Introduction to Process Optimization and Advanced Analytics with the PI System

Live Polling in this session: PollEV.com/osisoft2

Presented by
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Where are we in our PI System Basics journey?

01 2:00pm  Landscape
My Operational Data, the PI System and the Greater Technology Landscape

02 2:45pm  Asset Health
Introduction to Asset Monitoring & CBM with the PI System

03 3:45pm  Process Optimization
Intro to Process Optimization & Advanced Analytics with the PI System

04 4:30pm  Visualization
Introduction to Visualizing data with the PI System
Where are we in our PI System Basics journey?

01 Landscape
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Process optimization is a journey

Issue needs a solution

Opportunity is identified

Heroic levels of optimization
Two questions to be addressed in 30 minutes

How can the process of **process optimization** be optimized?

Is there a *buzz* word that I can use to optimize a process?
Age-old questions in process optimization

How can we:

- production by $X\%$?
- production time by $Y$ hours?
- operating costs by $Z$?

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#OSIsoftUC
Process optimization can be streamlined with the right tool set

**Identify**

**What** components are inefficient?

Challenges
- Data silos
- Access overhead

Solution

?  

**Analyze**

**Why** is it inefficient?

Challenges
- Many “truths”
- Comparison difficulty

Solution

?  

**Implement**

**How** can we improve it?

Challenges
- Thermodynamics
- Fluid mechanics

Solution

?  

**Validate**

**Did** the process’s efficiency improve?

Challenges
- Data silos
- Access overhead

Solution

?
How can the **PI System** help optimize a process?
Customer Success Story
Located in Bend, OR
Founded in 1988
Pub opened in Portland, OR in 2007
2 brewhouses
50+ vessels
Bottling and kegging
7th largest US craft brewer
Quick data access enables production increase

Challenge
“…uncharacteristic cooling behavior…”

Solution
“…PI System enabled the brewing team to quickly and efficiently implement a solution to correct this uncharacteristic behavior…”

Consistent and repeatable fermentation cooling with a 3°C or less change of IPA vs. the worst case exhibited
• Able to maximize fermentation capacity
• Avoid unnecessary additional capital investment for increased fermentation capacity
• Assuring the highest quality in final products
An ideal cooling process for the entire tank

- Tank level
- Top, middle, and bottom zone temperatures
- Cooling duration

Identify → Analyze → Implement → Validate
A deviation in cooling causes a delay in production

Impact

Production

Quality

Identify

Analyze

Implement

Validate
Before we save the beer ... what magic happened?

PI Data Archive

PI Asset Framework

PI Event Frames

Element Templates
- Building
- Process Line
- Plant
- Pump
- Substation
- Tank
- Well
- Wind Turbine

Elements
- Montreal Plant
  - Process Line 1
  - Centrifugal Pump #1
- TNK023
  - Tanks
- WTG-01
- WTG-02

Attributes
- Last Maintenance
- Model
- Status
- Speed
- Temperature

Event Frame Attributes
- Pressure Avg
- Product Loss
- Reason Code
- Temp Max

Events
- Process Excursion
- Startup
- Downtime
- Shutdown
- Batch
- Grade Change
- Environmental Excursion

Shift
Monitor temperature at the bottom of the vessel
Cone region response correlated with top region

1. Top & cone zone separation
2. Yeast pull
3. Top zone spike
4. Additional duration
5. Something happens in cone

Identify → Analyze → Implement → Validate

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Hypothesis drives change in process

Cool the cone of the vessel as fermentation begins to cease
Process change reduces cooling time

Result

Production

Quality

Identify → Analyze → Implement → Validate
Process optimization can be streamlined with the right tool set

- **Identify**
  - **What** components are inefficient?

- **Analyze**
  - **Why** is it inefficient?

- **Implement**
  - **How** can we improve it?

- **Validate**
  - **Did** the process’s efficiency improve?

**Challenges**
- Data silos
- Access overhead

**Solution**

**Challenges**
- Thermodynamics
- Fluid mechanics

**Solution**
- Domain expertise required

**Challenges**
- Many “truths”
- Comparison difficulty

**Solution**

**Challenges**
- Data silos
- Access overhead

**Solution**

Process optimization can be streamlined with the right tool set. Identify what components are inefficient, analyze why it is inefficient, implement how to improve it, and validate if the process’s efficiency improved. Challenges include data silos, access overhead, thermodynamics, fluid mechanics, many “truths”, comparison difficulty, and domain expertise required.
Advanced Analytics
What words describe your advanced analytics journey?
Ways to get value from (big) data with advanced analytics

Data Warehouses

Centralizing data from different business systems

Visual Correlations

Visualizing data sets across multiple variables

Data Science

Identifying patterns with statistical approaches
Need to predict transition from fermentation to free rise

Challenge
- Transition occurs between infrequent manual measurements

Time (hours)

Apparent Degree of Fermentation

Too late

Transition

Can this be predicted?
Spreadsheet analytics proves confidence in predictability

**Bring Raw Data In**

**Clean it Up**

**Fit to a Line**

<table>
<thead>
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<th>Time (hours)</th>
<th>Apparent Degree of Fermentation</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
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<td>0.1</td>
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<td>0.5</td>
</tr>
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<td>60</td>
<td>0.6</td>
</tr>
</tbody>
</table>

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How to operationalize data preparation and predictions
How to operationalize data preparation and predictions

Predictions as Future Data

PI System

Cortana Intelligence Suite

Intelligence
- Cognitive Services, Bot Framework, Cortana
- Power BI
- Machine learning, Stream Analytics, HDInsight
- Data Lake, SQL, DW
- Data Factory, Data Catalog, Event Hubs

Power BI

Machine learning, Stream Analytics, HDInsight

Data Lake, SQL, DW

Data Factory, Data Catalog, Event Hubs
Refining a predictive model take iterations and expertise

**Benchmark:** Measure accuracy against a standard (based on historical data)

**Predict:** Use 2 early densities to estimate transition time

**Refine:** base predictions on brand for greater accuracy
Operationalizing predictions for all brands and vessels

Mirror Pond Pale Ale – Vessel 16

Hop Slice Summer Ale – Vessel 27

Fresh Squeezed IPA – Vessel 39

Black Butte Porter – Vessel 45
In summary

Is there a *buzz* word that I can use to optimize a process?

**PI Integrators**

Automated data preparation for advanced analytics

**Cortana Intelligence Suite**

Apply advanced analytics to data to gain insight

How can the process of **process optimization** be optimized?

**PI System**

- Quick data access
- One version of truth
- Asset and event organization
Relevant Product Talks & Booths

Thursday (Day 3): 12:15 – 13:00
Product Track – Advanced PI System User – Arora 17
Streaming Analytics, Data Lakes and PI Integrators
Matt Ziegler and Daniele Farris

Partner and Product Expo – Arora Foyer
Visualizing PI System Data booth
PI Integrator booths
Questions

Please wait for the microphone before asking your questions

State your name & company

Please remember to...

Complete the Online Survey for this session

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- Meet and connect with other attendees

Search OSIsoft in the app store
What basic PI System questions do you have?

Respond at → PollEV.com/osisoft2
Have an idea how to improve our products? OSIsoft wants to hear from you!

https://feedback.osisoft.com/
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Thank You

감사합니다
谢谢谢
Merci
Danke
Gracias
ありがとう
Спасибо
Obrigado