Introduction

The pulp and paper sector makes extensive use of mixing and flow of aqueous systems and these processes represent some of the strongest areas for ITS’s p2+ instrument.

Indeed pulp and paper teams (in Europe and North America respectively) were among the earliest adopters of ITS’s technology - over 10 years ago. Commenting on the technique in an interview in 2007, Professor Chad Bennington, from the Pulp and Paper Research group at the University of British Columbia, said “the ability to see inside an opaque system is invaluable”

Areas where ITS systems have been applied include:

- Agitated pulp storage vessels
- Kraft digesters
- Oxygen delignification
- In-line bleaching
- De-inking

The flexibility of ITS instrumentation allows users to apply instrumentation in a variety of process environments, using probe sensors for large vessels and circular sensors for smaller vessels (up to 3.5m diameter). Key process parameters can then be identified and reduced to single or composite variables which are then fed to process control system through a 4-20mA output.

The application below shows an example from work carried out at University of British Columbia.

Application of electrical tomography to Kraft Digesters

Kraft digesters are used to cook wood chips in sodium sulphite / hydroxide (white liquor) at around 170°C and 14 bar to remove lignin and release individual fibres for further processing.

Current operating strategies rely on contacting the chips with liquors of different temperature and compositions throughout the cook to optimise reaction conditions so that pulp strength can be preserved.

Uniform flow of liquor through the chip column is needed to create distinct zones for the different reaction conditions. Work at UBC examined liquid fluid flow through chips under relevant conditions to determine the extent of flow non-uniformity and what actions can be taken to mitigate its effects. This has work subsequently been applied to CFD models of this complex process.
As might be expected in reactors of such geometries, the flow is likely to be non-uniform, particularly in larger digesters.

Improving uniformity can reduce corrosion in the lower digester, improve temperature uniformity (reducing overall energy consumption), and reduce variation in kappa number produced as a function of time. In addition significant heterogeneities lead to downstream processing problems.

More detailed information can be found under the following references:


(Figure 1: Demonstrates the flows observed with a tracer (for validation). Subsequent work has been carried out with wood chips.)