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

Presented by **Tim Alexander**

DESCHUTES BREWERY

Agenda

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

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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®

Rockwell Automation

Allen-Bradley

Ignition!
by inductive automation

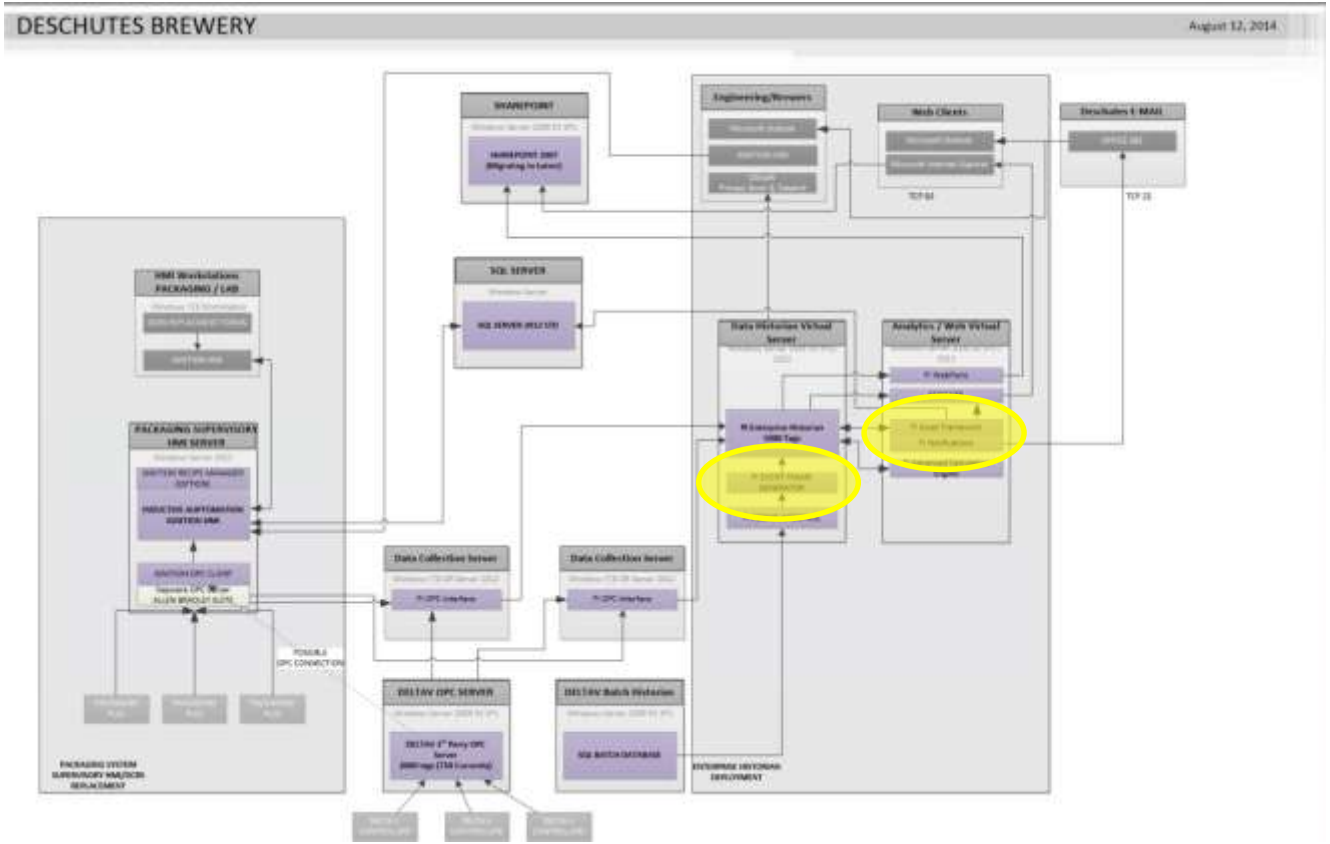
DELTAV™

Microsoft SQL Server

Others

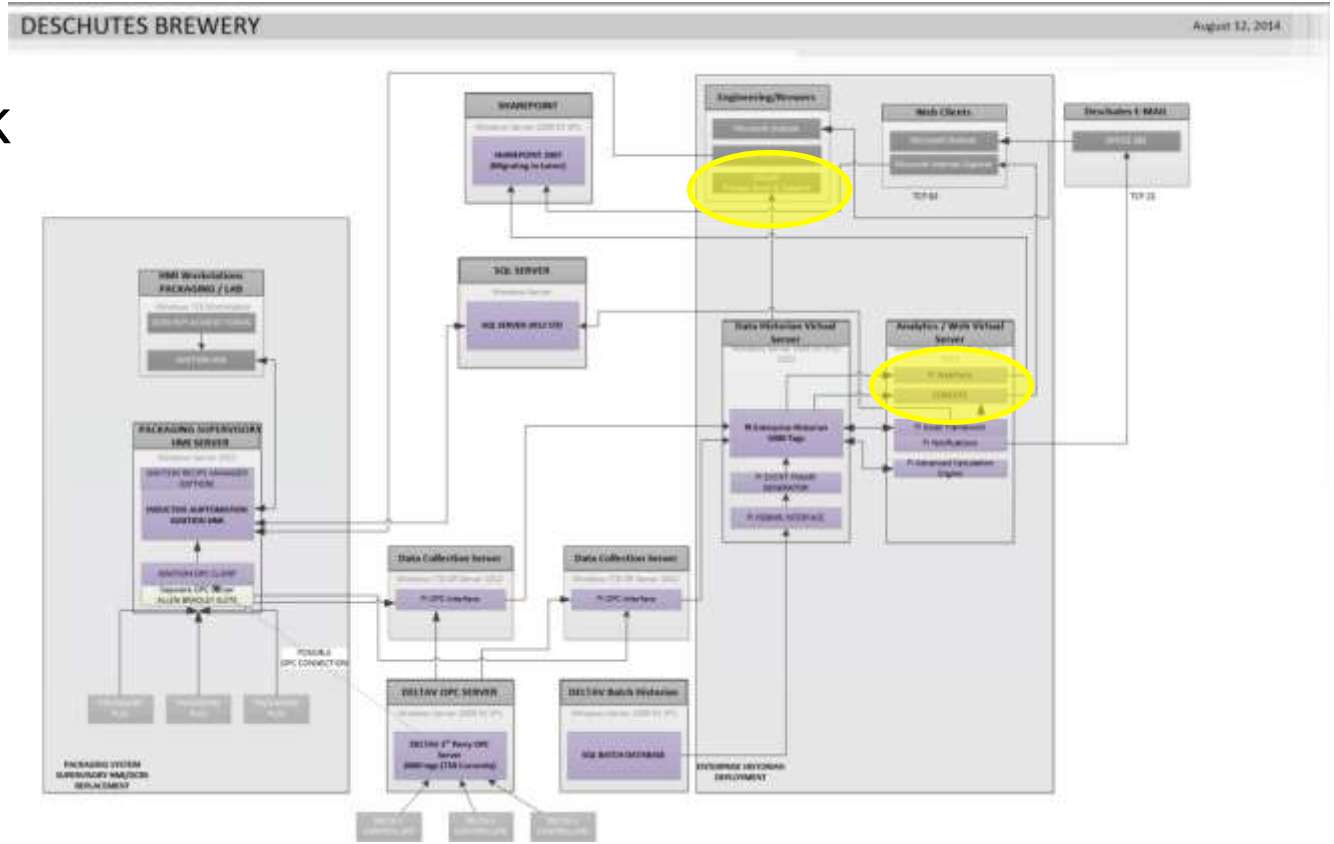
Deschutes Brewery – PI Solution, PI Server

- Asset Framework (AF)
- Event Frames



Deschutes Brewery – PI Solution, Analysis & Visulization

- PI ProcessBook
- PI DataLink
- PI Coresight



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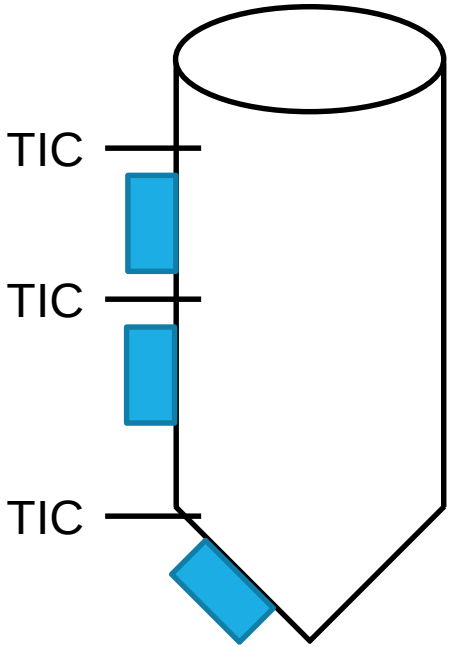
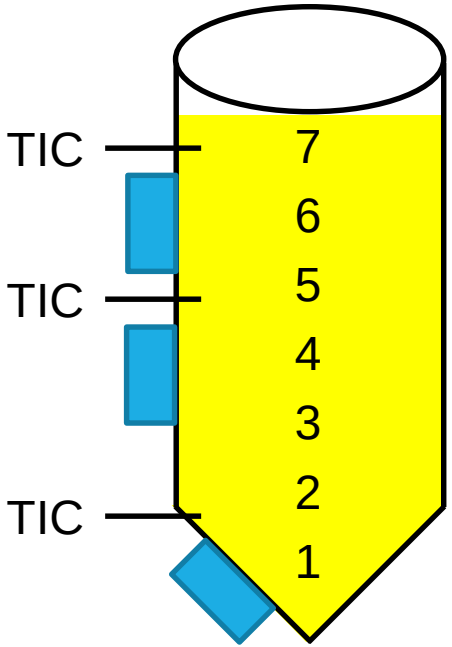
Revisit the Issue Presented Last Year – Equipment

- 1000 bbl (31,000 gal) working volume

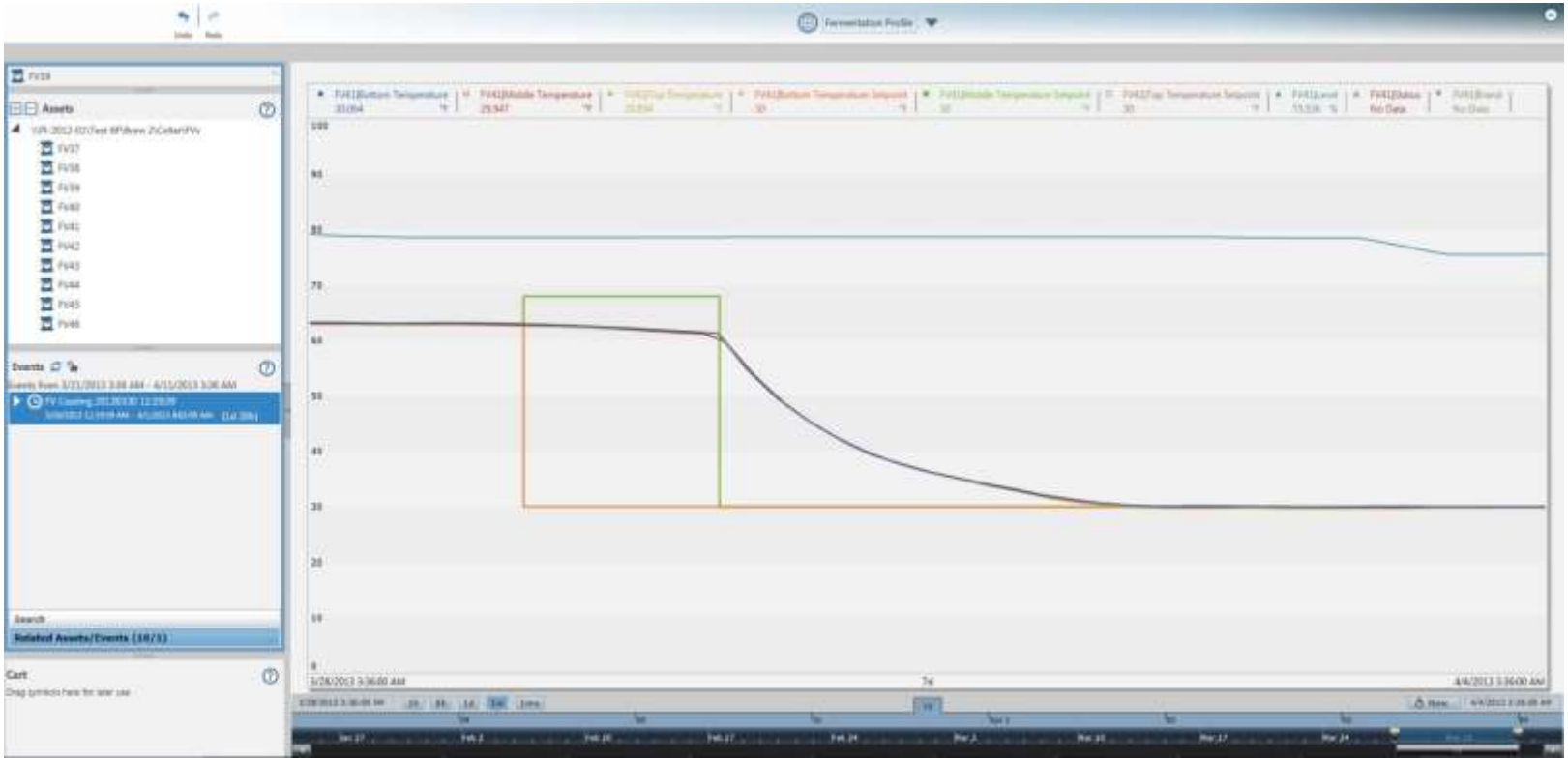


Revisit the Issue Presented Last Year – Equipment

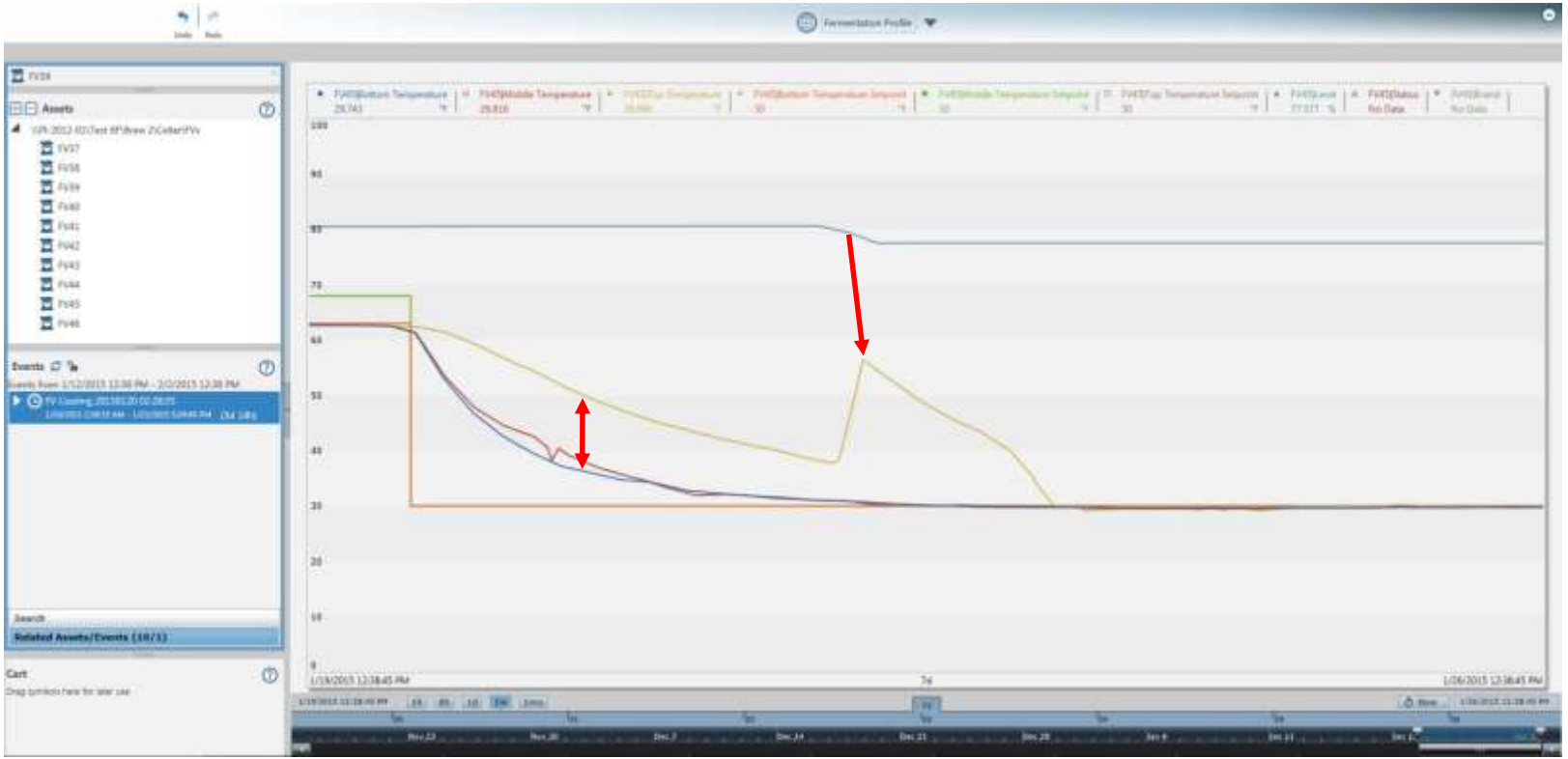
- 7 brew batch fill
- Approximately 2 hrs between fills



Revisit the Issue Presented Last Year – Ideal Cooling

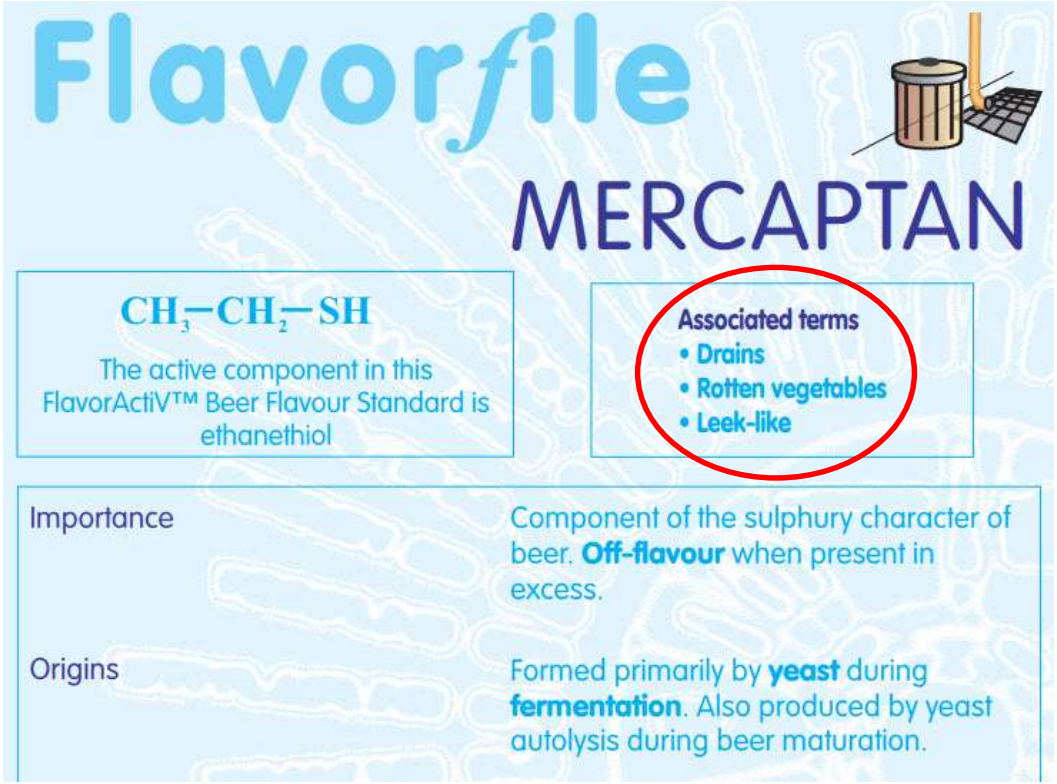


Revisit the Issue Presented Last Year – Stratified Cooling

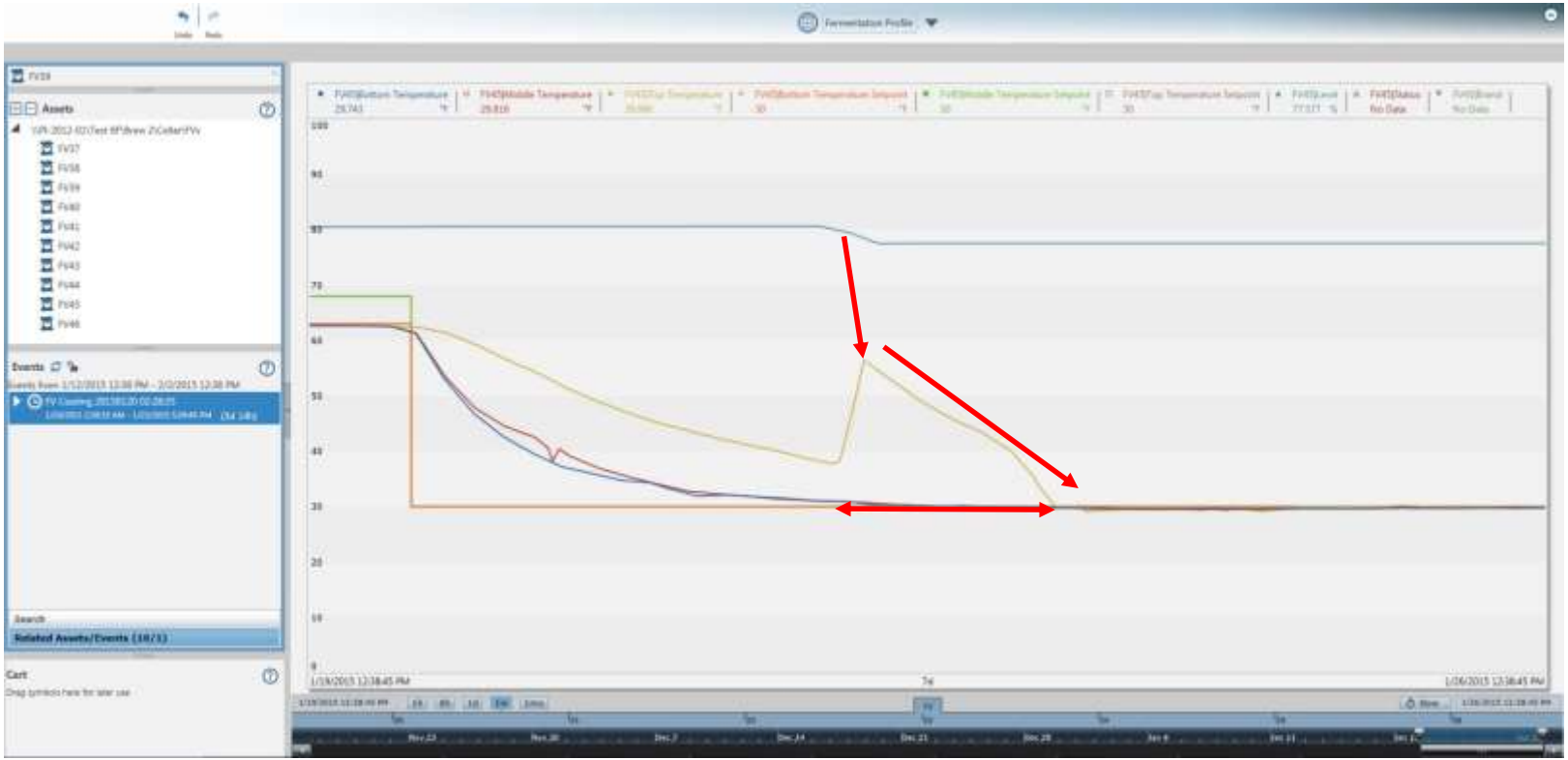


Revisit the Issue Presented Last Year – Quality Concerns

- Potential mercaptan production from yeast autolysis



Revisit the Issue Presented Last Year – Capacity Concerns



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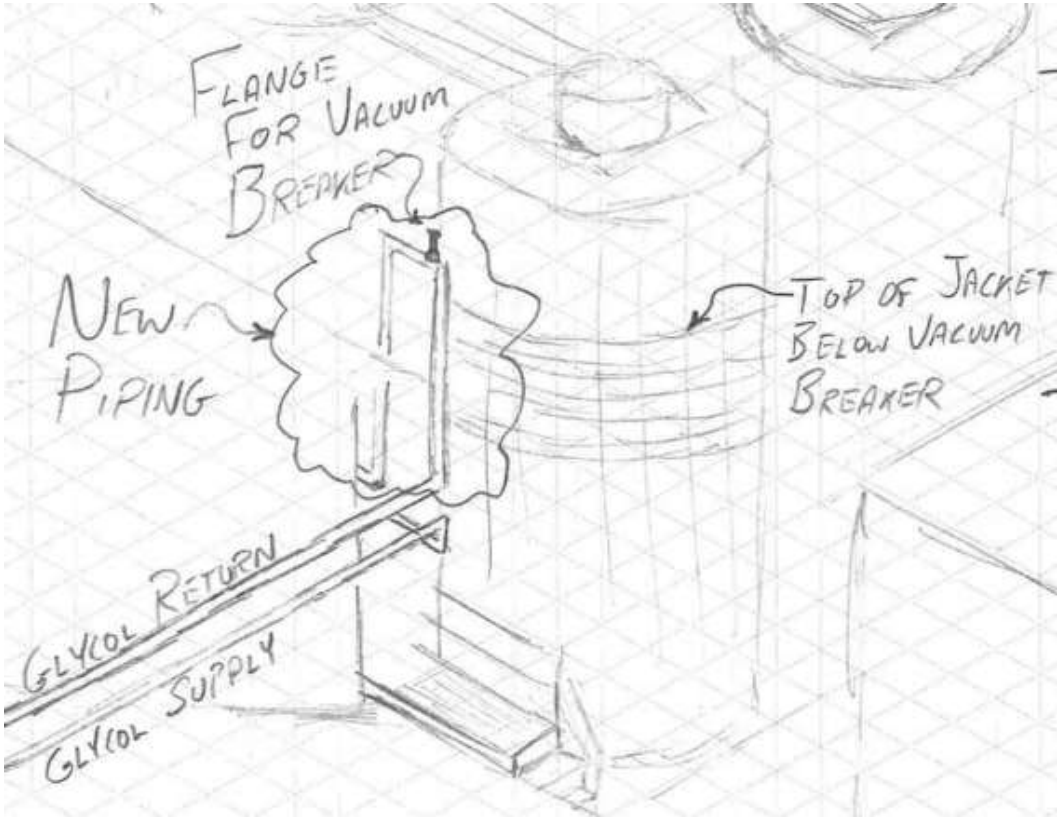
Mechanical Changes

- 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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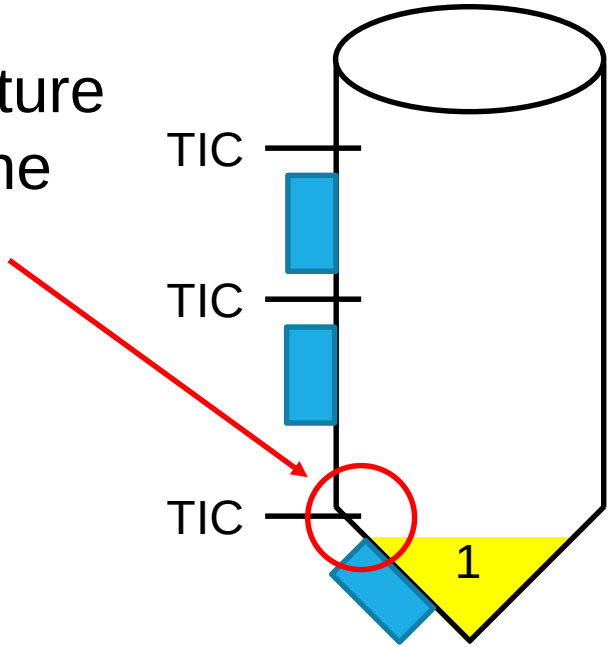
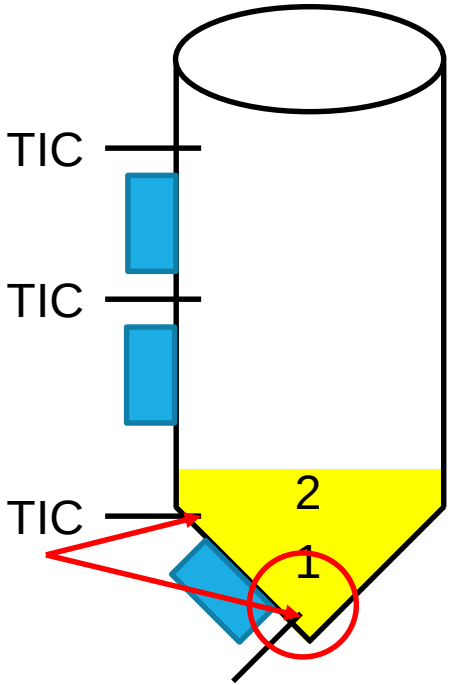
Process Changes – Equipment Revisited

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

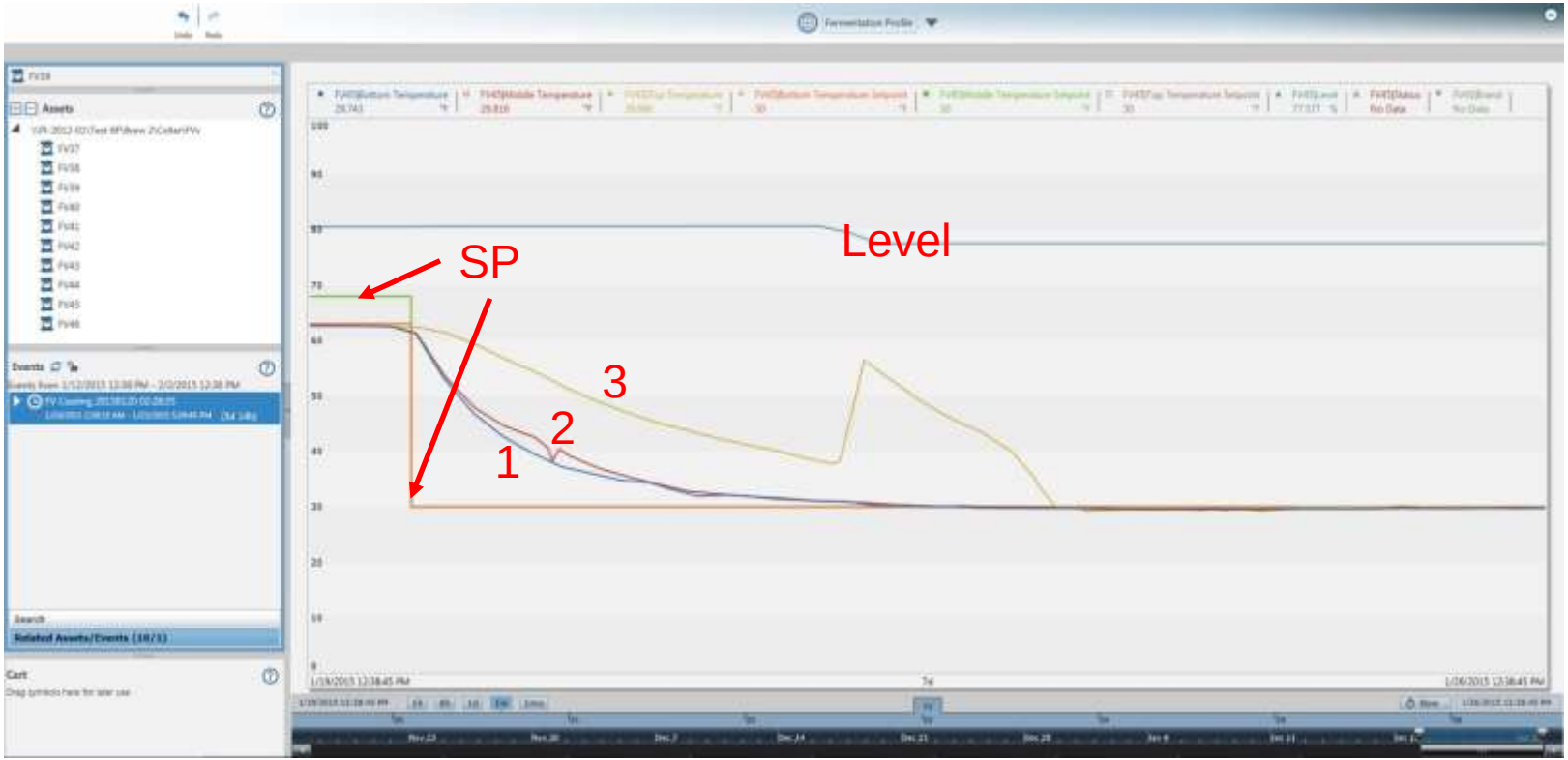


Process Changes – Equipment Revisited

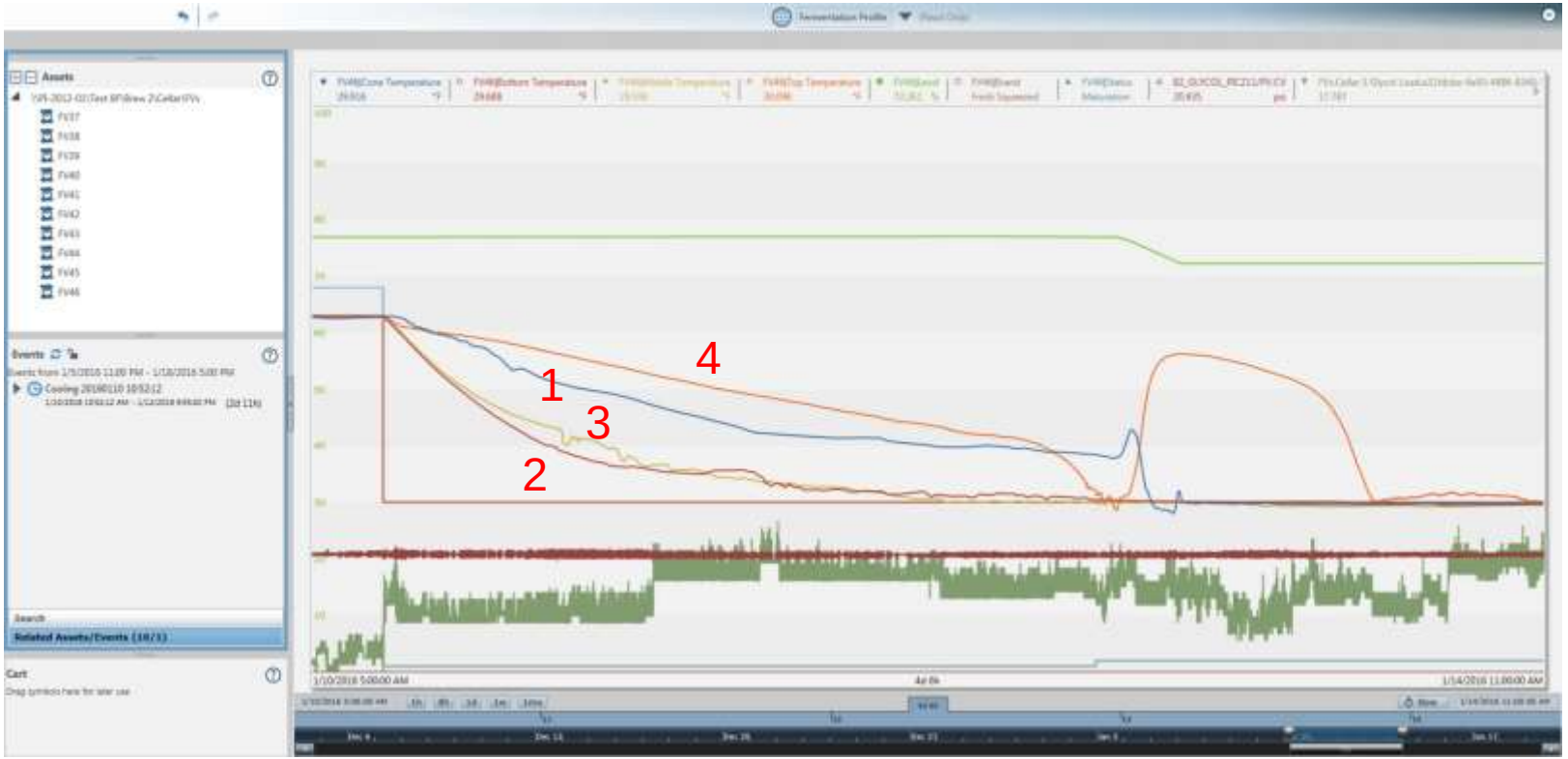
- Added an additional TI
- TIC input switches based on level



Process Changes – Trend Revisited

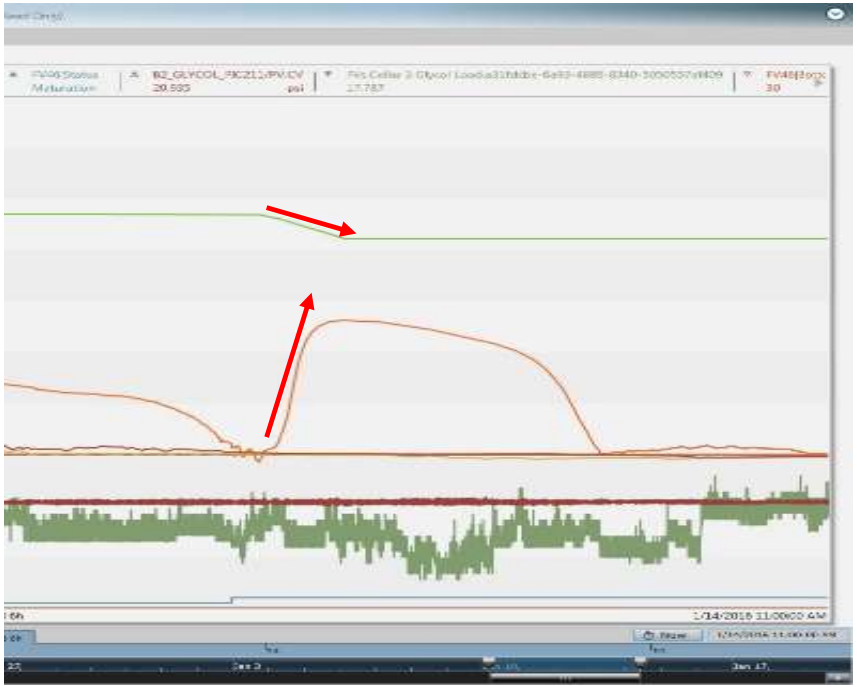


Process Changes – Trend Revisited



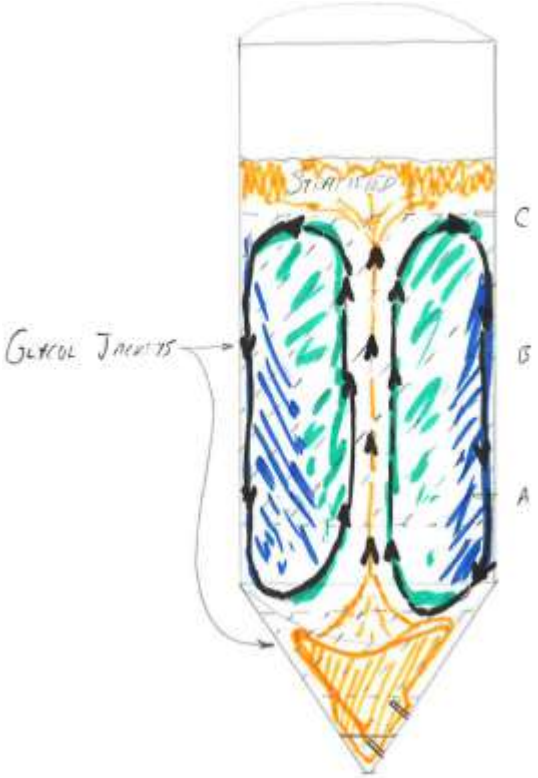
Process Changes – Trend Revisited

Without Cone TI

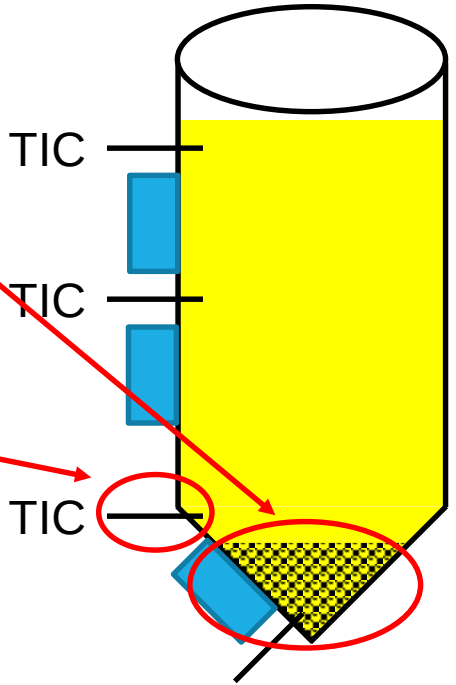


With Cone TI

Process Changes – Hypothesis

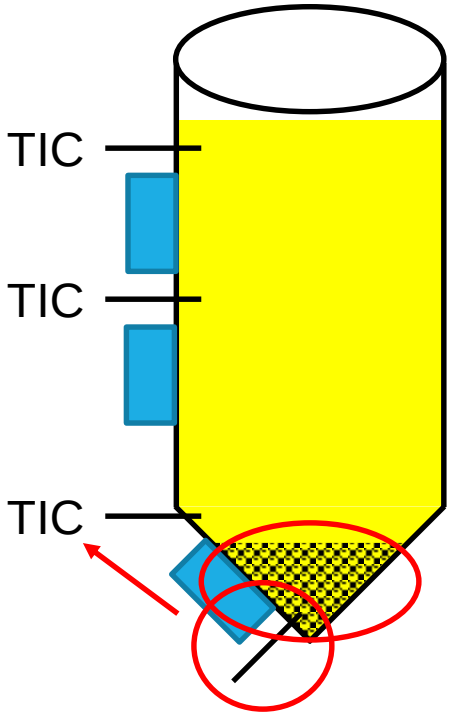


- Yeast heating up on the bottom of the FV as fermentation ceases
- Not seeing the entire picture due to switching TIC input once level is high enough

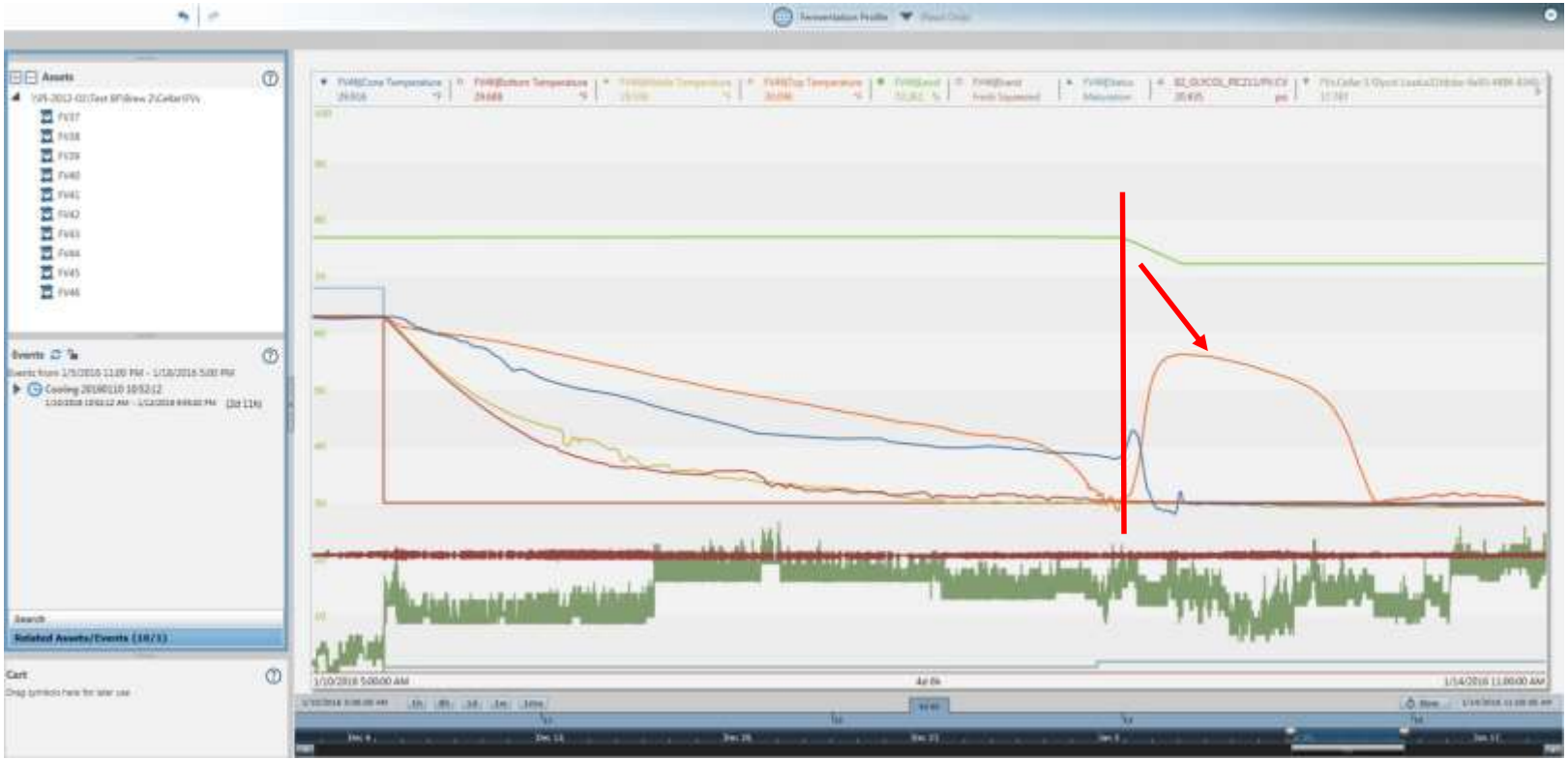


Process Changes – Trial Changes

- 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

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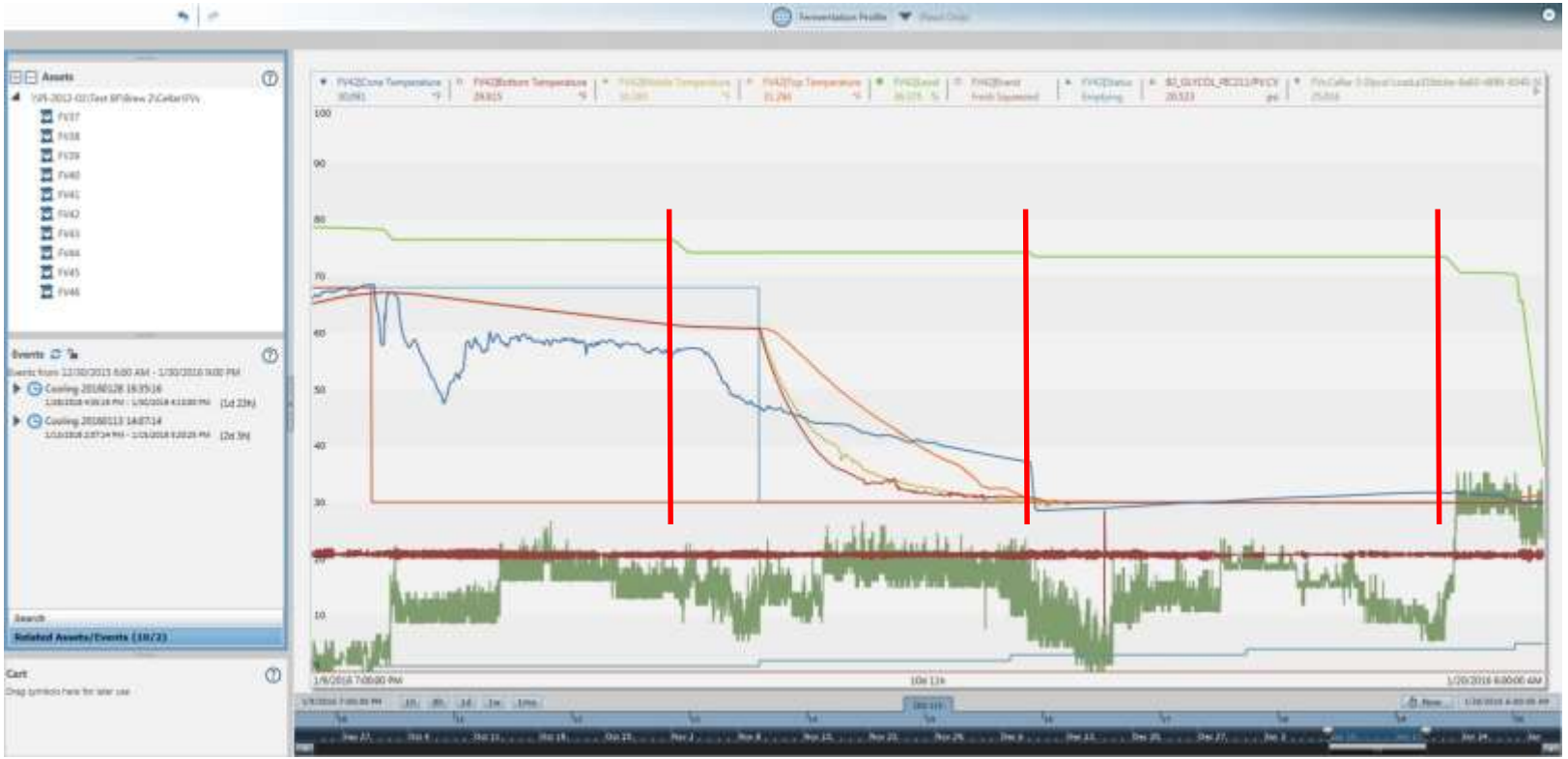

Leveraging the PI System to Assure Beer Quality and Production Capacity

DESCHUTES BREWERY

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

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

- Asset Framework (AF), Event Frames and 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 to put off capital investments while meeting demand
- 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

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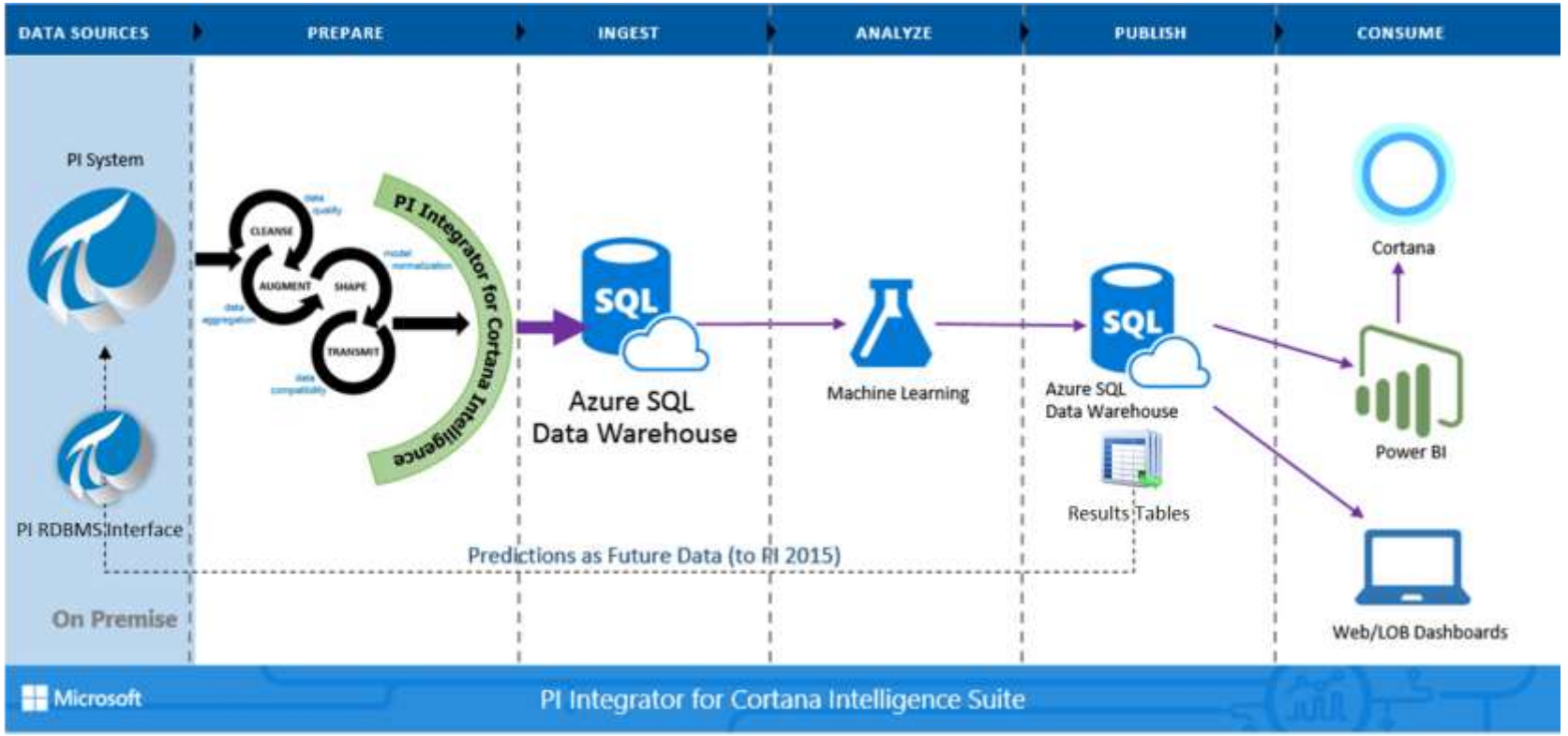
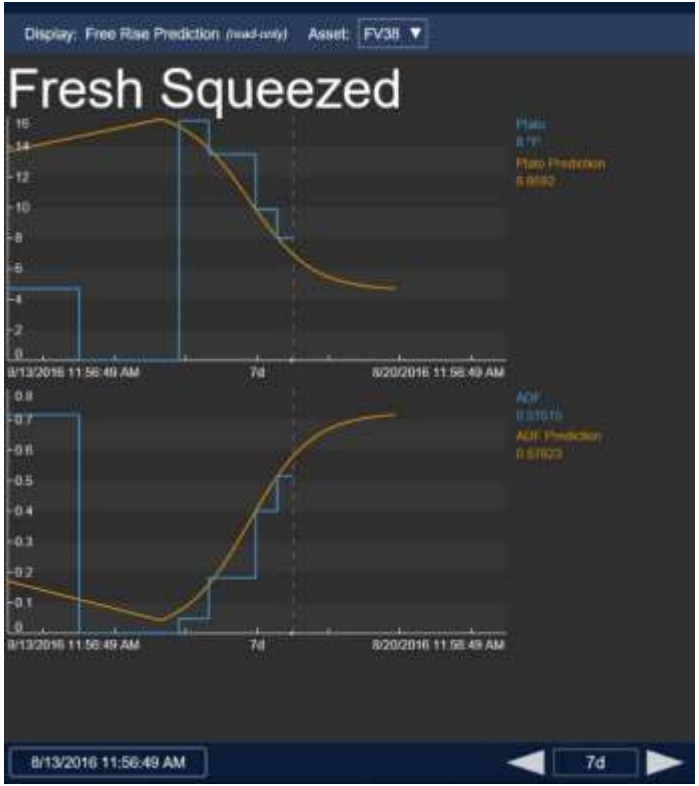
Next Steps – Fermentation Future Data

- Working with the PI RDBMS Interface and the PI Integrator for Cortana Intelligence we are predicting the next fermentation step based on past data:
  - Plato measurements are manually taken and entered into our quality SQL database by brewers during fermentation.
  - The RDBMS interface brings these into PI, and PI sends them to Azure, which uses machine learning and past fermentation data to predict how this fermentation will go; this saves lost time between readings.

Next Steps – System Diagram



Next Steps – Future Data Trends



Next Steps – Process Integration

- Improve data model as we get more data
  - Default curves
  - Correcting data entry errors
- Trigger action based on the data
  - Take plato reading at free rise time indicated on reports
  - Flag operator if a fermentation looks abnormal
  - Eventual automation of the move to free rise
  - Coresight and Microsoft Power BI reporting
- Expand to other fermentation steps: bung, diacetyl rest, cooling

Contact Information

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Deschutes Brewery

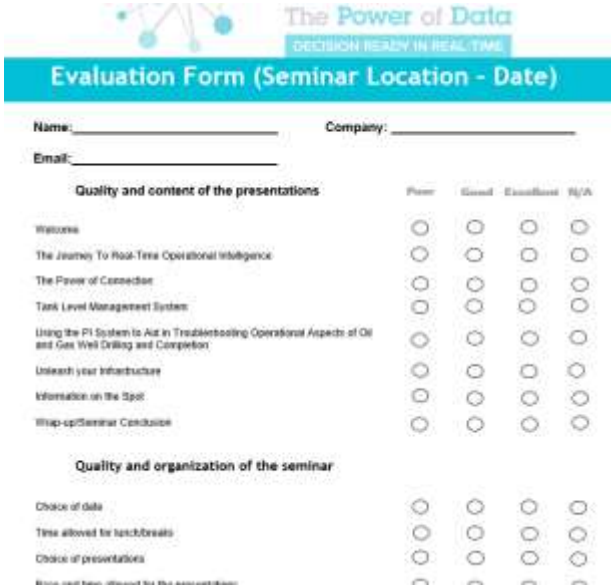
Questions

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

State your **name & company**

Please don't forget to…

Complete the Survey for this session


The Power of Data

DECISION READY IN REAL TIME

Evaluation Form (Seminar Location - Date)

Name:_____ Company:_____

Email:_____

Quality and content of the presentations	Poor	Good	Excellent	N/A
Welcome	○	○	○	○
The Journey To Real-Time Operational Intelligence	○	○	○	○
The Power of Connection	○	○	○	○
Tank Level Management System	○	○	○	○
Using the PI System to Aid in Troubleshooting Operational Aspects of Oil and Gas Well Drilling and Completion	○	○	○	○
Unleash your Infrastructure	○	○	○	○
Information on the Spot	○	○	○	○
Wrap-up/Seminar Conclusion	○	○	○	○

Quality and organization of the seminar				
Choice of date	○	○	○	○
Time allowed for lunch/breaks	○	○	○	○
Choice of presentations	○	○	○	○

감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado

I hope this did not run on too long!