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6<sup>th</sup> October 2014

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Based upon the information you have provided about your application and the subsequent technical response document that ITS engineers have completed (██) ITS is pleased to provide this quotation for the purchase of two of our Electrical Conductivity Densitometers (ECD).

### Electrical Resistance Tomography

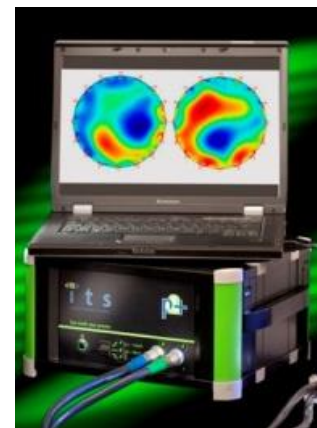
ITS's Electrical Conductivity Densitometers are based on the principles of electrical resistance tomography (ERT), which is a measurement technique for obtaining information about the contents of process vessels and pipelines. Multiple electrodes are arranged around the boundary of the pipeline at fixed locations in such a way that they make electrical contact with the fluid inside, but do not affect the flow or movement of materials.

Specific applications where ERT has been successfully utilised include solid/liquid and liquid/gas mixing, hydrocyclones, packed columns, flotation columns, precipitation processes, liquid-liquid extraction and hydraulic conveying. In principle, ERT can be used to investigate and monitor any process where the main continuous phase is at least slightly conducting and the other phases and components have differing values of conductivity.

### ERT applied to slurry flow monitoring

The characterisation of slurry flow regimes is useful for the design, optimisation and control of processes involving slurry flows. It is also useful for research purposes by providing experimental data to develop, optimise and validate empirical and numerical multi-phase flow models.

ITS has successfully developed and applied ERT to slurries in pipes. Typically 16-electrodes are arranged uniformly around the circumference of the pipe; ERT measures the conductivity distribution through the pipe cross-section by injecting an electrical current and measuring resultant voltages on a multi-electrode sensor.



**Cost breakdown for purchase of ECD package**

Code	Description	No. of units	Price per unit	Total
<b>Hardware</b>				
h1	Enclosure with p2+ instrument (1 plane)*, Bachman platform	1	£55,000	£55,000
h2	Temperature probe for correcting for changes in conductivity that result from changes in ambient temperature	1	£2,200	£2,200
<b>Software</b>				
a1	Core software	1	£5,400	£5,400
a4	Supplementary viewer licences	1	£400	£400
<b>Technical support</b>				
t1	On-site commissioning and training (2 days)	1	£3,300	£3,300
t2	12-months technical support (Level 1)	1	£2,500	£2,500
<b>Sensor</b>				
S01	<p>Steel tube with the following characteristics:</p> <ul style="list-style-type: none"> <li>• Inner polyurethane liner (16mm thickness)</li> <li>• Inner diameter with PU liner: 250mm</li> <li>• Outer diameter: 290mm</li> <li>• Length of the tube face to face 400mm</li> <li>• Outer surface coated with 2 layers of epoxy coat with a final PU topcoat 300 micron</li> </ul> <ul style="list-style-type: none"> <li>• On both ends: 2 flanges (395mm diameter), 12 holes (22 mm diameter) on a pcd of 350mm</li> <li>• Number of electrodes: 1 ring 16+2 ground</li> <li>• Electrode size 50 x 25mm, thickness 10mm. Cabling will be placed outside the tube.</li> <li>• Suitable for pressures from 1 to 8 bar, and temperatures from -10 to 40 °C</li> </ul>	1	£13,200	£13,200
A01	Unterminated LEMO cable and communication and power cables.	1	Incl.	Incl.

<b>Sub-Total for one complete system as detailed above</b>	£82,000.00	£82,000.00
<b>Total for two complete systems</b>	£164,000.00	£164,000.00
<i>Discount of 15% (if two complete systems are purchased simultaneously)*</i>	-£24,000.00	-£24,000.00
<b>Grand Total</b>	<b>£140,000.00</b>	<b>£140,000.00</b>

\* Order must be placed on or before 14th November 2014 to qualify for this discount

I hope that this proposal meets your requirements and allows us to move forward with this project. If you require any further information please do not hesitate to contact us.

Regards,

**Sam Wright**  
Marketing Executive

#### **Terms and conditions**

1. This quote is valid until **14<sup>th</sup> November 2014**
2. The price includes delivery and insurance in transit
3. Lead time is expected to be 12 weeks from PO received and sensor specification agreed
4. Payment terms: 80% with order, 20% on dispatch
5. Warranty is 12 months return-to-base for instrument used under normal conditions. No warranty is made for the performance of the instrument when operating outside its normal performance envelope. Please contact ITS for specification details. Warranty starts on delivery of instrumentation for testing.
6. Each software license is supplied on a single-user basis.