CUSTOMER CASE STUDY

Deschutes Brewery: Better data for better beer

Deschutes Brewery - www.deschutesbrewery.com
Industry - Food and beverage

Goals

- Make fermentation cooling consistent and repeatable
- Reduce the need for manual readings during beer fermentation transition phases

Challenges

- During the cooling phase of the brewing process, temperatures were spiking in fermenters
- It was difficult to predict when beers should transition from one phase of fermentation to the next

Results

- Deschutes reduced production time by up to 72 hours for each batch
- It increased capacity and postponed $8M in capital upgrades
- The brewery understands the brewing personality of each beer through machine learning

Solution

- AVEVA™ PI System™

Maximizing production with better temperature control

In 2015, Deschutes Brewery, the seventh-largest craft brewery in the United States, had a problem. During the cooling phase of the brewing process, temperatures were spiking in a new class of fermenters, an anomaly that could reduce capacity potential and affect the quality and flavor of their beers. Luckily, Deschutes had a secret weapon: AVEVA PI System.

The new class of fermenters was large, holding 31,000 gallons and taking seven brew batches to fill. Loading just one of these batches into the fermenter is a two-hour process, and the fermenters had three temperature gauges – one just above the bottom cone, one in the middle, and one at the top – to control three independent temperature zones.

During the cooling phase of brewing, the brewers decrease the temperature from 60°F to just below 30°. As the temperature drops, yeast cakes at the bottom of the fermenter. Brewers often pull this yeast to reuse in future batches. However, when Deschutes pulled yeast from the new fermenters, the temperature spiked in the top temperature zone. This spike increased the cooling time for each fermenter, which increased overall brewing time and reduced capacity. Deschutes contemplated capital upgrades. First, however, the company tried using the operational data collected by AVEVA PI System to shorten the cooling phase while maintaining beer quality.

Deschutes took an iterative approach to the problem, making a change and then reading the data to see how it affected cooling. The brewers started by adding an air valve to the top of the tank and adjusting the piping that the cooling agent (glycol) passed through. These mechanical changes improved the cooling time, but the top-zone temperature was still spiking.

Deschutes needed more insight. The brewers added a fourth temperature sensor to the bottom cone of the fermenter, an area that was not previously monitored. Deschutes used this fourth sensor to control the cooling in the bottom cone of the fermenters.

With this increased insight and control, the company eliminated the unwanted temperature spike. As Brian Faivre, Brewmaster of Operations, explained, the company was "seeing consistent and repeatable fermentation cooling times with a time savings of about 60% in some cases. We were able to put off the unnecessary $8 million capital project while assuring the highest quality in all our brands."

Machine learning and predictive analytics for fermentation

Craft breweries release new beers frequently to maintain customer interest. The fermentation process for each of these beers is different. That process includes up to nine distinct phases, and different beers transition from one phase to the next at different times. Typically, Deschutes required regular manual readings and analysis to know when to move a beer from one phase to the next.

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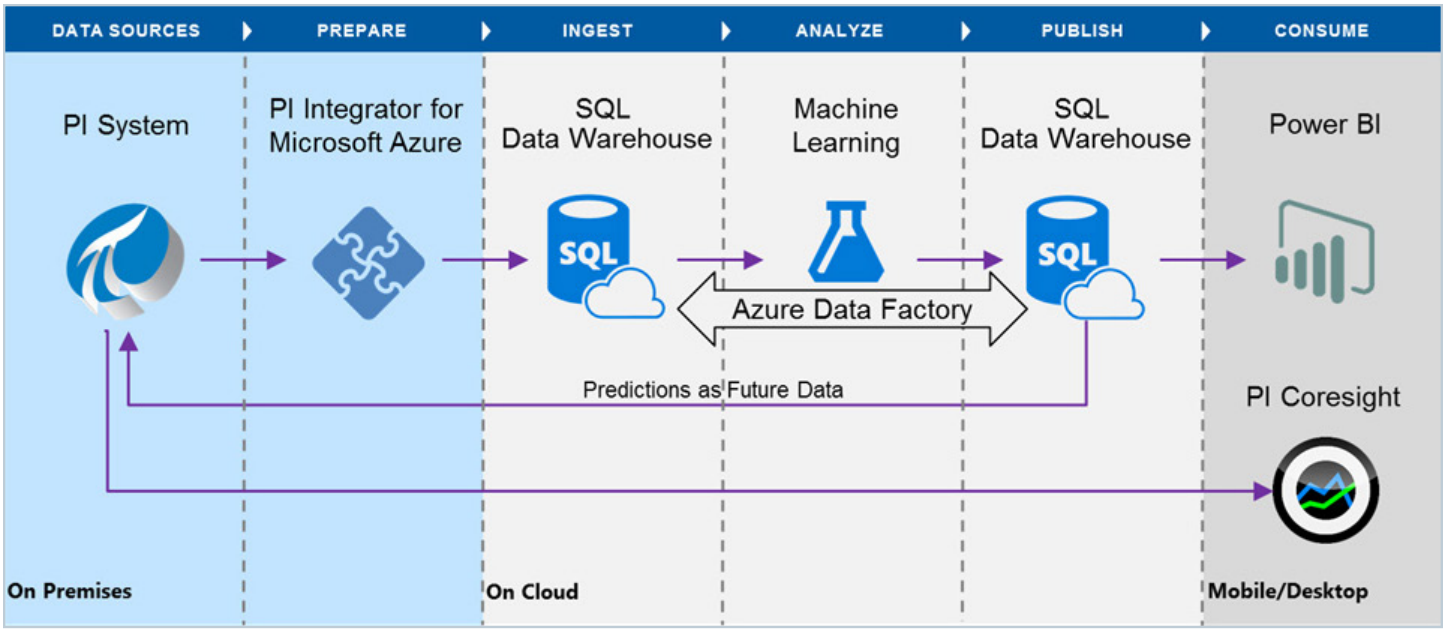
Brian Faivre
Brewmaster of Operations, Deschutes Brewery

Deschutes wondered if it could use AVEVA PI System data and machine learning to predict when transitions occurred to minimize the need for manual readings.

Within a few weeks, Deschutes built out asset frameworks in AVEVA PI System for all 50 fermenters, which gave context to the sensor data. The company then integrated AVEVA PI System with Microsoft Azure to compile data, context, and events into a format that it could feed into Microsoft's Cortana Intelligence Suite.



Saving time by smoothing transitions

Deschutes focused on predicting one phase transition – from fermentation to free rise – for its different beers. For the transition from fermentation to free rise, the company tracked the apparent degree of fermentation (ADF), or the percentage of the beer that had fermented. Using machine learning to update predictions after each manual reading, the company could predict the shift from fermentation to free rise for any beer. The predicted trends then moved back into AVEVA PI System, which allowed users to consume the information within their existing AVEVA PI System visualization tools.

As a result, Tim Alexander, Assistant Brewmaster, said, "within 24 hours of the start of fermentation, we can have a pretty accurate prediction of where it's going to end up.

"He added that these predictions "not only can save time in just moving to the next step in fermentation. You can actually save time in the future steps of fermentation because those steps go more smoothly if you transition out of this step at the right time."

The result: operationalizing the predictions for when different beers move from fermentation to free rise saved Deschutes up to 72 hours of production time for each fermenter.

In the future, Deschutes wants to fully automate predictions for every beer and every phase transition, or as Alexander put it, "get to the point where the system, is just saying, 'Let's move to the next step. It's time."

For more information about AVEVA PI System please click here.