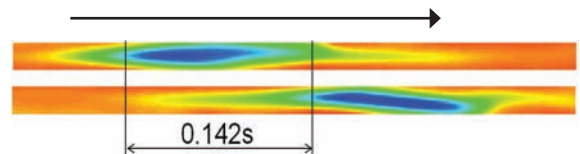
Mixing

- Starting point of process
- End point of process
- Mixing time
- Level of homogeneity
- Determine mixing efficiency



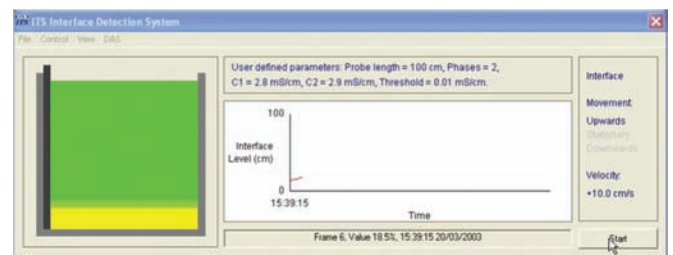
Flow

- Flow patterns/regimes visualisation, real time, online, high speed
- Cross correlation, velocity profiles
- Phase distribution/volume fraction
- Visualisation of solids transportation: speed, settlement, understanding of potential corrosion effects



Separation

- Start and end point
- Interface detection
- Quality of separation - validation of equipment such as separator for example
- Volume fraction
- Phase inversion



Reaction Engineering

- End and start point
- Visualisation of additions
- Crystallisation - information from nucleation stage, start of crystals formation, crystals homogeneity and dispersion