



ProcessPlugins Generator Capability Monitor



Partner Organizations:

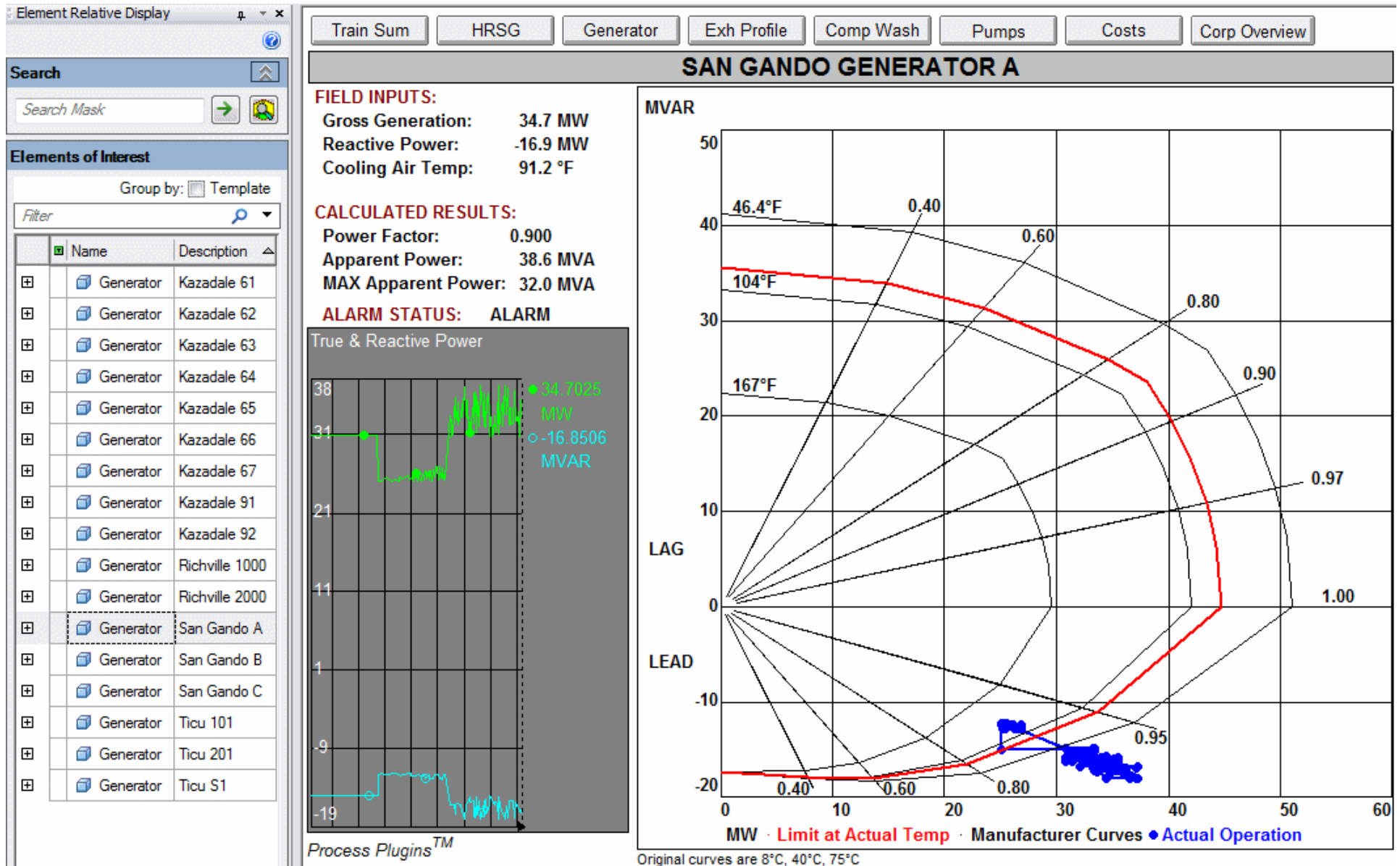


Process
Innovations
Inc.



PROCESS PLUGINS™ GENERATOR CAPABILITY MONITOR

The Generator Capability Monitor provides real-time Power Factor, Apparent Power, Maximum Apparent Power, and Alarm Status. This tool provides a handy visualization making it easy to compare actual conditions with the real-time dynamic limitation. Note that this plot does not use an image, but plots the black curves from a table, interpolates the red limit curve real-time, and plots the blue operating condition all within the same plot. The result is highly accurate.



The generator reactive capability curve is displayed in a dynamic real time display. This display is unique in that the cooling gas parameter (or voltage where applicable) “D-curve” accurately moves real-time and reactive/real power is plotted within. The D-curve is plotted with extreme accuracy using true polar coordinates so that the entire limit curve is displayed dynamically around the entire 180 degree plot. This tool provides a very handy visualization of real time operation compared to the limitations.

PI Notifications are triggered with this alarm to notify the appropriate personnel.

Using the ‘Element Relative Display’ feature, one master Process Book display file may be used to consistently display the key performance indicators of each Generator by simply selecting the asset in the Element Relative pane (left side of display). With the ‘Element Relative Display’ feature, one master display file may be used for an unlimited number of similar assets. Corporate level summary “drill down” screens make navigation easy via PI Process Book, or Internet Explorer using PI Web Parts.

Flexibility of the OSIsoft AF structure allows for value substitution whenever certain instrumentation may be unavailable. This substitution can take a number of forms including real-time calculation of the expected value based upon surrounding instrumentation, manual input via AF, manual input to a PI tag based on operator rounds, or any combination of manual and calculated inputs.

The Process Plugins™ solution has the capability of monitoring an unlimited number of assets, which could be added by the end user at any time in the future.

MORE ABOUT PROCESS PLUGINS™

OSIsoft’s PI System continues to be the industry standard in data historians, which has been the core of its 21st century real-time infrastructure platform. And now this platform comes fully loaded with every feature necessary to support all of your needs for monitoring, modeling, diagnostics, or forecasting without the need for any 3rd party software. That’s where the Process Plugins™ package comes in.

Process Plugins™ is not 3rd party software. The Process Plugins™ package customizes your OSIsoft platform for your plant. This is the only existing solution if you want:

1. No unnecessarily redundant PI tags
2. No 3rd party software
3. One Microsoft certified package with seamless integration of calculations and models
4. Web browser interface capability
5. Ability to drill down into calculations to see (or edit) exactly what they’re doing

PI System Explorer

File Edit View Go Tools Help

Database Query Date Back Check In New Element New Attribute Search

Elements

- Environment
- Fuel
- TrainA
 - FWPump
 - Gas Turbine
 - Compressor
 - Exhaust
 - FuelMixture
 - HeatRate
 - Output
 - PPI_WriteToPI1
 - PPI_WriteToPI2
 - Generator
 - PPI_CurveTableXY
 - PPI_CurveTableZXY
 - PPI_DrawPlot
 - PPI_DrawPolar
 - PPI_WriteToPI_Alarm
 - PPI_WriteToPI_AP
 - PPI_WriteToPI_PF
 - HRSG
 - Stack
 - EPA
- TrainB
 - FWPump
 - Gas Turbine

Generator

General Child Elements Attributes Ports Version

Filter

Name	Value
AirInletTemp	90.60548 °F
AirInTemp1	92.03717 °F
AirInTemp2	89.17378 °F
AlarmDisplay	ALARM
AlarmNormal	0
ApparentPower	38.95505 MVA
DisplayHeader	SAN GANDO GE...
GrossGeneration	34.87549 MW
PowerFactor	0.8952751
ReactivePower	-17.35501 MVAR
Theta	-0.4617481 rad

Group by: Category

Name: ApparentPower

Description:

Configuration Item:

Categories:

UOM: MVA

Value Type: Single

Value: 38.95505 MVA

Data Reference: Formula

Settings...

A=GrossGeneration,B=ReactivePower,[(A^2+B^2)^0.5];UOM=MVA

ApparentPower

The Process Plugins™ package resides primarily within OSIsoft's PI Asset Framework (PI-AF). Your plant customization exists in the form of *elements* which handle most of your basic performance calculations. Using PI System Explorer, system administrators can view, modify, or enhance elements as desired.

Element Formulas

The screenshot shows a 'Formula Configuration' dialog box for 'ApparentPower'. It is divided into two main sections: 'Parameters' and 'Equations'. The 'Parameters' section contains two entries: 'A=GrossGeneration' and 'B=ReactivePower'. The 'Equations' section contains the formula $(A^2+B^2)^{0.5}$. Below these sections is a checkbox for 'Default Values Allowed'. At the bottom, there is a 'Result' section with a 'Unit of Measure' dropdown set to 'MVA', and empty fields for 'Minimum' and 'Maximum'. An 'Evaluate' button is present, and the result field displays '37.1373572501292 MVA'. The dialog also has 'OK' and 'Cancel' buttons at the bottom.

Formula Configuration:(ApparentPower)

Parameters

A=GrossGeneration
B=ReactivePower

Equations

$(A^2+B^2)^{0.5}$

Default Values Allowed

Result

Unit of Measure: MVA Minimum: Maximum:

Evaluate 37.1373572501292 MVA

OK Cancel

Fundamental performance calculations exist as formulas within elements.

Element Templates

The screenshot displays the 'PPI - PI System Explorer' application window. The interface is divided into several sections:

- Library:** A list of element templates on the left, with 'PPIstmSI_VTL' selected and highlighted in blue.
- General Tab:** The main configuration area for the selected template. It includes a search bar and a table listing the template's attributes.
- Attribute Configuration:** A panel on the right for configuring the selected attribute, 'InputT'. It includes fields for Name, Description, UOM, Value Type, and Data Reference.
- Search Panel:** A search bar on the far right with a list of search criteria: Formula, PI Point, PI Point Array, and Table Lookup.

The 'Attribute Configuration' panel for 'InputT' shows the following settings:

- Name: InputT
- Description: Temperature
- Configuration Item:
- Categories: [Empty field]
- UOM: °C
- Value Type: Single
- Default Value: 0 °C
- Data Reference: Formula

The 'Settings...' button is visible below the configuration fields. The formula field contains the text: `A=..\|Temperature;UOM=°C;[A]`

The status bar at the bottom indicates: PPIstmSI_VTL Modified:2/14/2009 5:04:04 PM.

The Process Plugins™ package comes with a complete set of “Drag & Drop” Element Templates for use in PI-AF. Some routines utilize the Process Plugins™ Windows service, which delivers results back to an element.

Lookup Tables

GasProperties							
General	Table	Define Table	Version				
GasProperties							
	Name	Molecule	MolWeight	HHVdry	LHVdry	SpecHeatRati	SpecHeatCp
	Acetylene	C2H2	26.03728	1488	0	1.232	1.69
	Air	AIR	28.963	0	0	1.4	1.01
	Ammonia	NH4	18.03846	0	0	1.31	2.19
	Argon	Ar	39.948	0	0	1.667	0.52
▶	n-Butane	C4H10	58.123	3392	3131	1.094	1.67
	i-butane	C4H10	58.123	3392	3131	1.094	1.67
	Carbon Dioxide	CO2	44.01	0	0	1.289	0.844
	Carbon Monoxide	CO	28.01	321	321	1.4	1.02
	Chlorine	Cl2	70.906	0	0	1.34	0.48
	Ethane	C2H6	30.07	1789	1636	1.187	1.75
	Ethylene	C2H4	28.05316	1614	1485	1.24	1.53
	Helium	He	4.002602	0	0	1.667	5.19
	Heptanes	C7H16	100.204	5502.5	5100	1.05	0
	Hexanes	C6H14	86.177	4755.9	4403.8	1.06	0
	Hydrogen	H2	2.016	325	273.8	1.405	14.32
	Hydrochloric Acid	HCl	36.46094	0	0	1.41	0.8
	Hydrogen Sulfide	H2S	34.08	647	596	1.32	1.017
	Hydroxyl	OH	17.00734	0	0	1.384	1.76
	Methane	CH4	16.043	1014	913	1.304	2.22
	Methyl Chloride	CH2Cl	49.47958	0	0	1.2	1.005
	Nitric Oxide	NO	30.0061	0	0	1.386	0.995
	Nitrogen	N2	28.013	0	0	1.4	1.04
	Nitrous Oxide	N2O	44.0128	0	0	1.27	0.88
	Oxygen	O2	31.999	0	0	1.395	0.919
	n-Pentane	C5H12	72.15	4200	3884	1.07	0
	i-pentane	C5H12	72.15	4200	3884	1.07	0
	Propane	C3H8	44.097	2573	2367	1.127	1.67
	Propylene	C3H6	42.07974	2383	2192	1.15	1.5
	Sulphur Dioxide	SO2	64.0638	0	0	1.29	0.64

The Process Plugins™ package comes with both industry standard and site specific tables which are used by elements for lookup functions as well as interpolation.

Data Storage

The screenshot displays the 'PPI - PI System Explorer' application window. The interface is divided into several panes:

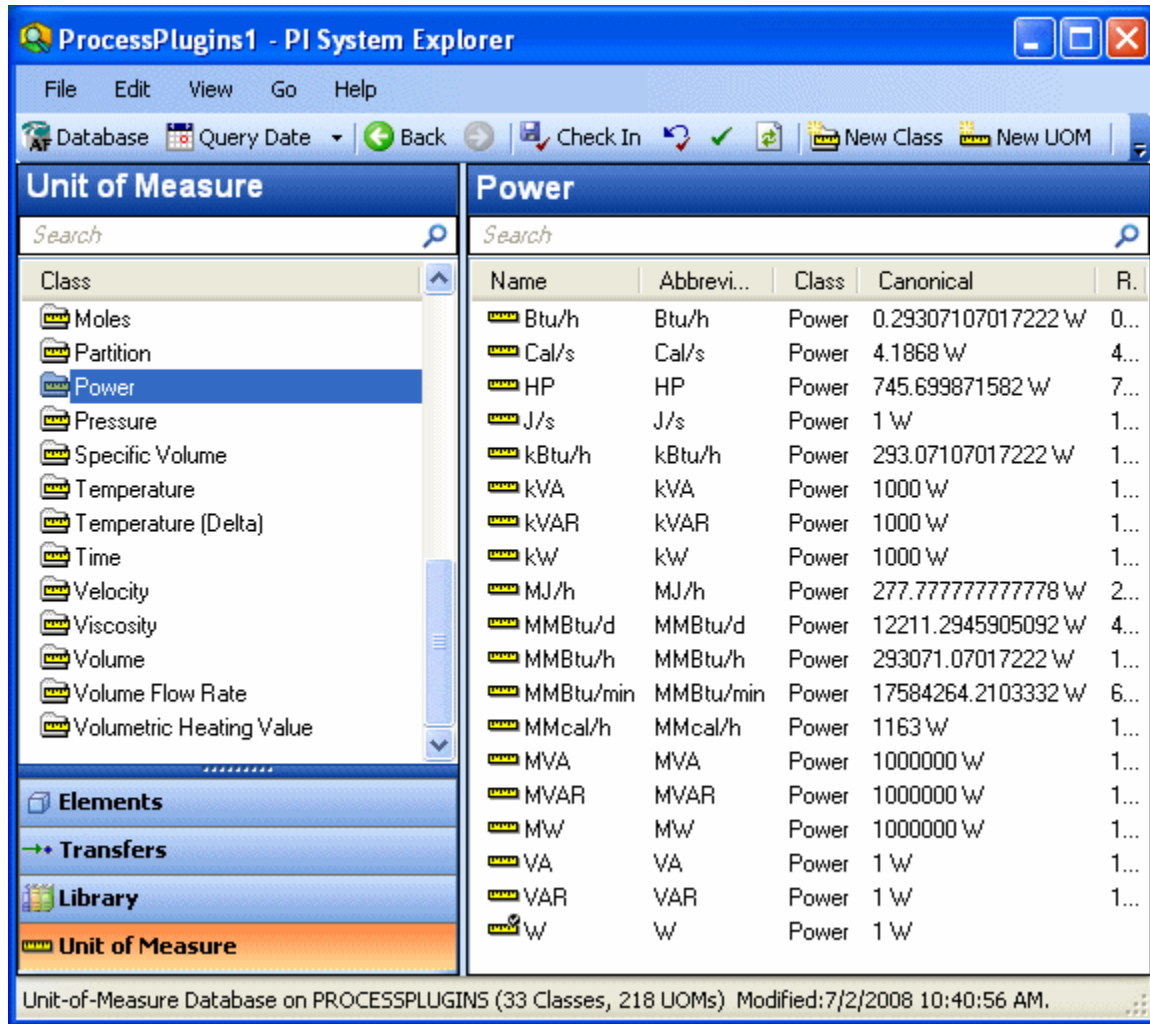
- Elements:** A tree view on the left showing a hierarchy of elements. The 'Performance' folder is expanded, and 'PPI_WriteToPI' is selected.
- Attributes:** A central pane showing the configuration for the selected 'PPI_WriteToPI' element. It includes a table with the following data:

Name	Value
Formula	6508.577
PIPoint	6508.572
- Properties:** A right-hand pane with various configuration fields for the 'PIPoint' attribute:
 - Name: PIPoint
 - Description: (empty)
 - Configuration Item:
 - Categories: (empty)
 - UOM: <None>
 - Value Type: Single
 - Value: 6508.572
 - Data Reference: PIPoint
- Search:** A list on the far right showing search results for various 'PPIStmEng' tags, including HPS, HPT, HPX, HsatP, HsatT, HTL, PsatT, SPH, SPT, SPTL, SPX, SsatP, SsatT, TPH, TPS, TsatP, VPH, VPS, VPT, VPTL, VsatP, and VsatT.

The status bar at the bottom of the window displays 'PIPoint'.

Key resultant data generated by Process Plugins™ modules are stored in the OSIsoft PI historian. Process Plugins™ modules do not store redundant or unnecessary data, but only a handful of PI tags for key results.

Units of Measure



ProcessPlugins1 - PI System Explorer

File Edit View Go Help

Database Query Date Back Check In New Class New UOM

Unit of Measure

Search

- Class
- Moles
- Partition
- Power**
- Pressure
- Specific Volume
- Temperature
- Temperature (Delta)
- Time
- Velocity
- Viscosity
- Volume
- Volume Flow Rate
- Volumetric Heating Value

Power

Search

Name	Abbrevi...	Class	Canonical	R.
Btu/h	Btu/h	Power	0.29307107017222 W	0...
Cal/s	Cal/s	Power	4.1868 W	4...
HP	HP	Power	745.699871582 W	7...
J/s	J/s	Power	1 W	1...
kBtu/h	kBtu/h	Power	293.07107017222 W	1...
kVA	kVA	Power	1000 W	1...
kVAR	kVAR	Power	1000 W	1...
kW	kW	Power	1000 W	1...
MJ/h	MJ/h	Power	277.777777777778 W	2...
MMBtu/d	MMBtu/d	Power	12211.2945905092 W	4...
MMBtu/h	MMBtu/h	Power	293071.07017222 W	1...
MMBtu/min	MMBtu/min	Power	17584264.2103332 W	6...
MMcal/h	MMcal/h	Power	1163 W	1...
MVA	MVA	Power	1000000 W	1...
MVAR	MVAR	Power	1000000 W	1...
MW	MW	Power	1000000 W	1...
VA	VA	Power	1 W	1...
VAR	VAR	Power	1 W	1...
W	W	Power	1 W	1...

Unit-of-Measure Database on PROCESSPLUGINS (33 Classes, 218 UOMs) Modified:7/2/2008 10:40:56 AM.

The Process Plugins™ package includes a complete set of engineering units utilized by the utility industry for use with the PI AF Unit of Measure (UOM) system. PI-AF automatically performs unit conversions on demand and delivers results in either the U.S. English or S.I. engineering unit systems.



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