PTL300 SAMPLE APPLICATIONS

Velocity and flow measurement in Pneumatic Conveying

A twin-plane ECT system can be used to monitor and measure the flow of particulates in a pneumatic conveying system. If the flow-regime is dual-phase (eg particulates and air) then the ECT system can measure the overall flow of the particulates. The measurement arrangement is shown in figure 1.

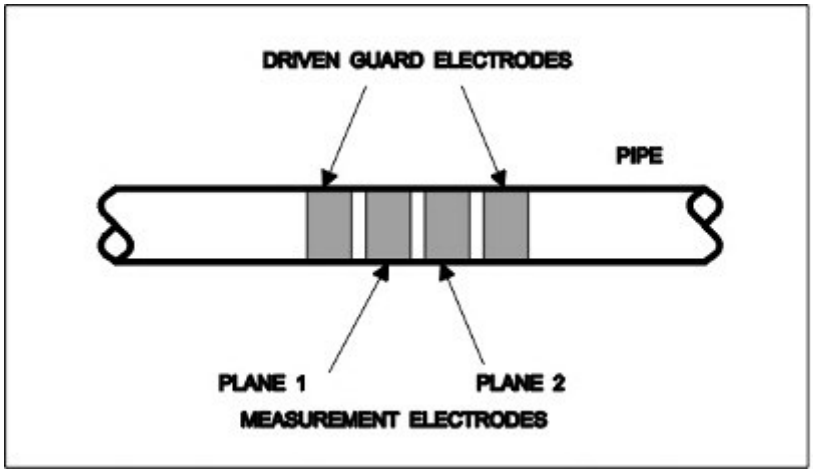

Figure 1. Principle of flow measurement using ECT

A twin-plane ECT sensor is used to continuously measure the particulate concentration profiles at two axially-separated locations on the pipe. Correlation techniques are then used to calculate the velocity profile across the pipe from these concentration profiles. The product of the concentration and velocity profiles is then integrated across the pipe cross-section to obtain the overall flow rate and this is then integrated over a period of time to obtain the volumetric flow of the particulates. Tomographic methods are the only techniques which can measure the flow in a 2-phase system according to the fundamental equations which define the true flow rates.

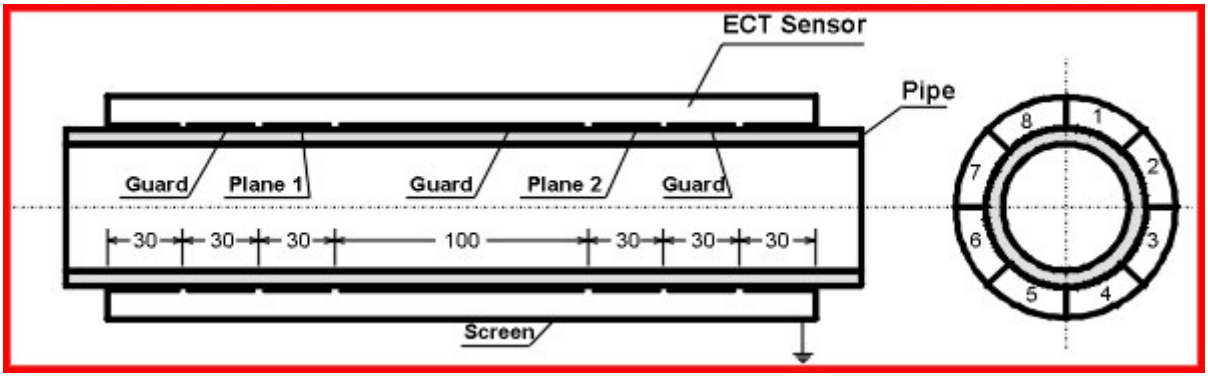

Figure 2. Cross-sections of 8-electrode twin-plane ECT sensor

A cross-section of a typical practical ECT sensor is shown in figure 2 and a photo of the sensor mounted on the vertical section of A pneumatic conveying flow loop, together with a twin-plane PTL ECT system, is shown in figure 3.

Figure 3. ECT sensor in vertical section of flow rig

The capacitance measurements are made continuously on-line and at high-speed and the concentration and velocity profiles are calculated off-line from captured capacitance data .

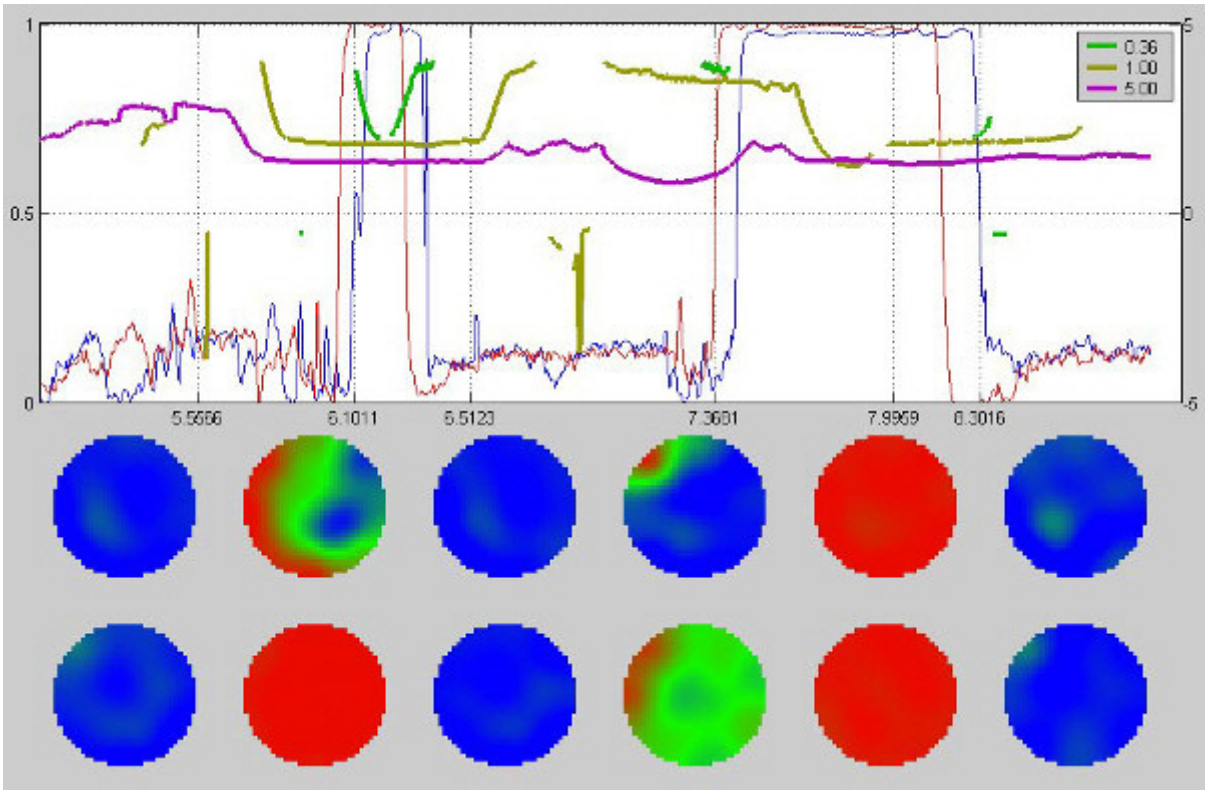

Figure 4. Velocity measurements at centre of sensor and concentration profiles

Figure 4 is a brief clip of processed data for a few seconds of flow. The pairs of circular images show the concentration profiles for a few representative time samples indicated by the vertical lines on the horizontal time axis. The lower circular concentration images are for the first (lower) measurement plane (viewed in the nominal direction of flow) and the upper images correspond to the second (upper) measurement plane.

The upper traces are the calculated flow velocities at the centre of the sensor for different correlation window widths. Narrow correlation windows give good temporal resolution but may fail to give correlatable results (resulting in the gaps in some of the traces). Wider correlation windows give poorer time resolution but more stable and continuous results.

FURTHER INFORMATION

For further information, please contact our sales department at the address below or email us at enquiries@tomography.com

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