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USERS CONFERENCE 2016

April 4-8, 2016 | San Francisco

TRANSFORM
YOURWORLD



What's Really Going on with your Beer's Fermentation?

Presented by **Brian Faivre**
Tim Alexander

DESCHUTES
BREWERY.

Agenda

- About Deschutes Brewery
- Revisit the Issue Presented Last Year
- Action Taken
 - Mechanical Changes
 - Process Changes
- Lessons Learned

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Deschutes Brewery – History

- Located in Bend, OR
- Founded in 1988
- Pub opened in Portland, OR in 2007



Deschutes Brewery – Production Facility

- 2 brewhouses
- 50+ vessels
- Bottling and kegging
- 7th largest craft brewer in the US



Deschutes Brewery – Data Sources



Compusense[®]



DELTA[™]V



Rockwell
Automation
 **Allen-Bradley**

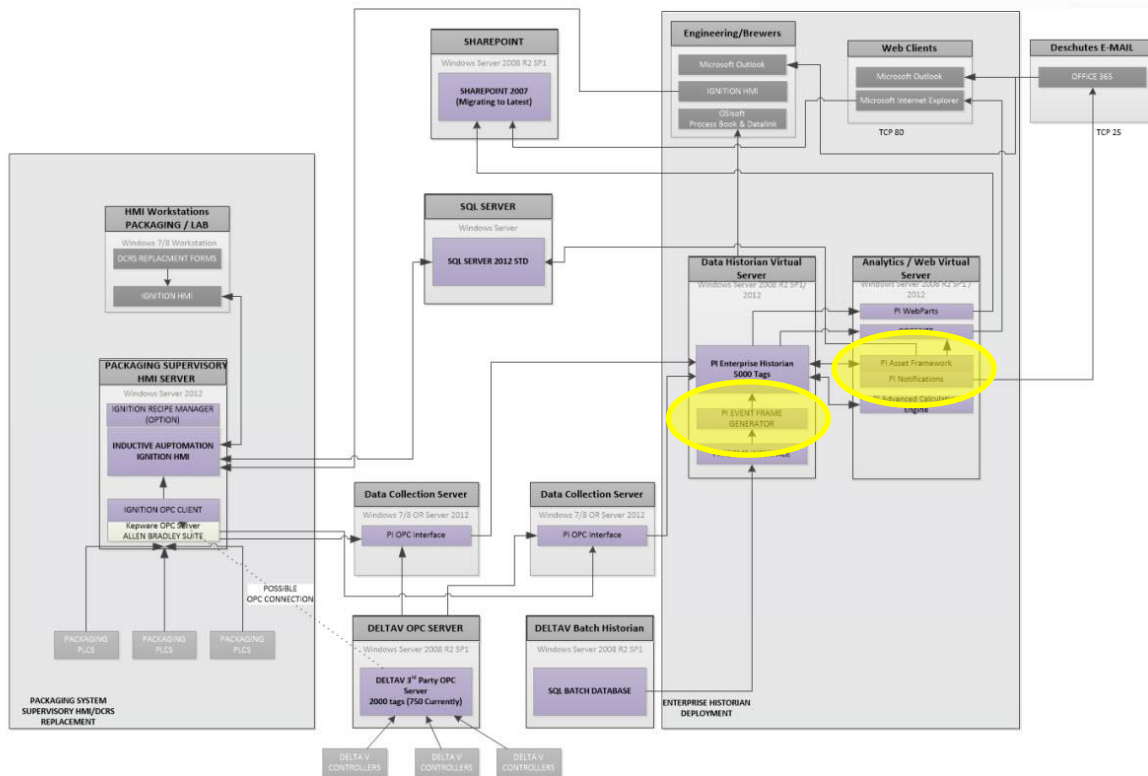
Ignition!
by inductive automation

Deschutes Brewery – PI Server

DESCHUTES BREWERY

August 12, 2014

- PI Asset Framework (AF)
- Event Frames

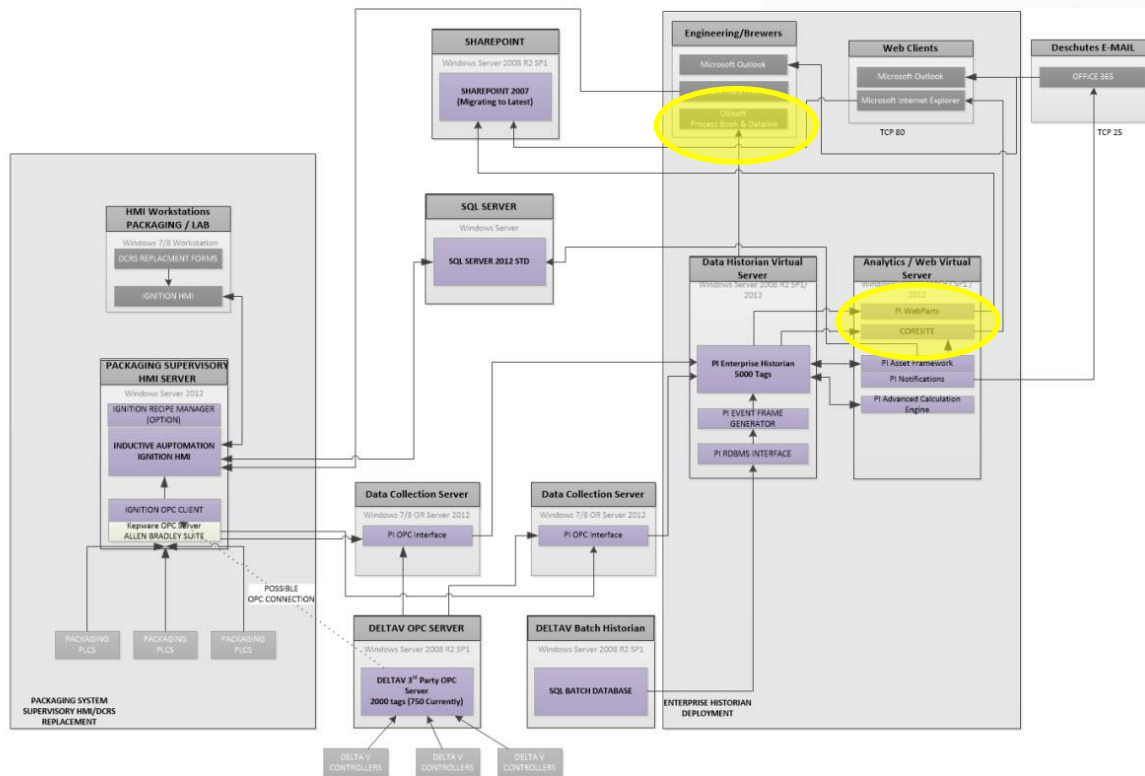


Deschutes Brewery –Analysis & Visualization

DESCHUTES BREWERY

August 12, 2014

- PI ProcessBook
- PI DataLink
- PI Coresight

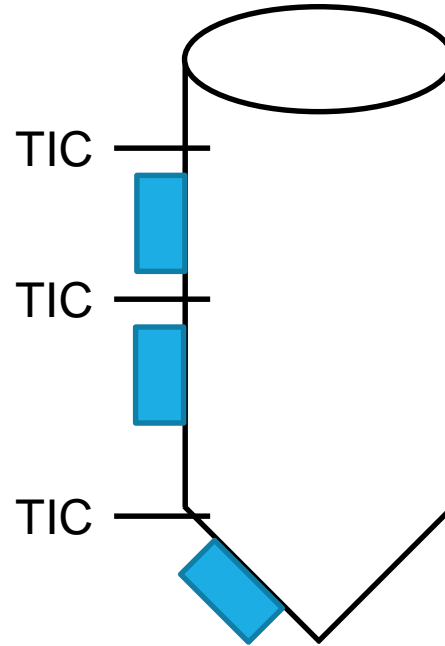


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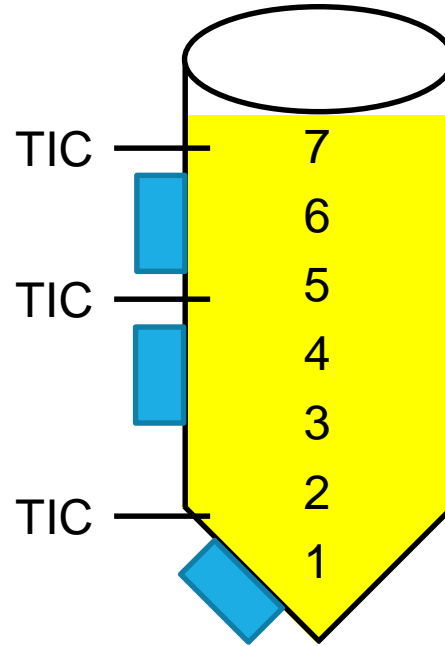
Revisit the Issue Presented Last Year – Equipment

- 1,000 bbl
(31,000 gal)
working volume

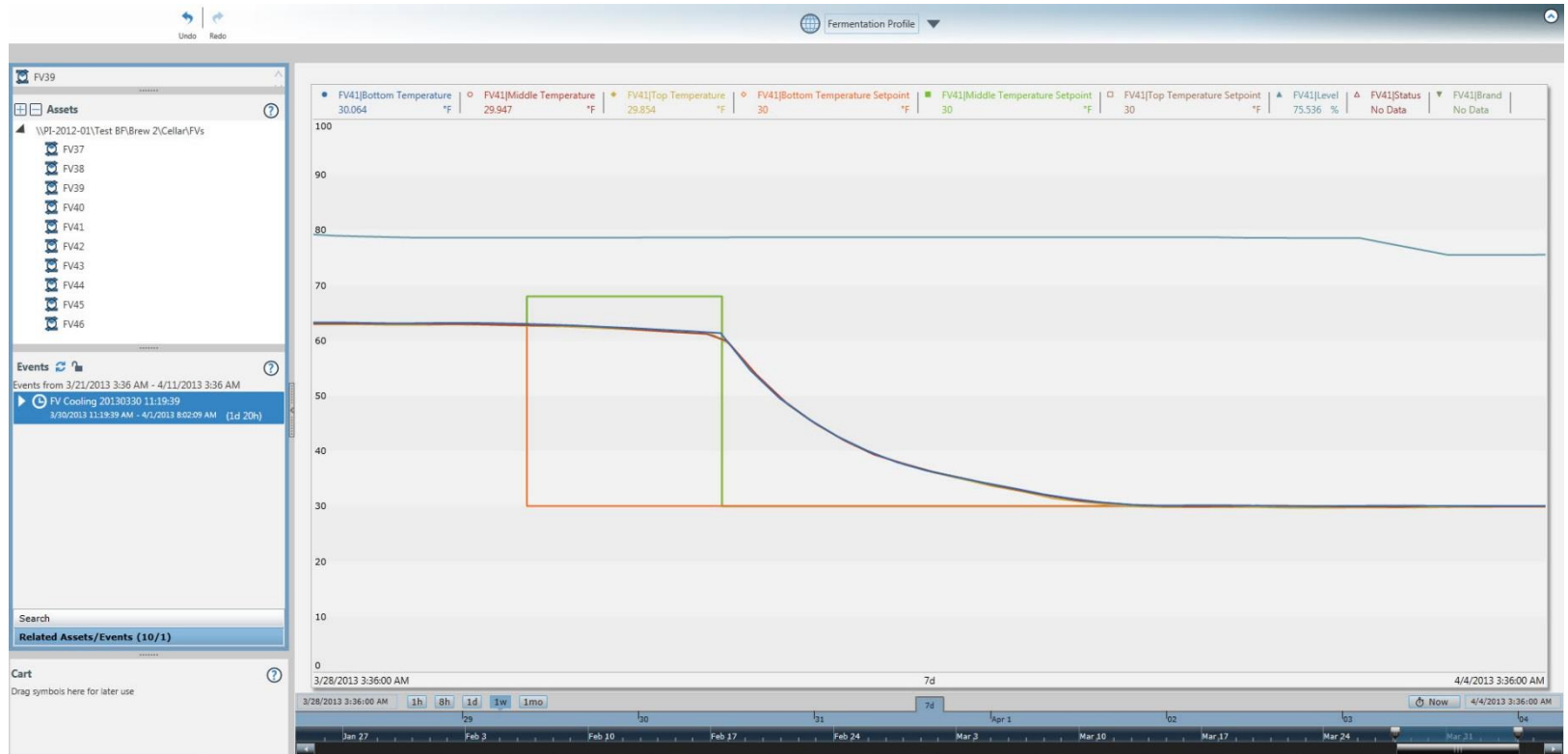


Revisit the Issue Presented Last Year – Equipment

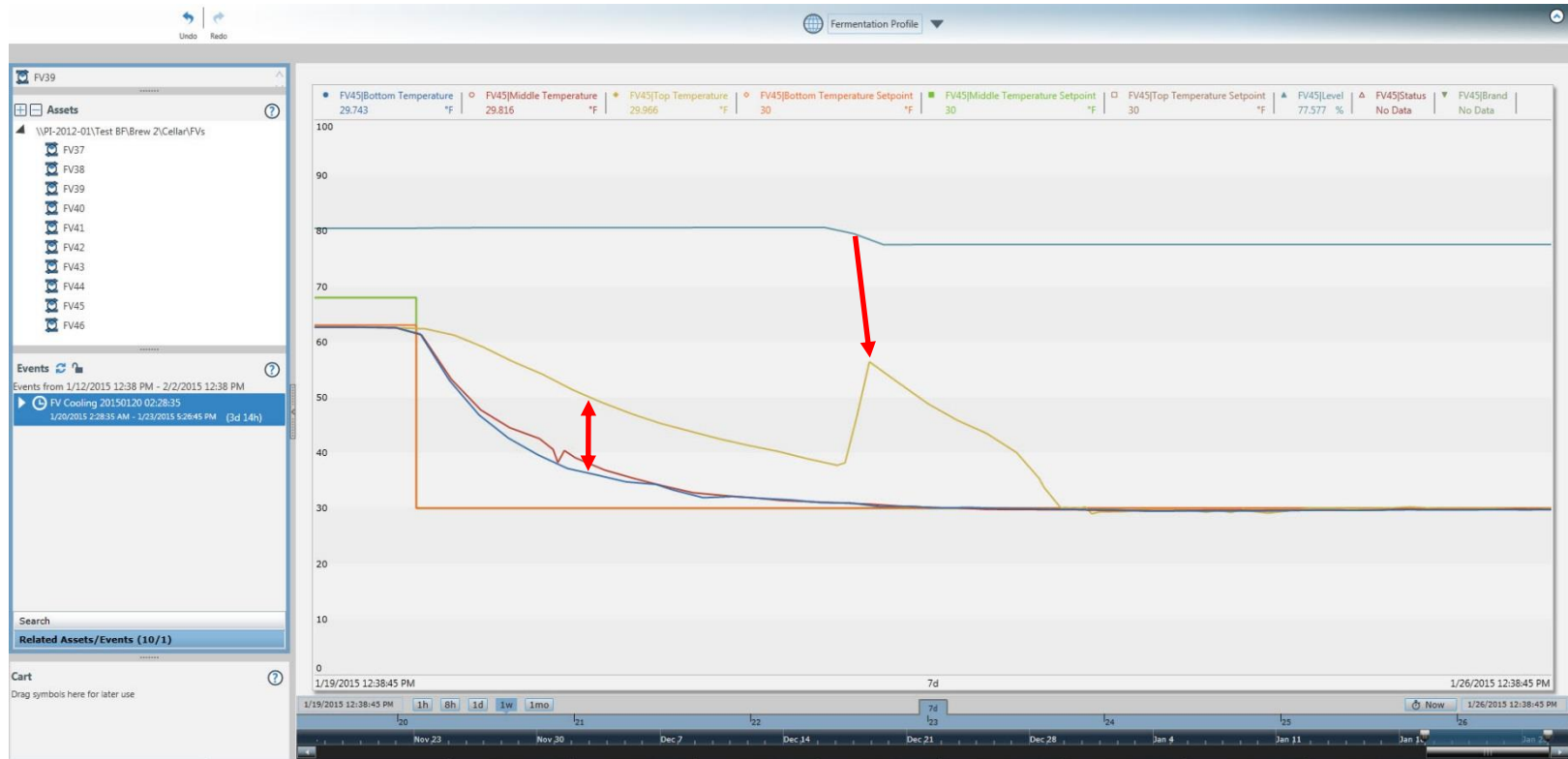
- 7 brew batch fill
- Approximately 2 hrs between fills



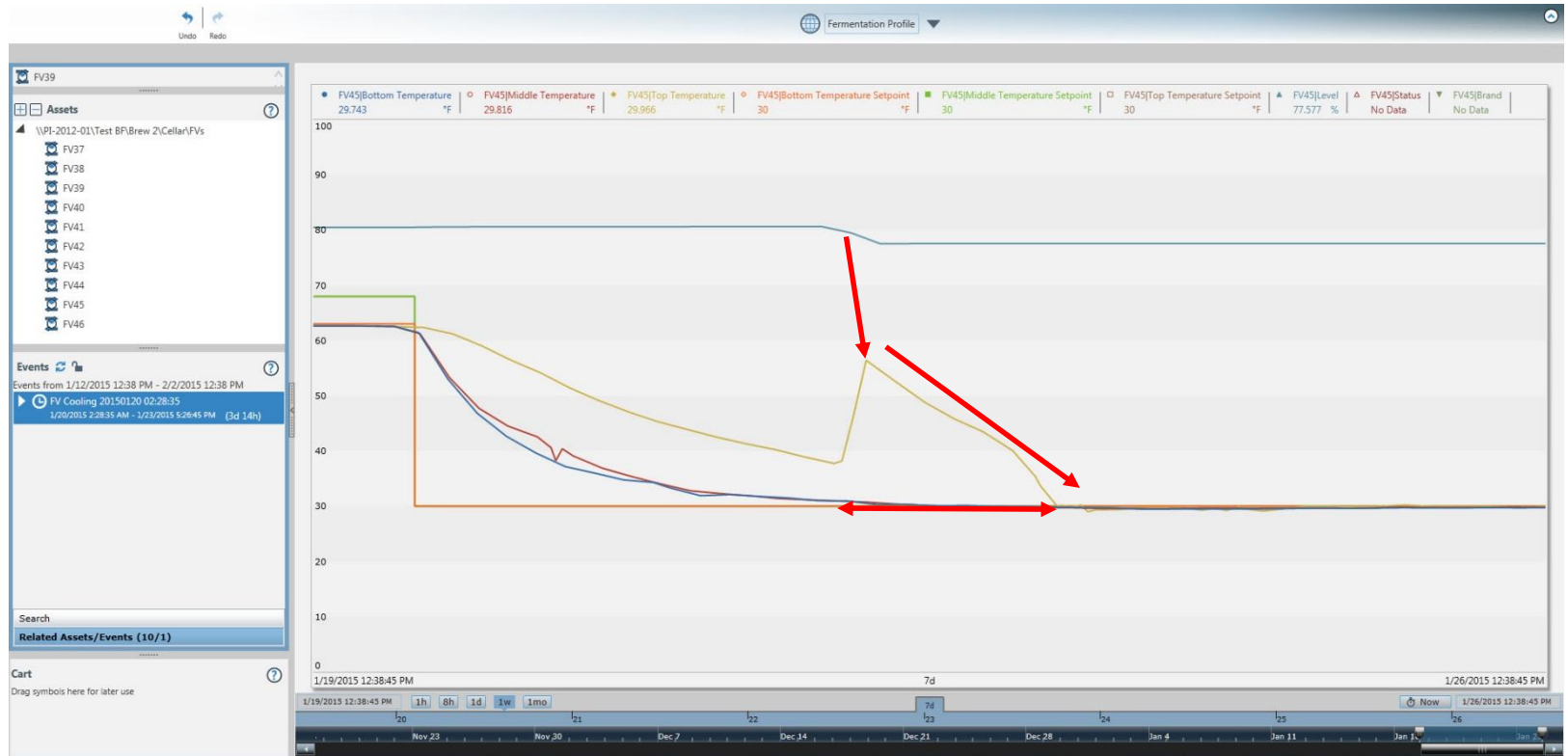
Revisit the Issue Presented Last Year – Ideal Cooling



Revisit the Issue Presented Last Year – Stratified Cooling

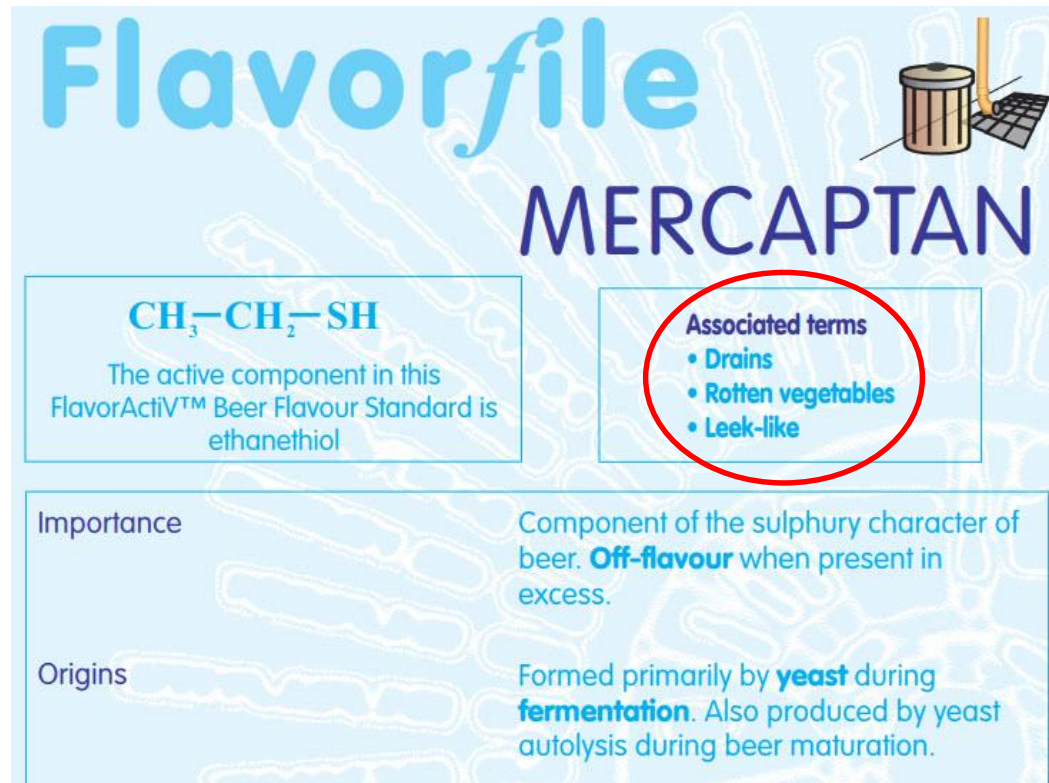


Revisit the Issue Presented Last Year – Capacity Concerns



Revisit the Issue Presented Last Year – Quality Concerns

- Potential mercaptan production from yeast autolysis



The image shows a product information card for 'Flavorfile MERCAPTAN'. The title 'Flavorfile' is in a large, light blue font, and 'MERCAPTAN' is in a smaller, dark blue font. To the right of the title is an illustration of a wooden barrel with a metal spout and a small wooden stand. Below the title, there are two boxes. The left box contains the chemical formula $\text{CH}_3\text{--CH}_2\text{--SH}$ and a description: 'The active component in this FlavorActiV™ Beer Flavour Standard is ethanethiol'. The right box is titled 'Associated terms' and contains a list of terms: 'Drains', 'Rotten vegetables', and 'Leek-like'. This right box is circled in red. Below these two boxes, there are two more sections: 'Importance' and 'Origins'. The 'Importance' section describes it as a component of the sulphury character of beer, noting that it is an 'Off-flavour' when present in excess. The 'Origins' section states it is formed primarily by yeast during fermentation and also produced by yeast autolysis during beer maturation.

Flavorfile

MERCAPTAN

$\text{CH}_3\text{--CH}_2\text{--SH}$

The active component in this FlavorActiV™ Beer Flavour Standard is ethanethiol

Associated terms

- Drains
- Rotten vegetables
- Leek-like

Importance

Component of the sulphury character of beer. **Off-flavour** when present in excess.

Origins

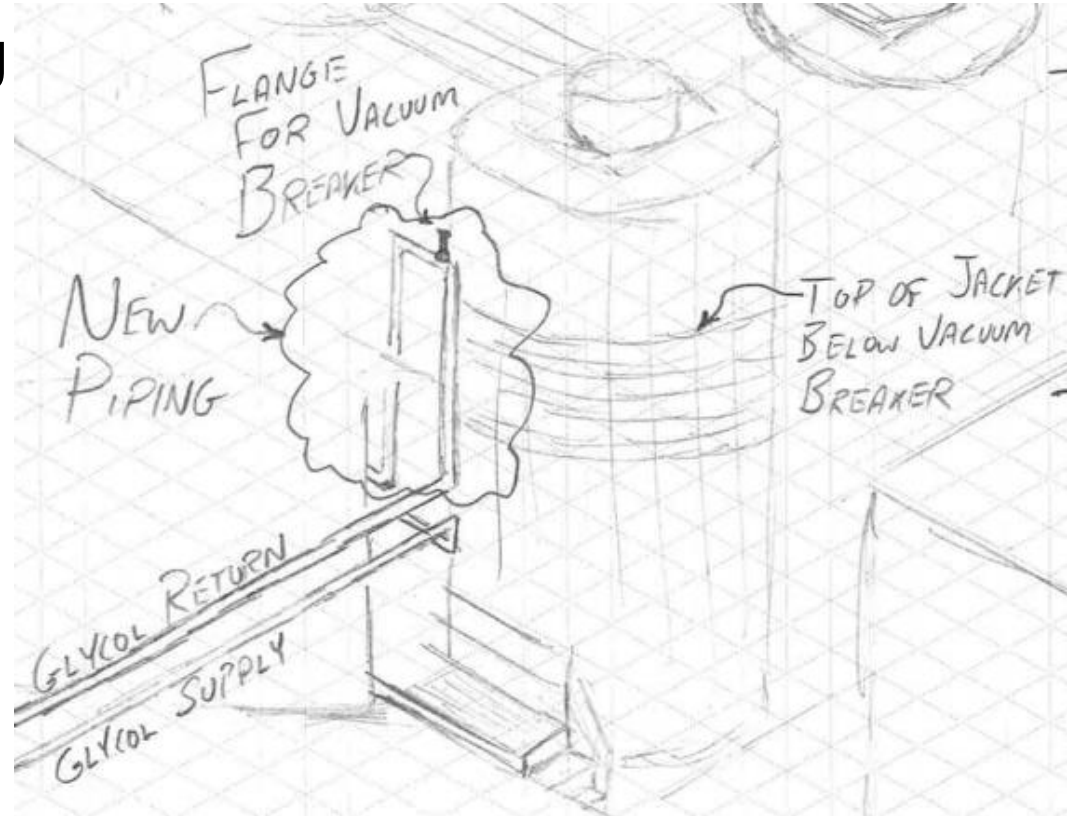
Formed primarily by **yeast** during **fermentation**. Also produced by yeast autolysis during beer maturation.

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Mechanical Changes

- Raised glycol return piping to above the top jacket to ensure the jacket was always full
- Put air relief valves at the top of each tank so entrained air would not collect



Before Mechanical Changes



Before Mechanical Changes



After Mechanical Changes

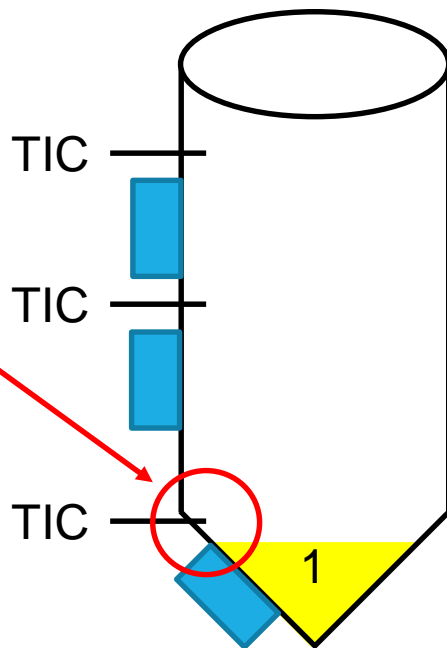


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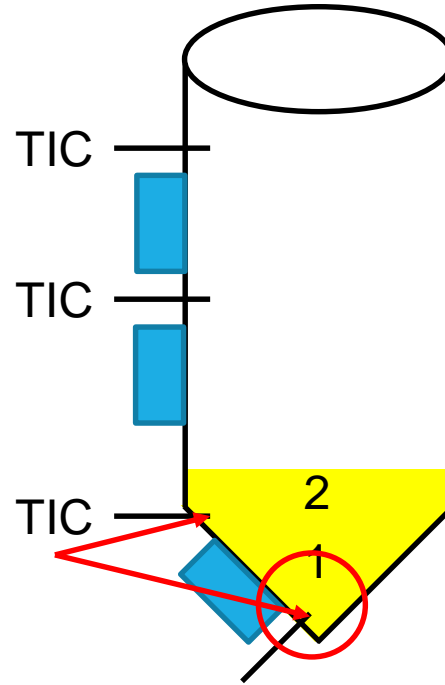
Process Changes – Equipment Revisited

- Whoops!
- No temperature control for the first ≈ 3 hrs

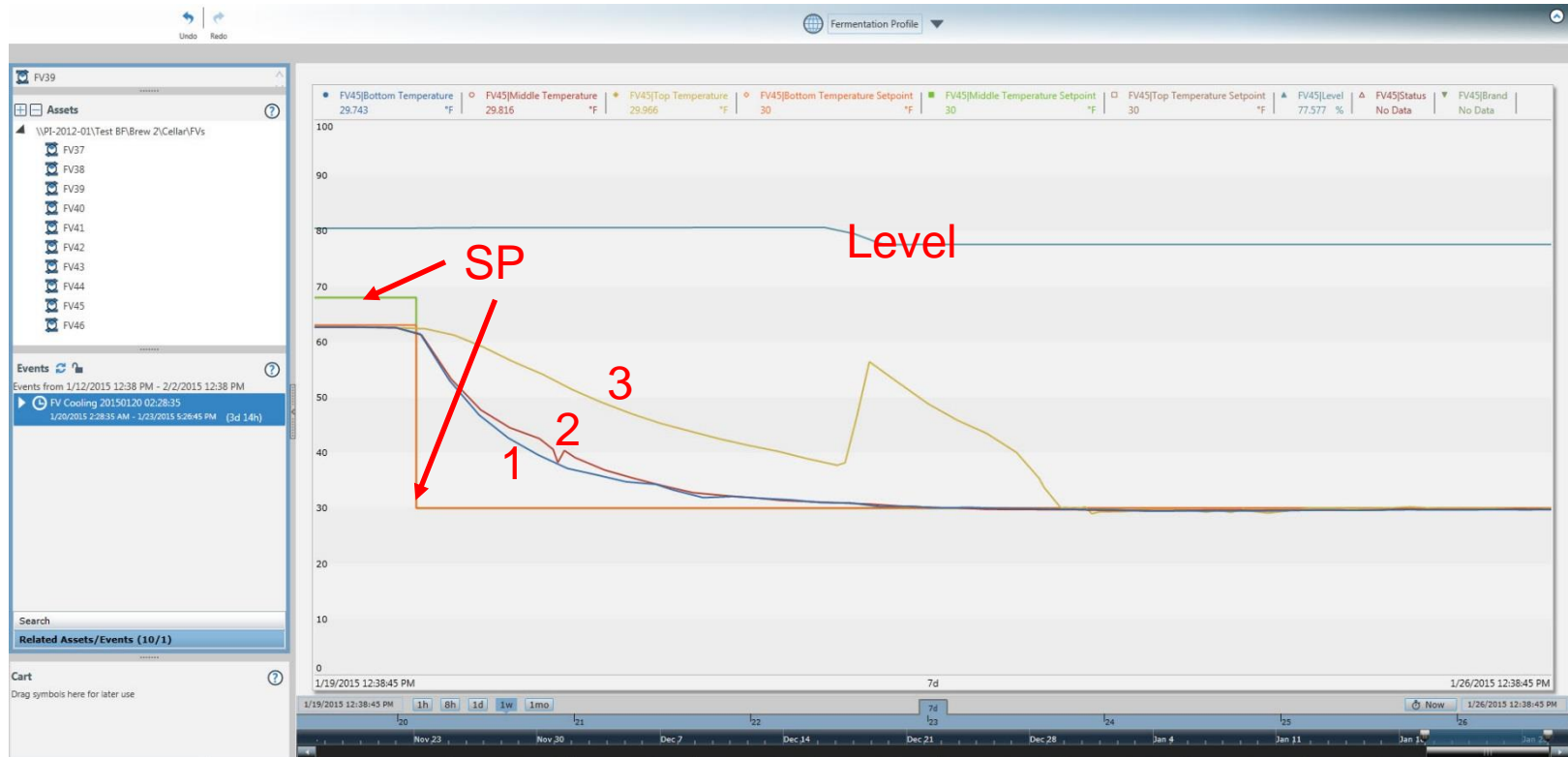


Process Changes – Equipment Revisited

- Added an additional TI
- TIC input switches based on level



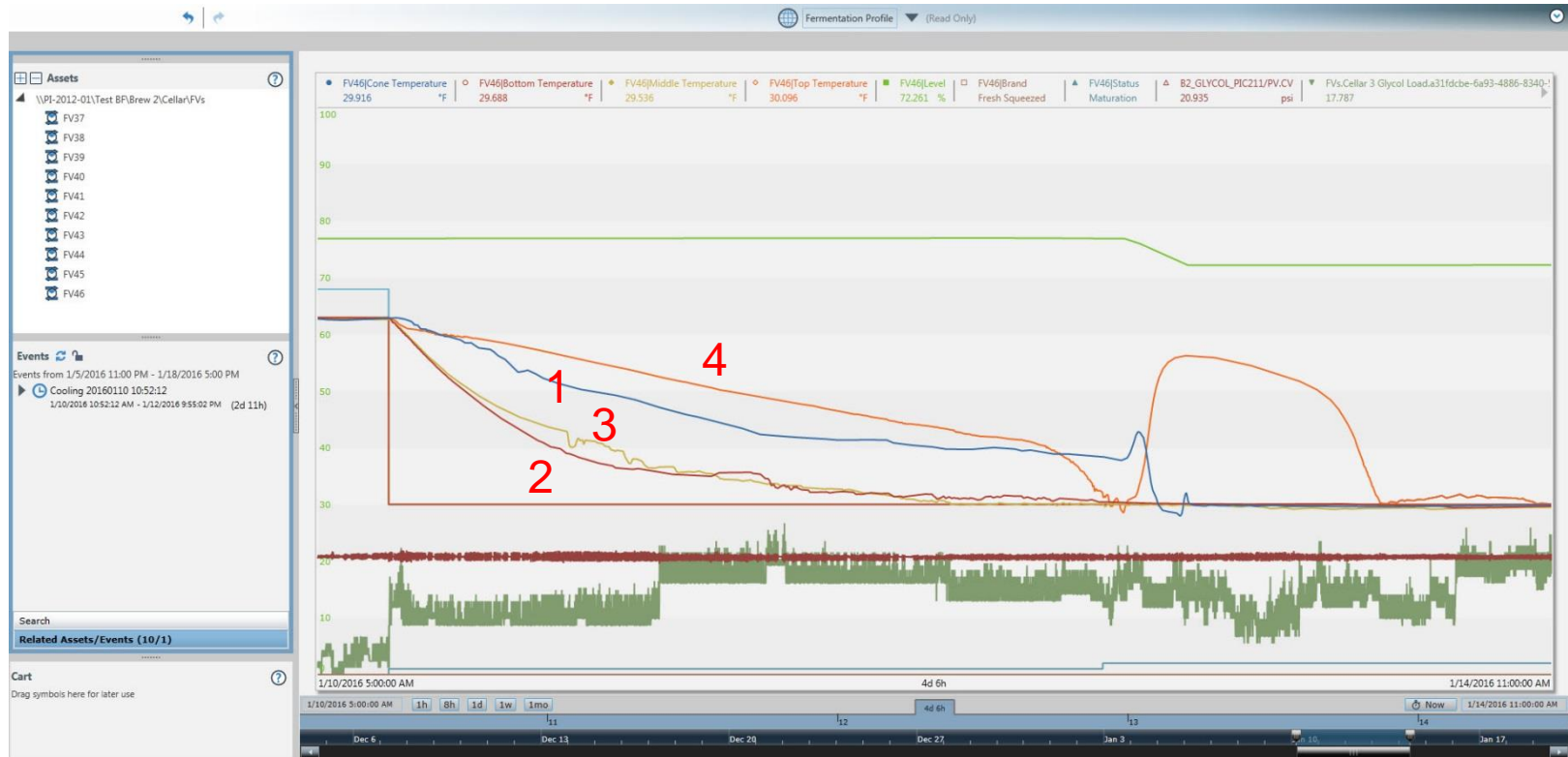
Process Changes – Trend Revisited



Process Changes – Our Very Own Oprah AHA! Moment

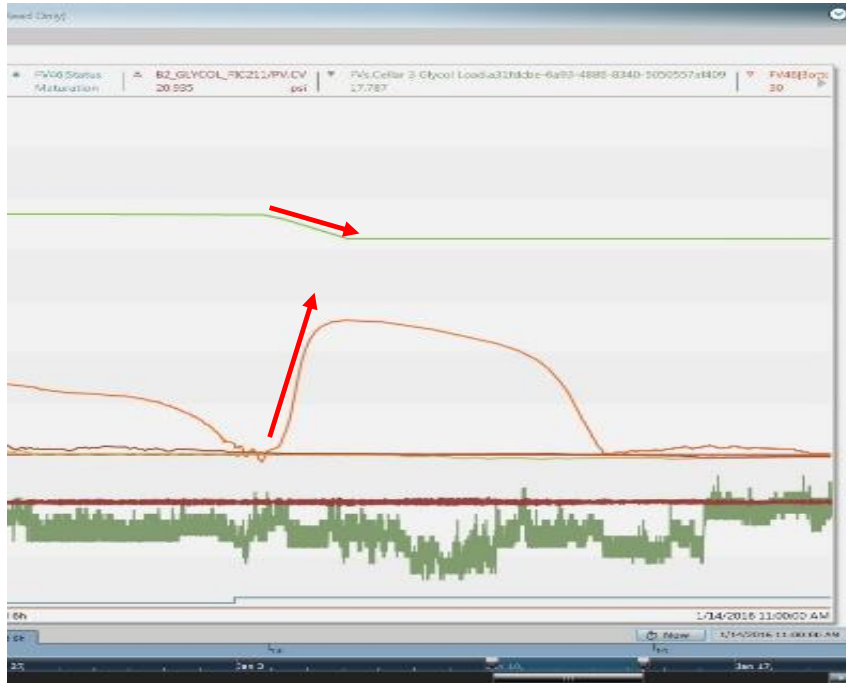


Process Changes – Trend Revisited



Process Changes – Trend Revisited

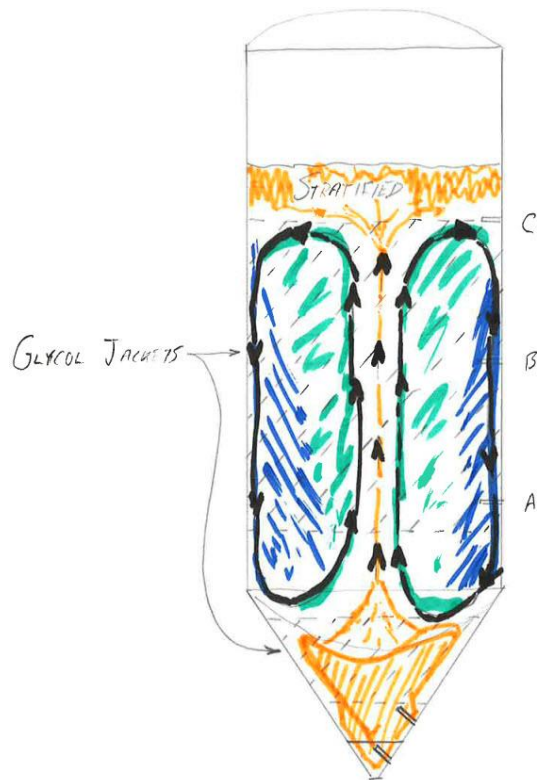
Without Cone TI



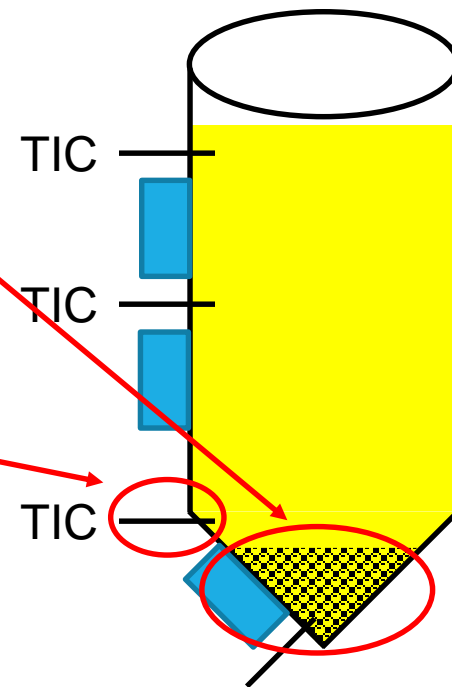
With Cone TI



Process Changes – Hypothesis

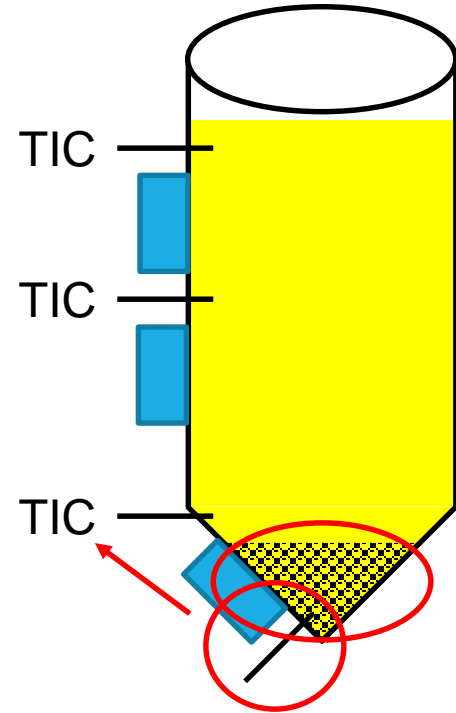


- Yeast heating up on the bottom of the FV as fermentation ceases
- Not seeing the entire picture due to switching TIC input once level is high enough

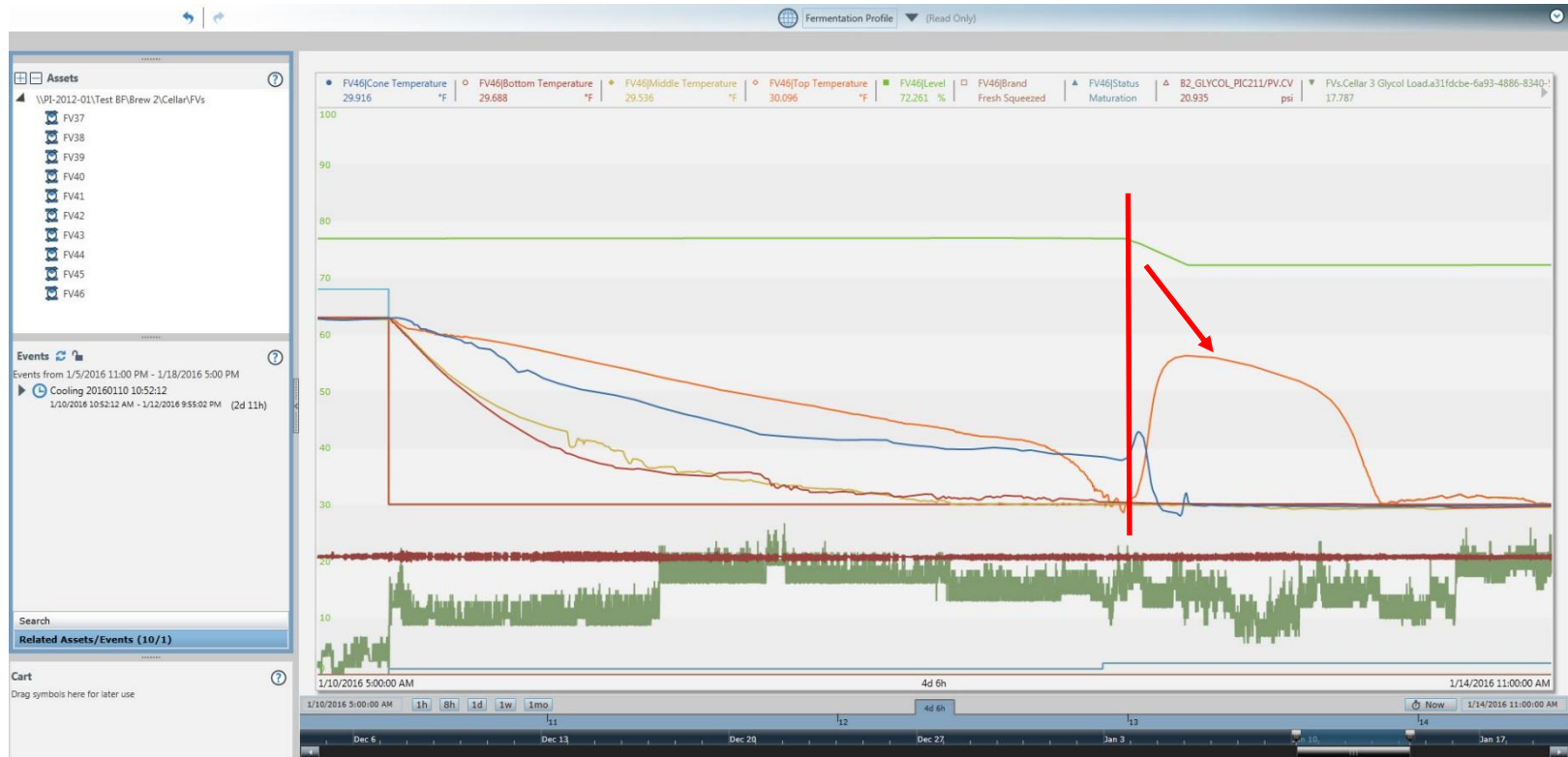


Process Changes – Trial Changes

- Use the cone probe for the bottom TIC input during cooling
- Start the cone final cooling process as fermentation ceases



Process Changes – Unwanted Trend



Process Changes – Trial Trend 1



Process Changes – Trial Trend 2



Leveraging the PI System to Assure Beer Quality and Production Capacity

COMPANY and GOAL

Deschutes Brewery is the 7th largest craft brewery in US, and wanted to **maximize it's current infrastructure** to support strategic initiatives

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CHALLENGE

New class of fermenters were displaying uncharacteristic cooling behavior reducing capacity potential

- Potential quality off flavors were also a concern

SOLUTION

Fermentation data from their DCS connected to the PI System for analysis

- PI Asset Framework (AF), Event Frames and PI Coresight enabled the brewing team to quickly and efficiently implement a solution to correct this uncharacteristic behavior in their fermentations

RESULTS

Consistent and repeatable fermentation cooling with a time savings of 60% vs. the worst cases exhibited

- Able to maximize existing capacity
- Avoid unnecessary ≈ 8 million dollar capital investment to expand fermentation capacity
- Assuring the highest quality in their products

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Lessons Learned

- Having the right data is critical
- Problem solving is iterative
- Start with what you know based on data
- If further iteration is needed, figure out the data that is missing, and use that to take the next step
- Having time to focus on the PI System is important

DESCHUTES
BREWERY®

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Brewmaster

Deschutes Brewery



Questions

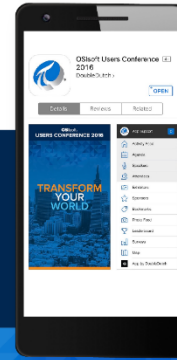
Please wait for the **microphone** before asking your questions



State your **name & company**

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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado

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