

Example Application

Food Product Inline Mixer Monitoring and Control

Requirement: Sense composition distribution before and after mixer

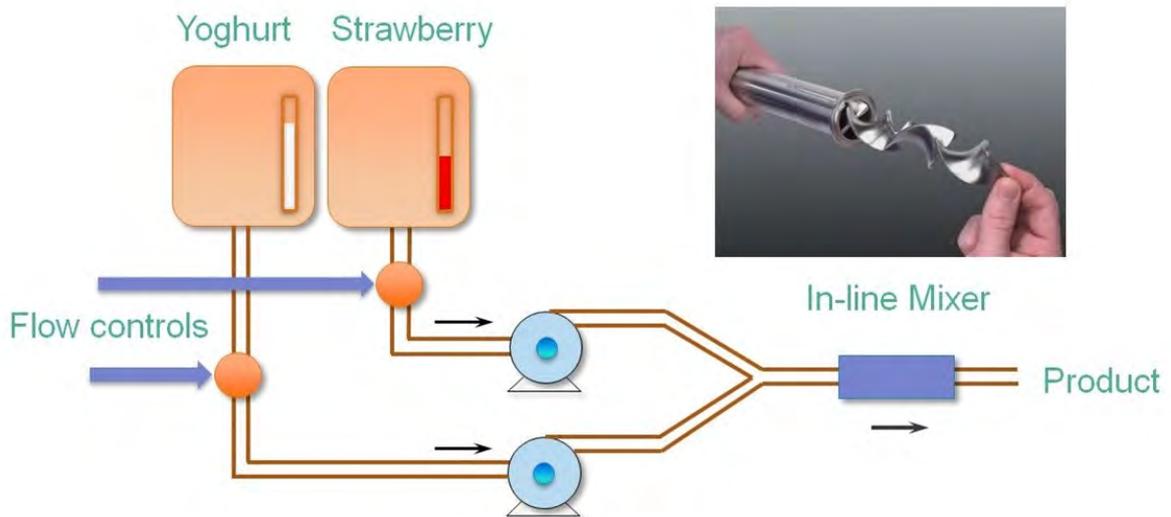
A food manufacturer operates production lines to manufacture a wide range of fruit and dairy products. This seems straightforward, but in practice it is difficult to repeatedly get perfect composition. In fruit yoghurt people typically want fruit parts to be mixed, but not liquidised as in baby food.

Each batch and portion must contain the correct amount of fruit mixed in with the correct consistency.



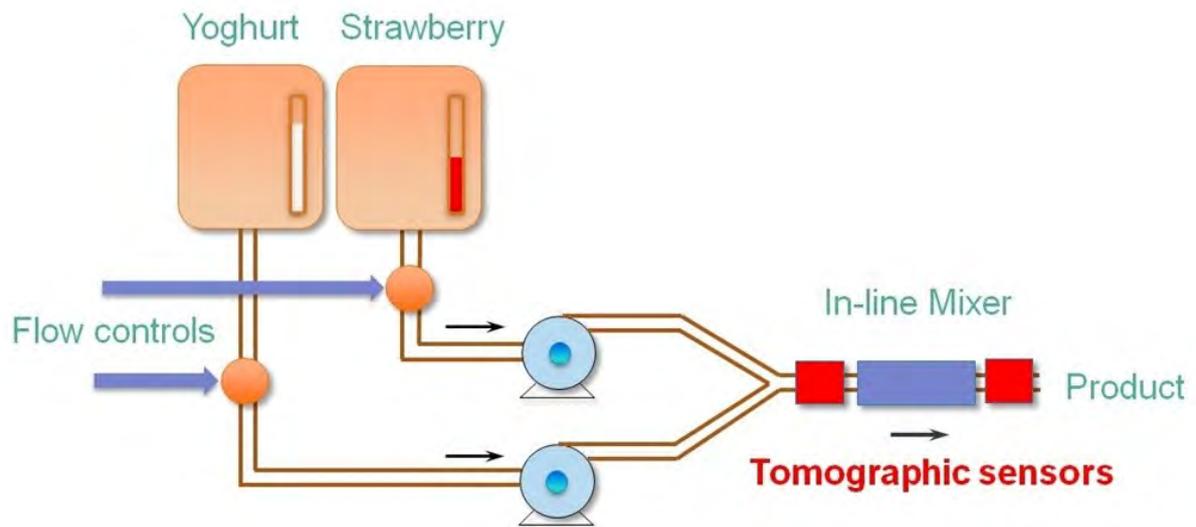
We can examine the mixing process to explore how this can be achieved..

As shown schematically ingredients are stored in tanks with outlet control valves and pumps to pressurise the flow.



They combine at the union and pass through an in-line mixer. As the example illustrates, with its internals visible - these devices work by generating turbulence.

To monitor product composition we use tomographic sensors before and after the inline mixer..



We can take a closer look at the tomographic sensor devices..



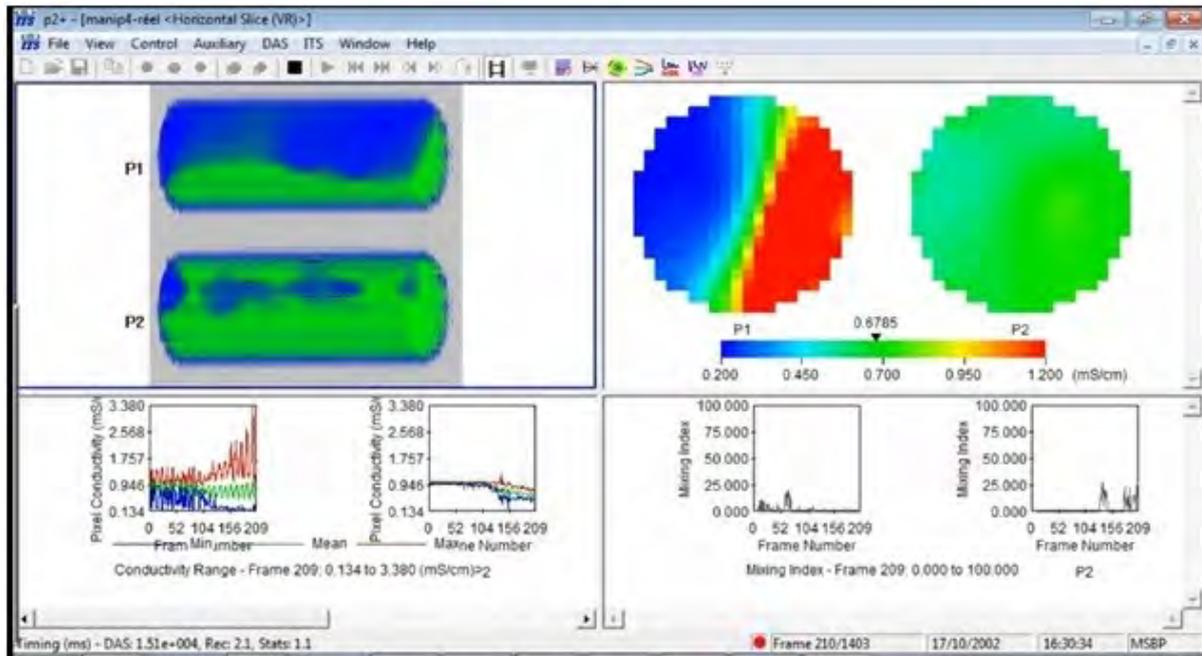
These have end coupling flanges and a cable to the processing unit. Internally they have a ring of 16 electrodes.

They comply with *Clean In Place* specifications required for food processing, as denoted by CIP marking.

Both sensors connect to an *Industrial Tomography Systems P2+* Processing System which computes instantaneous cross-sectional concentration and generates displays and data feeds for external control use.

We can examine the data produced..

The purpose-designed display shows images produced from the twin sensors in several forms. In the upper right block the horizontal scale represents the range of composition. **Red** represents the pure base yoghurt, **Blue** represents the fruit component. The target is an even **Green** mixture value which corresponds to the set-level concentration of fruit.



We see two circles above the scale: **P1** on the left shows the cross-section view of the highly segmented state prior to the mixer; **P2** shows the well-mixed state after the mixer. The upper left displays show P1 and P2 data as rolling 3D-time sequences.

The lower graphs provide an overview of most recent product log statistics (where 0 is the current time). Stored values allow tracking of batch variations for production control.



In conclusion

Seeing inside this process..

- provides improved monitoring and control;
- delivers consistent high product quality,
- optimises plant use, and
- reduces waste materials and energy consumption.

Acknowledgement: we are grateful to Industrial Tomography Systems plc for data and images used in this case study.