The Continuing Evolution of the PI System as Strategic Element of Energy and Process Optimization at Sun Chemical

Presented by Francis Lauryssens
PI Systems Specialist
Agenda

- About Sun Chemical
- Our PI System – History and Architecture Overview
- The PI System as an Integration and Applications Infrastructure
- The Energy Model – Enabling Proactive & Adaptive Decisions
- Use of PI System’s Advanced Functionality – PI-AF and PI Batch
- Summary and Closing Remarks
Agenda

1. About Sun Chemical
2. Our PI System – History and Architecture Overview
3. The PI System as an Integration and Applications Infrastructure
5. Use of PI System’s Advanced Functionality – PI-AF and PI Batch
6. Summary and Closing Remarks
About “Sun Chemical”

• World's largest producer of printing inks and pigments. Leading provider of materials to packaging, publication, coatings, plastic, cosmetics etc…

• Annual sales over $3.5 billion

• More than 8,000 employees

• 250+ locations in 56 countries

• Our Customer needs:
  • Improve performance and reliability
  • Increase On time delivery
  • Provide consistent product quality
“The Power of Data - Thriving in a World of Change”

“The PI System has evolved into a critical element of decision support processes by providing timely, quality, and actionable information in context. Without the PI System, our plant would not be running as well today.”

Plant Manager, Scott Hendryx

<table>
<thead>
<tr>
<th>Business Challenge</th>
<th>Solution</th>
<th>Results and Benefits</th>
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<tbody>
<tr>
<td>• Challenging and Dynamic Business Environment</td>
<td>• Evolved the PI System’s use as a “historian” to a strategic provider of data and information</td>
<td>• Sustainability – “the ability to endure” by innovating and adapting with information</td>
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<td>• Open capacity</td>
<td>• Focus on energy and process reliability and optimization</td>
<td>• Improved Energy &amp; Process Optimization &amp; Reliability</td>
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<td>• Energy and Power largest variable costs</td>
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<td>• Continuous Improvement Culture</td>
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<td>• Asset reliability issues</td>
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SunChemical®
a member of the DIC group
Agenda

About Sun Chemical

Our PI System – History and Architecture Overview

The PI System as an Integration and Applications Infrastructure

The Energy Model – Enabling Proactive & Adaptive Decisions

Use of PI System’s Advanced Functionality – PI-AF and PI Batch

Summary and Closing Remarks
Our PI System History and Architecture

PI Server 2010 with 15,000 tags.
The Evolution Continues……
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Integration and Applications Infrastructure

• Integration of Different Data Sources
  – DCS, SCADA, PLCs, LIMS
  – Power Logic System
  – Manual Data
  – And many more….

• Infrastructure for Applications:
  – Electrical Usage and Purchase Optimizations
  – Land Fill Gas
  – Batch First Pass Yield
  – Utilities Usage and Optimization (Electricity, steam, etc)
  – Process Optimization
  – Asset Reliability and Performance Management
  – And many more….
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Summary and Closing Remarks
Recap of Prior UC2010 Presentation

Business Challenge: Create an energy model for the plant that can be used for budgets and set baselines.

1. Integration of energy data
   - Electricity data from Power Logic System
   - Gas data from flow meters in PI and manual readings
   - Boiler house steam production and flow meters
   - Water data from meters and manual entry

2. Leverage of PI Systems Advanced Functionality
   - PI-Performance Equations and Totalizers
   - PI-AF
   - PI-ACE
   - PI-Batch
Decomposing the Energy Management “Solution”

Energy Management “Solution”

Gather Process Information
Transform into Energy Information
Combine into Systems with Equations and Logic
Generate and Collaborate with KPIs and Other Summary Information
Develop Models for Optimization (Plan vs. Actual, Control)

Functionality CONFIGURED in the PI System

“Programmed” in PI ACE

Streaming Data and Events
Asset Structure
It all Starts with PI-AF....
Obtaining Missing Data With PI Manual Logger
Real-Time Power Dashboard

• A dashboard that reflects how electricity is billed.
• A contracted usage for the site: 4 Mega Watts peak demand.
• Peak hours from 7 am to 11 pm on weekdays.
• A monthly and annual demand peak based upon 15 minutes and hourly averages and calculations.
Continuous Improvement in Action

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<th>Monthly Demand</th>
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Natural Gas and Landfill Gas - Example of the Power of Data

• The PI System was used to calculate how much gas we used and how much we could replace with landfill gas.
  – Landfill gas that was not used by others would be available to Sun Chemical.
  – Savings in cheaper gas and no transportation costs.
  – 1 boiler was converted to consume landfill gas.
Optimizing Boiler House Operations

- Major steam leaks were identified and repaired.
- Boiler 2 was shutdown.
- Reduced pressure on boiler 3 to minimize natural gas usage.
- Increased the allowable steam header pressure on boiler 1 to maximize landfill gas.
- Requested a 2 psi pressure increase from the county.
- Increased allowable load on the landfill gas boiler from 60% to 80% to maximize usage of landfill gas.
- Adjusted controls on boiler 1 to keep boiler running during low landfill gas conditions.
Real time Monitoring

County drilling extra new wells

Gas Usage 2012
Heating Natural Gas - CCF per HDD

Heating Degree Days 65F based
Warehouse Heating Improvement

• Sealed and repaired all doors for air leaks.

• Installed fans to distribute the heat better.

• Lowered the thermostat five degrees Celcius.

• Data from the PI System enabled and Operator buy in.

• Tracking gas usage per HDD (reviewing every other week)
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PI Performance Equation Example

```
if (trunc(HVF_YEL_TC_82111_OUTPUT;10) = 0 then 0 + (HVF_YEL_TC_82111_OUTPUT;10) * 0.205 else if trunc(HVF_YEL_TC_82111_OUTPUT;10) = 2.05 then 2.05 * (HVF_YEL_TC_82111_OUTPUT;10) else if trunc(HVF_YEL_TC_82111_OUTPUT;10) = 3.02 else if trunc(HVF_YEL_TC_82111_OUTPUT;10) = 20 then 5.07 + (HVF_YEL_TC_82111_OUTPUT;10) else if trunc(HVF_YEL_TC_82111_OUTPUT;10) = 30 then 10 + (HVF_YEL_TC_82111_OUTPUT;10) else if trunc(HVF_YEL_TC_82111_OUTPUT;10) = 0.72 else if...
```
PI Totalizers Are Used Extensively
PI-AF is the Foundation
PI-ACE Further Extends the PI System’s Analytical Capabilities

The image contains a code snippet from a software, possibly related to process control or simulation. The text in the image mentions extending the analytical capabilities of the PI system, but the specific details of the code are not fully legible due to the image quality.

The text and code snippet suggest the implementation of features or improvements in a process control software or system, specifically mentioning an extended analytical capability. However, without clearer visibility, the exact nature of these extensions remains unclear.

The snippet references code or script, possibly Python or another language, indicating some form of automation or analysis within the software. The code includes variables and functions, hinting at computational or algorithmic processes.

Given the nature of the code and the context provided, it's likely related to enhancing the diagnostic or control functionalities within a process automation environment.
Use of PI-Batch and PI Process Templates

Business Driver - Improve the First Pass Yield.

- Exele PI Process Templates Project

- Building on our event history (PI Batch)

- Builds a “visual roadmap” of a process by displaying upper and lower control limits from historical data.

- Shows where the process is versus where the process is supposed to be.

- Critical to Quality parameters such as pH, temperature, transfer rates, etc…
Benefits of PI Process Templates

• 6 to 9 Critical-To-Quality parameters for each of over 75 codes made in the department were “templated”.

• A visual roadmap of the expected process makes analysis timely and easy.

• Batches are reviewed with operators upon completion. This interaction is critical to learning everyday what does and what doesn’t make our processes work.

• Potential process upsets are alarmed in real time; therefore decisions can be made in real time. (Pro-Active)
Example Screen Shots for PI Batch
Example Screen Shots for PI Batch
Real-Time Templates in ProcessBook

**T1421 ALARMS**

- **REAL TIME ALARMS**
  - TZ Weight: 485.356 LBS
- **BLINKING RED EQUALS OUT OF RANGE**
  - pH (4.42 pH)
- **GREEN EQUALS IN CONTROL**
  - Temperature (92.74 °C)

**REAL TIME MEASUREMENTS**

- TZ Rundown Rate
- Couple pH
- Couple Temp
- Coupler Rundown Rate
- Aftertreatment pH
- Aftertreatment Temp
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How the PI System was Leveraged

• Integration, analytics, visualization, and reporting

• The use of advanced functionality:
  • PI-AF
  • PI ACE
  • PI Batch and
  • PI Process Templates

• Migration of Applications

• Foundation for real-time collaboration and continuous improvement.
## Tangible/Intangible Benefits

- FPY  

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- 2010 and later: new product lines adversely affected the FPY.

- “**Millions** of Dollars saved” – Still operating…still alive
In the Spirit of Continuous Improvement - Future plans at Sun Chemical

• Expand PI templates usage to more processes.

• Generate process optimization projects by identifying process capability opportunities.

• Continue to Expand the PI AF asset model and expand use.

• Migrate PI-Batch Generator to PI Event Frames in AF.
Summary

• The PI System has evolved significantly and now is capable of doing over 90% of traditional “solutions”…”From Historian to a *Infrastructure*”

• Continuous improvement is about a 1000 projects to drive cultural change from leveraging real time information and collaboration – “The Power of *Real-Time Data*”… and making data based decisions

• “Evolutionary” applications like energy management are more cost effective and lasting vs. the “Big Bang” propriety solutions

• The PI System has enabled Sun Chemical to realize and monetize their most important asset – real-time information- to survive (hopefully Thrive)
Francis Lauryssens

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THANK YOU