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Plant Performance and Condition Based Maintenance Using OSIsoft Foundation

By: Process Innovations, Inc. and Process Plugins Inc.
Joe Devine – President
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Introduction to ProcessPlugins

ProcessPlugins:

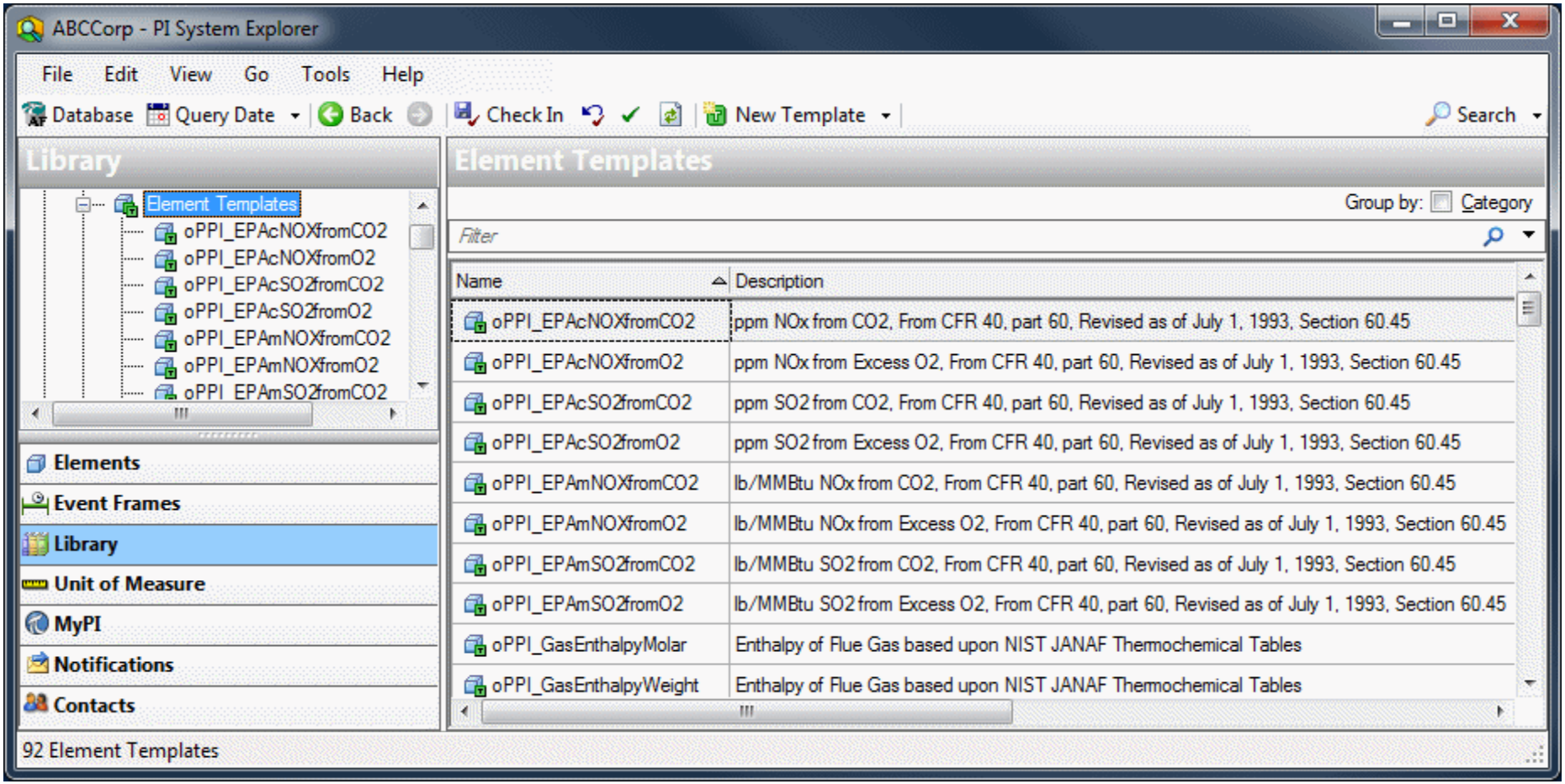
- Engineers with extensive plant performance and condition monitoring experience.
- Experts in OSIsoft technology and the relationship to business systems.
- A result of having built hundreds of custom applications for the OSIsoft PI System
- A flexible set of configurations that empower you to monitor a single asset or an entire fleet.

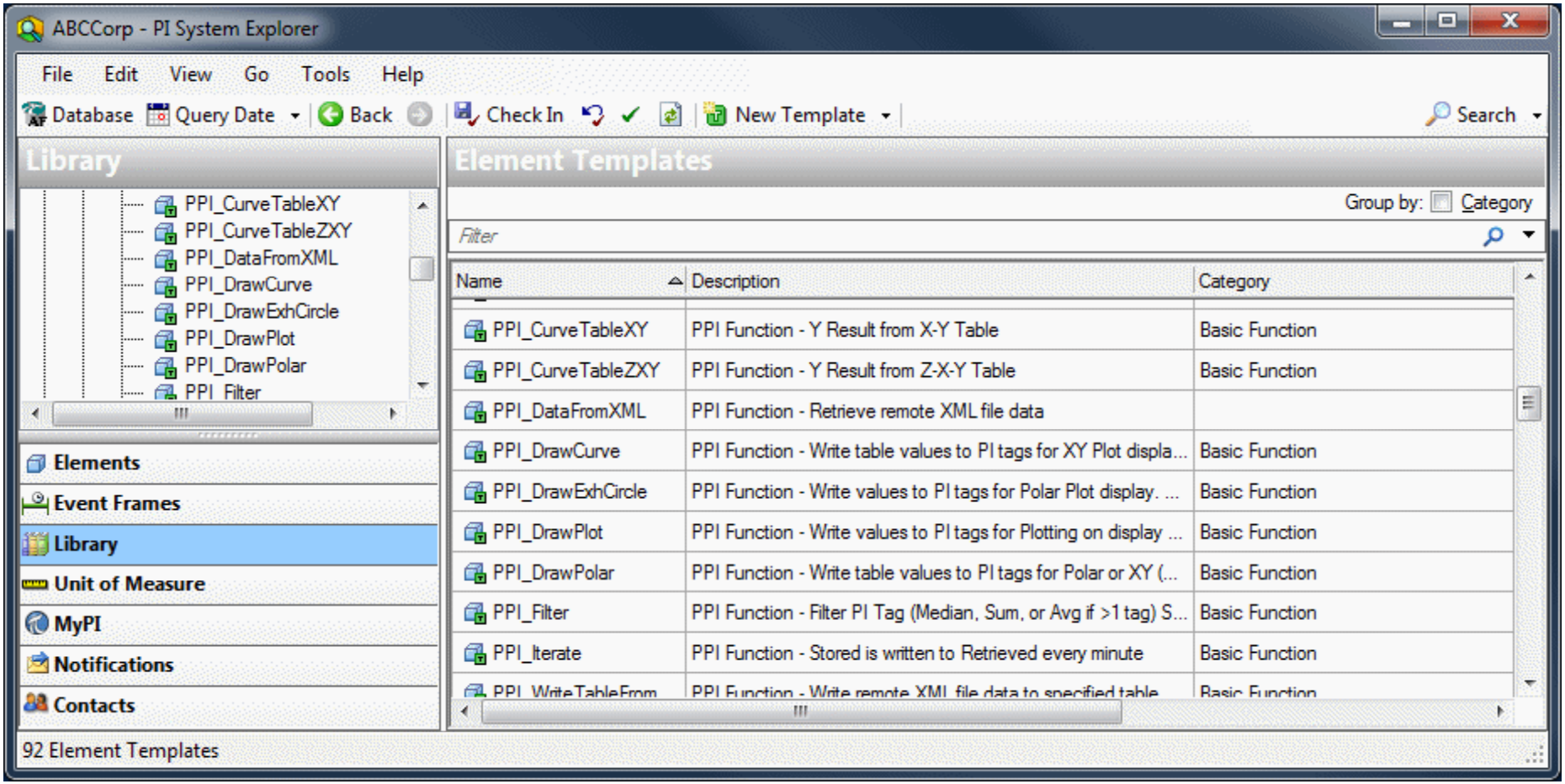
ProcessPlugins Key Drivers

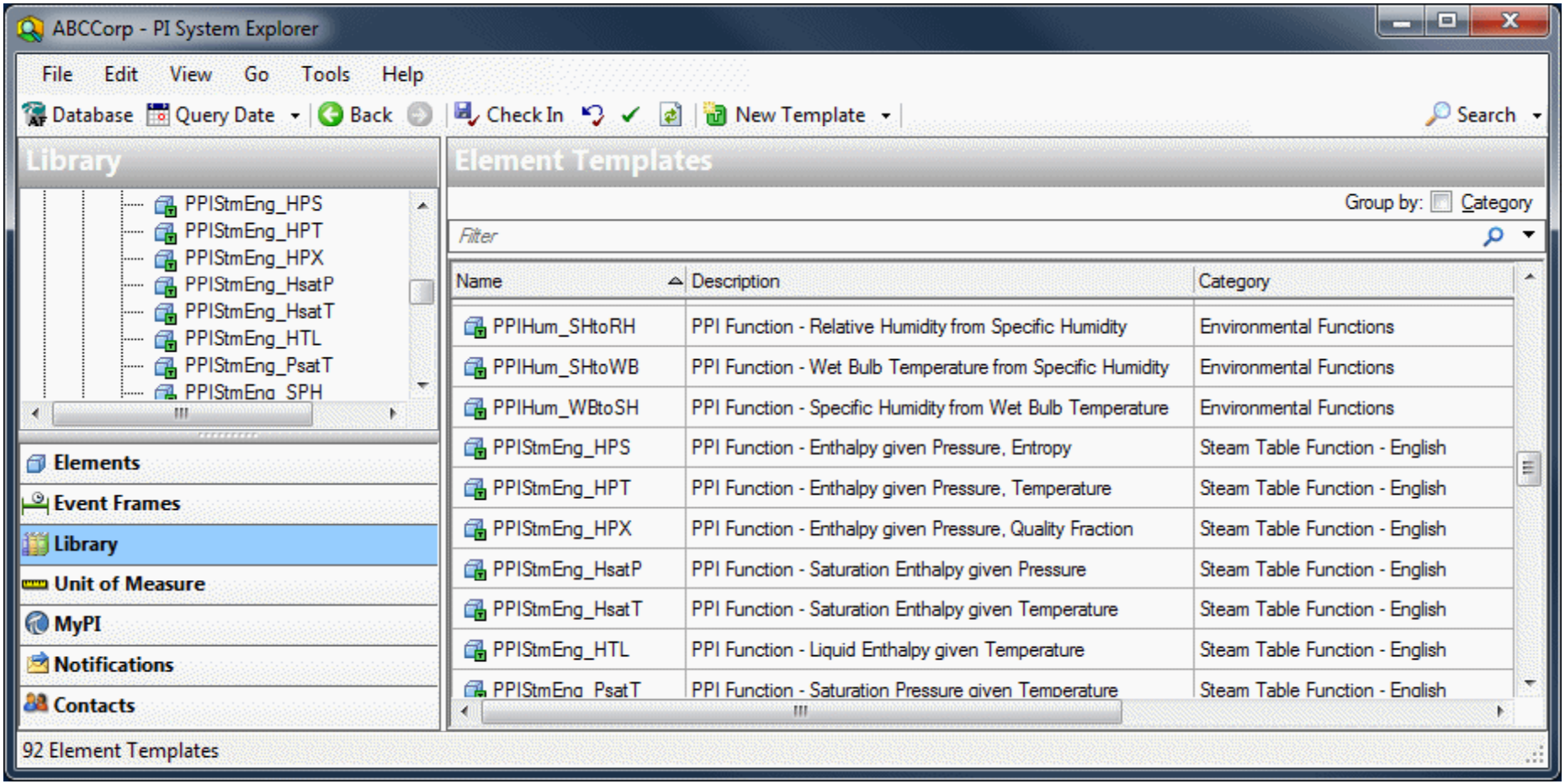
- The system resides entirely within the OSIsoft platform.
- Calculations reside in the open PI AF environment for total visibility (No black box).
- PI AF provides robust, scalable, repeatable and flexible calculations.
- The system is a self-documenting living resource for all of your performance engineering methodologies.
- Process Plugins utilizes OSIsoft visualizations including PI WebParts, and makes full use of PI Notifications.
- Process Plugins stays up to date on OSIsoft releases to match every step.

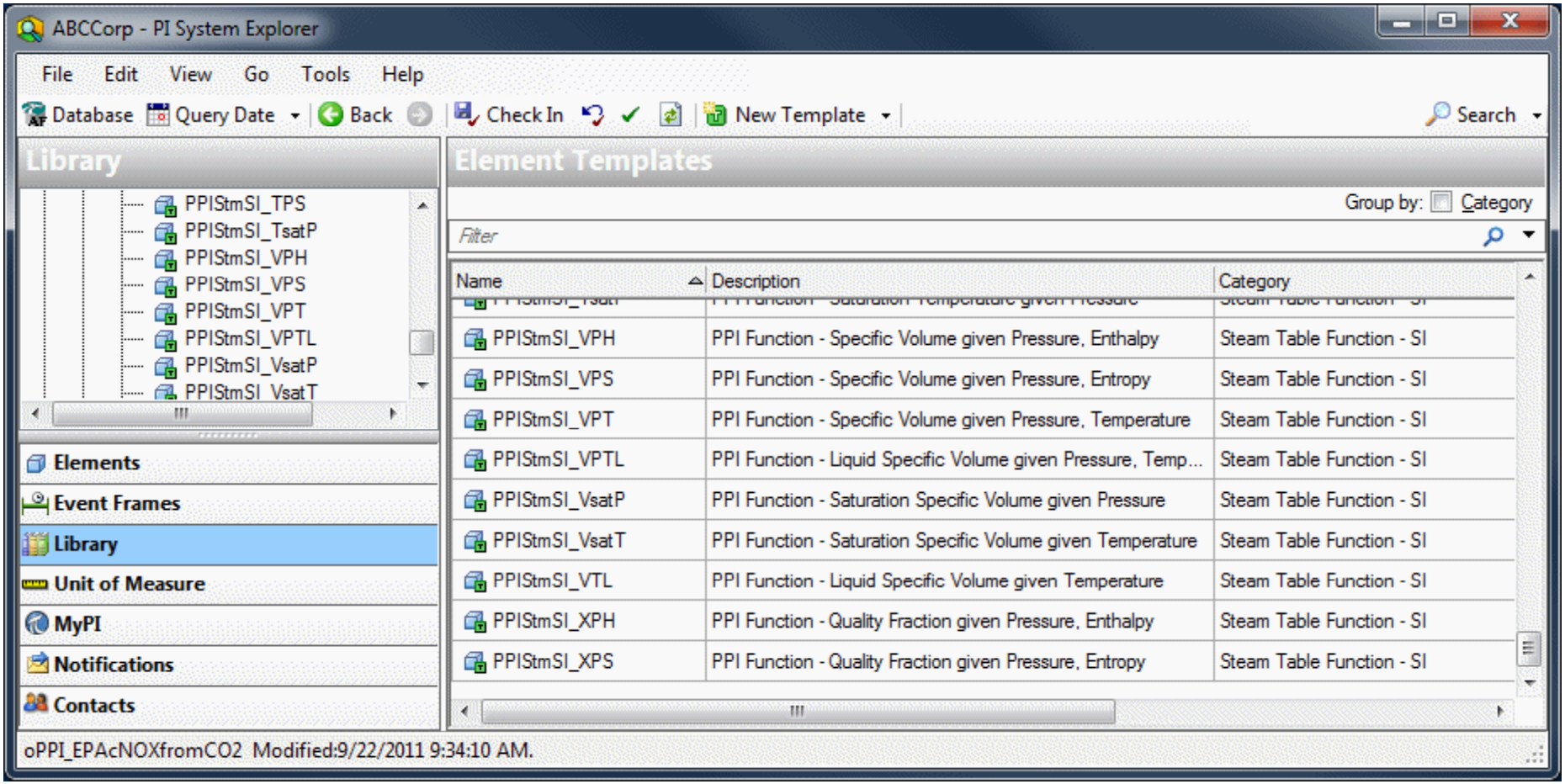
How ProcessPlugins Work

- A library of PI AF templates driven by a Windows service that utilize and enhance the capability of PI AF.
- Custom performance and condition monitoring calculations and methodologies configurations.
- Additional industry specific Units of Measure.
- Custom visualization templates for PI ProcessBook, PI WebParts, and PI DataLink.





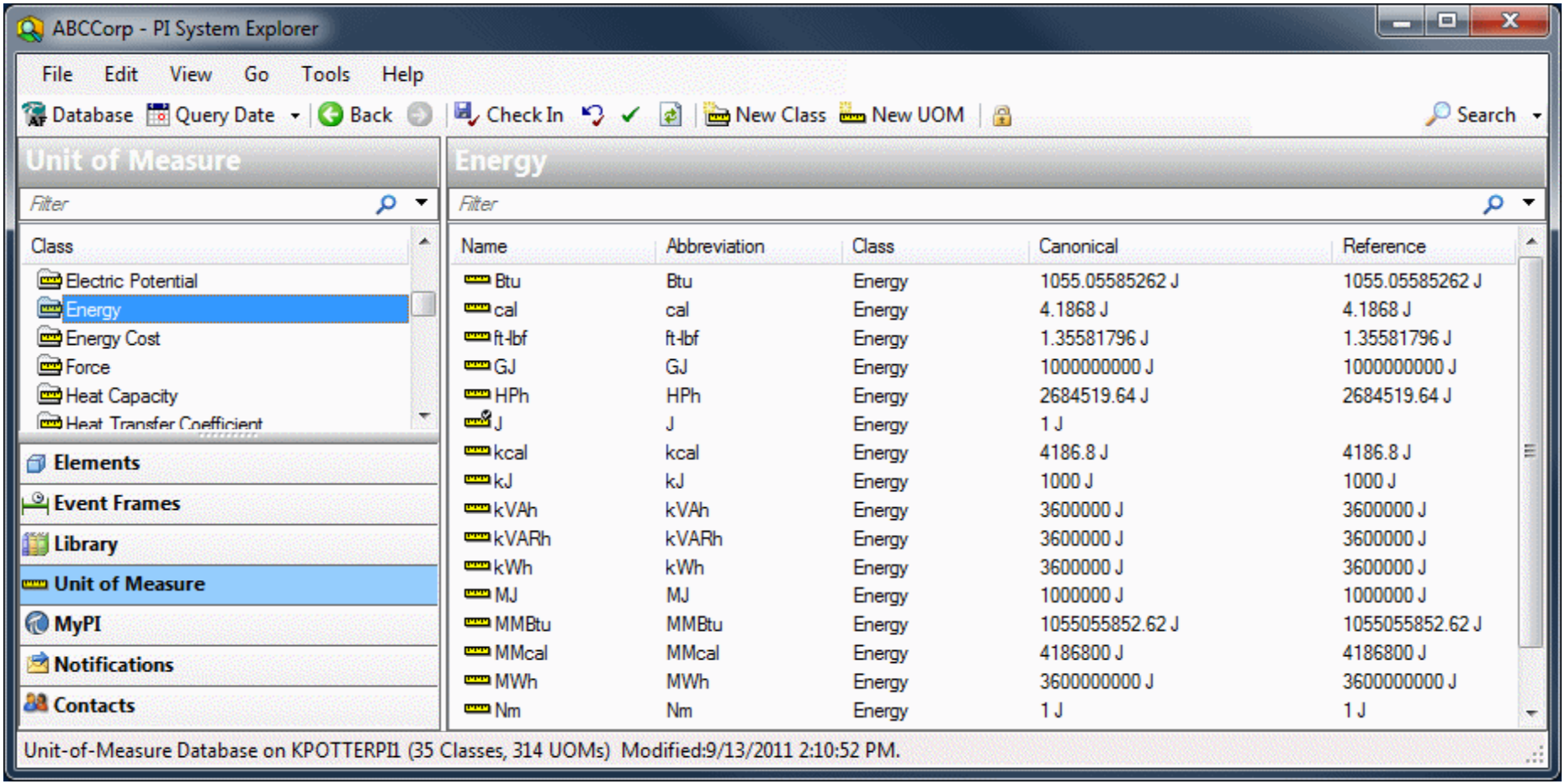


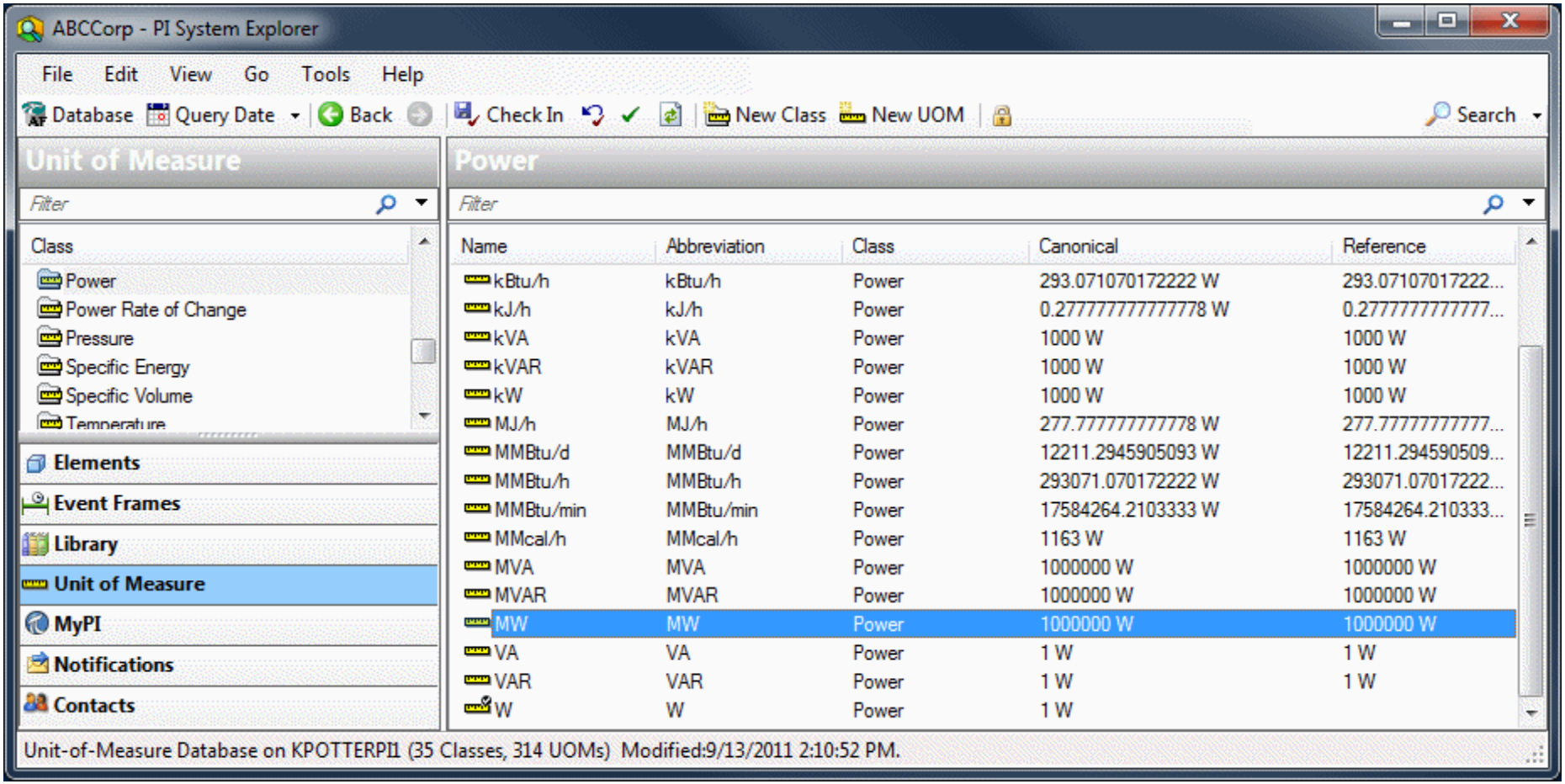


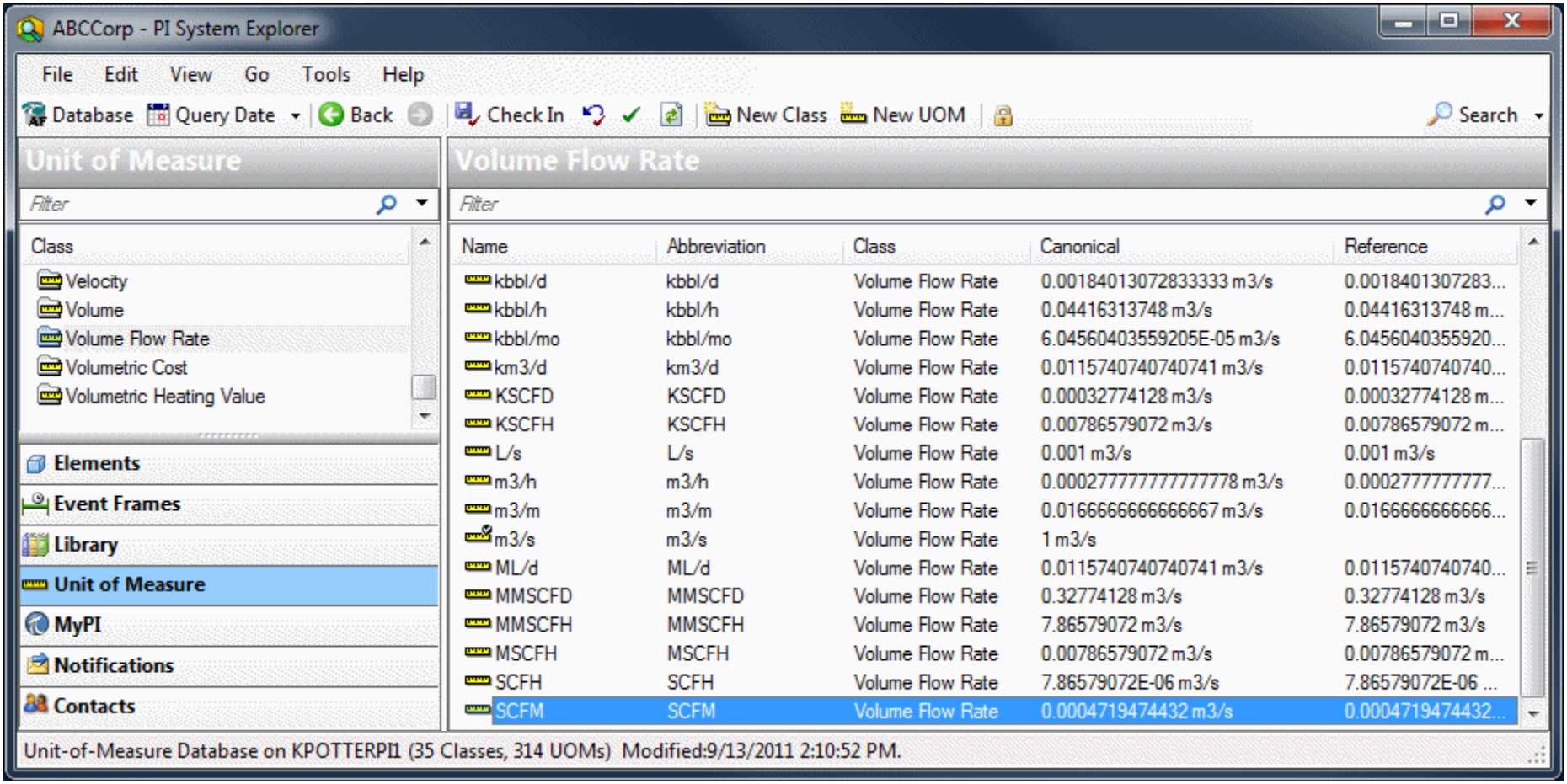
Units of Measure (UOM)

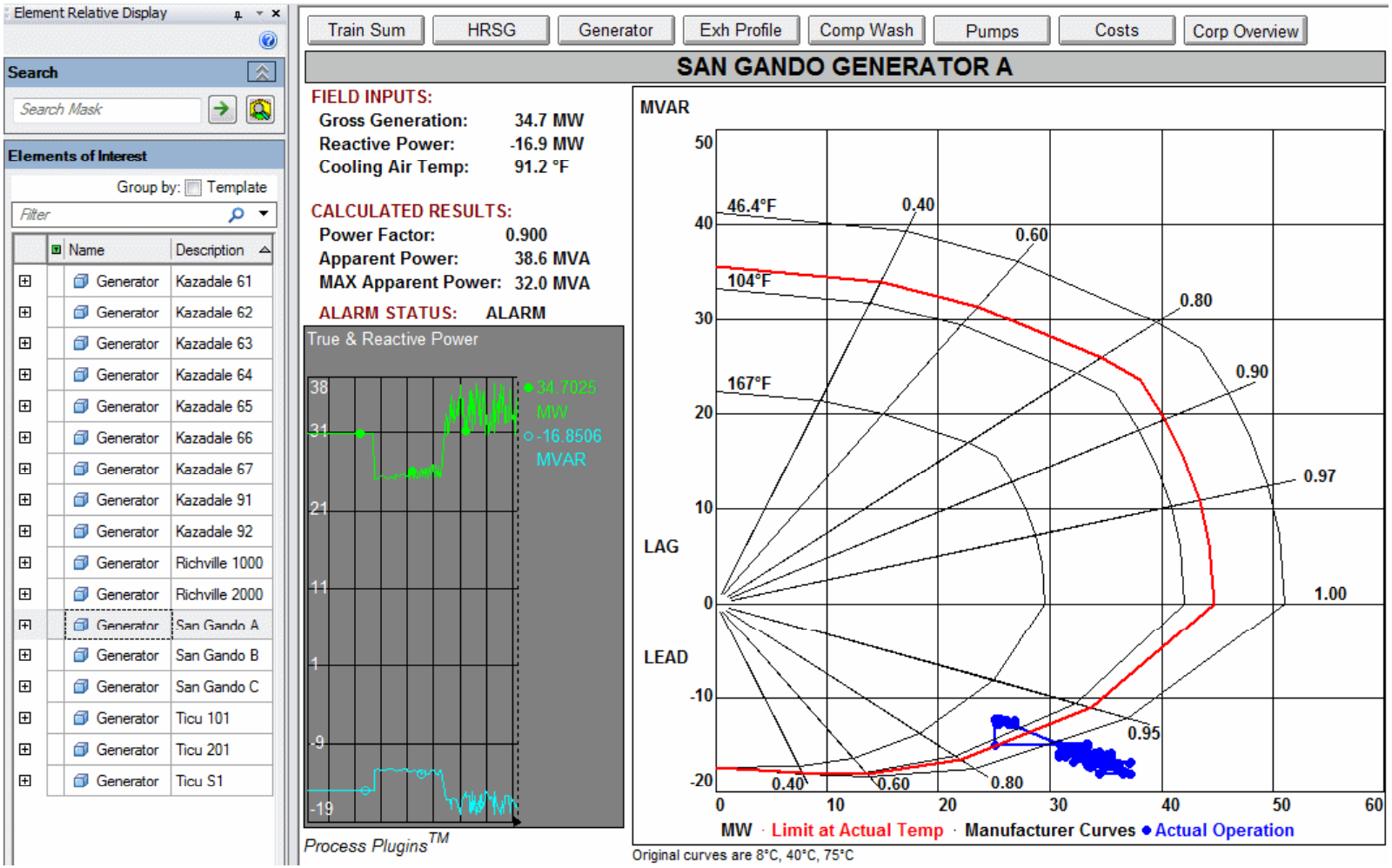
ProcessPlugins UOMs are Plant Ready

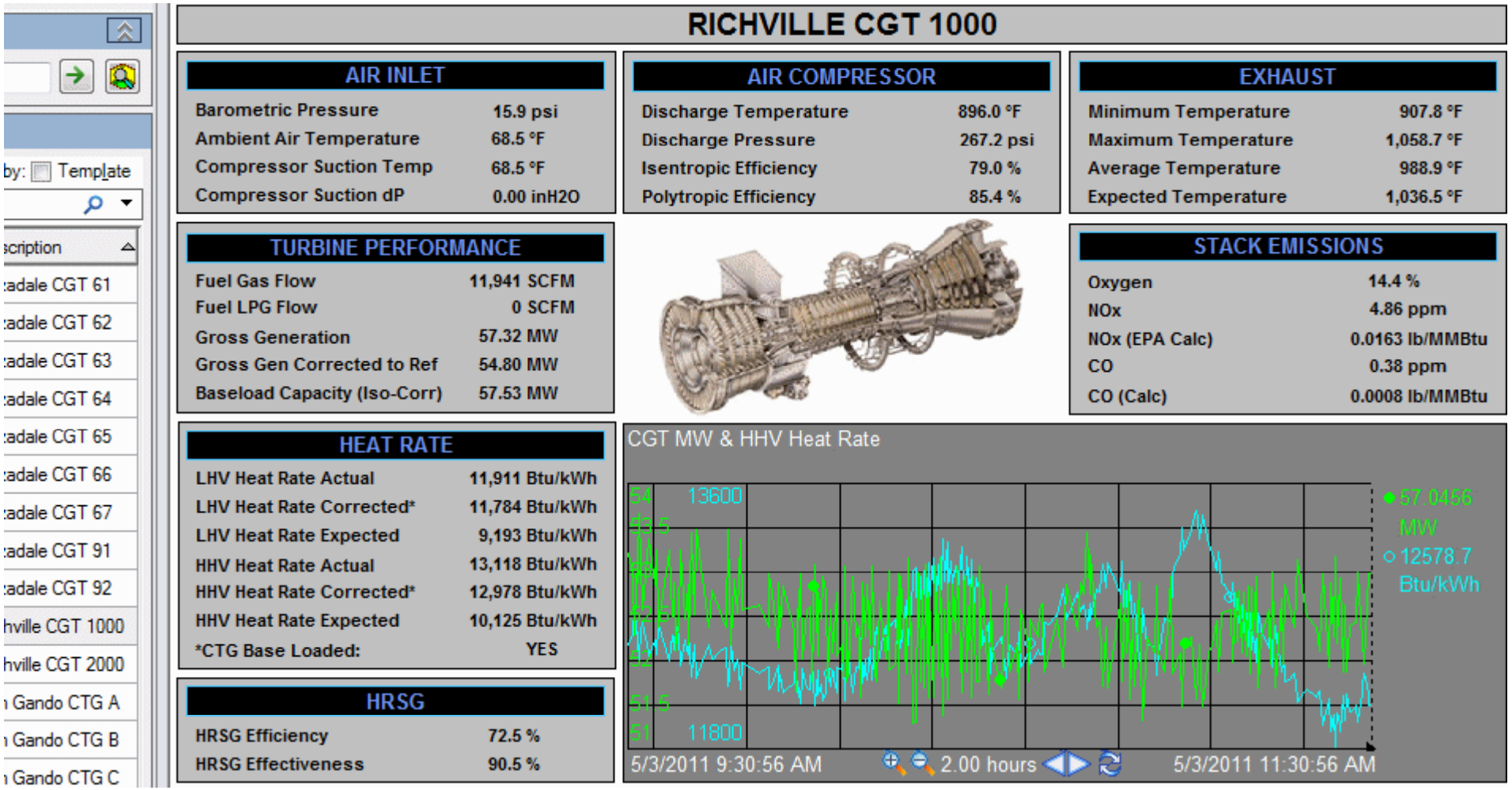
- Industry Standard UOMs are available with drop-downs.
- Units may be easily added or edited to conform to any syntax standards.
- PI AF performs unit conversions automatically, simplifying calculations and precluding conversion errors.

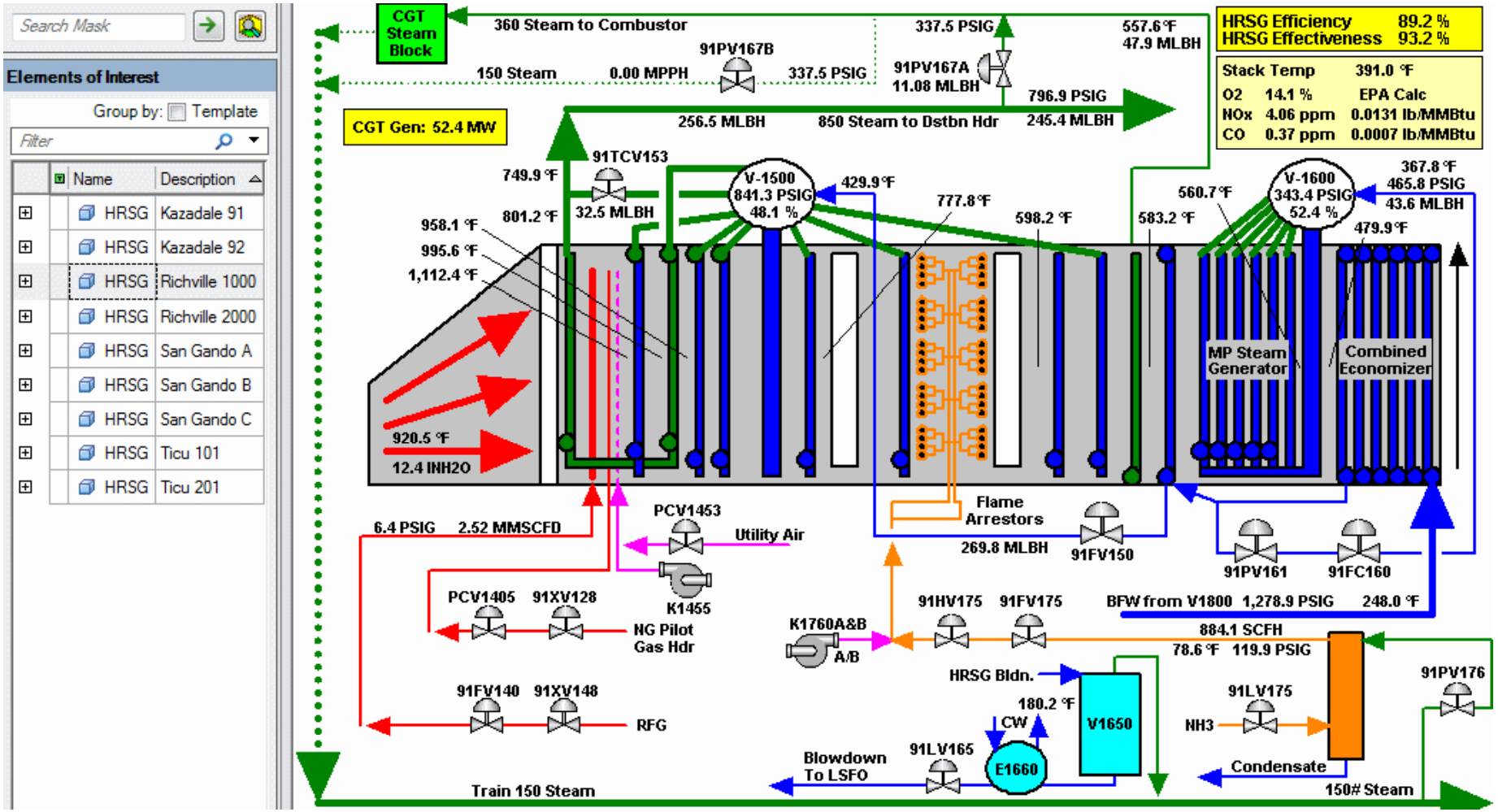


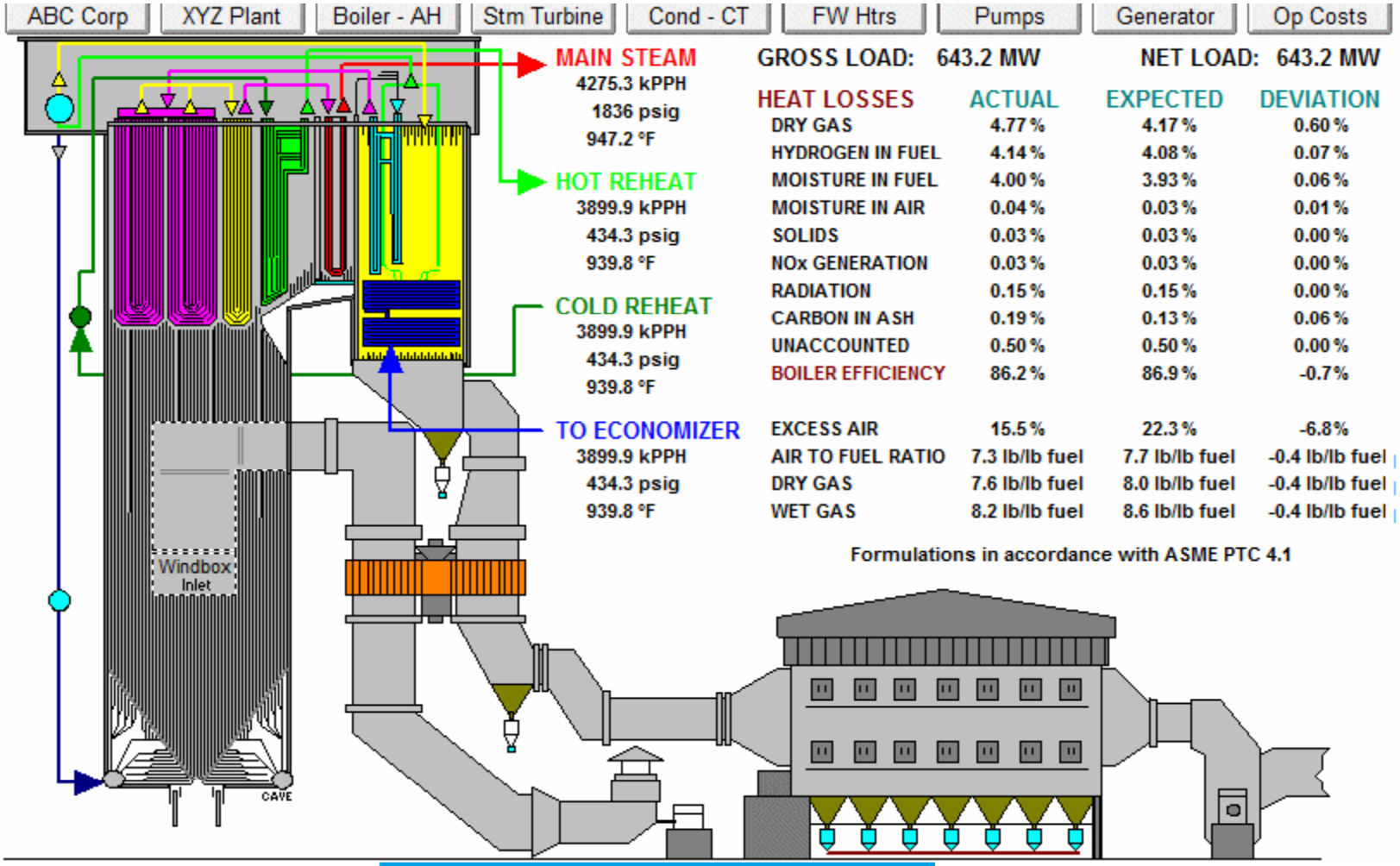


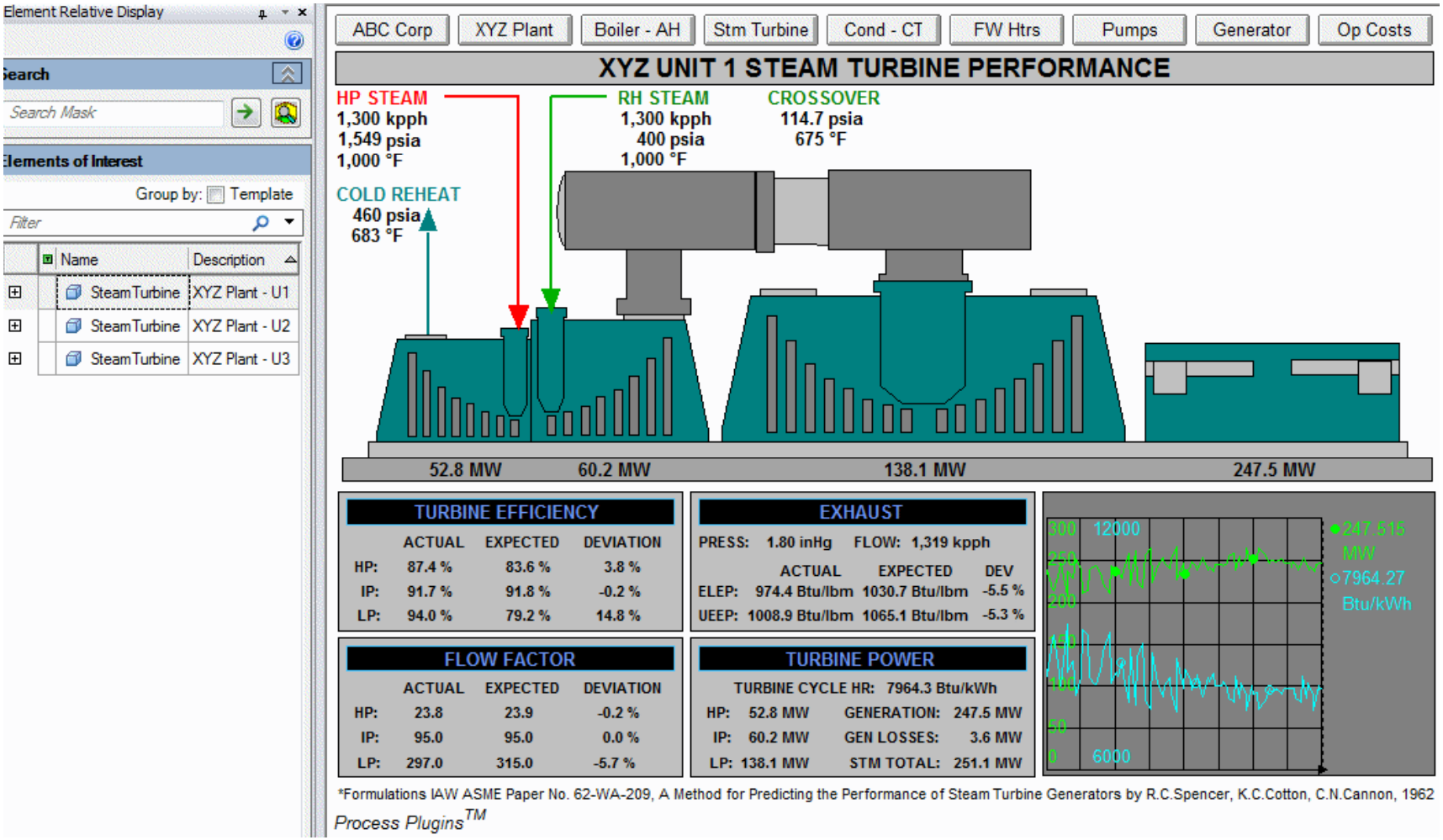












FORECAST			
	Amb Air	Output	Heat Rate
10/5/2011 8:00:00 AM	56.0 °F	53.7 MW	10,045 Btu/kWh
10/5/2011 9:00:00 AM	56.3 °F	53.6 MW	10,048 Btu/kWh
10/5/2011 10:00:00 AM	56.7 °F	53.6 MW	10,051 Btu/kWh
10/5/2011 11:00:00 AM	57.0 °F	53.5 MW	10,054 Btu/kWh
10/5/2011 12:00:00 PM	57.0 °F	53.5 MW	10,054 Btu/kWh
10/5/2011 1:00:00 PM	57.0 °F	53.5 MW	10,054 Btu/kWh
10/5/2011 2:00:00 PM	57.0 °F	53.5 MW	10,054 Btu/kWh
10/5/2011 3:00:00 PM	56.7 °F	53.6 MW	10,051 Btu/kWh
10/5/2011 4:00:00 PM	56.3 °F	53.6 MW	10,048 Btu/kWh
10/5/2011 5:00:00 PM	56.0 °F	53.7 MW	10,045 Btu/kWh
10/5/2011 6:00:00 PM	55.3 °F	53.8 MW	10,039 Btu/kWh
10/5/2011 7:00:00 PM	54.7 °F	53.9 MW	10,033 Btu/kWh
10/5/2011 8:00:00 PM	54.0 °F	54.0 MW	10,027 Btu/kWh
10/5/2011 9:00:00 PM	53.7 °F	54.1 MW	10,024 Btu/kWh
10/5/2011 10:00:00 PM	53.3 °F	54.2 MW	10,021 Btu/kWh
10/5/2011 11:00:00 PM	53.0 °F	54.2 MW	10,018 Btu/kWh
10/6/2011 12:00:00 AM	53.0 °F	54.2 MW	10,018 Btu/kWh
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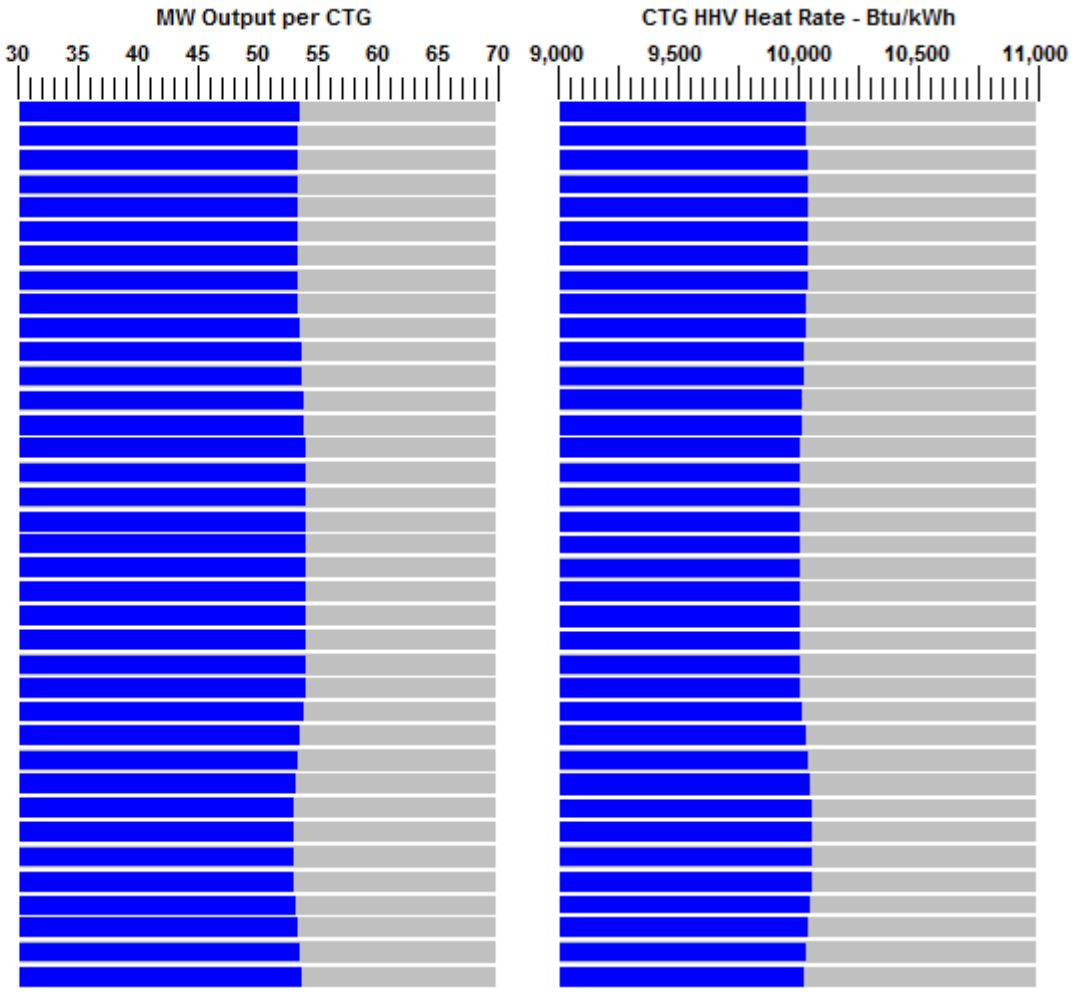
10/6/2011 8:00:00 AM	53.0 °F	54.2 MW	10,018 Btu/kWh
10/6/2011 9:00:00 AM	54.3 °F	54.0 MW	10,030 Btu/kWh
10/6/2011 10:00:00 AM	55.7 °F	53.7 MW	10,042 Btu/kWh
10/6/2011 11:00:00 AM	57.0 °F	53.5 MW	10,054 Btu/kWh
10/6/2011 12:00:00 PM	57.7 °F	53.4 MW	10,060 Btu/kWh
10/6/2011 1:00:00 PM	58.3 °F	53.3 MW	10,066 Btu/kWh
10/6/2011 2:00:00 PM	59.0 °F	53.1 MW	10,072 Btu/kWh
10/6/2011 3:00:00 PM	58.7 °F	53.2 MW	10,069 Btu/kWh
10/6/2011 4:00:00 PM	58.3 °F	53.3 MW	10,066 Btu/kWh
10/6/2011 5:00:00 PM	58.0 °F	53.3 MW	10,063 Btu/kWh
10/6/2011 6:00:00 PM	57.0 °F	53.5 MW	10,054 Btu/kWh
10/6/2011 7:00:00 PM	56.0 °F	53.7 MW	10,045 Btu/kWh
10/6/2011 8:00:00 PM	55.0 °F	53.9 MW	10,036 Btu/kWh



ProcessPlugins Forecaster

- Weather forecast data is used to automatically calculate your future capacity and performance.
- Projection is 7 days into the future
- Incorporates specific machine curves
- Works with Wind Turbines, Solar Panels, Combustion Gas Turbines, and Cooling Towers

Compressor Overview

T5 Profile

Pumps

Engine Performance

LP Compressor Performance

HP Compressor Performance

PI TreeView

- Pumps
  - P1123A
  - P1123B

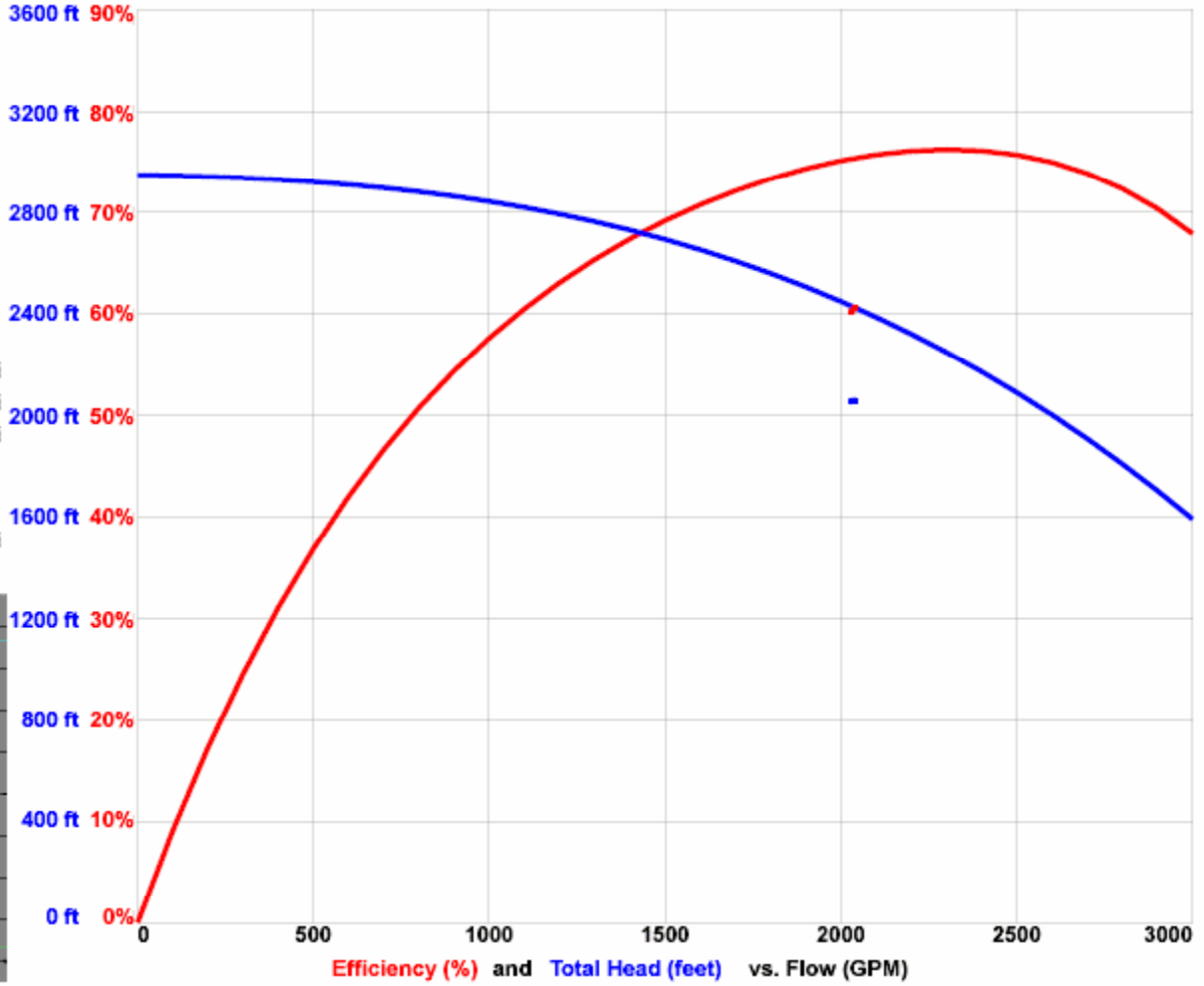
FIELD INPUTS:

Temperature:	131.4	°F
Suction Press:	49.1	psig
Discharge Press:	952.1	psig
Mass Flow:	2,040.4	GPM
Motor Voltage:	4,127	V
Control Valve:	69.0	%

CALCULATED RESULTS:

Pump Flow:	2,040.4	GPM
Motor Power:	1,860.5	hp
Fluid Power:	1,078.6	hp
Suction Head:	112.5 ft	49.5 psi
NPSH:	134.0 ft	57.2 psi
Discharge Head:	2,171.8 ft	955.7 psi

	ACTUAL	DESIGN
Total Head:	2,059.2 ft	2,425.7 ft
	879.8 psi	1,036.4 psi
Efficiency:	60.7 %	75.4 %



Compressor Overview

T5 Profile

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PI TreeView

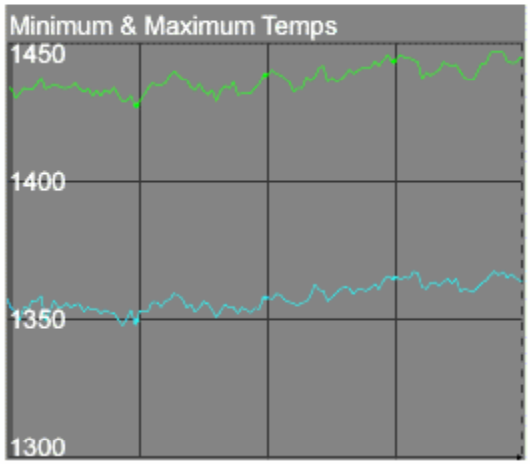
- Compressors
  - C1403A
  - C1403B
  - C1403C

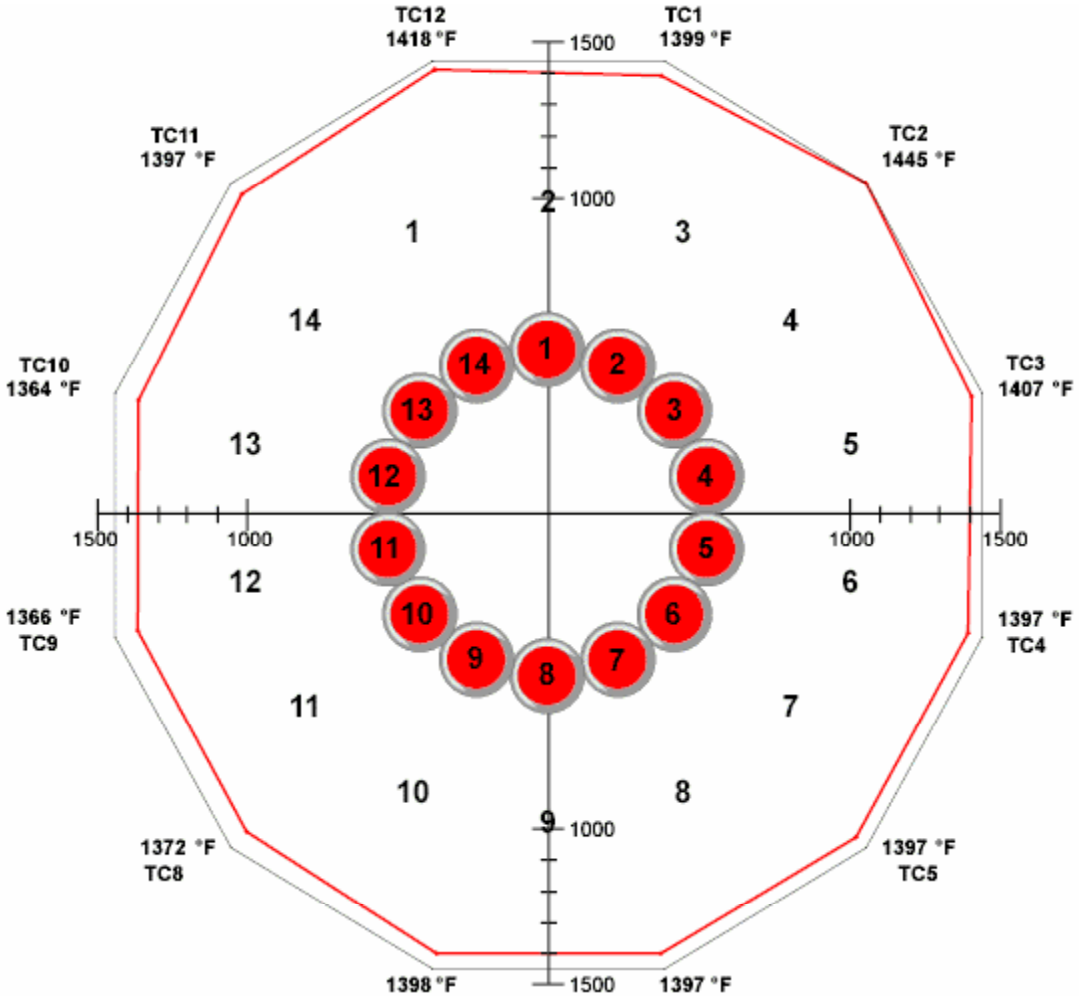
Solar Turbines

A Caterpillar Company

NGP: 99.8 % NPT: 89.8 %

Swirl Angle:	30.0 °
Minimum Temperature:	1363.7 °F
Maximum Temperature:	1444.9 °F
Temperature Spread:	81.2 °F





ProcessPlugins displays in PI WebParts

- All PI ProcessBook displays are replicated in PI WebParts for use in SharePoint

Compressor Overview

T5 Profile

Pumps

Engine Performance

LP Compressor Performance

HP Compressor Performance

PI TreeView

- Compressors
  - C1403A
  - C1403B
  - C1403C

Solar Turbines

A Caterpillar Company

NGP: 97.5 % **NPT:** 88.7 %

SPEED:

Actual	7,821 RPM
Nominal	7,641 RPM
Deviation	180 RPM

EFFICIENCY:

Actual	0.757
Nominal	0.780
Deviation	-0.023

HORSEPOWER:

Shaft	8,447 hp

ISENTROPIC HEAD:

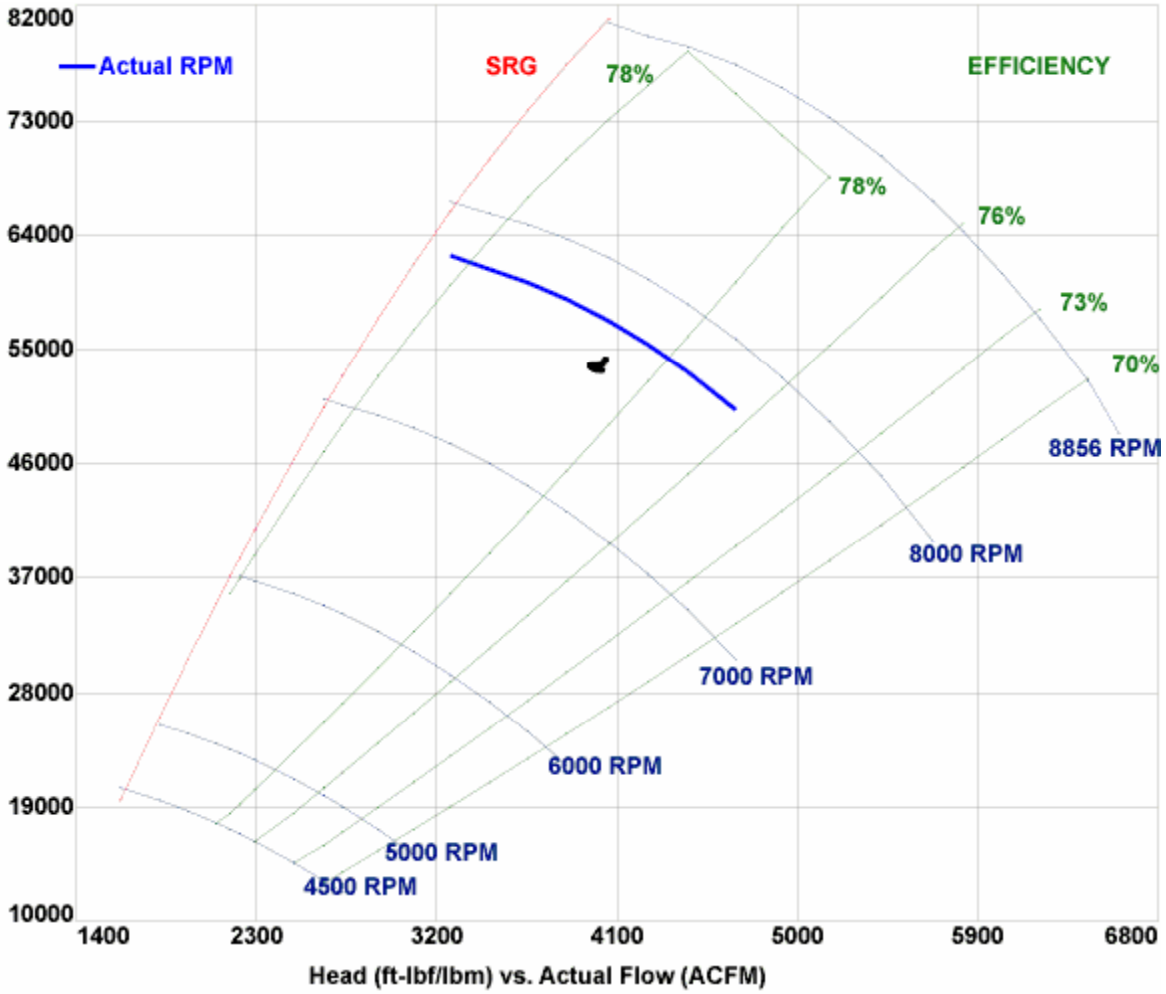
Actual	54,218 ft-lbf/lbm
Predicted	54,879 ft-lbf/lbm
Deviation	-1.20 %

INLET FLOW:

Actual	4,042 acfm
Standard	127 MMscfd

SETPOINTS:

NGP	97.8 %
T5	1,402 °F
SoLoNOx T5	1,368 °F
Discharge	1,338 psig
Flow	145 MMscfd
Suction	305 psig



Key Advantages

- Entire system is within the OSIsoft Enterprise Infrastructure
- No worries about operating system changes, Windows patches, NERC CIP requirements, or OSIsoft Enterprise Infrastructure updates to any part of the platform.
- No need to juggle visualization methods since only OSIsoft client tools render the Process Plugins displays.
- Key business systems are already connectable to OSIsoft Enterprise Infrastructure for condition based maintenance.

Key Advantages

- Calculations are never in a black box so verification and further enhancements are simple. Your system is self documenting.
- PI AF templates provide flexible drag-and-drop calculations for any type of equipment.
- All plants are easily monitored from a single location and single instance of the Process Plugins solutions.
- With minimal training, you can configure your own systems, or have Process Innovations do it for you.

ProcessPlugins

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Thank you