



Process Plugins Calculations & Characterization Embedded in PI Asset Framework

Presented by Williams Midstream



Agenda

- **Review of Agenda**
- **Webinar Series and Partner Solution Showcase**
- **Introductions**
- **Williams Midstream**
- **Process Innovations Inc.**
- **Demonstration**
- **Questions**
- **Conclusions and Thank You!**



Mission



**“Our mission is to
maximize the Value
our customers get
from our product
and services”**



OSIsoft Partner Solution Showcase

- Find software solutions from OSIsoft partners with specific industry and domain expertise.
- <http://partners.osisoft.com/solutions>



pss@osisoft.com

eliminating any threats or cyber-attack originating from external networks.

By Waterfall Security Solutions LTD April, 10, 2012 ☆☆☆☆☆ (0)

Sigmafine

Sigmafine is an open, configurable platform that allows the user to model a plant or a process to perform data reconciliation and validation based on a mass, volume, component or energy balances.



By Pimsoft Inc April, 10, 2012 ☆☆☆☆☆ (0)

Process Plugins

Process Plugins solutions customize the OSIsoft® infrastructure for industry applications, and formulations are designed to reside entirely in PI Asset Framework™ (PI AF). Users can view, modify, or enhance formulations. Most formulas are designed to be calculated directly in PI AF. The Process Plugins library includes additional functions that are handled by the Process Plugins Windows service, using PI SDK®.



By Process Innovations Inc April, 07, 2012 ☆☆☆☆☆ (0)

Williams Midstream



- Williams Midstream is one of the largest providers of energy infrastructure in North America
- Their businesses are:
 - Natural gas gathering and processing
 - NGL & crude oil transportation
 - NGL storage
 - Olefins production
- <http://co.williams.com>

Process Innovations Inc.

- Process Innovations Inc. has been an OSIsoft partner for more than 8 years. The business is focused solely on adding value to the OSIsoft Infrastructure.
- Process Plugins provides immediate value to OSIsoft's PI System. Process Plugins tools reside directly in the stable OSIsoft platform. These specialized, easily customizable solutions automate and manage performance monitoring, analysis, reporting and prediction.
- www.ProcessPlugins.com

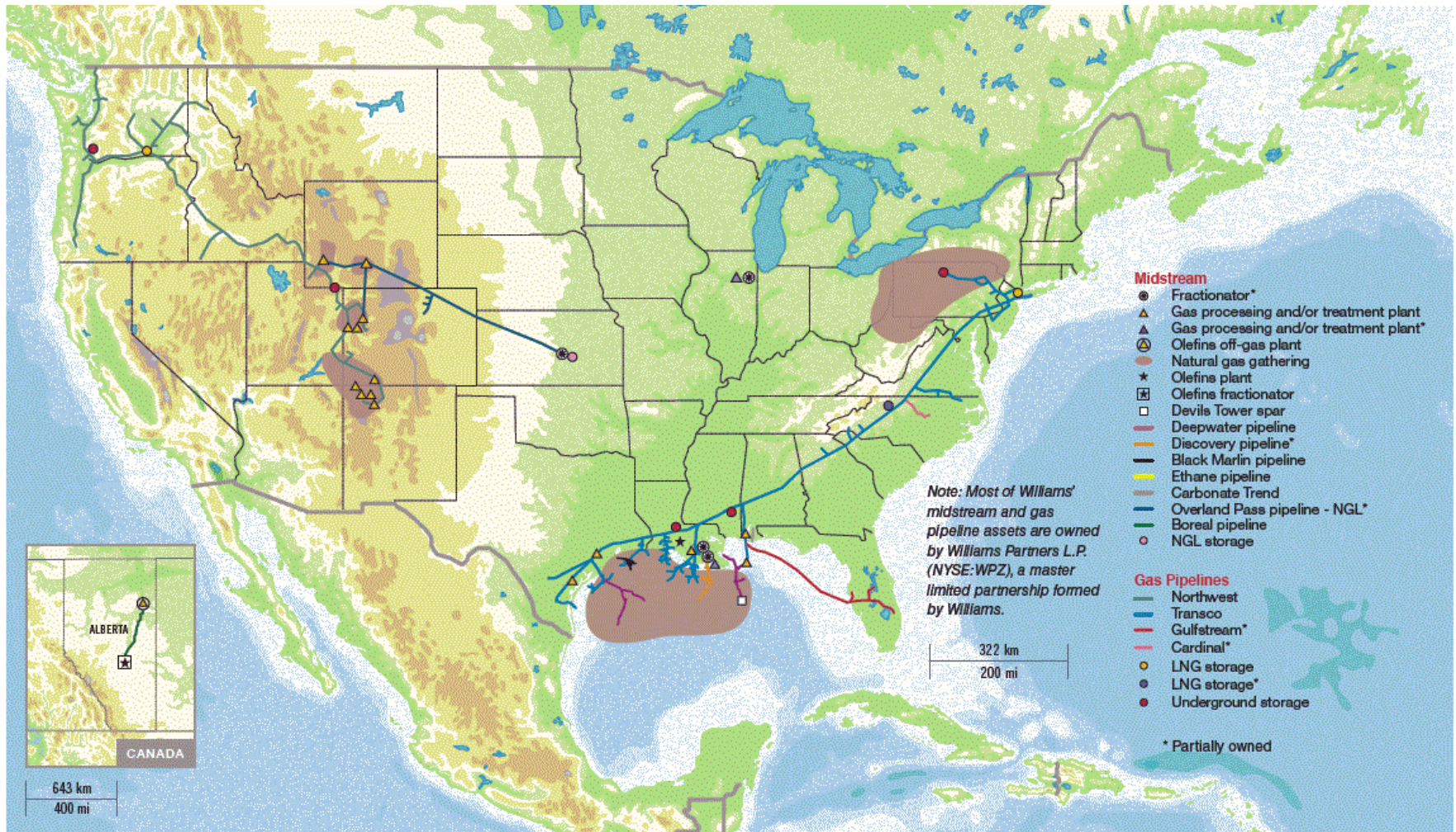
Presenters

- **Steve Barker – Staff Engineer, Operations Analysis**
Williams Midstream
Office: 918-573-2000
Email: steve.barker@williams.com
- **Joe Devine – President / Application Consultant**
Process Innovations Inc.
Office: (970) 266-8551
Email: JDevine@Process-Innovations.net
- **Erika Ferguson - Partner Manager, Americas**
OSIsoft, LLC
Mobile: (510) 604- 9053
Email: eferguson@osisoft.com



Williams

Williams Assets

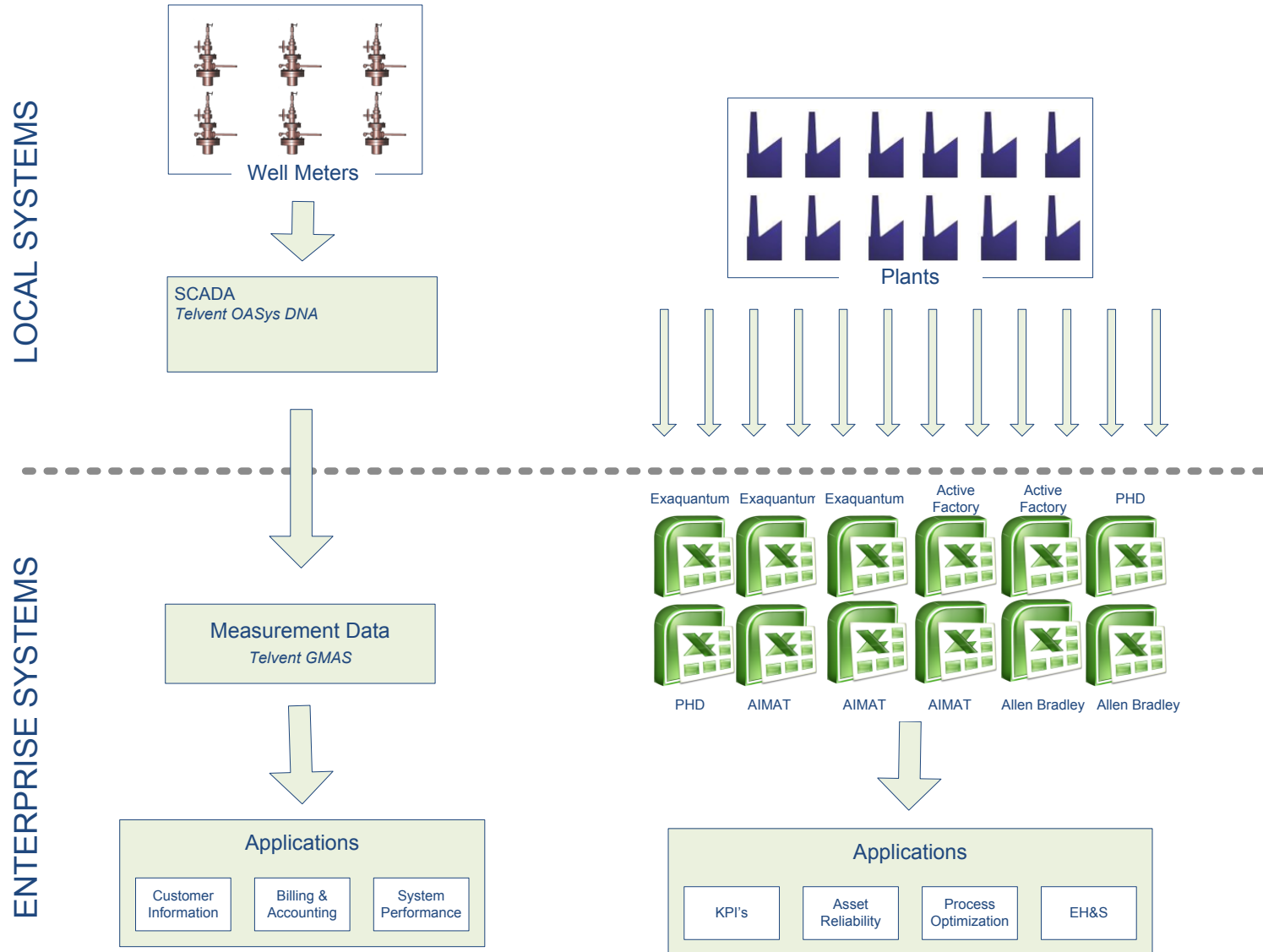


The challenge is to provide centralized, well organized, consistent monitoring and analysis of Williams' fleet of assets.

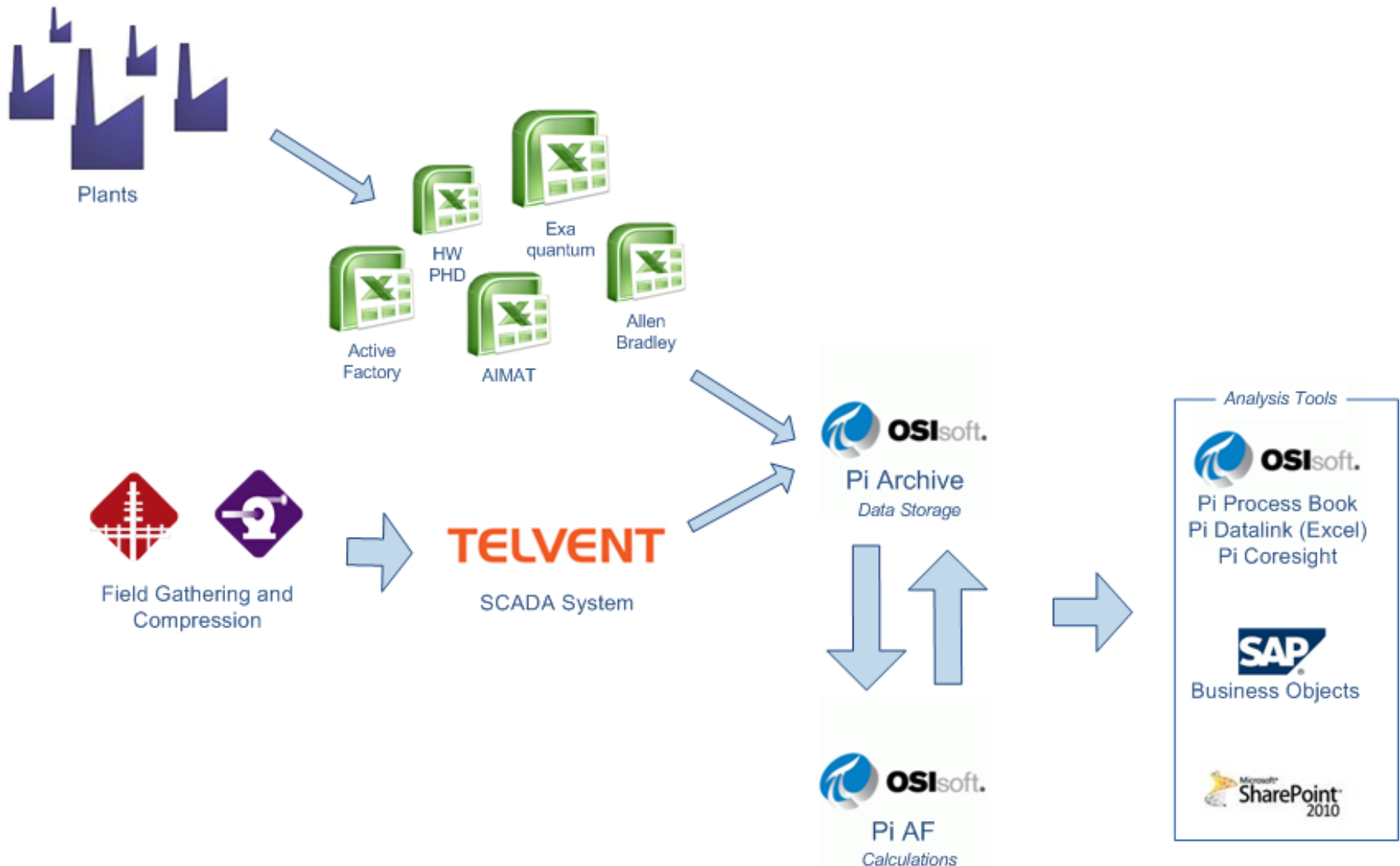


PI System at Williams Midstream

Williams Midstream – Before the PI System



Williams Midstream – After the PI System



Williams Midstream and the PI System

Williams uses the OSIsoft infrastructure to provide insight into their operations.

- PI Server™
- PI Asset Framework™ (PI AF)
- PI ProcessBook™
- PI WebParts™
- PI Coresight™
- PI OLEDB Enterprise™
- PI System Management Tools™ (PI SMT)
- PI System Explorer™
- PI DataLink™

PI WebParts at Williams Midstream

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 %

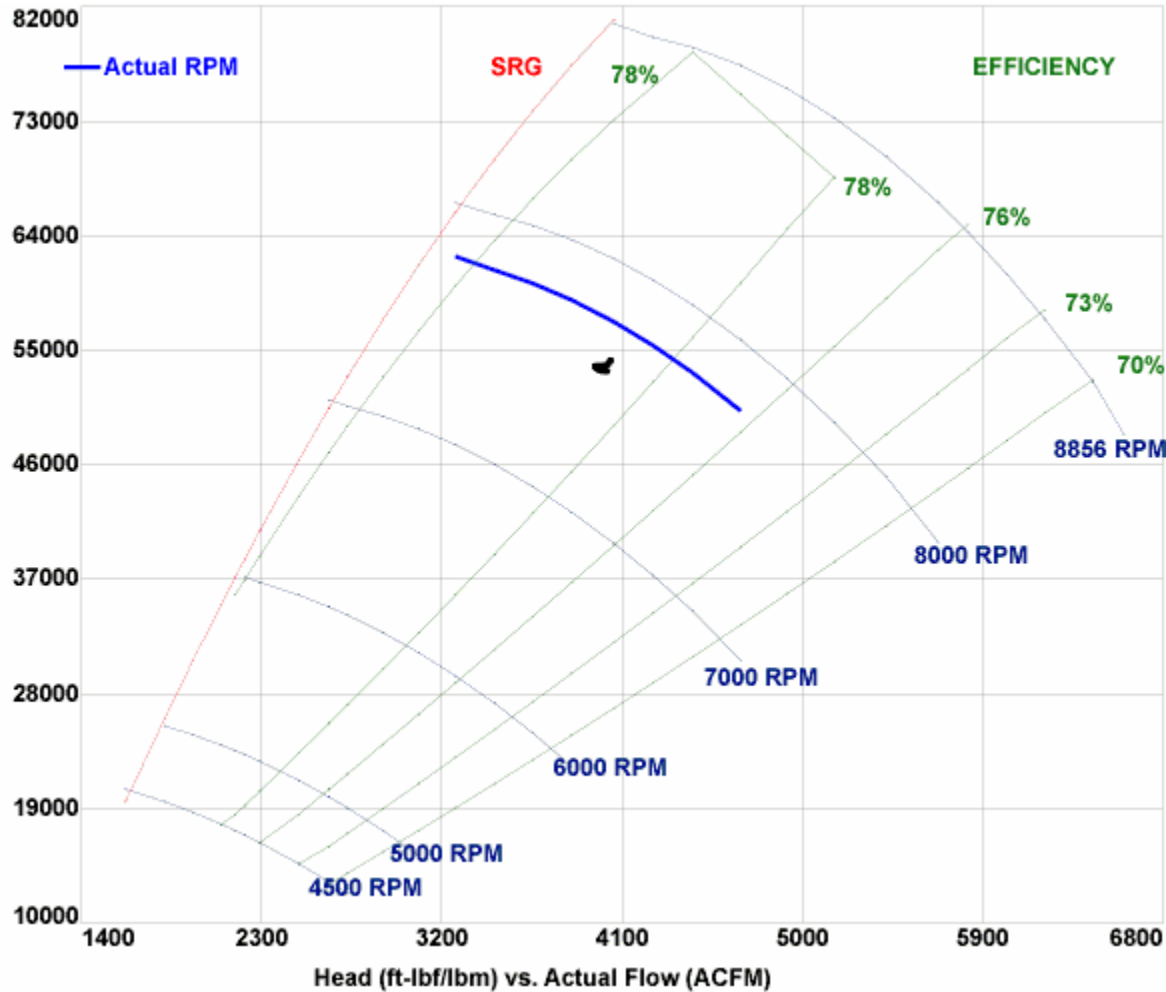
T5 1,402 °F

SoLoNOx T5 1,368 °F

Discharge 1,338 psig

Flow 145 MMscfd

Suction 305 psig



With PI WebParts, we can share the results with the entire corporation without the need to install software on each viewer's computer.



PI WebParts at Williams Midstream

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: 99.8 % NPT: 89.8 %

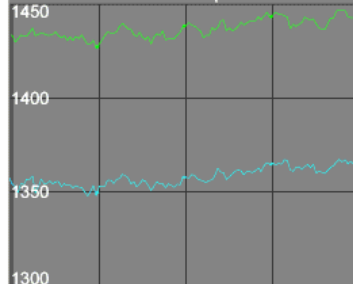
Swirl Angle: 30.0 °

Minimum Temperature: 1363.7 °F

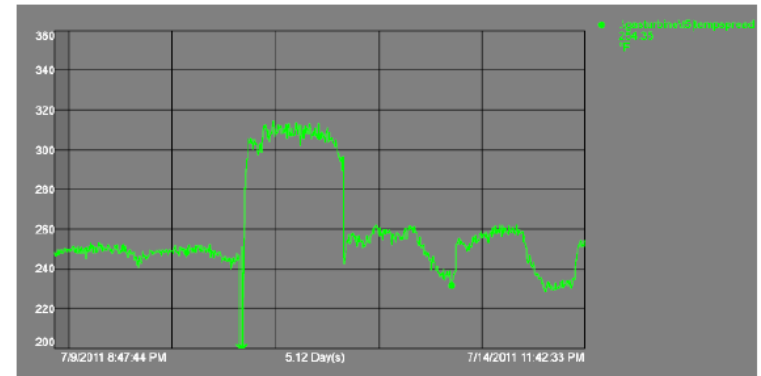
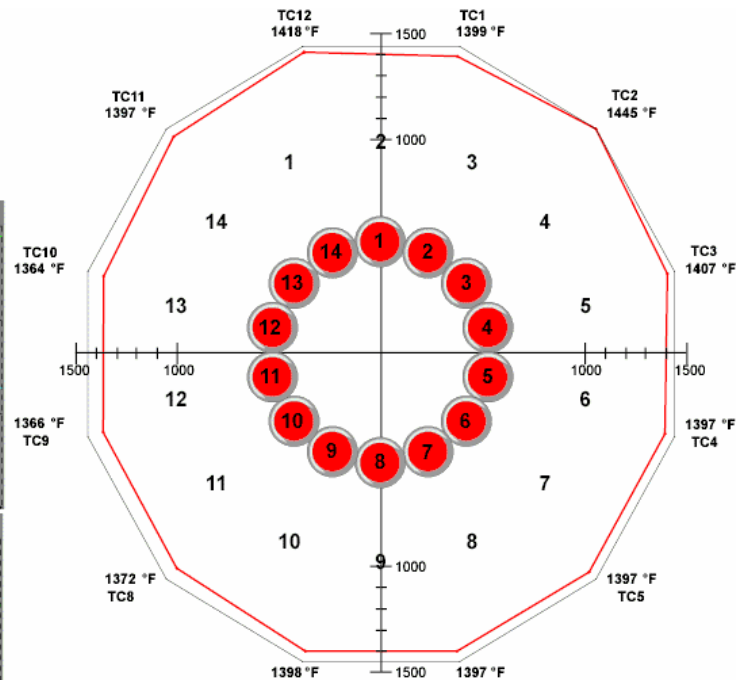
Maximum Temperature: 1444.9 °F

Temperature Spread: 81.2 °F

Minimum & Maximum Temps



Temperature Spread



“Exhaust Temperature Profile” solution provided an immediate success story by displaying an anomaly with exhaust gas temperatures.



PI AF at Williams Midstream

The screenshot displays the 'Williams - PI System Explorer' application. The left pane shows a hierarchical tree of 'Elements' under 'Gas Plant', with 'Gas Turbine - GT-1641' selected. The main pane shows the configuration for 'Gas Turbine - GT-1641' with tabs for 'General', 'Child Elements', 'Attributes', 'Ports', and 'Version'. The 'Attributes' tab is active, showing a table of attributes. The right pane shows configuration details for the selected attribute, including Name, Description, Configuration Item, Categories, Default UOM, Value Type, Value, and Data Reference. A 'Settings...' button is also visible.

Name	Value
GT1641_AR_0.PV	99.96154 %
GT1641_AR_1.PV	0.003753662 %
GT1641_AR_2.PV	113 %
GT1641_AR_3.PV	113.0038 %
GT1641_AR_4.PV	27.77436 VDC
GT1641_AR_5.PV	2.331731 inH2O
GT1641_AR_6.PV	0.7051282 inH2O
GT1641_AR_7.PV	60.03711 Hz
GT1641_AR_8.PV	4159.5 VAC
GT1641_AR_9.PV	4160 VAC
GT1641_AR_10.PV	4160.5 VAC
GT1641_AR_11.PV	4164.75 VAC
GT1641_AR_12.PV	4160.25 VAC
GT1641_AR_13.PV	4156.75 VAC
GT1641_AR_14.PV	1.759888 A
GT1641_AR_15.PV	0.8518066 %
GT1641_AR_16.PV	27.5957 VDC

Gas Turbine - GT-1641 Modified:8/4/2011 7:37:44 AM. Version: 1/1/1970 12:00:00 AM, Revision 1

With PI AF, real time data is systematically organized.

PI AF at Williams Midstream

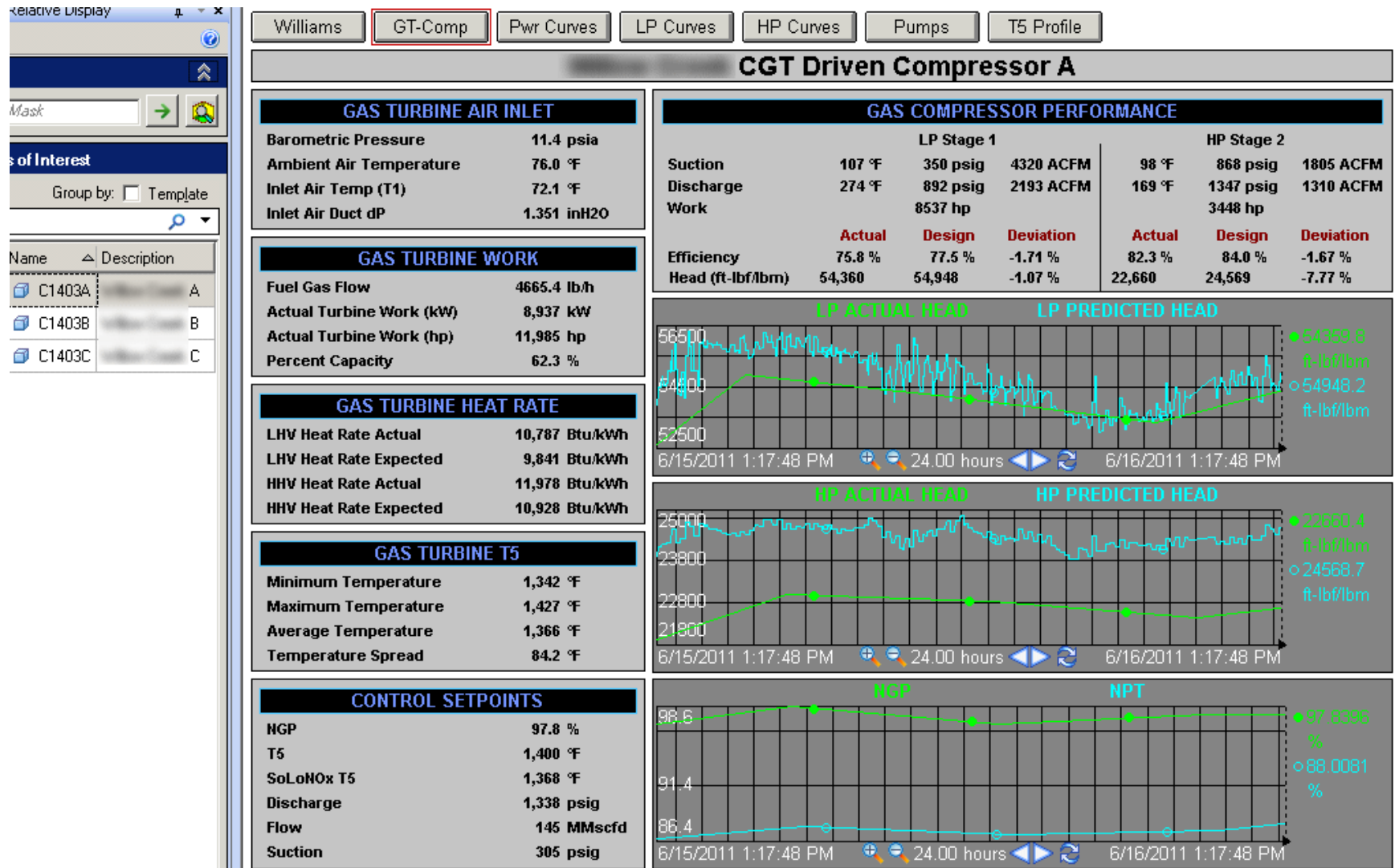
The screenshot displays the PI System Explorer interface. On the left, a 'Library' pane lists various data sources, including SolarTaurus and SolarTitan models. The main window shows the 'SolarTurbinesSpecs' table, which contains specifications for different turbine models. The table has columns for Item, Saturn20, Centaur40, Centaur50, Taurus60, Taurus70, Mars90, Mars100, Titan130, and Titan. The 'AirCompAirFlow_LBpSec' item is highlighted, showing values across the different models.

Item	Saturn20	Centaur40	Centaur50	Taurus60	Taurus70	Mars90	Mars100	Titan130	Titan
AirCompAirFlow_LBpSec	14.2	41.3	40.9	47	57.7	87.5	91.8	105.2	143.5
NumInj_conv	12	10	12	12	12	21	21	21	21
NumInj_SoLoNOx	12	12	12	12	12	14	14	14	14
Output_KW	1185	3500	4570	5740	8140	9860	11860	15290	22370
HR_KJpKwH	14670	12905	12030	11265	10195	10830	10465	9940	9000
HR_BTUpKwH	13904.48	12231.58	11402.24	10677.16	9662.995	10264...	9918.9...	9421.302	8530.
ExhaustFlow_LBpHr	51615	150320	149380	171690	215545	318755	337850	396940	54153
ExhaustTemp_F	970	835	960	950	945	870	905	940	865
AirCompInletTemp_F	59	59	59	59	59	59	59	59	59
RelativeHumidity_Pct	60	60	60	60	60	60	60	60	60
FuelLHV_BTUpFt3	940	940	940	940	940	940	940	940	940
*									

SolarTurbinesSpecs Modified:3/21/2012 2:19:59 PM. Version: 1/1/1970 12:00:00 AM, Revision 1

PI AF tables allow consistent use of centrally organized specifications which are needed in many engineering calculations.

PI ProcessBook at Williams Midstream



With PI ProcessBook's Element Relative feature, a single display provides visualizations for many assets.

ProcessPlugins

Your OSIsoft Technology Partner



Partner Organizations:

 Process
Innovations
Inc.



Process Plugins



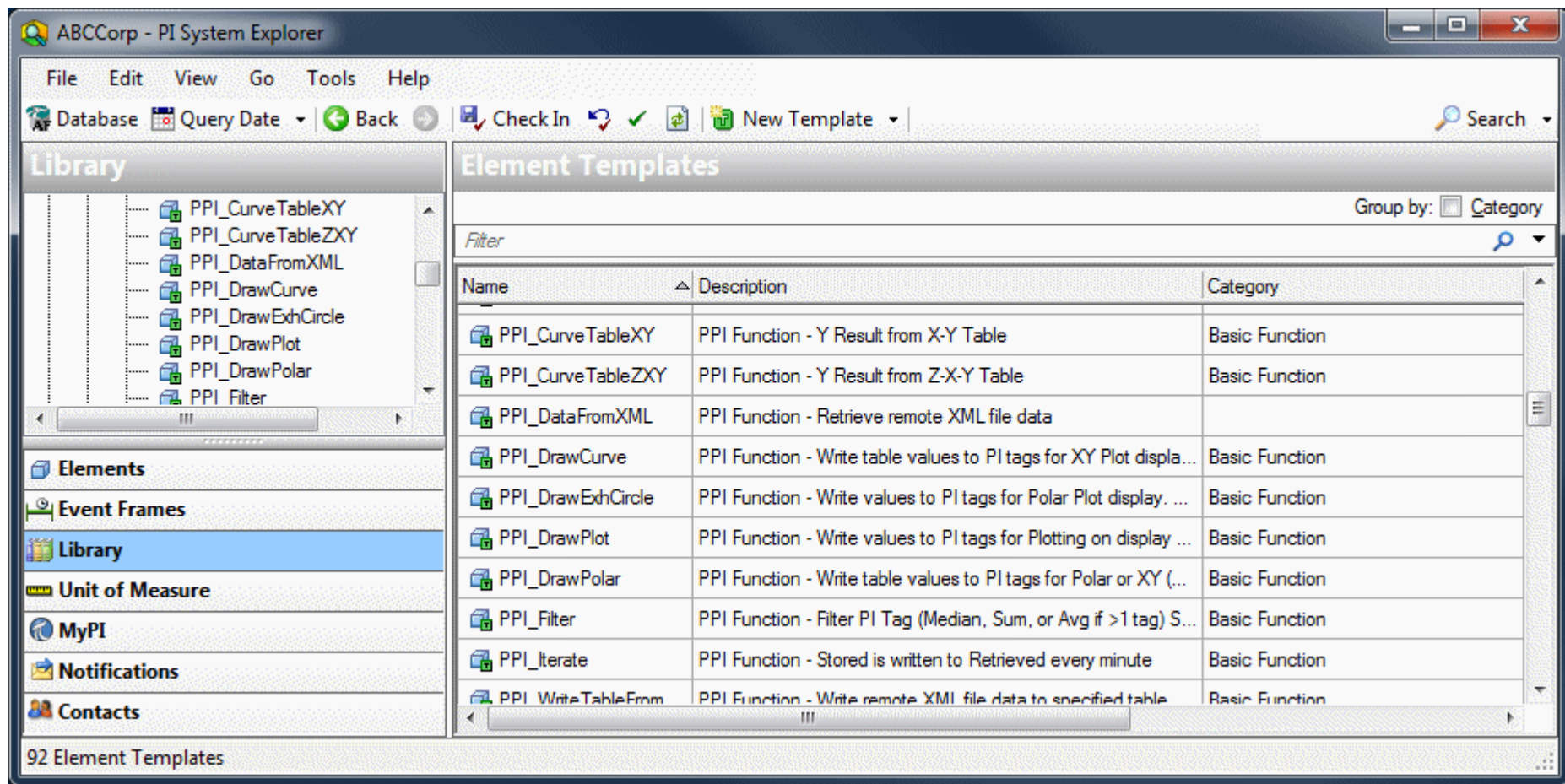
- Process Innovations Inc. has been an OSIsoft partner for more than 8 years. The business is focused solely on adding value to the OSIsoft Infrastructure.
- Process Plugins, started in 2006, provides performance packages for a number of process industries.

“Asset Framework 2.x allows for a fully functional package residing entirely within the OSIsoft Asset Framework.”



Process Plugins at Williams

Process Plugins at Williams Midstream



Process Plugins adds a vast array of Element Templates utilized by Williams Midstream, particularly in rendering real time performance curves.

Process Plugins at Williams Midstream

ABCCorp - PI System Explorer

File Edit View Go Tools Help

Database Query Date Back Check In New Class New UOM Search

Unit of Measure

Filter

Class

- Velocity
- Volume
- Volume Flow Rate
- Volumetric Cost
- Volumetric Heating Value

Elements

Event Frames

Library

Unit of Measure

MyPI

Notifications

Contacts

Volume Flow Rate

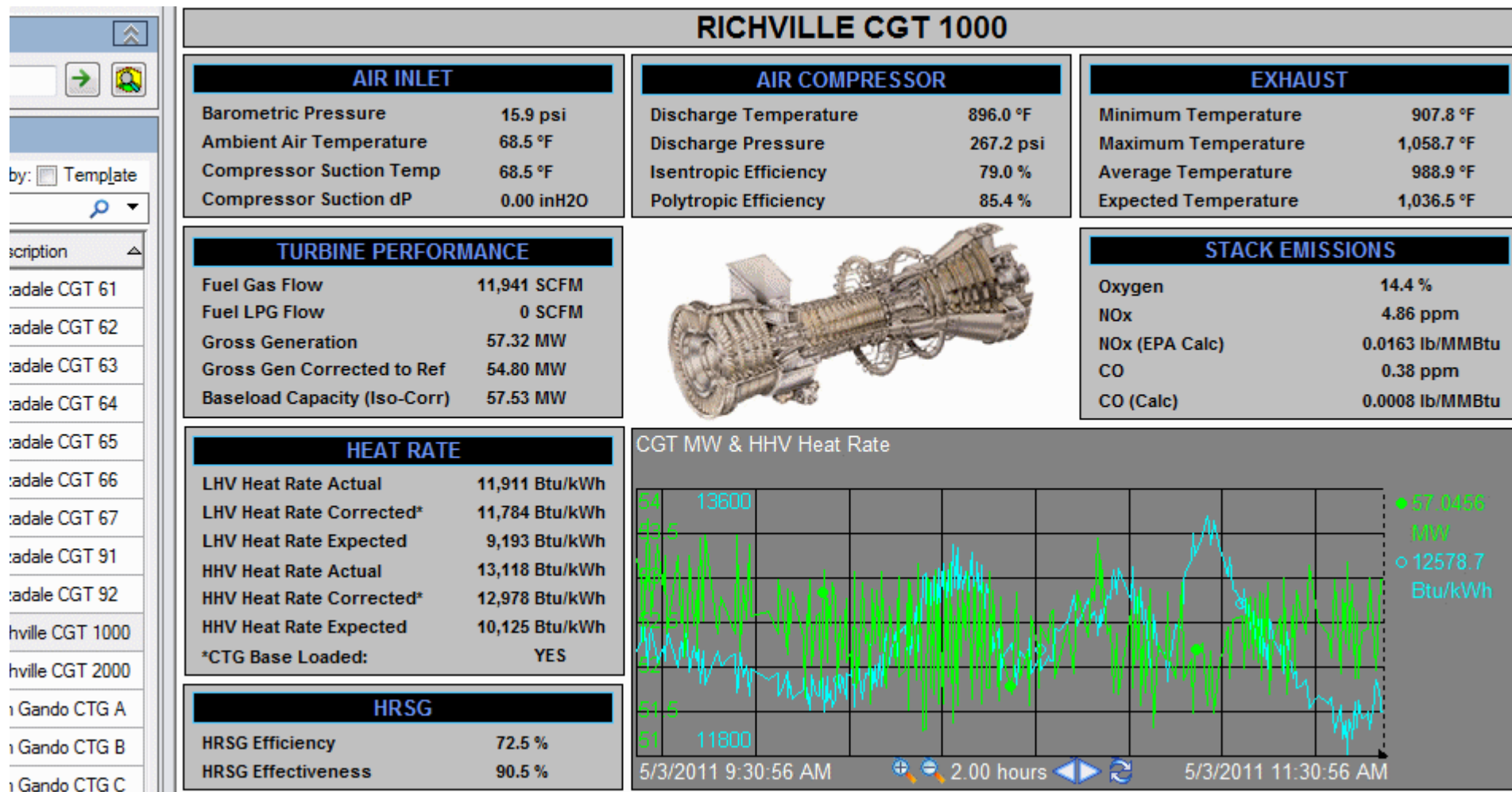
Filter

Name	Abbreviation	Class	Canonical	Reference
kbbl/d	kbbl/d	Volume Flow Rate	0.0018401307283333 m3/s	0.0018401307283...
kbbl/h	kbbl/h	Volume Flow Rate	0.04416313748 m3/s	0.04416313748 m...
kbbl/mo	kbbl/mo	Volume Flow Rate	6.04560403559205E-05 m3/s	6.0456040355920...
km3/d	km3/d	Volume Flow Rate	0.0115740740740741 m3/s	0.0115740740740...
KSCFD	KSCFD	Volume Flow Rate	0.00032774128 m3/s	0.00032774128 m...
KSCFH	KSCFH	Volume Flow Rate	0.00786579072 m3/s	0.00786579072 m...
L/s	L/s	Volume Flow Rate	0.001 m3/s	0.001 m3/s
m3/h	m3/h	Volume Flow Rate	0.000277777777777778 m3/s	0.000277777777...
m3/m	m3/m	Volume Flow Rate	0.0166666666666667 m3/s	0.016666666666...
m3/s	m3/s	Volume Flow Rate	1 m3/s	
ML/d	ML/d	Volume Flow Rate	0.0115740740740741 m3/s	0.0115740740740...
MMSCFD	MMSCFD	Volume Flow Rate	0.32774128 m3/s	0.32774128 m3/s
MMSCFH	MMSCFH	Volume Flow Rate	7.86579072 m3/s	7.86579072 m3/s
MSCFH	MSCFH	Volume Flow Rate	0.00786579072 m3/s	0.00786579072 m...
SCFH	SCFH	Volume Flow Rate	7.86579072E-06 m3/s	7.86579072E-06 ...
SCFM	SCFM	Volume Flow Rate	0.0004719474432 m3/s	0.0004719474432...

Unit-of-Measure Database on KPOTTERPI1 (35 Classes, 314 UOMs) Modified:9/13/2011 2:10:52 PM.

Process Plugins adds dozens of Units of Measure particularly useful in the utilities.

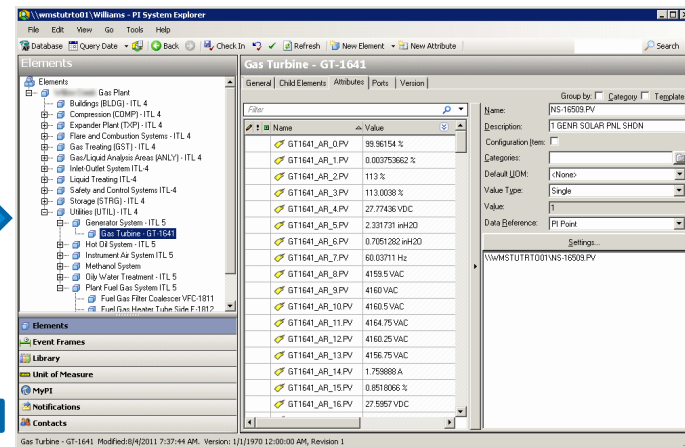
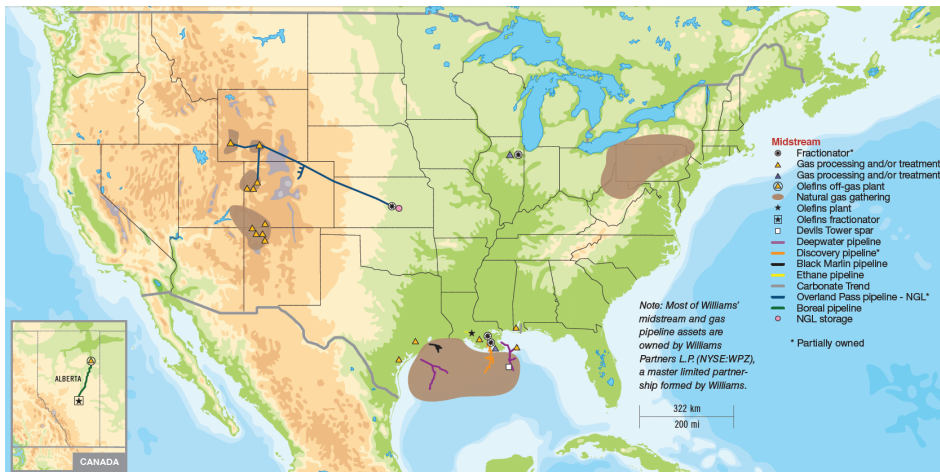
Process Plugins at Williams Midstream



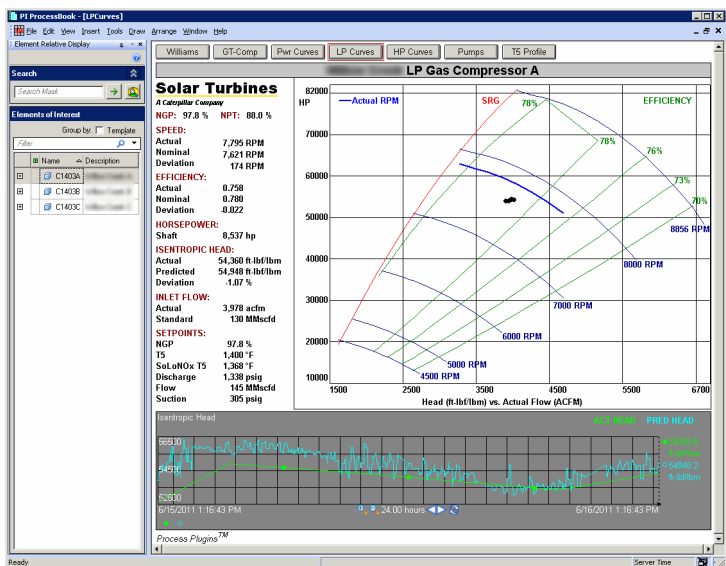
Process Plugins' expertise with OSIsoft products, and vast library of tools has rapidly added substantial value to Williams Midstream's enterprise system.



Demonstration



ProcessPlugins



Compressor Overview

TS 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-lb/ftm

Predicted: 54,878 ft-lb/ftm

Deviation: -1.20 %

INLET FLOW:

Actual: 4,042 acfm

Standard: 127 MMscfd

SETPOINTS:

NGP: 97.8 %

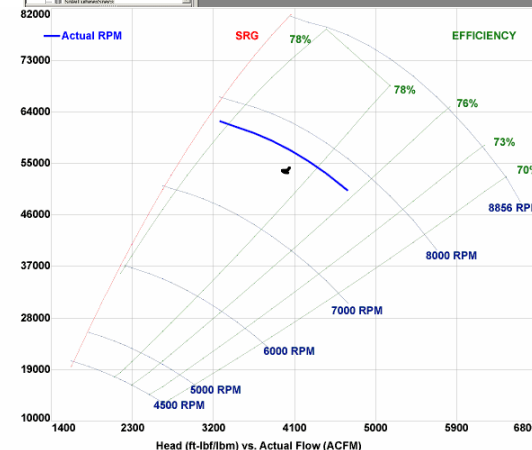
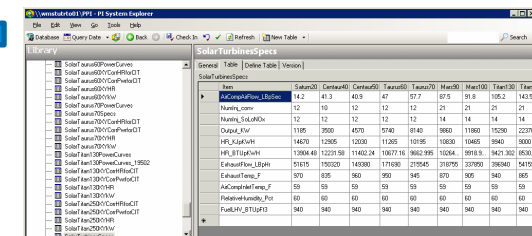
T5: 1,402 °F

SoLoNox T5: 1,368 °F

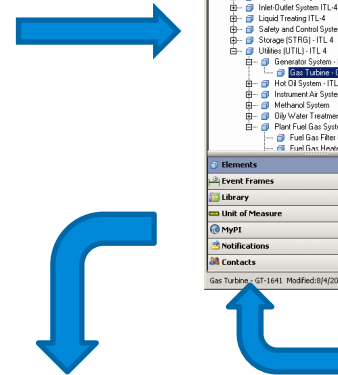
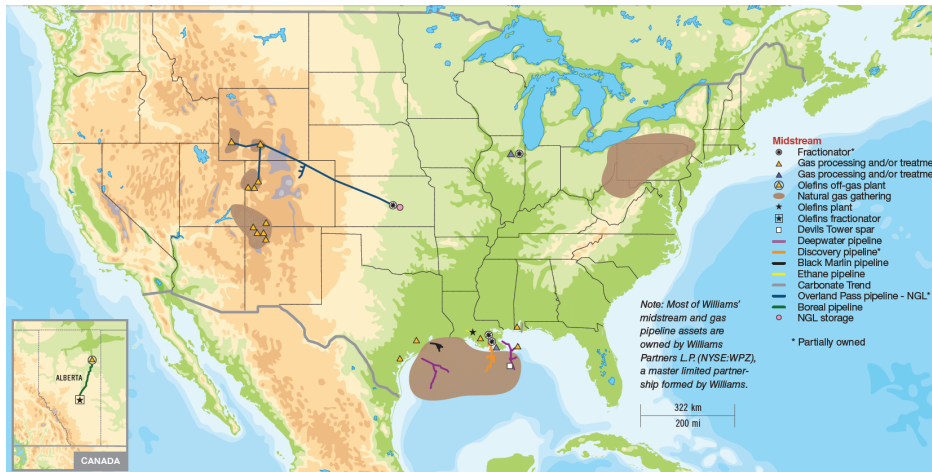
Discharge: 1,338 psig

Flow: 145 MMscfd

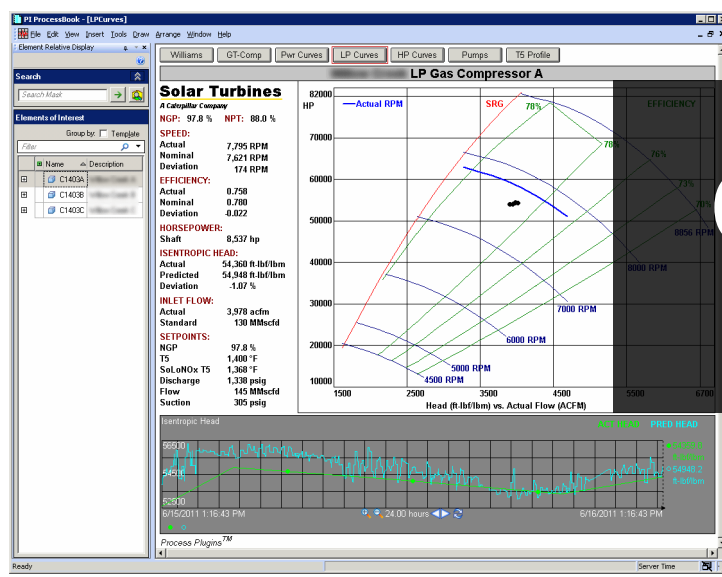
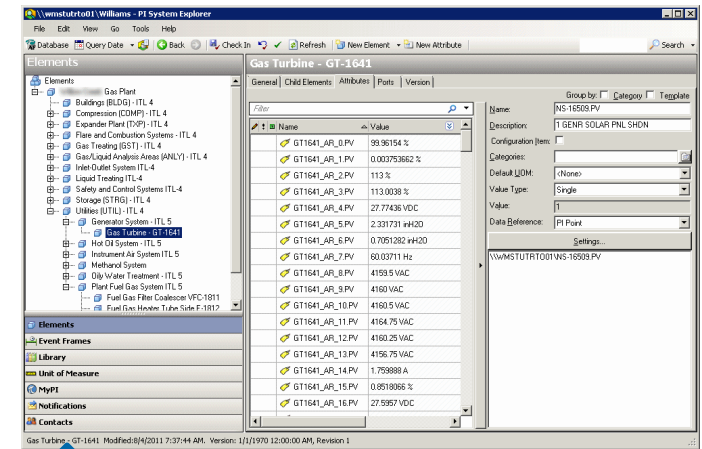
Suction: 305 psig



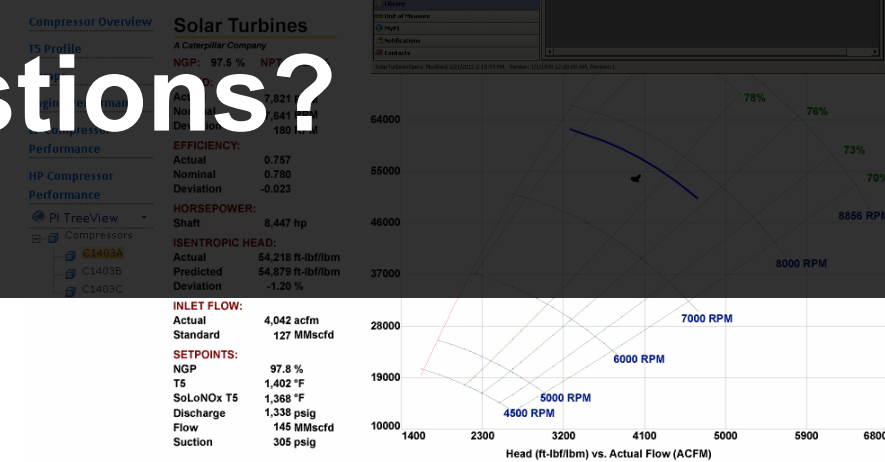
Process Plugins is adding immediate value to Williams' OSIsoft product suite.



ProcessPlugins



Questions?



Summary

With hundreds of turbines, compressors and large pieces of equipment operated by Williams across the USA and Canada a system was needed to monitor the status of all of these assets:

- Utilization of the OSIsoft PI system was the first step in this process.
- Asset Framework and the Process Plugins solutions then provided continuous conditions monitoring.
- With Process Plugins and integration of PI Notifications, the combined solution now provides real time monitoring and notification of equipment status to Williams

“What we really want to emphasize is that now we have one platform for display of equipment performance readily accessible to everyone in the company, 24/7. It’s available instantaneously and without the need of special analysis tools or special data mining tools. We save time and effort.”



Contacts – Follow up

Would you want to use Process Plugins at your site

Joe Devine – President / Application Consultant

Process Innovations Inc. Process Plugins Inc.

Office: 1-970-266-8551

Email: JDevine@Process-Innovations.net

Ken Potter – Director of Product Development

Process Plugins Inc.

Office: 1-262-227-7495

Email: KPotter@ProcessPlugins.com

For OSIsoft questions please contact your representative or

Erika Ferguson - Partner Manager, Americas

OSIsoft, LLC

Mobile: (510) 604- 9053

Email: eferguson@osisoft.com

Webinars

October 17 - Overall Equipment Effectiveness in the PI System Ecosystem - *recording available on-line*

November 7 - Process Calculations and Characterization embedded in PI Asset Framework

December 5 - KPIs, Data and Events On Any Mobile Device

More to follow – Working on the schedule for 2013



Thank you

© Copyright 2012 OSIsoft, LLC.
777 Davis St., San Leandro, CA 94577