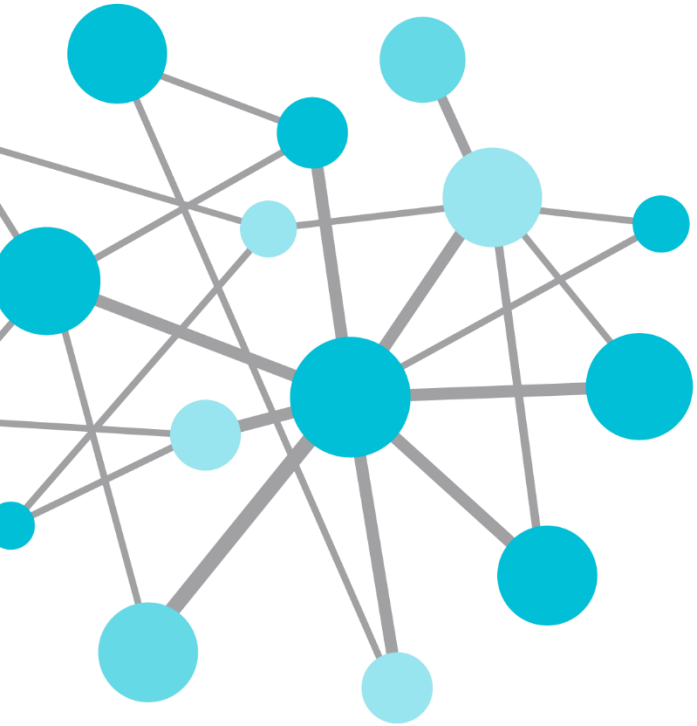
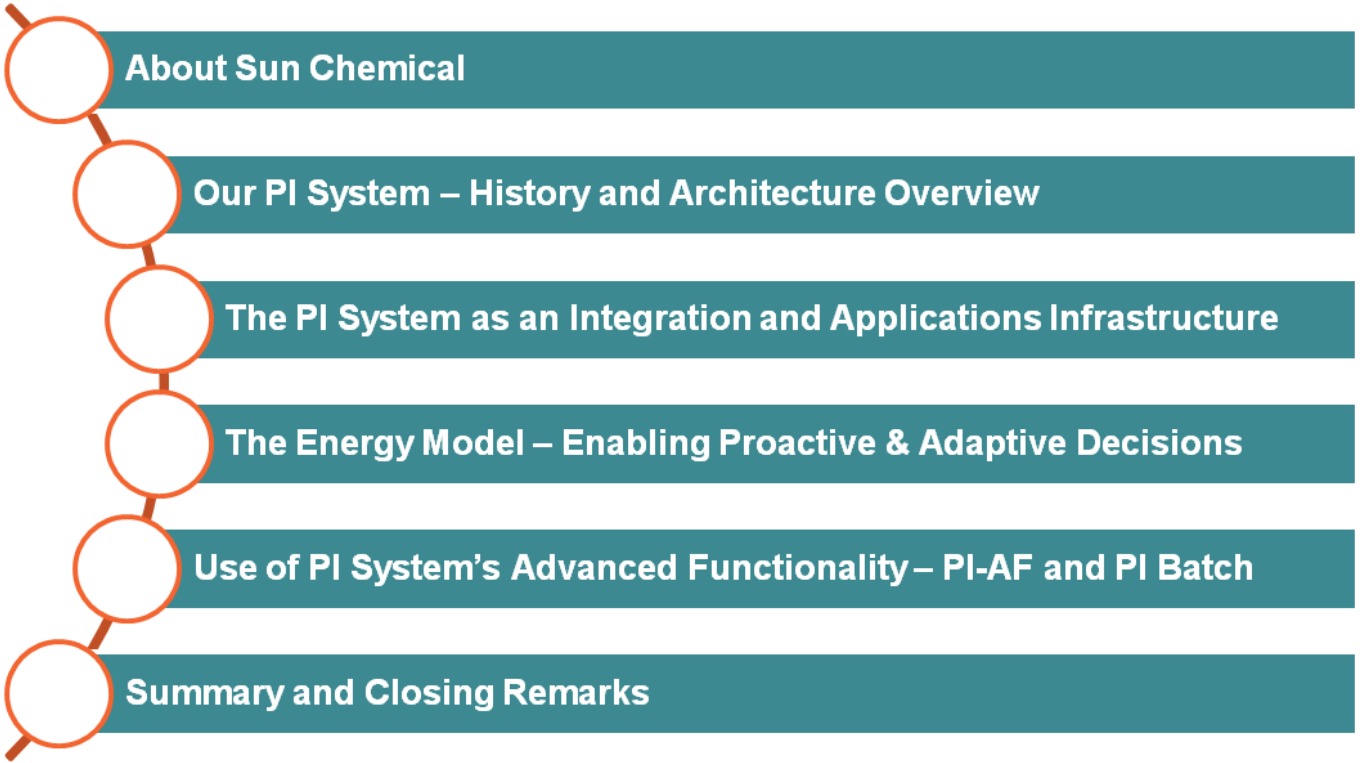


The Continuing Evolution of the PI System as Strategic Element of Energy and Process Optimization at Sun Chemical

Presented by **Francis Lauryssens**

PI Systems Specialist

Agenda



Agenda

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

SunChemical® a member of the DIC group

Business Challenge

- Challenging and Dynamic Business Environment
- Open capacity
- Energy and Power largest variable costs
- Asset reliability issues

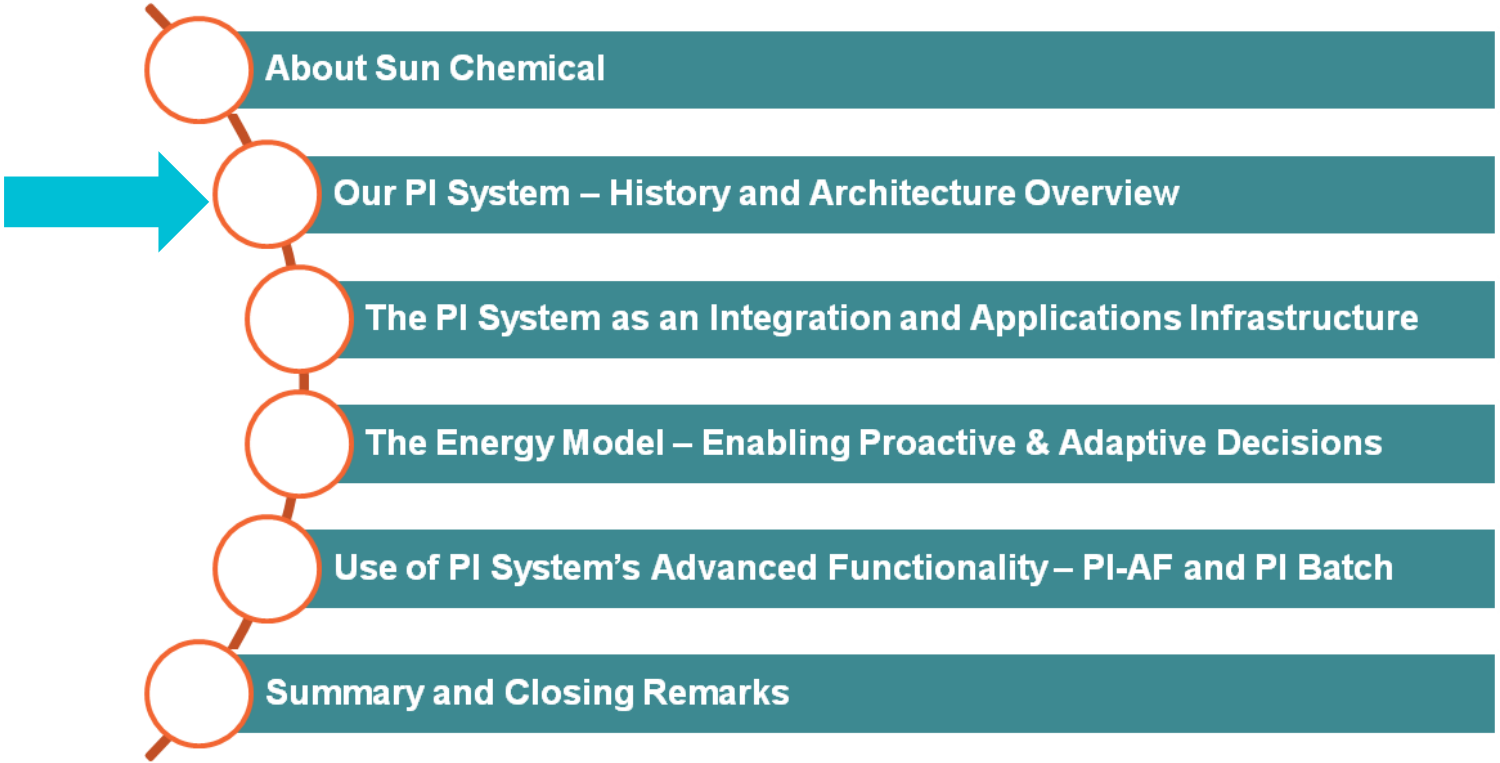
Solution

- Evolved the PI System’s use as a “historian” to a strategic provider of data and information
- Focus on energy and process reliability and optimization

Results and Benefits

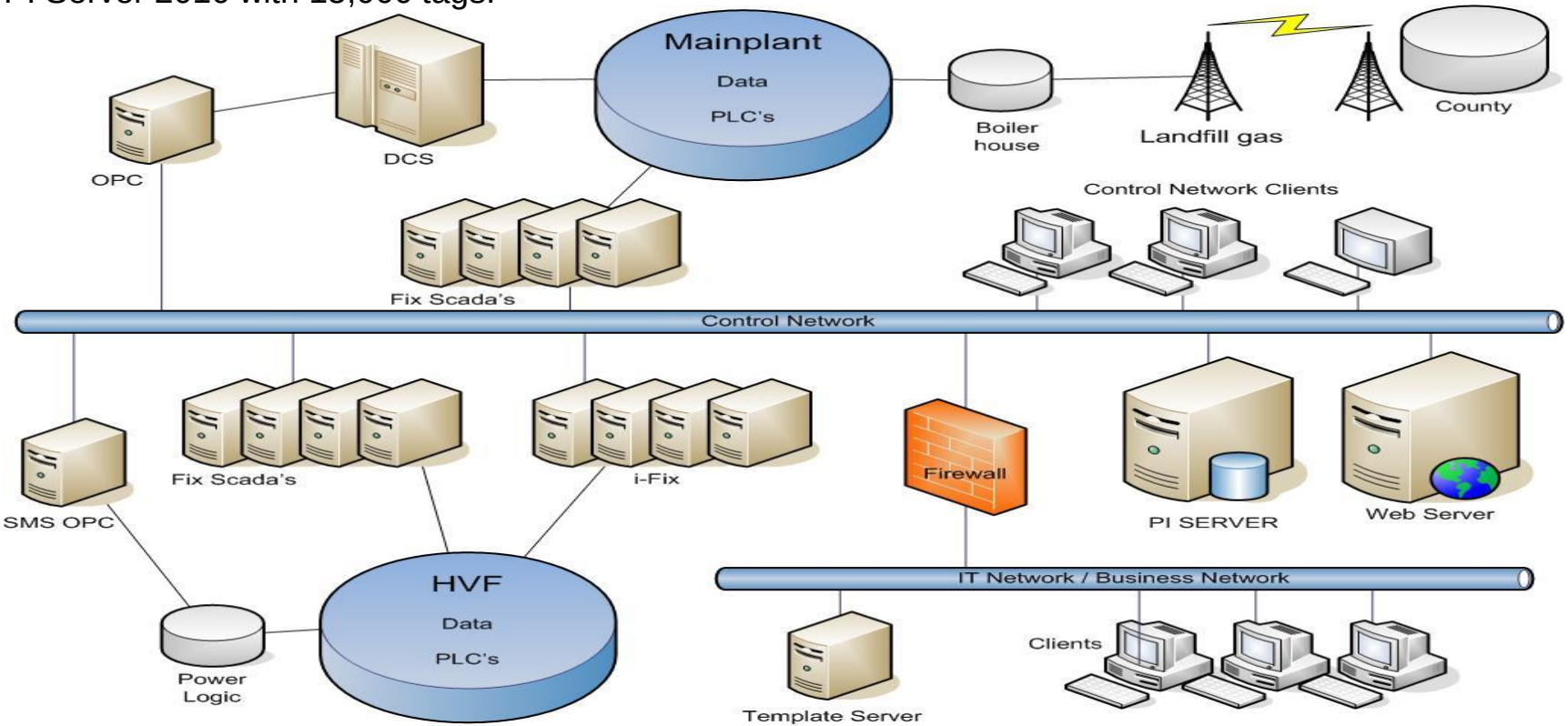
- Sustainability – “the ability to endure” by innovating and adapting with information
- Improved Energy & Process Optimization & Reliability
- Continuous Improvement Culture

Agenda

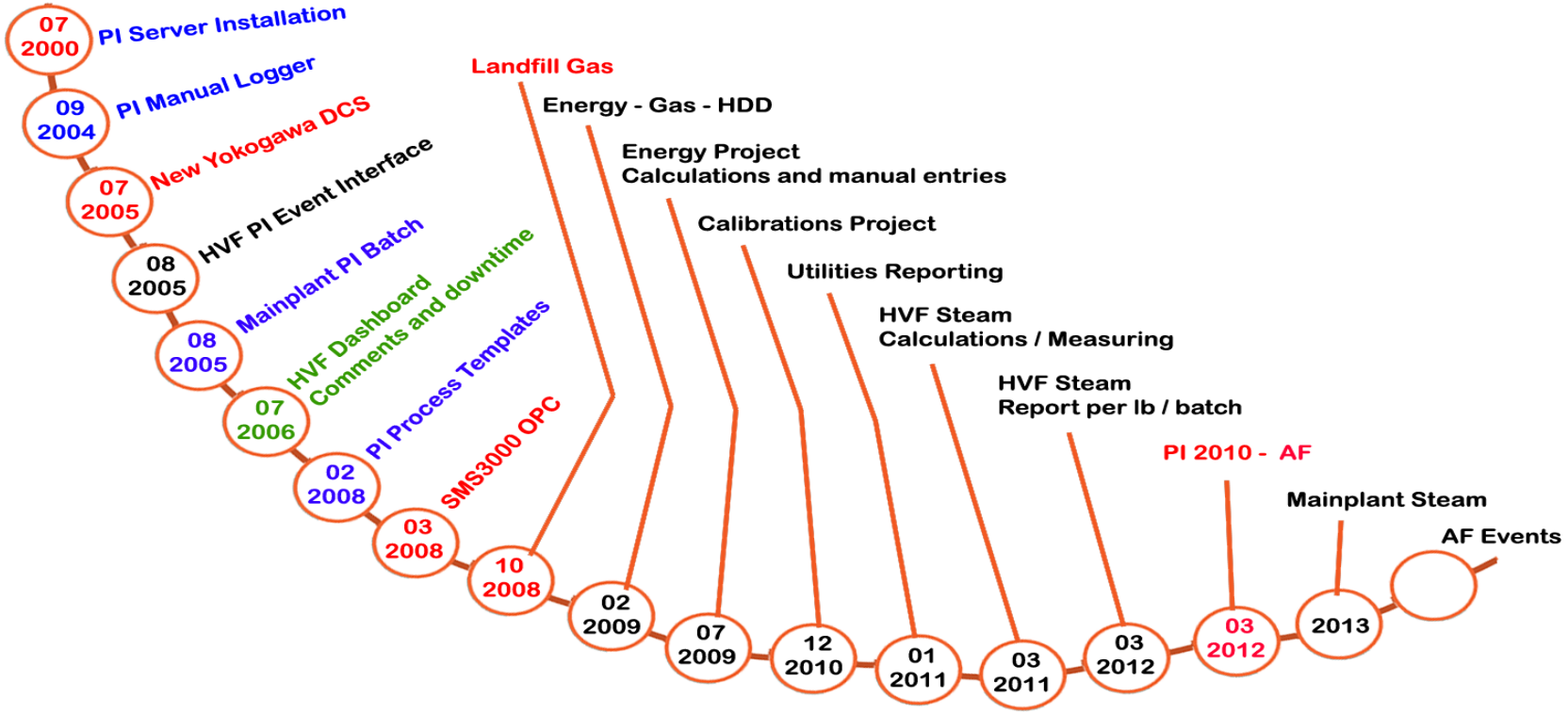


Our PI System History and Architecture

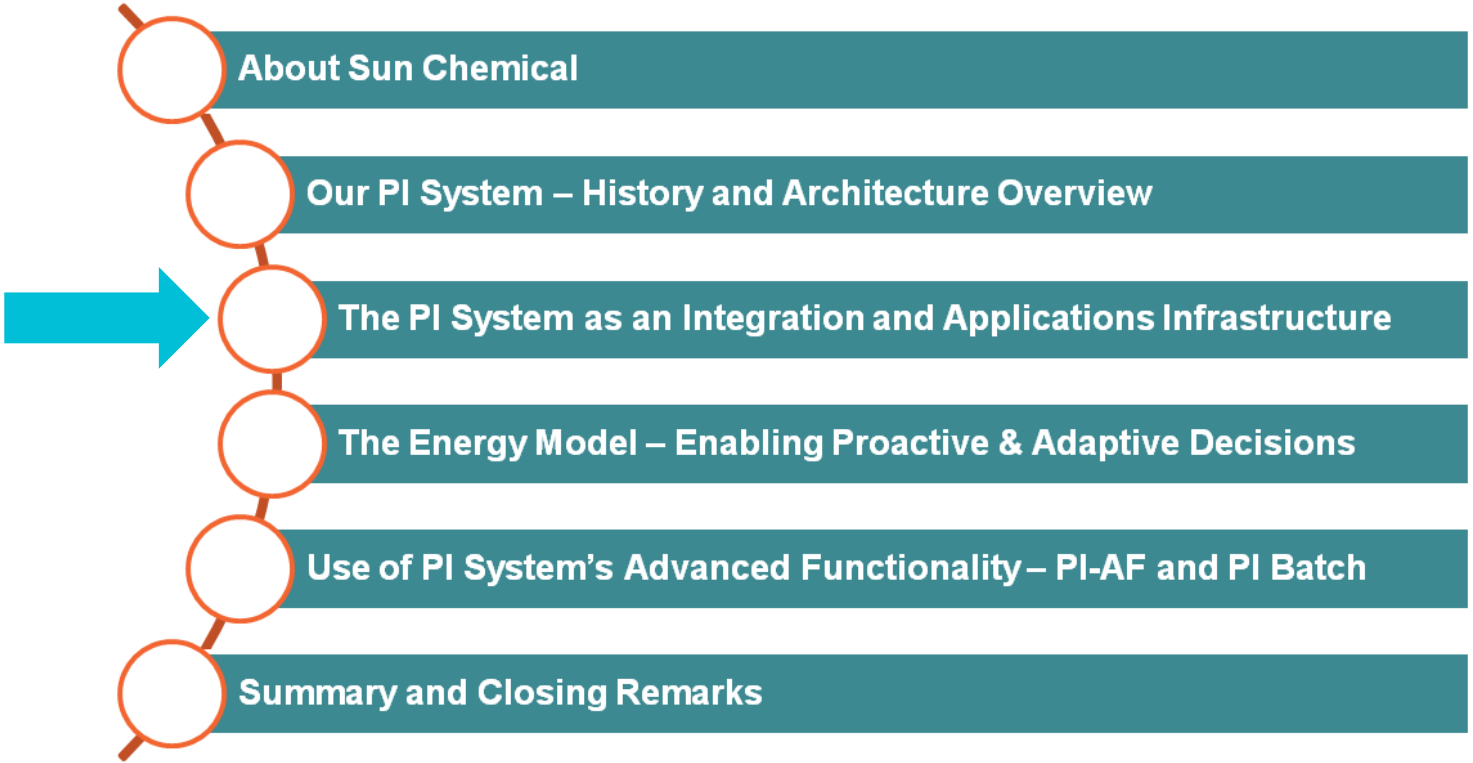
PI Server 2010 with 15,000 tags.



The Evolution Continues……

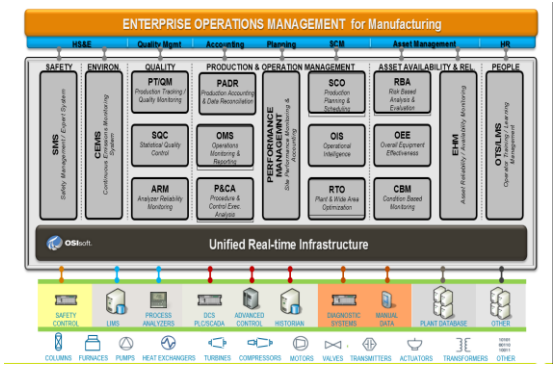


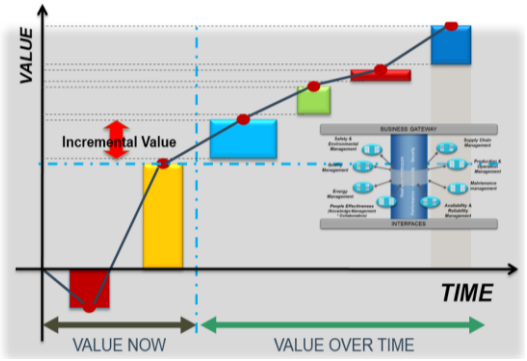
Agenda



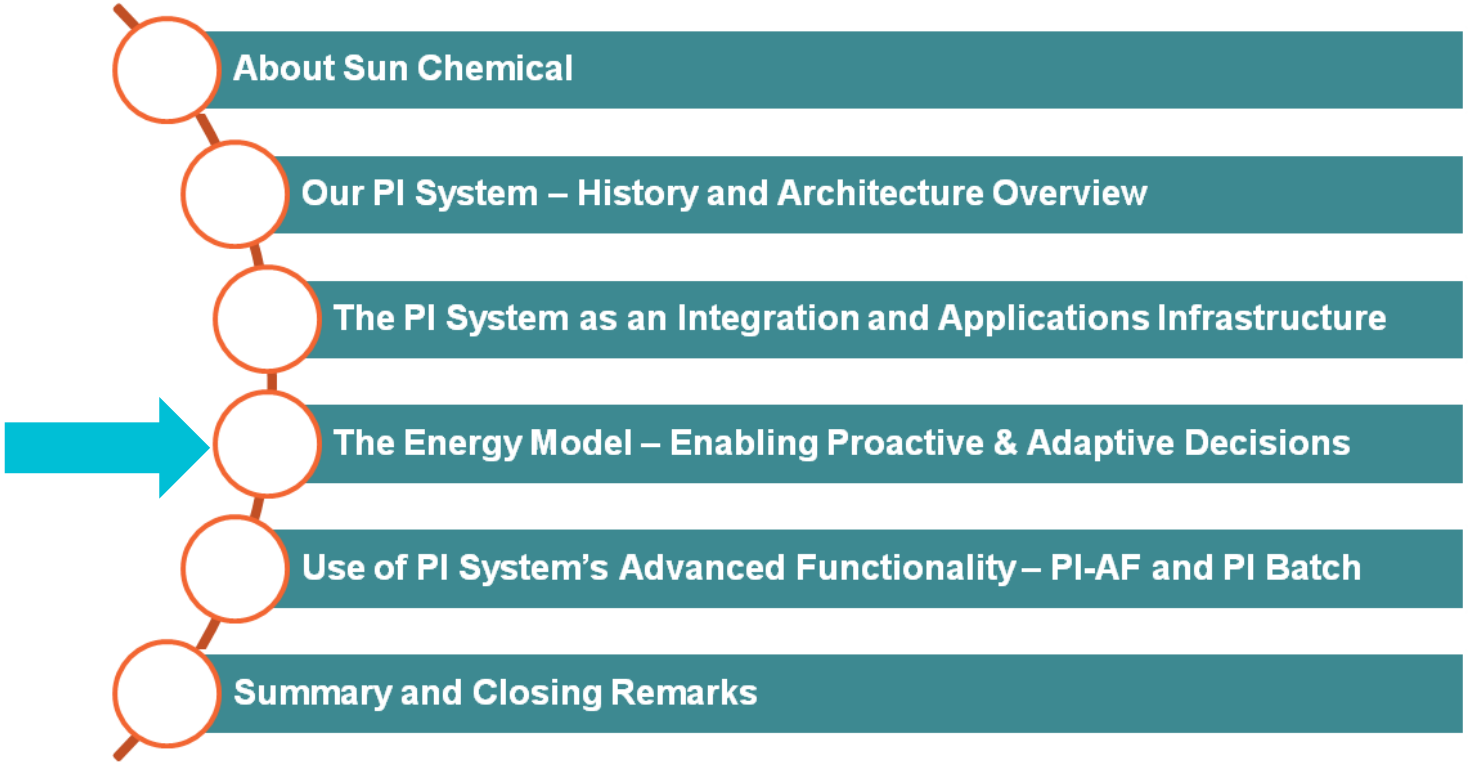
Integration and Applications Infrastructure

- 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….





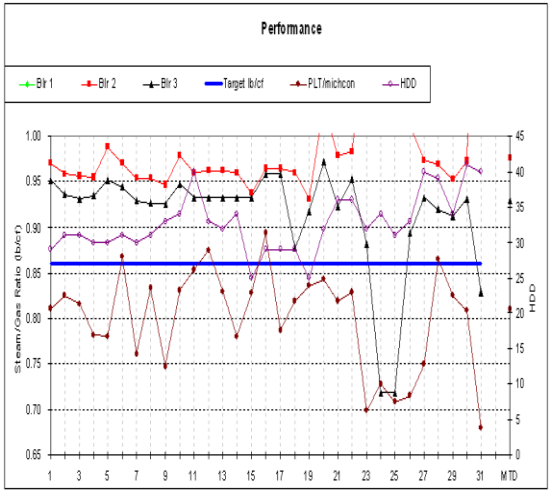
Agenda



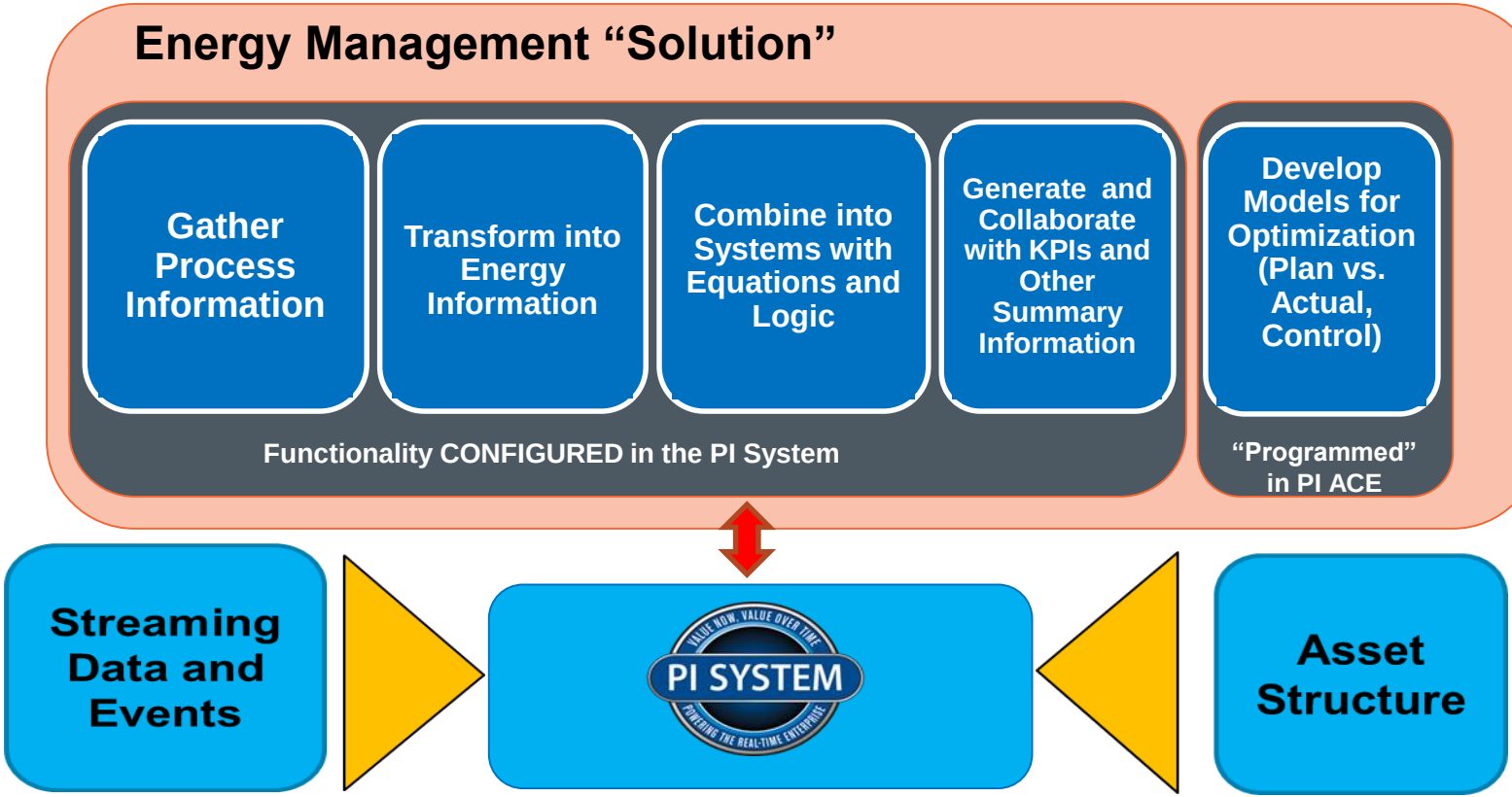
Recap of Prior UC2010 Presentation

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

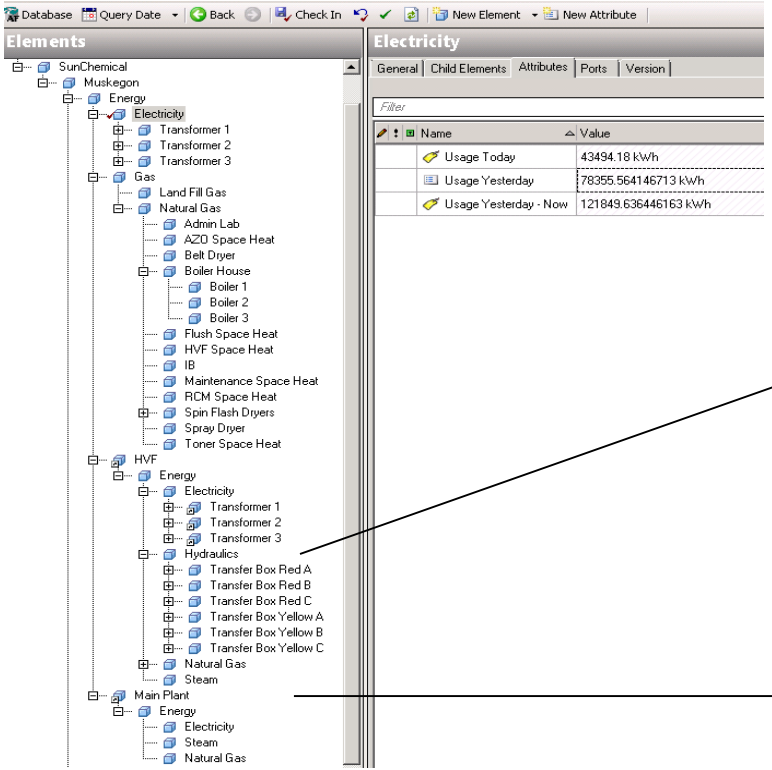
1. Integration of energy data
   - Electricity data from Power Logic System
   - Gas data from flow meters in PI and manual readings
   - Boiler house steam production and flow meters
   - Water data from meters and manual entry
2. Leverage of PI Systems Advanced Functionality
   - PI-Performance Equations and Totalizers
   - PI-AF
   - PI-ACE
   - PI-Batch

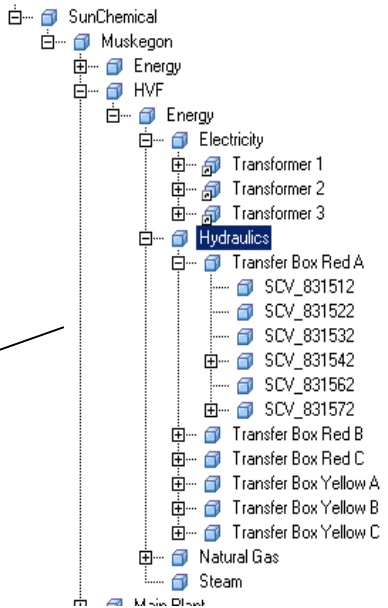


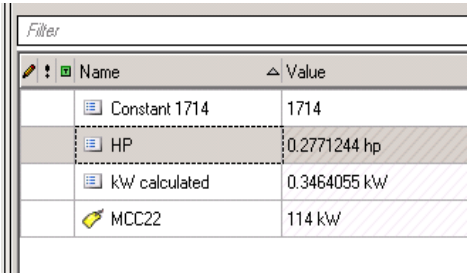
Decomposing the Energy Management “Solution”

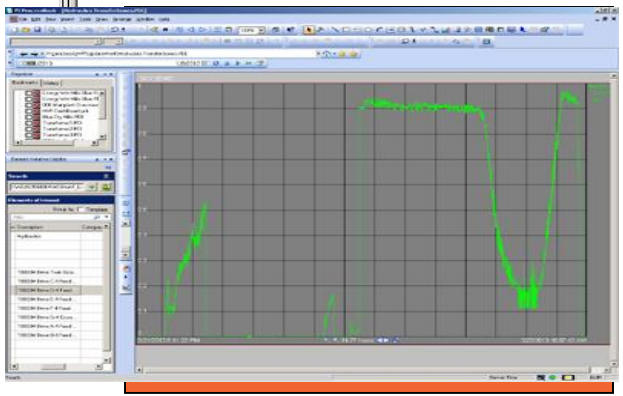


It all Starts with PI-AF….

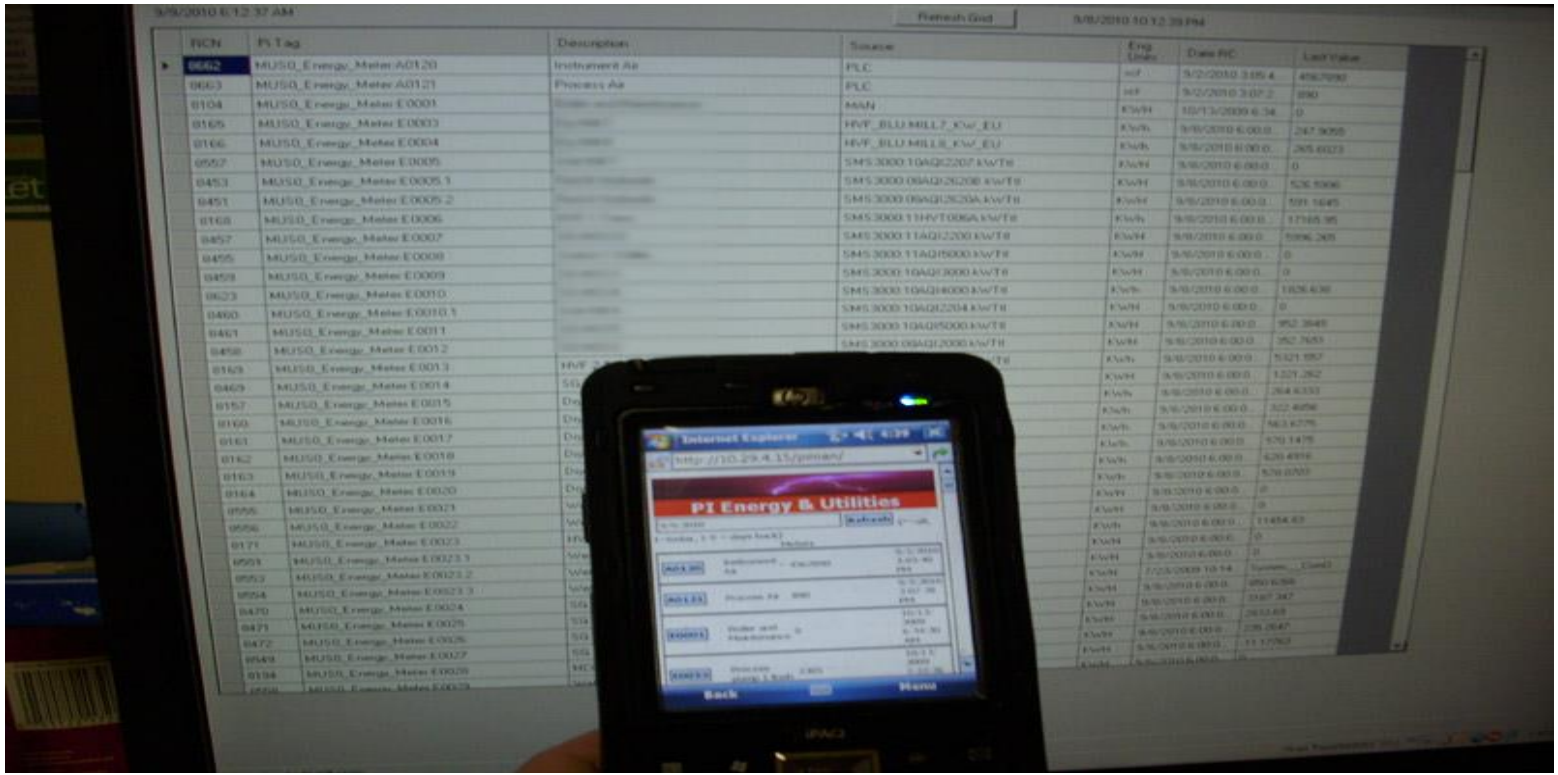






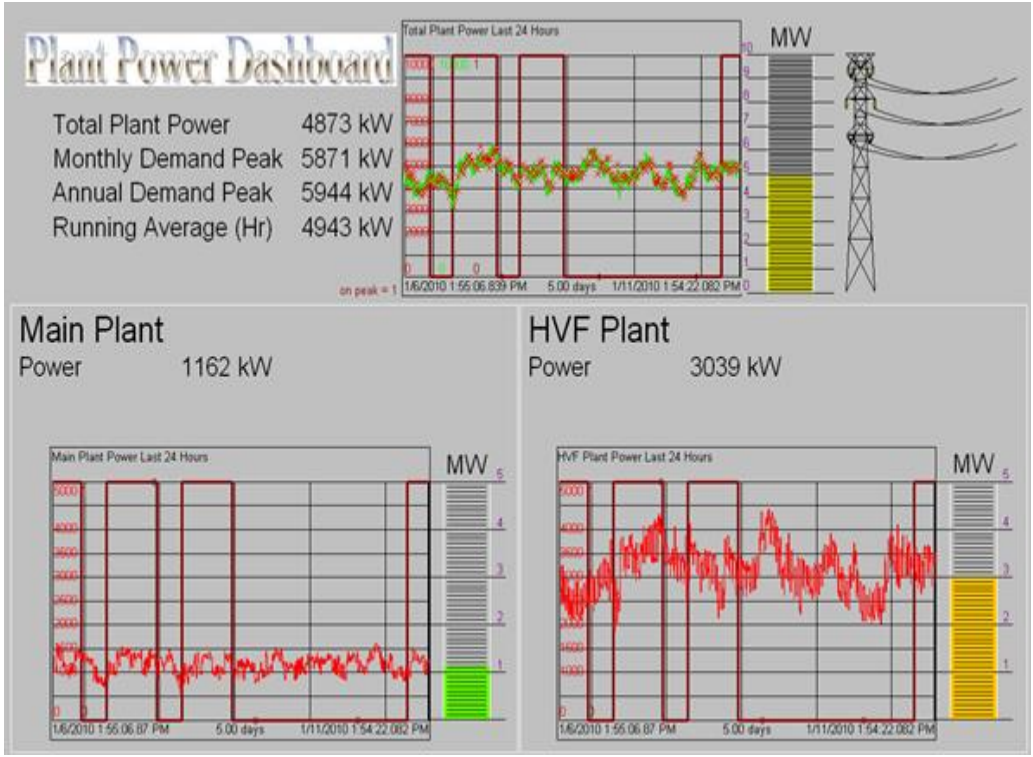


Obtaining Missing Data With PI Manual Logger

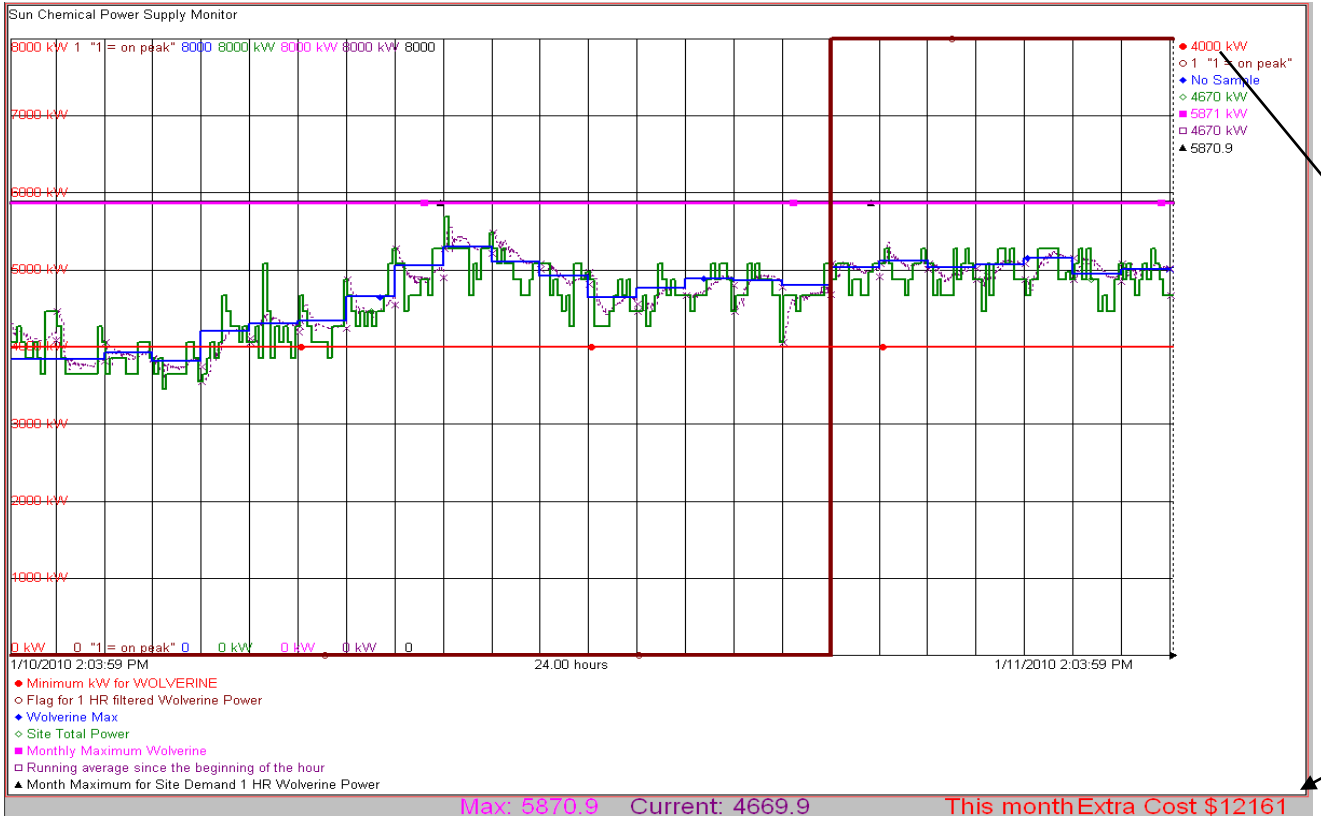


Real-Time Power Dashboard

- 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.



Real- Time Monitoring of Power Supply



5871 kW

-4000 kW

1871 kW

$6.50

$12,161

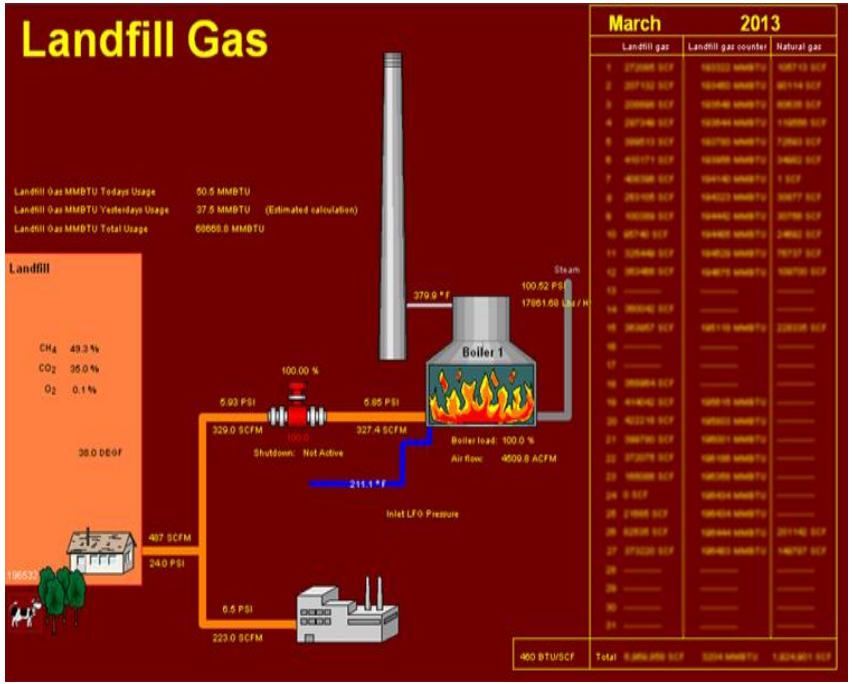
Continuous Improvement in Action

Operators monitor site demand vs. the maximum demand target

5/23/12	[blurred] kW	[blurred] kW	[blurred] kW	[blurred] kW	[blurred] kW	[blurred] kW	[blurred] kW	[blurred] kW	[blurred] kW	[blurred] kW	[blurred] kW	[blurred] kW	Monthly Demand	Site kW	[blurred] Weight	[blurred] Weight	[blurred] Weight	V
5/23/12 6:00	57	1	58	61	59	60	63	64	46	57	68	60	5244	4467	4958	4990	4623	
5/23/12 6:30	56	42	57	61	59	60	43	66	47	58	69	61	5244	4873	5149	4989	4624	
5/23/12 7:00	55	61	58	62	60	60	58	66	33	58	59	62	5244	4873	5669	4989	4624	
5/23/12 7:30	54	60	37	62	50	60	59	39	40	46	51	62	5244	5279	6063	5462	4623	
5/23/12 8:00	44	60	35	49	20	54	60	61	43	38	65	20	5244	4873	6691	6097	4624	
5/23/12 8:30	59	61	58	17	50	18	61	63	44	59	66	60	5244	5076	6986	6692	4624	
5/23/12 9:00	58	61	57	59	61	63	62	64	44	58	66	60	5244	5076	6872	6752	4624	
5/23/12 9:30	56	36	56	63	61	61	39	65	45	58	67	60	5244	5279	4340	7208	4624	
5/23/12 10:00	56	59	57	62	61	60	42	65	34	59	62	61	5244	5076	2537	6834	4623	
5/23/12 10:30	56	60	57	63	62	61	61	6	0	57	18	62	5244	4873	2972	4258	4624	
5/23/12 11:00	15	60	42	63	55	62	62	16	0	13	0	31	5244	5279	3366	3135	4624	
5/23/12 11:30	0	61	25	63	1	20	63	7	0	0	0	38	5244	4467	3872	4038	4624	
5/23/12 12:00	0	61	0	10	0	0	64	64	0	0	0	61	5244	4264	3919	4472	4624	
5/23/12 12:30	0	18	0	0	0	0	63	5	0	0	0	5	5244	4264	3971	4806	4624	
5/23/12 13:00	0	0	0	0	0	0	4	0	0	0	0	0	5244	4264	4253	4831	4624	
5/23/12 13:30	0	0	0	0	0	0	0	0	0	0	0	0	5244	3858	4251	4829	4624	
5/23/12 14:00	0	0	0	0	0	0	0	0	0	0	0	0	5244	4061	4251	4828	4625	
5/23/12 14:30	0	0	0	0	0	0	0	0	0	0	0	0	5244	4061	4250	4825	4624	
5/23/12 15:00	0	0	0	0	0	0	0	0	0	0	0	0	5244	3858	4246	4826	4623	
5/23/12 15:30	0	0	0	0	0	0	0	0	0	0	0	0	5244	3249	4246	4825	4623	
5/23/12 16:00	0	0	0	0	0	0	0	0	0	0	0	0	5244	3452	4246	4823	4623	
5/23/12 16:30	0	0	0	0	0	0	0	0	0	0	0	0	5244	3046	4246	4821	4622	
5/23/12 17:00	0	0	0	0	0	0	0	0	0	0	0	0	5244	3452	4247	4820	4622	
5/23/12 17:30	0	0	0	0	0	0	0	0	0	0	0	0	5244	3046	4247	4821	4622	
5/23/12 18:00	0	0	0	0	0	0	0	0	0	0	0	0	5244	3452	4246	4821	4623	
5/23/12 18:30	0	0	0	0	0	0	0	0	0	0	0	0	5244	3046	4247	4821	4624	
5/23/12 19:00	37	2	17	0	15	0	42	18	16	0	15	16	5244	3655	4248	4823	4625	
5/23/12 19:30	61	29	62	3	49	6	64	67	45	27	57	64	5244	3858	4245	4825	4625	
5/23/12 20:00	60	63	58	47	63	62	64	67	46	62	69	63	5244	4264	4245	4825	4625	
5/23/12 20:30	59	62	58	65	63	62	64	67	47	59	69	64	5244	4467	4243	4821	4625	
5/23/12 21:00	59	62	58	63	63	61	65	67	46	59	69	62	5244	4264	4245	4869	4625	
5/23/12 21:30	54	63	59	64	63	61	65	45	47	59	70	45	5244	4467	4269	5430	4625	
5/23/12 22:00	41	63	48	64	40	62	43	63	19	60	46	63	5244	4467	4757	5492	4624	
5/23/12 22:30	51	33	0	64	25	32	62	64	18	38	9	62	5244	4670	5348	5961	4625	
5/23/12 23:00	59	57	0	44	42	9	62	65	25	60	37	62	5244	4873	5565	6731	4625	
5/23/12 23:30	58	60	0	67	60	59	62	66	43	59	68	63	5244	4873	2765	6822	4625	
5/24/12 0:00	57	60	40	62	60	61	63	66	44	58	67	50	5244	5279	1940	5510	4626	
5/24/12 0:30	57	61	58	63	60	60	62	8	44	59	67	0	5244	5482	2041	2802	4628	
5/24/12 1:00	56	61	57	63	61	60	42	17	45	60	68	26	5244	5482	2400	2082	4627	
5/24/12 1:30	42	51	57	63	61	61	59	52	46	41	69	61	5244	5482	2702	2800	4625	

Natural Gas and Landfill Gas - Example of the Power of Data

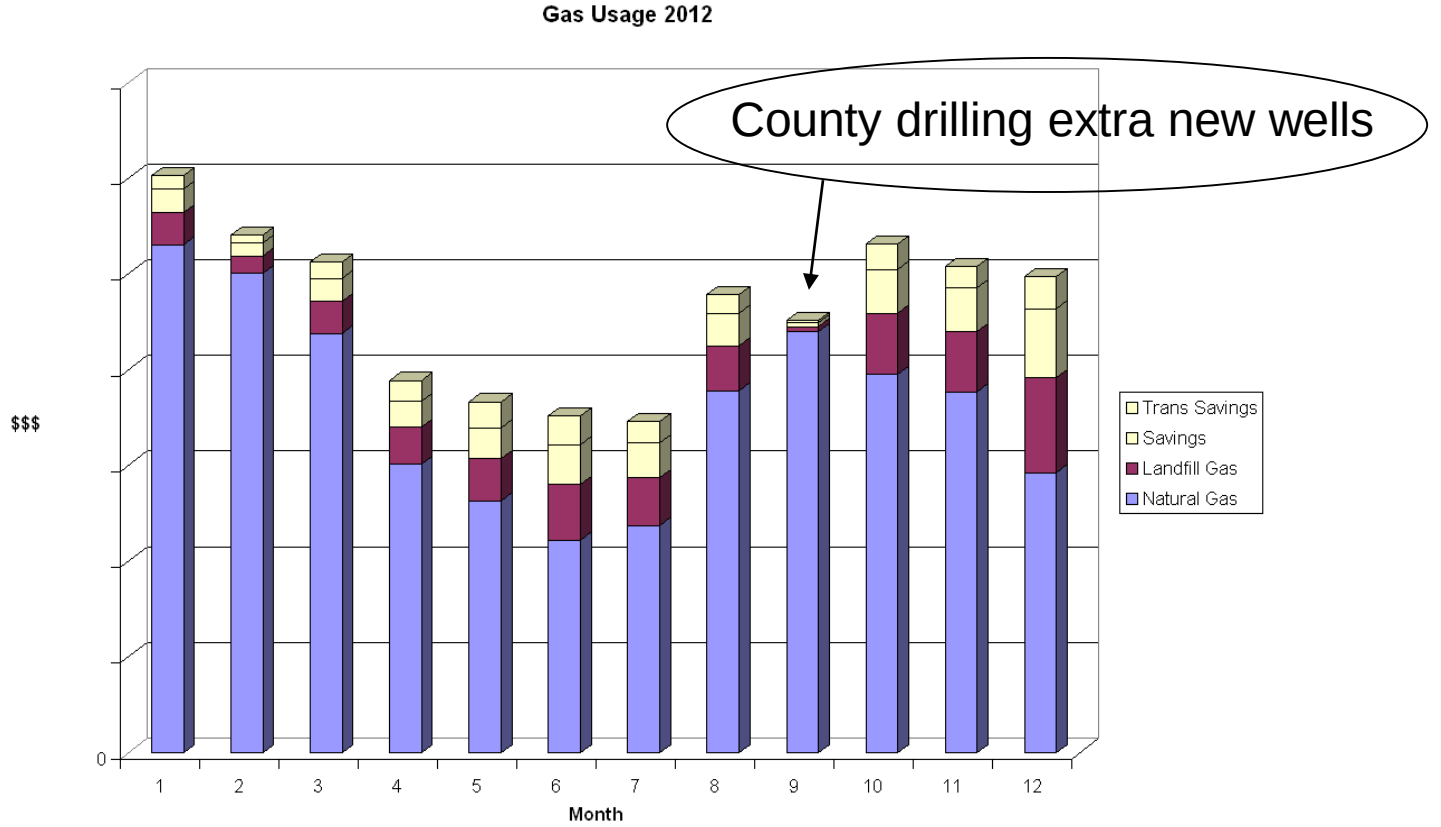
- The PI System was used to calculate how much gas we used and how much we could replace with landfill gas.
  - Landfill gas that was not used by others would be available to Sun Chemical.
  - Savings in cheaper gas and no transportation costs.
  - 1 boiler was converted to consume landfill gas.



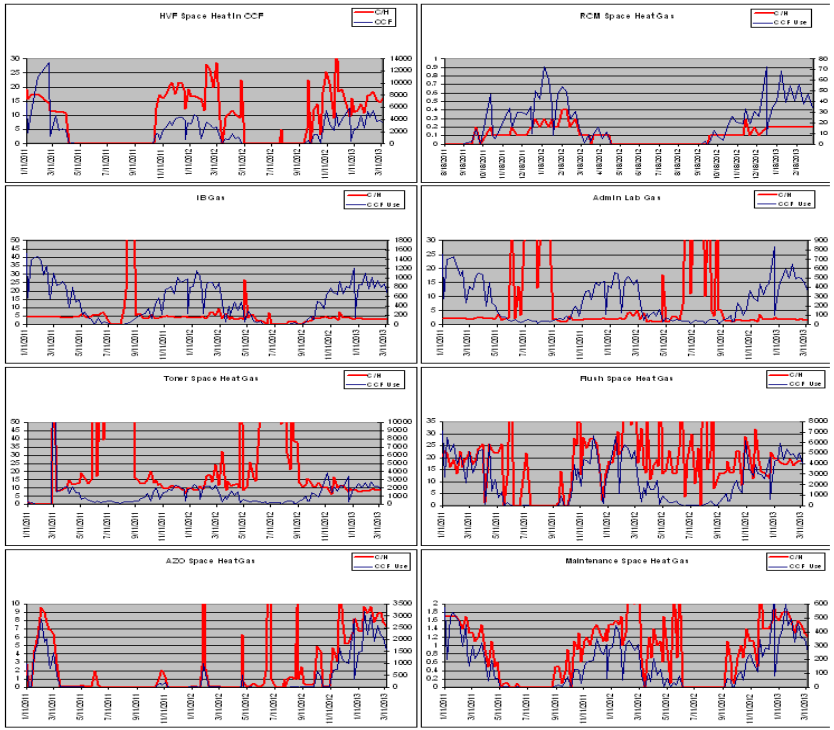
Optimizing Boiler House Operations

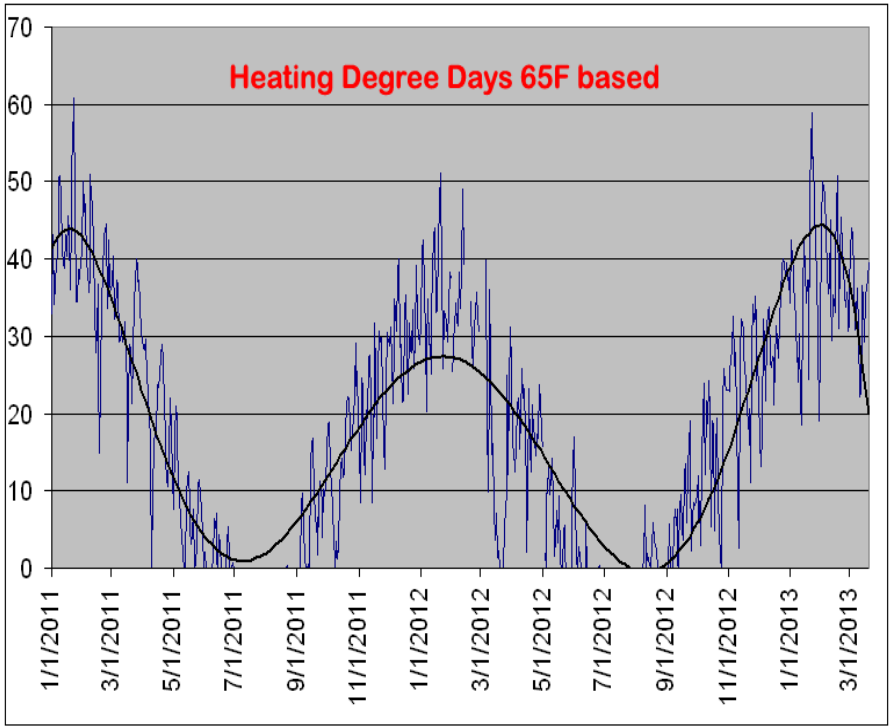
- Major steam leaks were identified and repaired.
- Boiler 2 was shutdown.
- Reduced pressure on boiler 3 to minimize natural gas usage.
- Increased the allowable steam header pressure on boiler 1 to maximize landfill gas.
- Requested a 2 psi pressure increase from the county.
- Increased allowable load 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



Heating Natural Gas - CCF per HDD

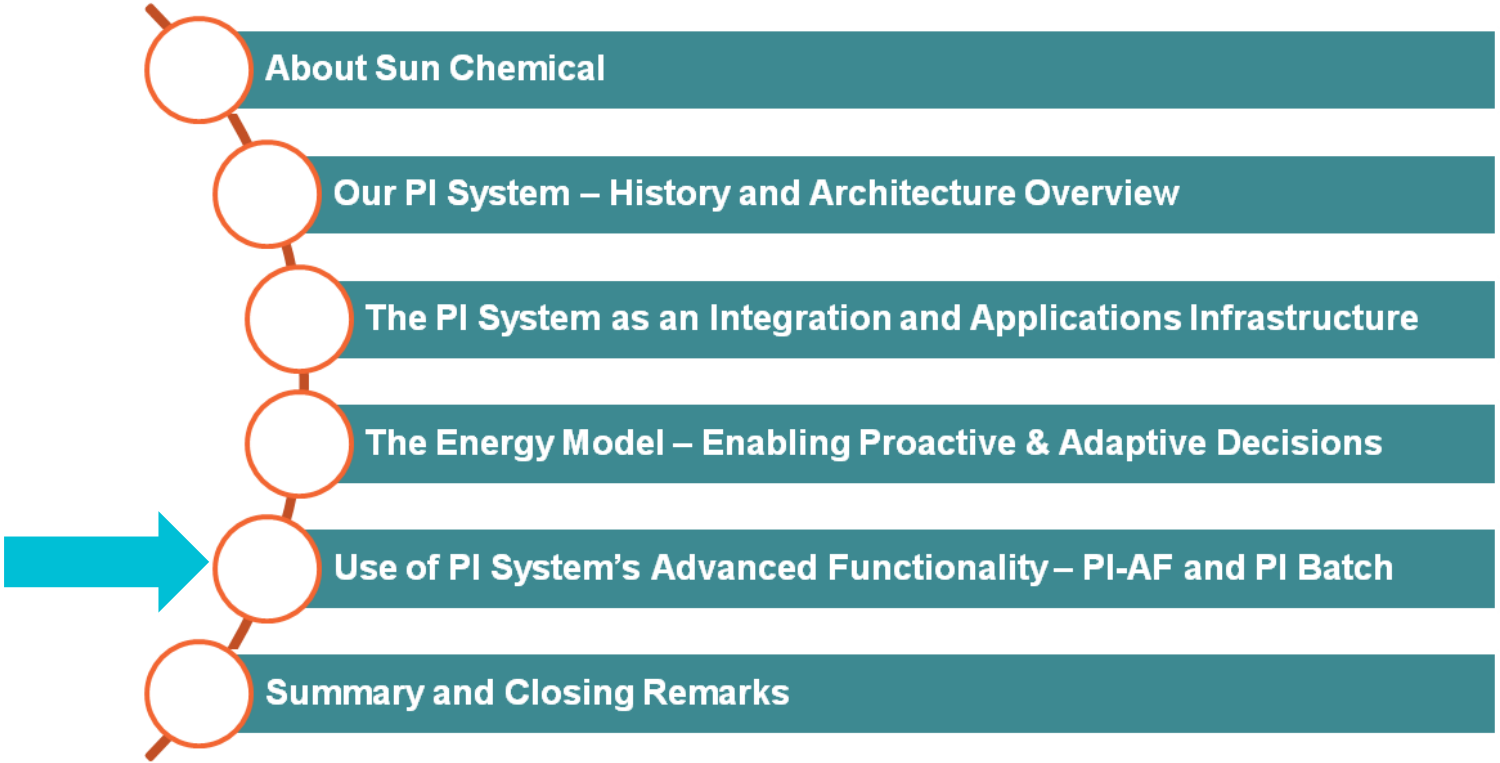




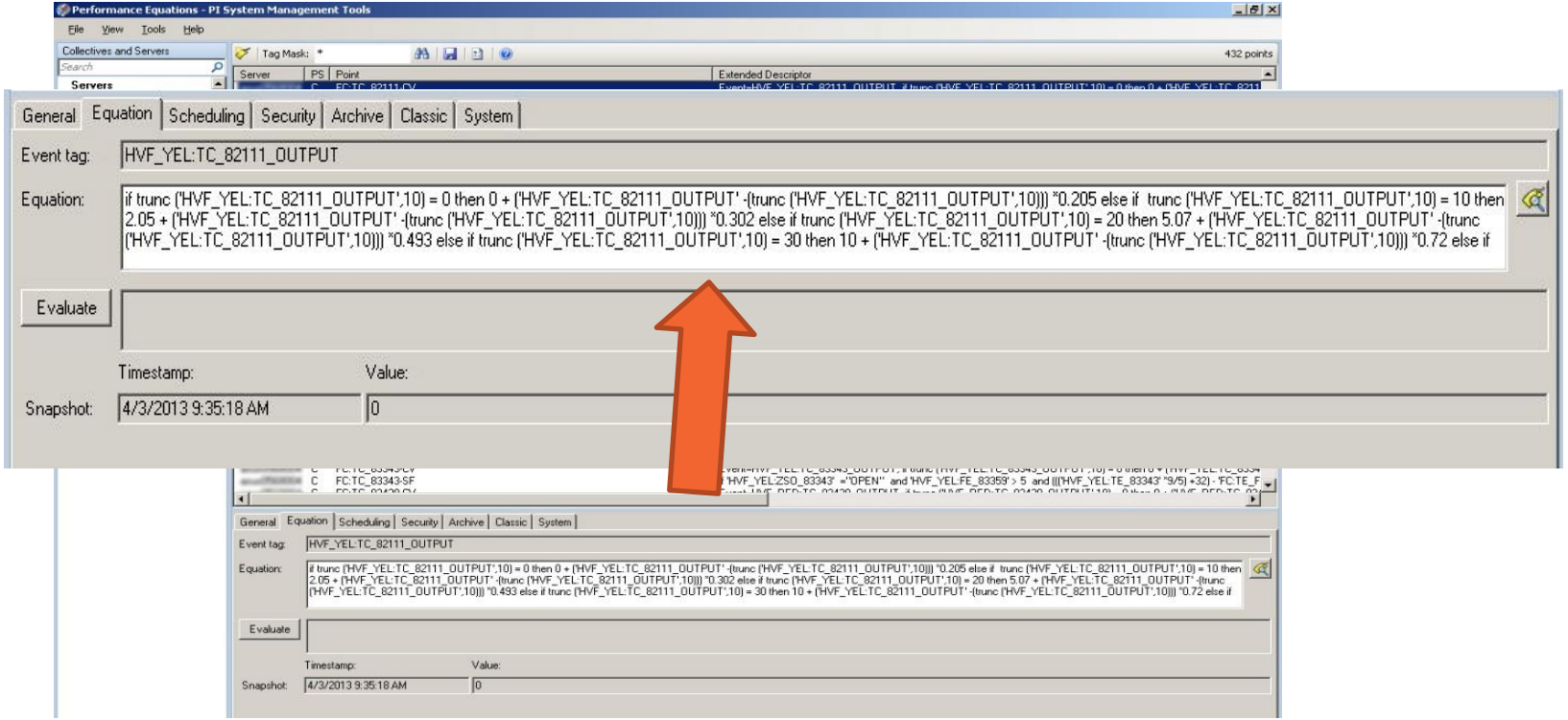
Warehouse Heating Improvement

- 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)

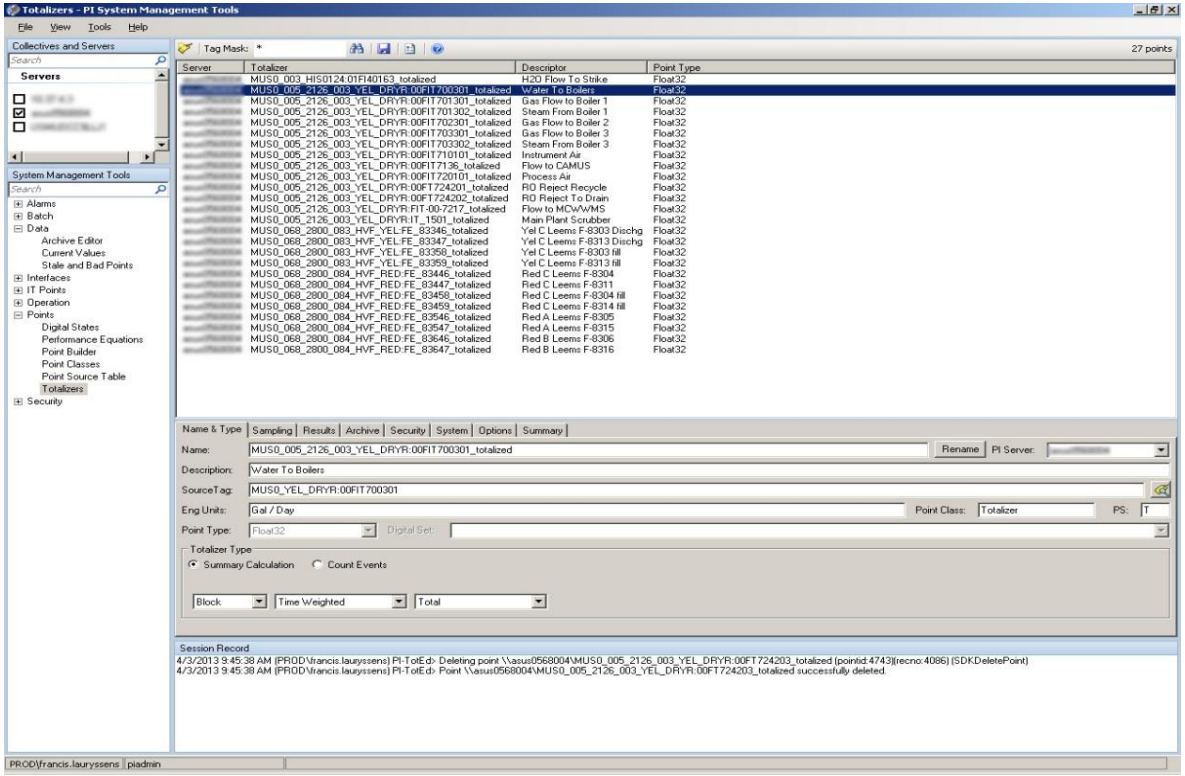
Agenda



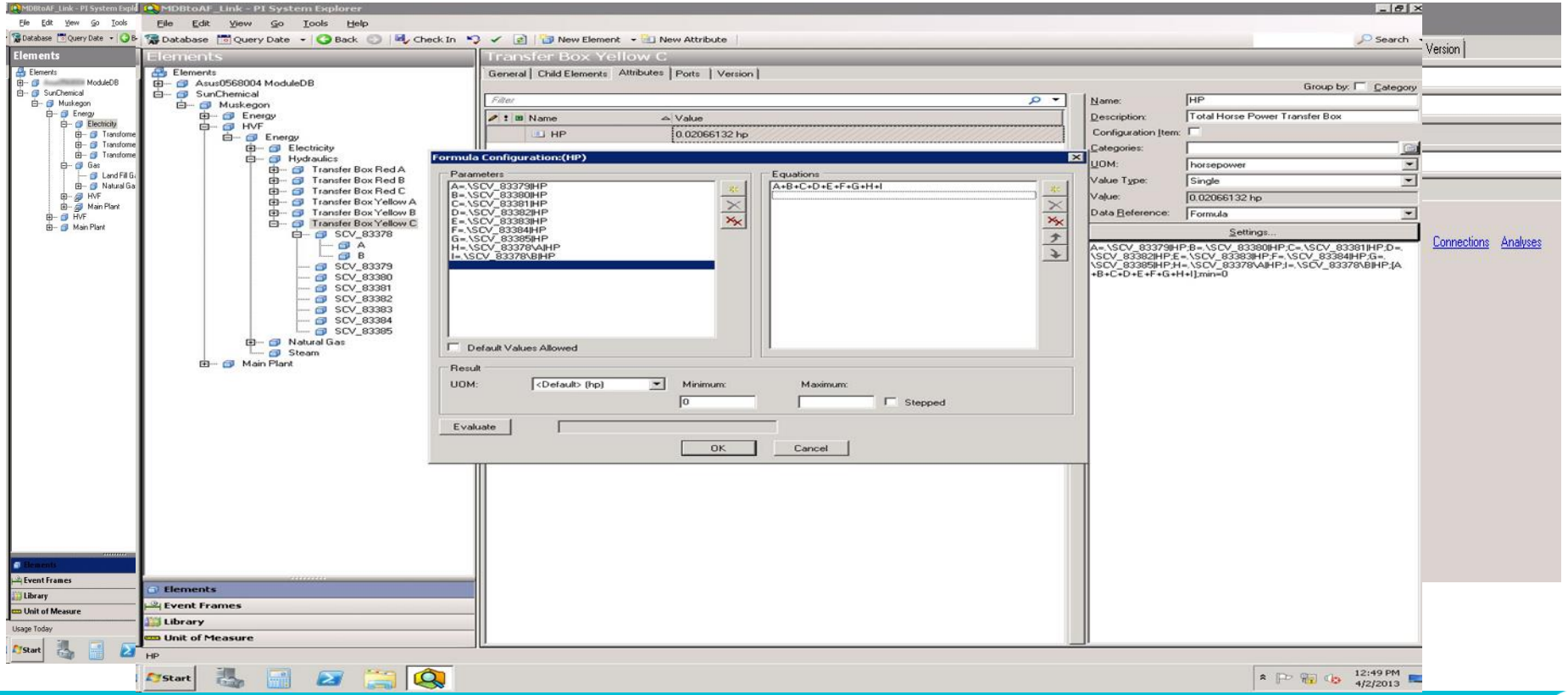
PI Performance Equation Example



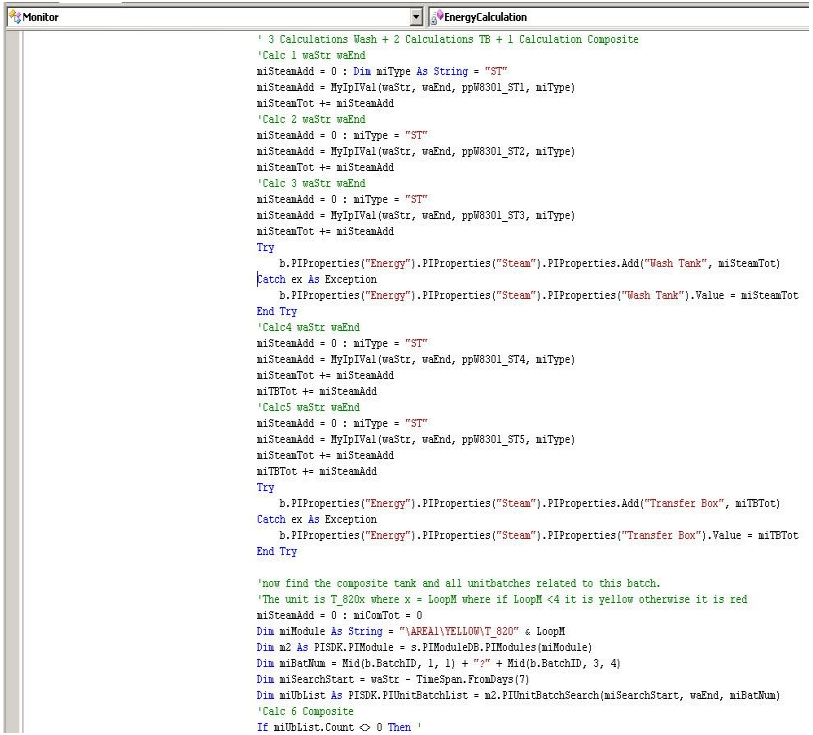
PI Totalizers Are Used Extensively



PI-AF is the Foundation

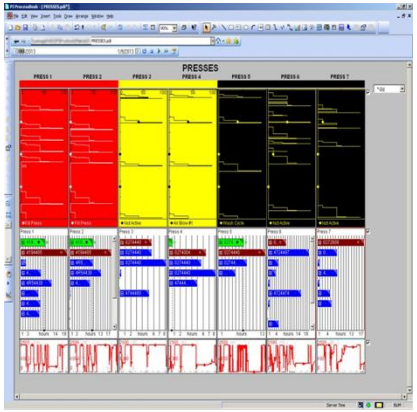


PI-ACE Further Extends the PI System's Analytical Capabilities



Use of PI-Batch and PI Process Templates

Business Driver-Improve the First Pass Yield.

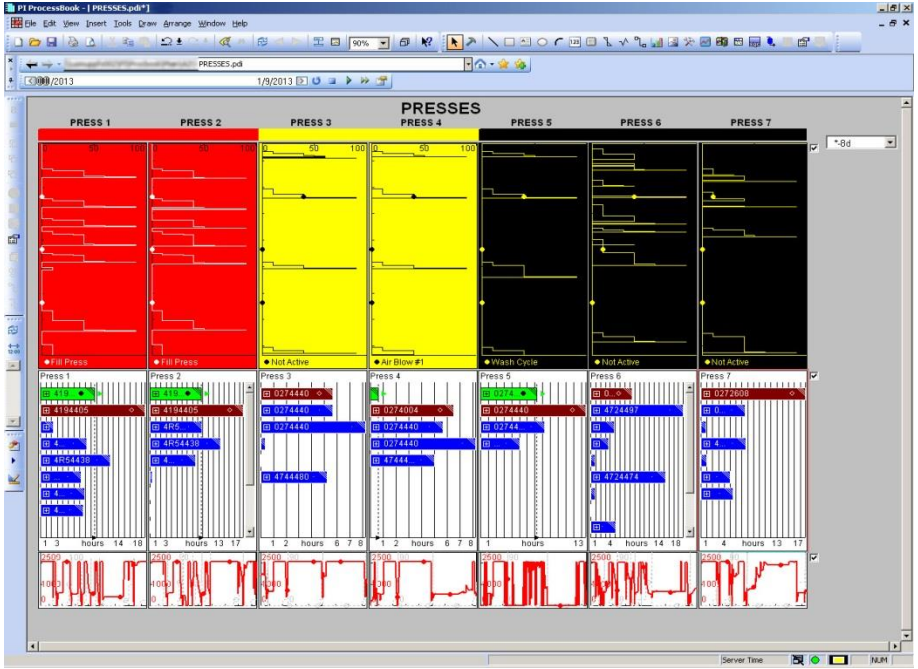


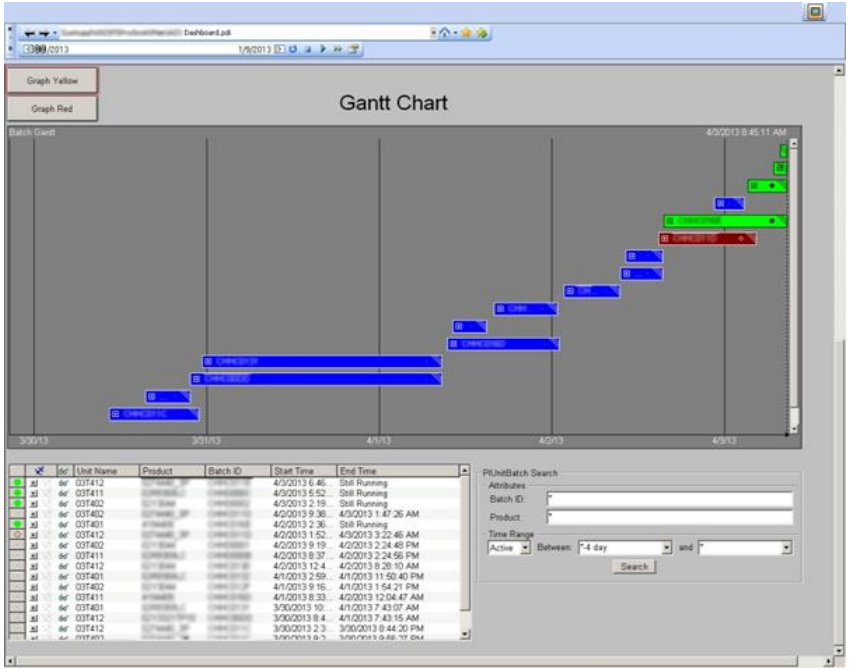
- Exele PI Process Templates Project
- Building on our event history (PI Batch)
- Builds a “visual roadmap” of a process by displaying upper and lower control limits from historical data.
- Shows where the process is versus where the process is supposed to be.
- Critical to Quality parameters such as pH, temperature, transfer rates, etc…

Benefits of PI Process Templates

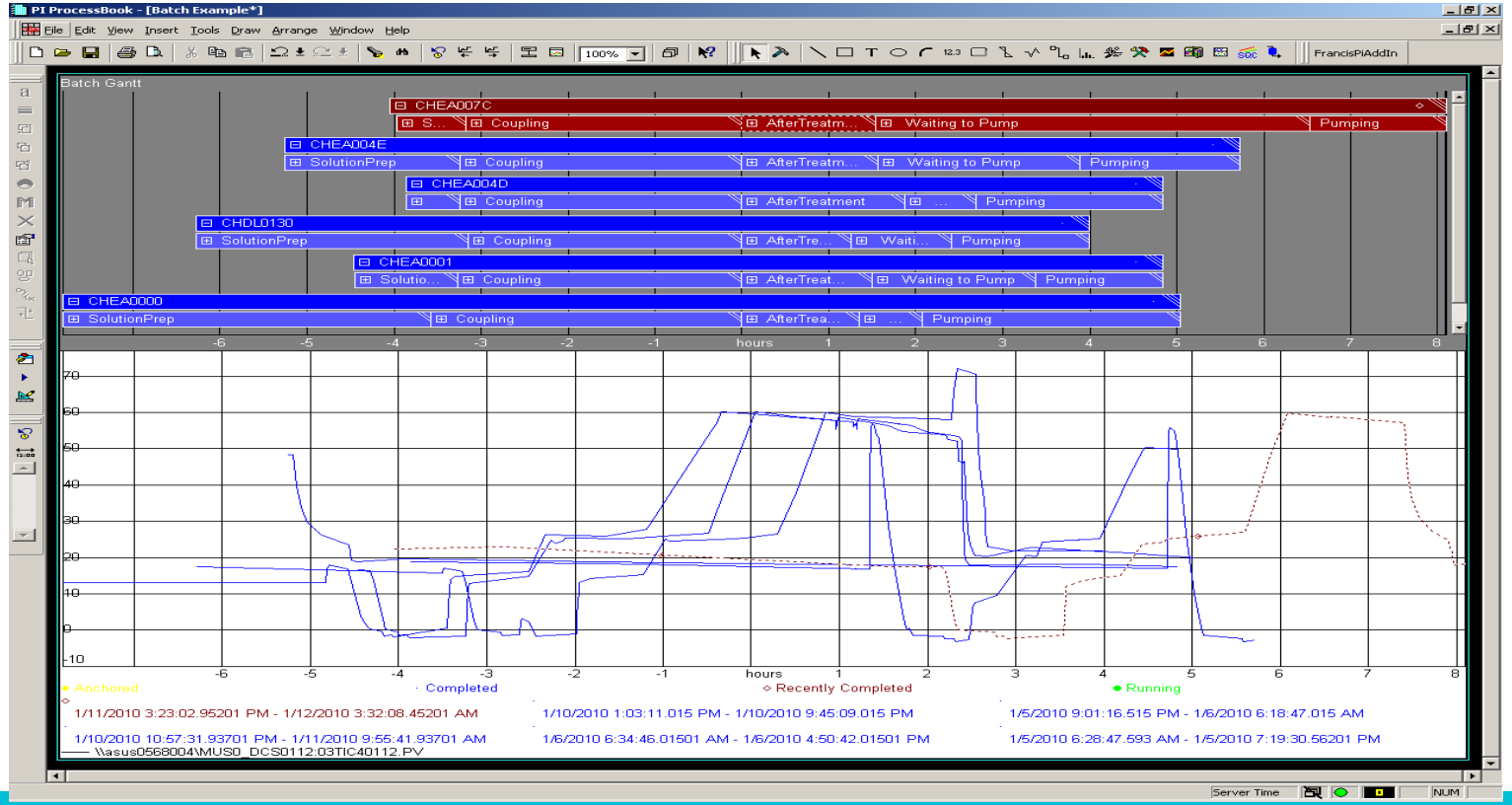
- 6 to 9 Critical-To-Quality parameters for each of over 75 codes made in the department were “templated”.
- A visual roadmap of the expected process makes analysis timely and easy.
- Batches are reviewed with operators upon completion. This interaction is critical to learning everyday what does and 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

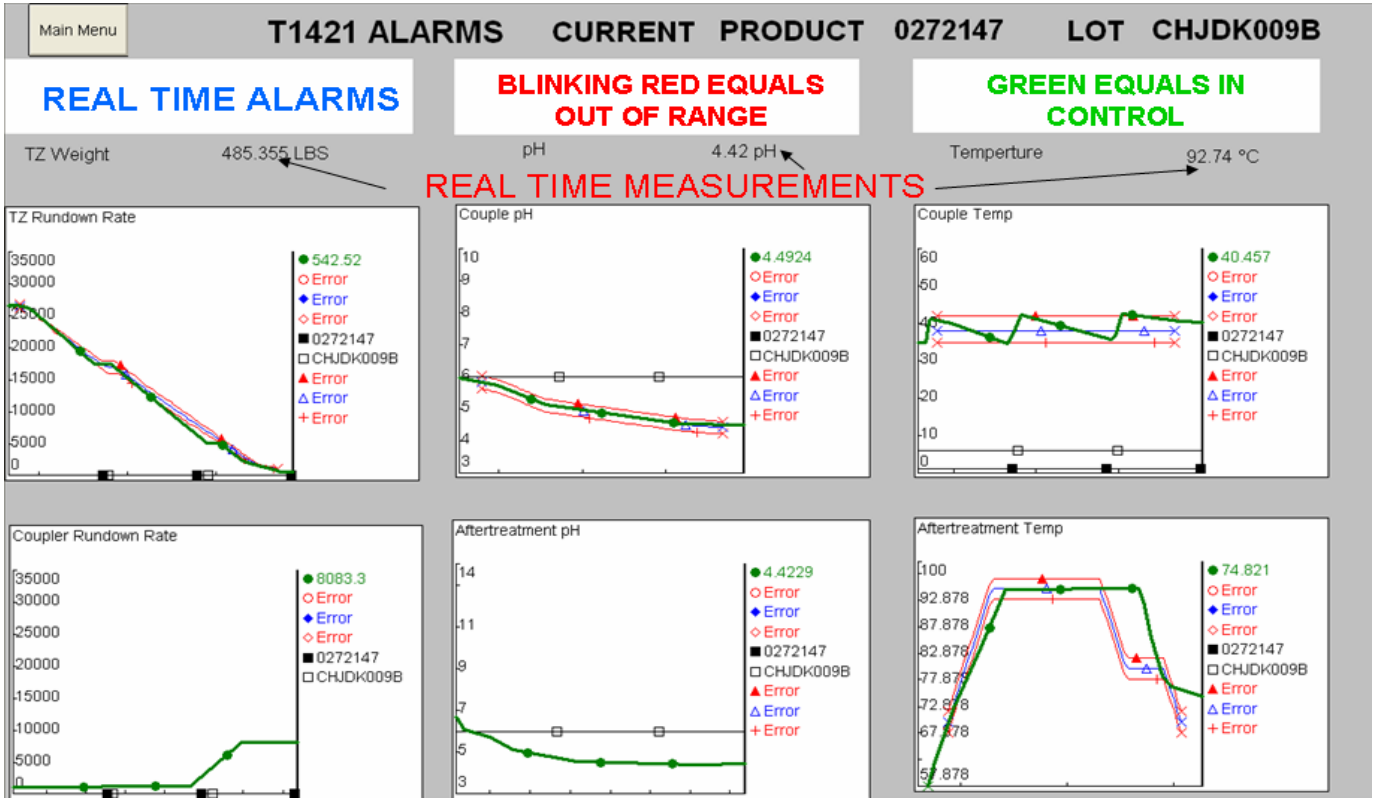




Example Screen Shots for PI Batch



Real-Time Templates in ProcessBook



Agenda

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

Year	Goal	%
2008		96.27
2009	97.02	97.25
2010		98.28
2011		97.76
2012		97.09
2013		97.76

- 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

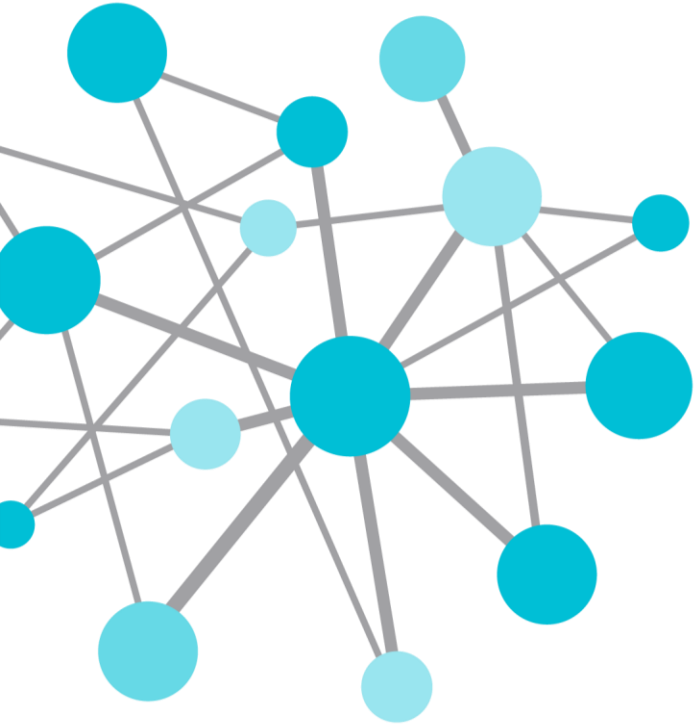
- The PI System has evolved significantly and now is capable of doing over 90% of traditional “solutions”…”From Historian to a *Infrastructure*”
- Continuous improvement is about a 1000 projects to drive cultural change from leveraging real time information and collaboration – “The Power of *Real-Time* 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

Francis.Lauryssens@sunchemical.com

PI Systems Specialist

SunChemical



THANK YOU