Acrylic glass manufacturer increases process efficiency with Micro Motion Fork Viscosity Meter

RESULTS

- Continuous, repeatable viscosity measurements with high accuracy, compared to other technologies
- Meter installation in tanks required no major changes to plant or operation
- Easy-to-clean meters required minimal maintenance, despite polymer coating buildup

Optimized production – by reducing product waste, reducing operator intervention, and increasing reactor output.

APPLICATION

A leading chemical manufacturer in Spain uses viscosity meters in its polymer reaction control batch process to produce sheets of acrylic glass. This process involves the polymerization of methyl methacrylate (MMA) in heated reactor vessels to produce larger molecules, called polymethyl methacrylate (PMMA). PMMA is a transparent thermoplastic that is used as a light or shatter-resistant alternative to glass.The polymerization process is considered complete when the desired viscosity is achieved.

CHALLENGE

As the polymerization process advances, it becomes exothermic and viscosity increases rapidly — only offering a small (20-second) window in which the molecular chain length is optimal for producing a strong, translucent acrylic sheet. It is critical to detect the end point quickly and to quench the reaction (by rapid cooling) to stop further polymerization.

Typically, manufacturers use the Ford cup measurement method to measure viscosity at the reactor vessel. This method measures the time it takes for a known volume of the PMMA sample to drain out of the cup through an orifice of known size. This method is imprecise, but it gives a very quick indication of viscosity. This method is also operator dependent, which means the operator must detect the end point of reaction and take samples accordingly. The laboratory measurement may take 20-30 minutes, sometimes longer.

To increase the accuracy of and automate the viscosity measurement process, the manufacturer decided to install online viscosity meters. Because the polymer solution can create a coating buildup, the company was looking for a meter that would require minimal maintenance.

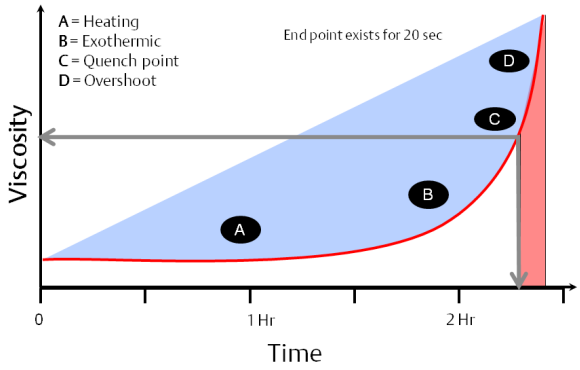

Illustration of the polymerization reaction, showing viscosity in relationship to time

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www.MicroMotion.com/chemical
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SOLUTION

With support from APLEIN Ingenieros S.A., a solutions provider in Spain and Portugal, the chemical manufacturer chose to install two long-stem Micro Motion® Fork Viscosity Meters on two of its reactor vessels. Fitting the fork viscosity meters into the process showed significant benefits. The primary benefit being continuous, repeatable measurement with high accuracy. Other benefits of the meters were:

- The installation on the reactor vessels, or tanks, required no major changes to the plant or operation.
- The meter's ability to withstand mechanical cleaning in the event of coating buildup minimized maintenance requirements.
- The rapid response to changes in viscosity allowed operators to detect and react to fluid changes as they happened, rather than having to rely on an averaged sample.

Overall, the manufacturer was able to optimize its production process by reducing product waste, reducing operator intervention, and increasing reactor output.

Micro Motion Fork Viscosity Meter

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