



SUMMARY



Deschutes Brewery

Industry

Food & Beverage

Business Value

- Process Optimization
- Increased Yield
- Quality Improvement
- Data Democratization
- Predictive Analytics
- Real-time KPI Dashboards

PI System™ Components

- PI Server™
 - Data Archive
 - Asset Framework (AF)
 - Event Frames
 - Notifications

PI Coresight™

PI DataLink™

PI ProcessBook™

PI Integrator for Microsoft Azure

Strategic Alliance

Microsoft

- Cortana Intelligence
- Power BI
- Red Carpet Incubation Program

Microsoft Azure

Deschutes: Better Data for Better Beer

At OSIsoft's 2016 Users Conferences in San Francisco and Berlin, Brian Faivre (Brewmaster of Operations) and Tim Alexander (Assistant Brewmaster) explained how the PI System has helped Deschutes:

- Reduce production time by up to 72 hours for each batch
- Maximize capacity and postpone \$8 million in capital upgrades
- Understand the brewing personality of each of its beers through machine learning

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 potentially reduce capacity potential and affect the quality and flavor of their beers. Luckily, Deschutes had a secret weapon: the PI System.

The new class of fermenters were large, holding 31,000 gallons and taking seven brew batches to fill. Loading just one of these batches into the fermenter was 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 have to decrease the temperature from 60 degrees Fahrenheit to just below 30 degrees. 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 started to pull 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 decided to see if they could use the operational data collected by the PI System to shorten the cooling phase while maintaining beer quality.

They took an iterative approach to the problem, making a change and then reading the data to see how it affected cooling. They 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. They added a fourth temperature sensor to the bottom cone of the fermenter, an area that had previously not been monitored. The company 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 Faivre explained, they were “seeing consistent and repeatable fermentation cooling times with a time savings of about 60 percent in some cases... We [we]re able to put off the unnecessary \$8 million capital project... while assuring the highest quality in all our brands.”

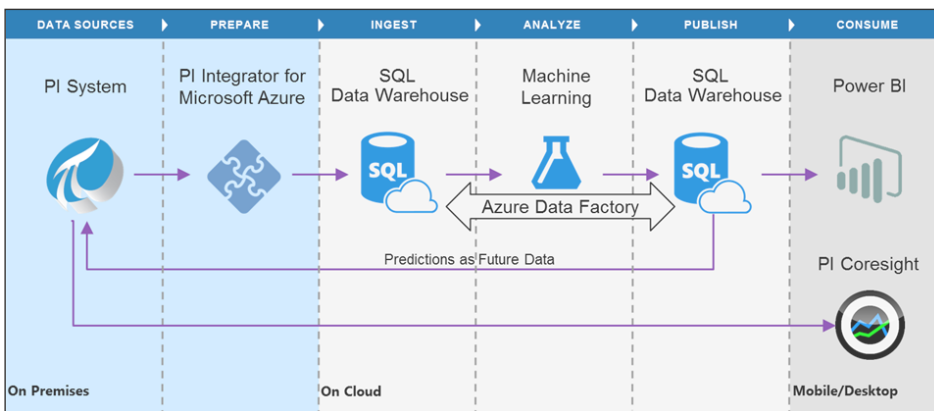
Machine Learning & Predictive Analytics for Fermentation

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

Deschutes wondered if they could use PI System data and machine learning to predict when transitions occurred to minimize the need for manual readings. In 2016 Deschutes joined the exclusive, invitation-only OS|soft | Microsoft Red Carpet Incubation Program (RCIP) to explore advanced analytics to optimize operations.

Within a few weeks Deschutes built out a PI System Asset Framework for all 50 fermenters, which gave context to the sensor data. The company then implemented the PI Integrator for Microsoft Azure to automate the preparation of PI System data, context and events into a format that could be fed into Microsoft's Cortana Intelligence Suite.

With the help of Microsoft's data scientist as part of RCIP engagement, Deschutes focused on predicting one phase transition – from fermentation to free rise – for their different beers. For the transition from fermentation to free rise, Deschutes tracked the Apparent Degree of Fermentation (ADF), or the percent of the beer that had fermented. Using machine learning to update predictions after each manual reading, the company was able to effectively predict the shift from fermentation to free rise for any beer. The predicted trends were then sent back to the PI System which allowed users to consume the information within their existing PI Visualization tools.



As a result, Alexander 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 moved 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.”

Alexander, Tim and Brian Faivre. *What’s Really Going On with Your Beer’s Fermentation?* OS|soft.com. 6 April 2016. Web. 19 April 2016. <<http://www.osisoft.com/Presentations/What-s-Really-Going-on-with-your-Beer-s-Fermentation->>>.

Alexander, Tim and Brian Faivre. *Reducing Beer Production Time with Predictions.* OS|soft.com. 27 Sept. 2016. Web. 1 November 2016. <<http://www.osisoft.com/Presentations/Deschutes-Brewery--Reducing-Beer-Production-Time-with-Predictions->>>.

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Brewmaster of Operations
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