SUMMARY

In its West Chester, Pennsylvania plant, Sartomer, a subsidiary of global chemical company Arkema, manufactures hundreds of acrylic and methacrylic monomers to meet thousands of different customer specifications for paints, inks, coatings, flooring, electronics, and fiber optics. At the 2014 OSIsoft Users Conference, Production Engineer Kelsey Duffy explained how his company uses PI ProcessBook, PI BatchView, and Visual Basic for small batch monitoring that is proactive rather than reactive. With this technology, Sartomer has real-time visibility into production runs, and in the control room, any person, new or experienced, can detect off-track batches and minor deviations as they occur.

Duffy began his talk by describing the challenges of small batch manufacturing with swing production. “We have 11 different [multipurpose] reactors in West Chester and well over 200 different recipes. Each recipe runs slightly differently… and each vessel acts slightly differently,” he said. As a result, it is difficult “to identify small deviations between how your batch is running and an ideal batch,” even though these deviations can effect batch yield and quality and become major problems later in the production process.

The solution for Sartomer was a PI BatchView display in PI ProcessBook that runs 24/7 untouched and uses Visual Basic code to automatically update the display whenever a batch is completed or a new batch starts. The display charts the current batch alongside a golden batch and the three most recent batches of that same product in that same vessel. The plant has color-coded the display, using green for the current batch, blue for the three most recent previous batches, and yellow for the golden batch. Whenever a new recipe starts, the Visual Basic code identifies the relevant batches using the batch ID, which corresponds to a PI Tag. For the golden batch, Duffy explained, “Engineering has gone through and has identified all the different golden batches that we need and has recorded their batch IDs.” These golden batches have been anchored to a results table, so that the golden batch for a particular recipe is always displayed.

With this automated display, Sartomer engineers can compare a current batch to a golden batch and recent batches without any manual interaction or configuration by the operators. “You get to just walk into the control room if you’re an engineer and see how the batches are running. It’s very obvious if the current batch is matching the historical batches and also the golden batch that we have for each recipe in each vessel,” Duffy said. “You can actually identify small deviations that are vessel specific and recipe specific [and] have a very good, very precise monitoring of that batch.” Better production visibility means Sartomer can be more proactive in catching problems. Once a problem is detected, plant
engineers can take corrective action to save a batch from being off-spec or to adjust the process to improve yield.

**Use Case 1: Salvaging Yield of an Off-Spec Batch**

As a use case, Duffy described the batch shown in Figure 1. The current batch in green is easily spotted as off-track from the golden batch and previous batches for this reactor and recipe. Because engineering was notified earlier, corrective action was taken to run the batch longer than normal to keep the yield up. "We were able to salvage a few thousand dollars worth of raw materials by not losing this yield," Duffy said.

**Figure 1.**

**Figure 2.**

**Use Case 2: Quicker identification of a Temperature Spike**

In a second use case, shown in Figure 2, there was an obvious spike in the green current batch approximately 3 hours into the batch. Duffy said, “That’s a very obvious problem to people who run our process. However, at this instance in time, the operator was out of the control room. He was taking a sample, bringing it to the lab, and when he came back, he noticed this." Without this display, the plant wouldn't have detected the problem until 4-5 hours later in the quality lab. With the display, Duffy explained, “we had more flexibility with what we were going to do with that solvent, knowing that it had to have something special done to it."

Duffy concluded that a 24/7 automated display “is obviously a perfect fit for batch plants, especially ones with swing production vessels like we have. But it’s really a good display for anybody with a repeatable unit operation. You don’t even have to be a batch plant. You can call every 24-hour period a batch in your continuous plan. You can still find benefit out of this concept. Ultimately, it allows our plant to run smoother.”
