

EMPOWER YOUR ANALYTICS WITH OPERATIONAL DATA  
2019 OSISOFT NEW DELHI SEMINAR

# Asset Framework, Asset Analytics, and Visual Analytics for Critical Operations

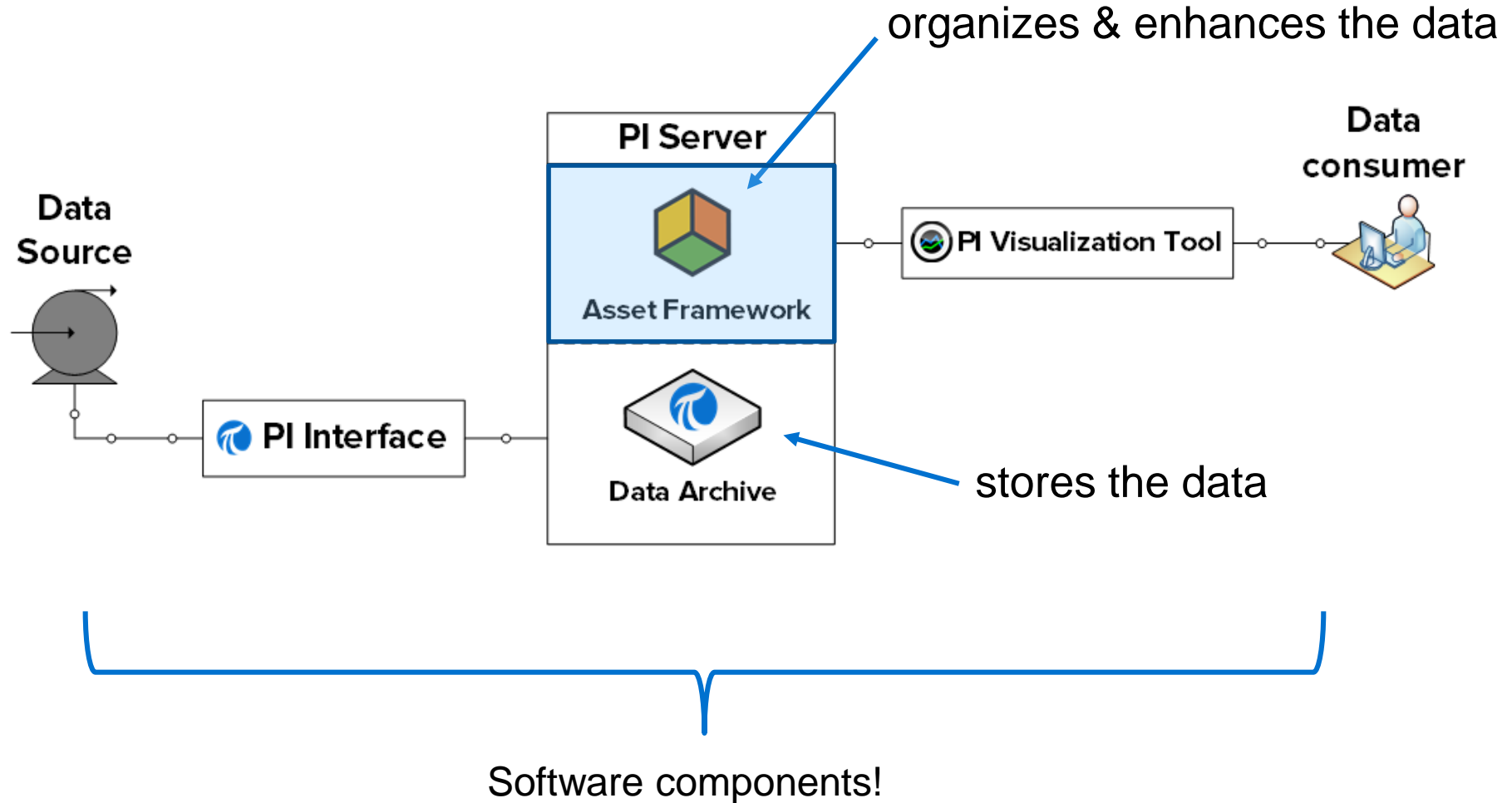
*Michael Luo (Regional Services Manager)*

*Wednesday, 16-Oct-2019*

# Agenda

1. Why is Asset Framework (AF) important for analytics?
2. What are the key features of AF?
3. Where do you utilize Asset Analytics?
4. Use Case (Yasref)

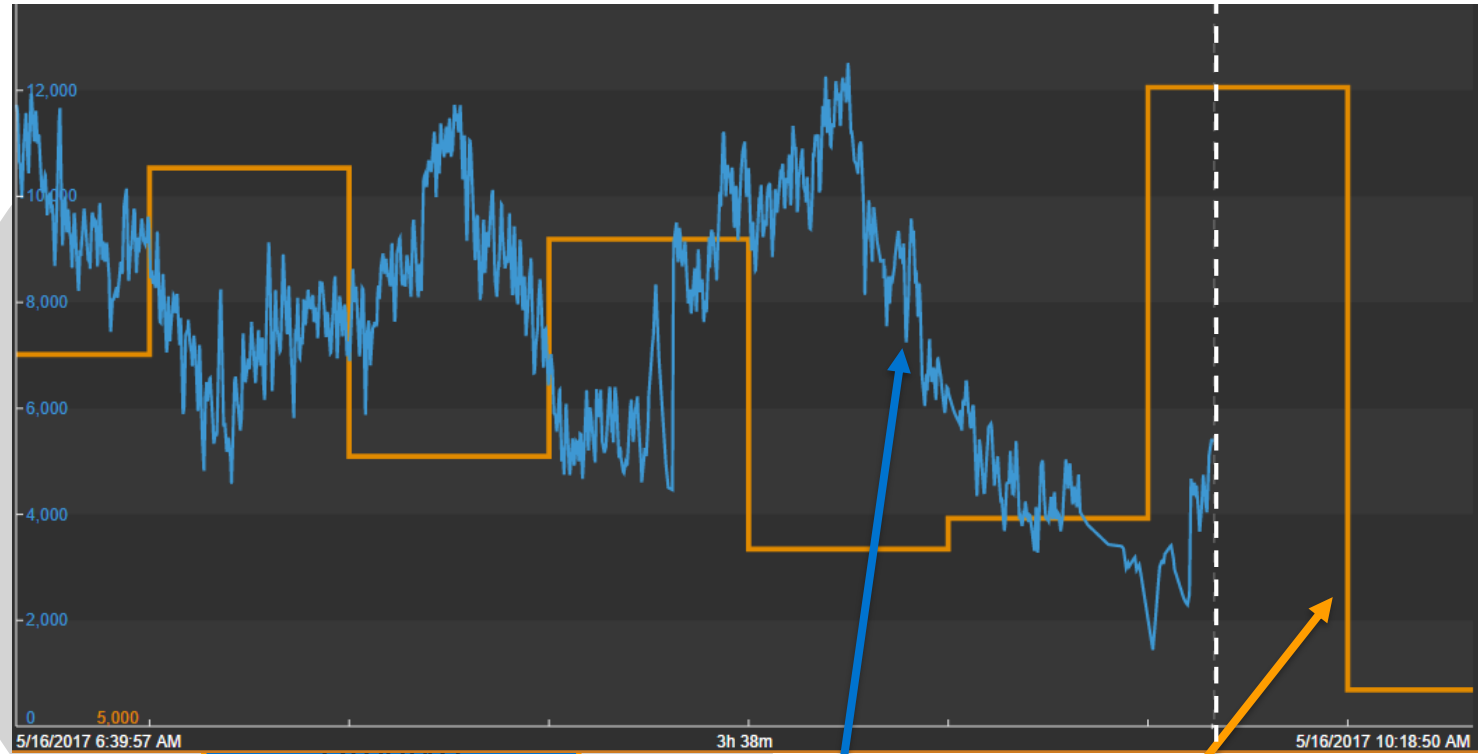
# Basic components of a PI System



# PI System Infrastructure



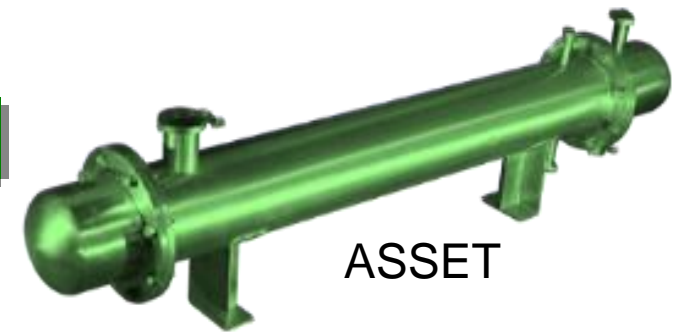
PI Interfaces & PI Connectors



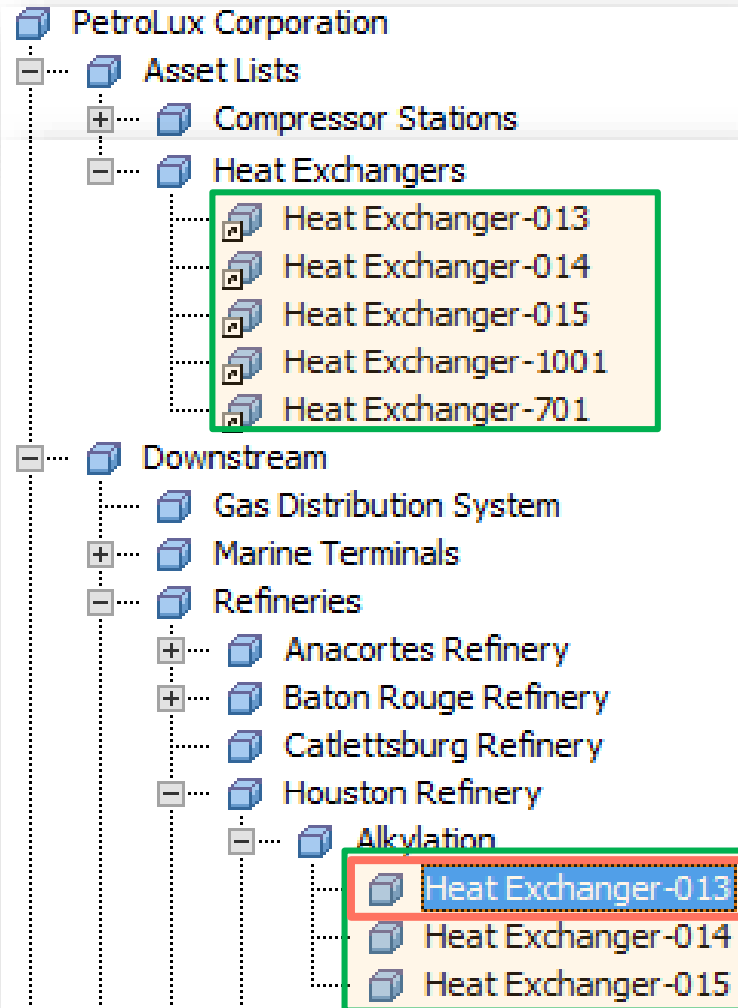
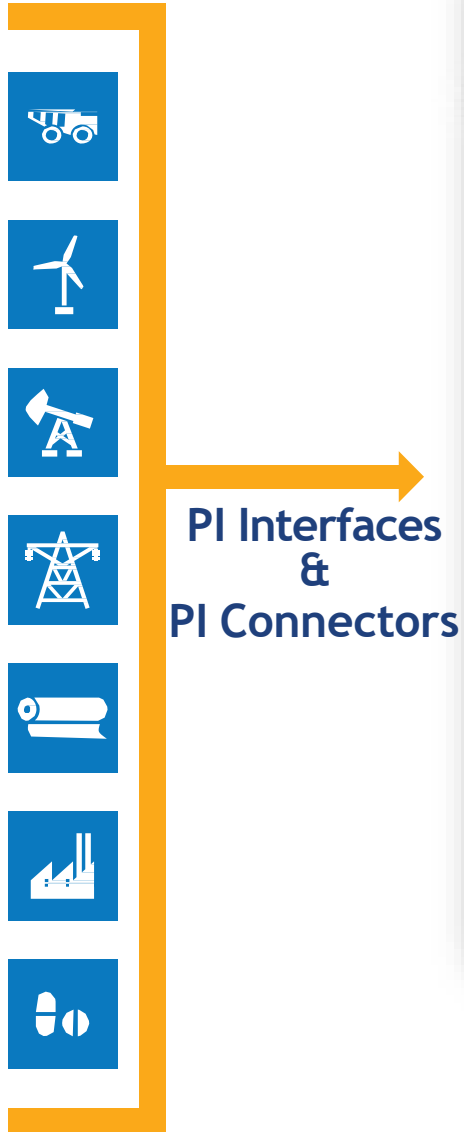
PI Server

TAG	TIME	VALUE	STATUS
HE013.HSOT.PV	11/6/2019 2:39:50 PM	205.99	GOOD
HE013.HSOT.FV	11/6/2019 2:39:50 PM	210.15	GOOD

# PI System Infrastructure - Enhancement



ASSET



PI Server

Category: ProcessData	
Hot Side Outlet Temperature	205.99 °F
Category: Forecast	
Expected Hot Side Outlet Temp.	210.15 °F

TAG	TIME	VALUE	STATUS
HE013.HSOT.FV	11/6/2019 2:39:50 PM	205.99	GOOD
HE013.HSOT.FV	11/6/2019 2:39:50 PM	210.15	GOOD

# Asset Framework (AF)



- **Object Oriented Contextual Abstraction Layer**

Templatised and server based

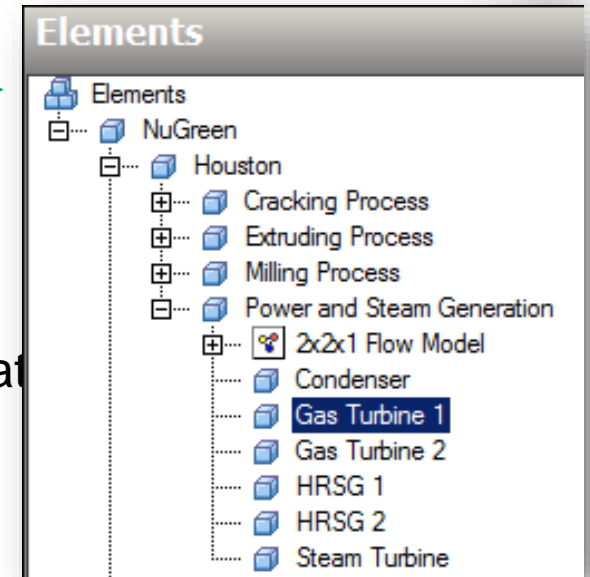
- **It allows the PI System to:**

Contextualized and Manage your assets in a scalable and extensible data model

Search data coming from different PI Servers

Access non time series data sources

Integrate with analysis and notification tools



Name	Value
Density	3.422 kg/L
Level	37.9689865112305 ft
Manufacturer	ACME HX Corp
Serial Number	90122323-112
Photo	SetFolderPermission.log
Mass	365.679412628174 kg
Product	HC1500
Volume	106.861312866211 m3

# PI System Infrastructure - Enhancement



Category: Material Properties

Shell Side Heat Capacity	0.95 Btu/lb/F
Shell Side Material	WX1000

PI Int  
PI Con

PI Data  
Archive

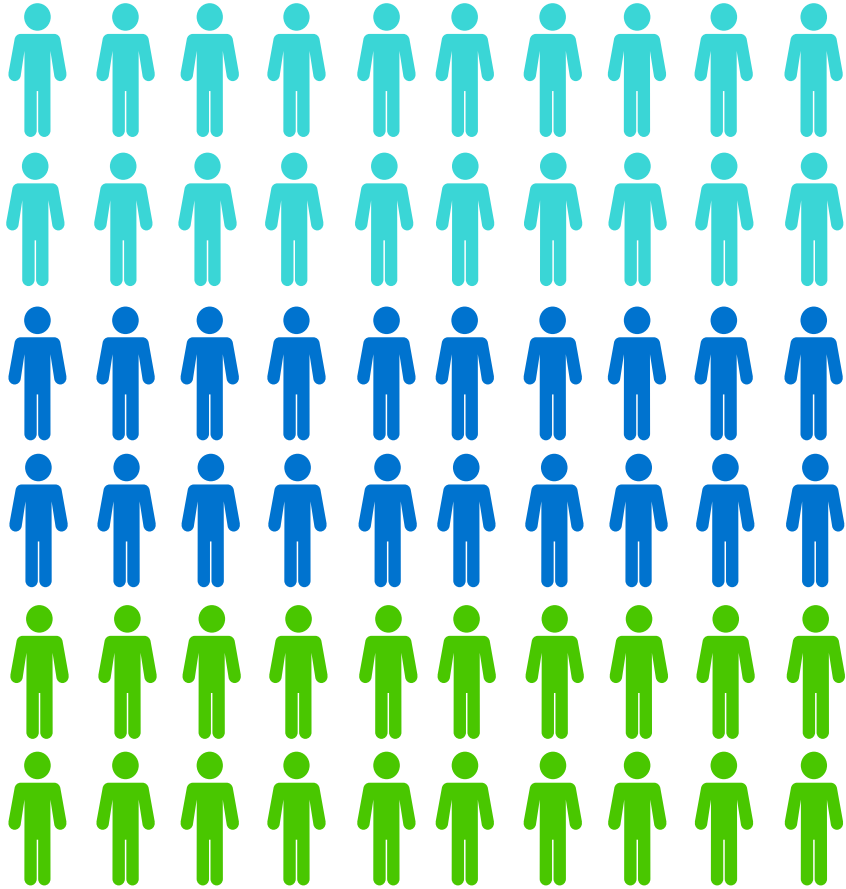
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HE013.HSOT.FV	11/6/2019 2:39:50 PM	210.15	GOOD

# OSIsoft: Self-service Analytics to Operations

## Operations



## Your Experience and Knowledge



### Analytics:

- Equipment efficiency
- Pre-failure warning
- KPI
- etc.



# Asset Analytics

## Complex Calculations

Name	Expression	Value at Evaluation	Value at Last Trig	Output Attribute
DeltaTCold	// Cold fluid temperature difference (shell side) in delta degF 'Cold Side Outlet Temperature'-'Cold Side Inlet Temperature'	44.69	44.69	Cold Side Temperature Difference
DeltaTHot	// Hot fluid temperature difference (tube side) in delta degF 'Hot Side Inlet Temperature'-'Hot Side Outlet Temperature'	89.084	89.084	Hot Side Temperature Difference
ColdFluidFlow	// Cold fluid mass flow in lb/s (shell side) Convert('Shell Side Volume Flow', "ft3/s")*Convert('Shell Side Density', "lb/ft3")	299.07	299.07	Shell Side Mass Flow
HotFluidFlow	// Hot fluid mass flow in lb/s (tube side) Convert('Tube Side Volume Flow', "ft3/s")*Convert('Tube Side Density', "lb/ft3")	361.83	361.83	Tube Side Mass Flow
HeatDutyCold	// Heat duty cold side (shell side) [delta degF * lb/s * Btu/lb/degF]->btu/s Convert((DeltaTCold*ColdFluidFlow*Shell Side Heat Capacity'), "Btu/s")	12697 Btu/s	12697 Btu/s	Heat Duty Shell Side
HeatDutyHot	//Heat duty hot side (tube side) [delta degF * lb/s * Btu/lb/degF]->btu/s Convert((DeltaTHot*HotFluidFlow*Tube Side Heat Capacity'), "Btu/s")	28527 Btu/s	28527 Btu/s	Heat Duty Tube Side
R	//Capacity Ratio 'Hot Side Temperature Difference'/'Cold Side Temperature Difference'	2.0134	2.0134	Capacity Ratio
S	//Effectiveness 'Cold Side Temperature Difference'/'Hot Side Inlet Temperature'-'Cold Side Inlet Temperature'	0.19455	0.19455	Effectiveness
LMTD	((('Hot Side Inlet Temperature'-'Cold Side Outlet Temperature')-'Hot Side Outlet Temperature')/ln((('Hot Side Inlet Temperature'-'Cold Side Outlet Temperature')/('Hot Side Inlet Temperature'-'Cold Side Inlet Temperature'))/((('Hot Side Inlet Temperature'-'Cold Side Outlet Temperature')/('Hot Side Inlet Temperature'-'Cold Side Inlet Temperature'))/('Hot Side Inlet Temperature'-'Cold Side Inlet Temperature'))))	160.8	160.8	LMTD
F	//Correction Factor to account for Cross flow (sqr(R+1)*Log((1-S*R)/(1-S)))/((1-R)*Log((2-S*(R+1-sqr(R+1)))/(2-S*(R+1+sqr(R+1)))))	0.98711	0.98711	LMTD Correction Factor
CorrectedLMTD	F*LMTD	158.72	158.72	Corrected LMTD
S	Convert('Heat Duty Shell Side', "Btu/h")	4.5623E+07 Btu/h	4.5623E+07 Btu/h	Map
T	Convert('Heat Duty Tube Side', "Btu/h")	1.0222E+08 Btu/h	1.0222E+08 Btu/h	Map
M	Max(S,T)	1.0222E+08	1.0222E+08	Map
U	if ('Heat Transfer Area' > 0 and 'Corrected LMTD' > 0) then M/('Heat Transfer Area')	226.51	226.51	Overall Heat Transfer Coefficient

Add a new variable

Evaluation Time: 5/15/2017 7:32:58 PM Last Trigger Time: 5/15/2017 7:32:35 PM

Scheduling:  Event-Triggered  Periodic

Trigger on: Any Input

Connected to the PI Analysis Service.

## Forecasts

Name	Expression	Value at Evaluation	Value at Last Trig	Output Attribute
forecastedVolume	TagVal('... StorageVolume-Predicted')	12.967	12.954	Map
forecastedKwh	3220*forecastedVolume	41754	41712	KWhModel 1
interruptiblePeriodLengthRatio	('Transform			
forecastedElectricityCost	(1-interruptiblePeriodLengthRatio)*interruptiblePeriodLengthRatio * forecastedKwh * Penalty)			

**Output Time Stamp**

Trigger Time

Execution Time

Relative to Trigger Time:

Add a new variable


Evaluation Time: 5/16/2017 4:59:01 PM Last Trigger Time: 5/16/2017 12:00:00 AM


Scheduling:  Event-Triggered  Periodic

Run every day at 12:00 AM

Output time stamp override: \*/+7d

Connected to the PI Analysis Service.

 **Category: KPI**

 **Overall Heat Transfer Coefficient** | 228 Btu/h/ft2/F

# Configure rollup calculations to ensure consistency across the hierarchy

The screenshot shows the PI System Explorer interface. On the left is a tree view of elements, with 'Black Mesa Wind Farm' expanded to show its sub-elements (GE01-GE10). The main window is titled 'Black Mesa Wind Farm' and has several tabs: 'General', 'Child Elements', 'Attributes', 'Ports', 'Analyses', 'Notification Rules', and 'Version'. The 'Analyses' tab is active, showing a list of analyses: 'Active Power Rollup', 'Daily Energy', 'Farm Power Forecast (1 Day)', and 'Farm Power Forecast (1h)'. The 'Active Power Rollup' analysis is selected, and its configuration is shown in the right pane. The 'Name' field is 'Active Power Rollup'. The 'Analysis Type' is set to 'Rollup'. Below this, there are options for 'Rollup attributes from' (Child elements of Black Mesa Wind Farm) and 'To select attributes set criteria below' (Attribute Name: Active Power, Attribute Level: Root Level). A table shows the function 'Sum' applied to 'Active Power' to produce 'Farm Total Powe'. A list of attributes is shown on the right, with 'Active Power' selected. At the bottom, the 'Scheduling' is set to 'Event-Triggered' and the 'Trigger on' is 'Any Input'. The status bar indicates 'Connected to the PI Analysis Service.'

Elements

- Generation
  - Equipment List
  - Fossil Generating Station
    - Matador 1 CCGT
  - OSIsoft Power
  - PowerCo
  - Solar Power Generation Fleet
  - Wind Power Generation Fleet
    - Big Buffalo Wind Farm
    - Black Mesa Wind Farm
      - GE01
      - GE02
      - GE03
      - GE04
      - GE05
      - GE06
      - GE07
      - GE08
      - GE09
      - GE10
    - Black Wolf Wind Farm
    - Deep Valley Wind Farm
    - Eldorado Wind Farm
    - Grand Ridge Wind Farm
    - White Bear Wind Farm
    - Wild River Wind Farm
    - Windy Valley Wind Farm
    - Yellow Creek Wind Farm
  - Wind Power Maintenance Crews
  - Windtopia
- Navigation Trees
- PI Data Archive
- Transmission and Distribution
- Weather
- Element Searches

Black Mesa Wind Farm

Analyses

Name
Active Power Rollup
Daily Energy
Farm Power Forecast (1 Day)
Farm Power Forecast (1h)

Rollup attributes from

To select attributes set criteria below

Attribute Name: Active Power

Attribute Level: Root Level

Attribute Category:

Element Category:

Element Template:

Select the function(s) to write to an attribute

Function	Output(s)	Value At Eval	Value At Last
<input checked="" type="checkbox"/> Sum	Farm Total Powe		
<input type="checkbox"/> Average			
<input type="checkbox"/> Minimum			
<input type="checkbox"/> Maximum			
<input type="checkbox"/> Count			
<input type="checkbox"/> Median			
<input type="checkbox"/> Population standard deviation			
<input type="checkbox"/> Sample standard deviation			

Sample Child Element: GE01

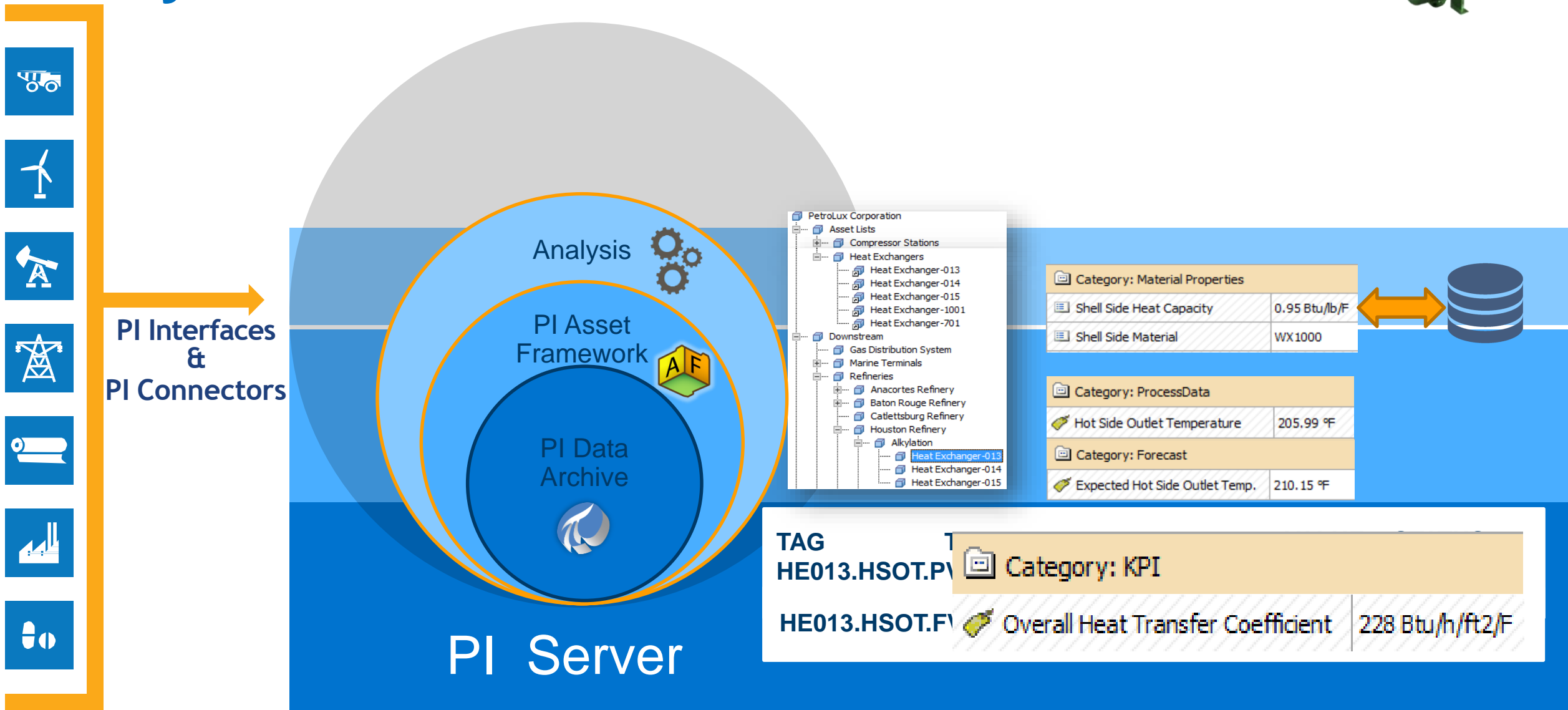
Name
Active Power
Apparent Power
Apparent Power (calc)
BatchWindBinFilter
Bearing A Temperature
Bearing B Temperature
Bearing Shaft Temperature
Blade 1 Error
Blade 2 Error
Blade 3 Error
Blade Total Error
Blade1, Actual Value
Blade1, Set Value
Blade2, Actual Value
Blade2, Set Value
Blade3, Actual Value
Blade3, Set Value
Capacity

Scheduling: Event-Triggered

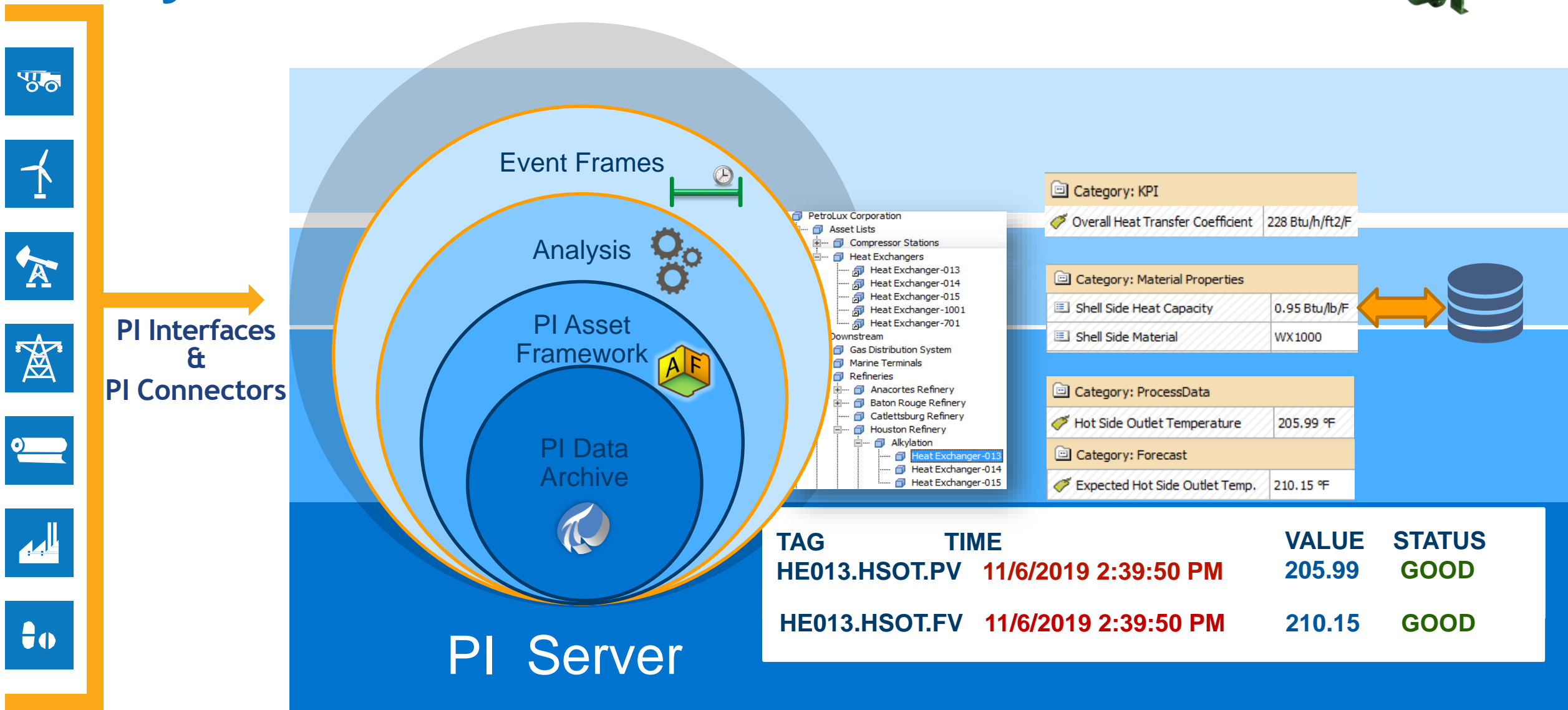
Trigger on: Any Input

Connected to the PI Analysis Service.

# PI System Infrastructure - Enhancement



# PI System Infrastructure - Enhancement



PI Interfaces & PI Connectors

PI Server

Category: KPI	
Overall Heat Transfer Coefficient	228 Btu/h/ft <sup>2</sup> /F
Category: Material Properties	
Shell Side Heat Capacity	0.95 Btu/lb/F
Shell Side Material	WX1000
Category: ProcessData	
Hot Side Outlet Temperature	205.99 °F
Category: Forecast	
Expected Hot Side Outlet Temp.	210.15 °F

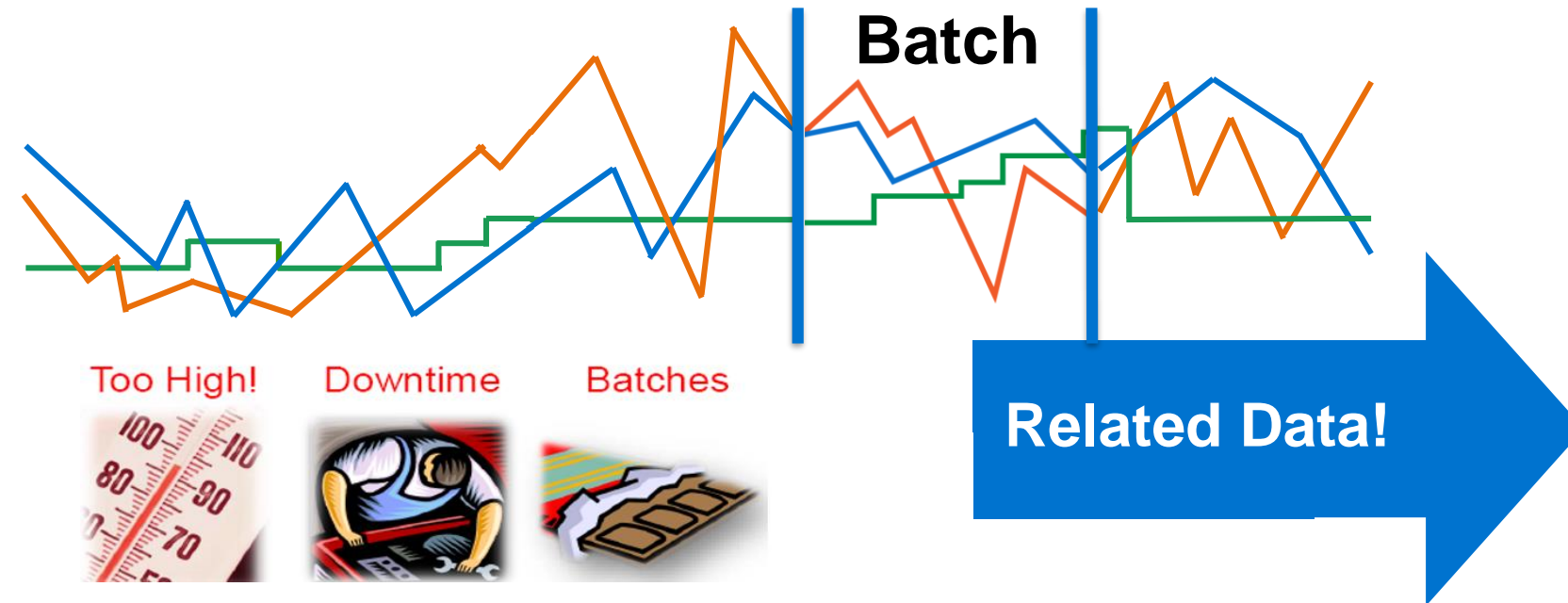
TAG	TIME	VALUE	STATUS
HE013.HSOT.PV	11/6/2019 2:39:50 PM	205.99	GOOD
HE013.HSOT.FV	11/6/2019 2:39:50 PM	210.15	GOOD

# Event Frames

## Event Frames Shorten the Time to Insight

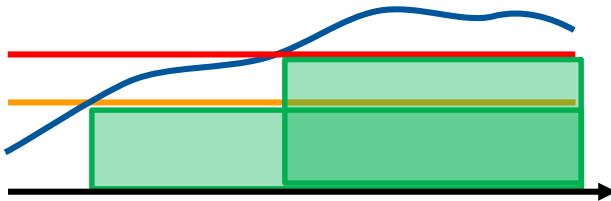
Event Frames automatically bookmarks PI time-series data so that it's more meaningful to engineers and business users, AND easier for them to find, analyze, and report on.

**Downtime  
Excursion  
Batch**



Event Attribute	Value
Name	TempExc B-352 2018-12-15
Start	15-Dec-2012 10:35:02
End	15-Dec-2012 10:47:26
Duration	12 min, 24 sec
Asset	Boiler-352
Excursion Type	High Violation
Fuel Gas Flow.Avg	37.12 k sft3/h
Fuel.Start	823.48 k sft3/ton
myPIKPI.Max	47.19 bbl/d

# Event Frames Generation



Event Frame Template: Heat Exchanger - Low Overall Heat Transfer Coefficient

Name	Expression	True for	Severity	Value at Evaluation	Value at Last Trigger
Start triggers					
Limit	'Fouling factor'>'Fouling factor Limit'	Set (optional)	Information	False	False
CriticalLimit	'Fouling factor'>'Fouling factor CriticalLimit'	Set (optional)	Critical	False	False
End trigger					
EndTrigger	Type an expression (optional)				

[Add a new variable](#) [Add a new start trigger](#) [Advanced Event Frame Settings...](#)

Evaluation Time: 5/16/2017 10:23:32 AM Last Trigger Time: 5/16/2017 10:23:05 AM

Multiple start triggers are configured. Child event frames will be generated when the trigger changes. See documentation for more details.

Scheduling:  Event-Triggered  Periodic

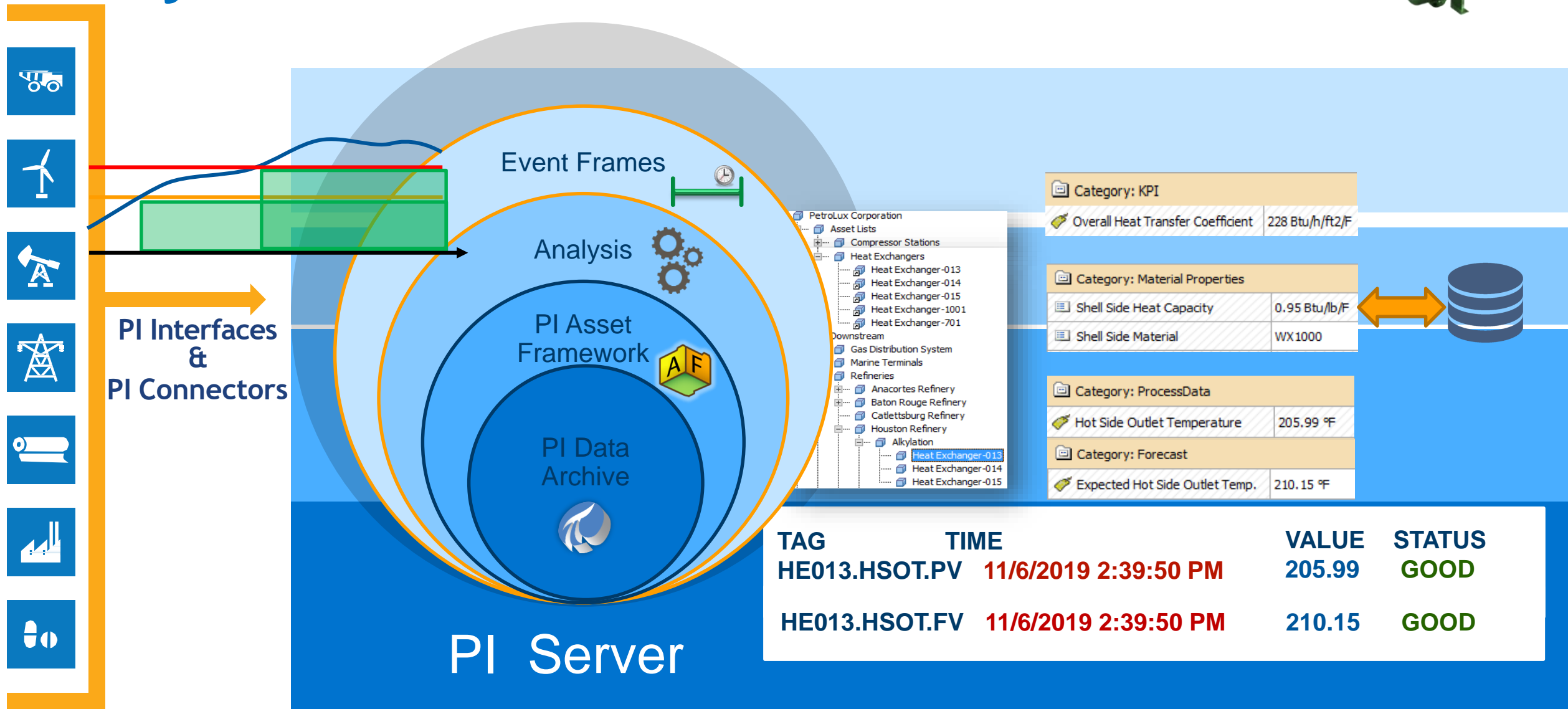
Trigger on: Any Input

Fouling Factor > Limit

Fouling Factor > Critical Limit

		Duration	Start-time	End-time	Severity
Heat Exchanger-013 - Low Overall Heat Transfer Coefficient		1:18:53:00	5/13/2017 9:5...	5/15/2017 ...	Critical
Heat Exchanger-013 - Low Overall Heat Transfer Coefficient		6:01:00	5/13/2017 9:5...	5/14/2017 ...	Information
Root Cause		1:0:00:00	5/12/2017 9:5...	5/13/2017 ...	None

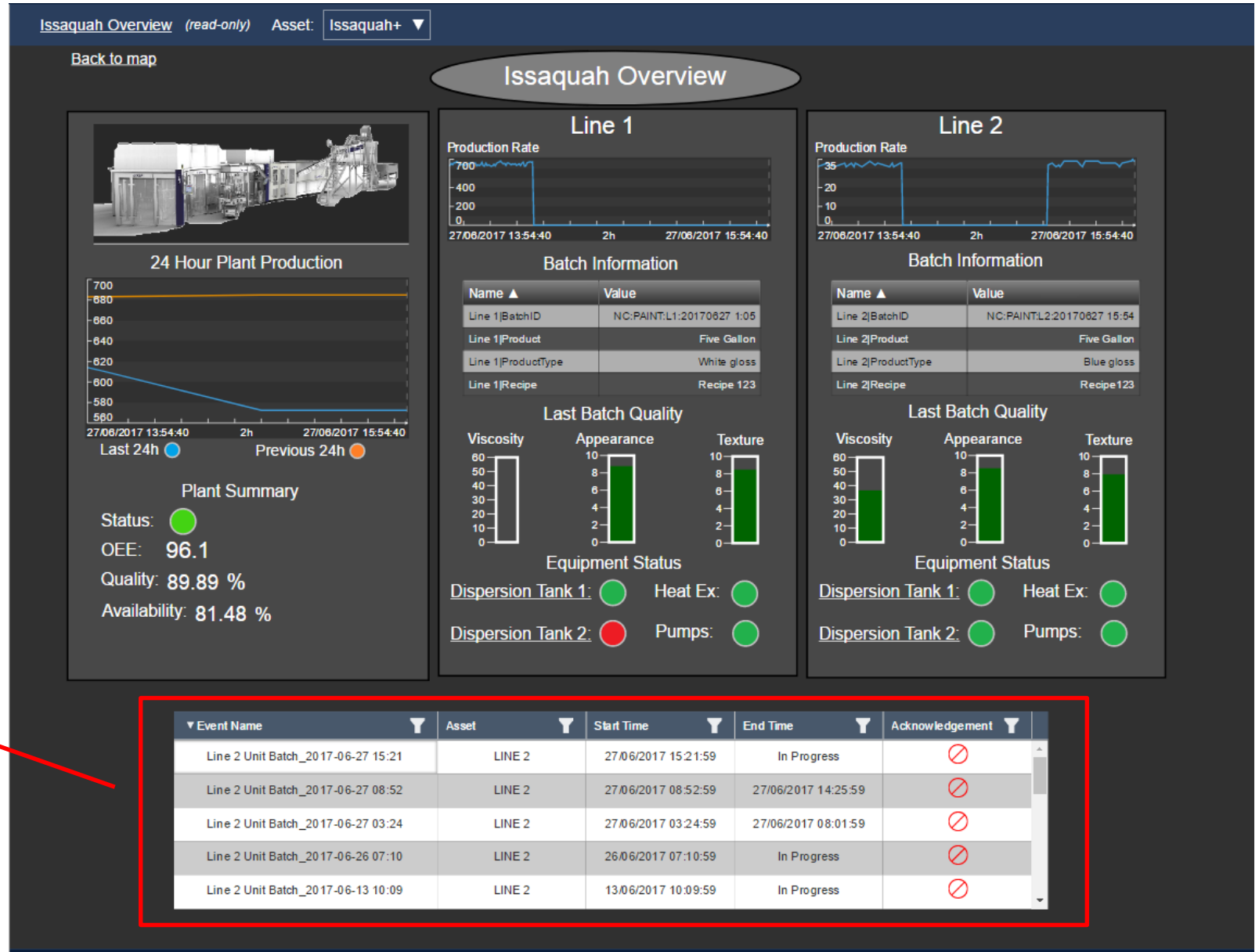
# PI System Infrastructure - Enhancement



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HE013.HSOT.FV	11/6/2019 2:39:50 PM	210.15	GOOD

# View events list on PI Vision Display







# Equipment Summary

- Overview
- Equipment**
- Pumps
- Report

	OEE	Pumps				Air Blowers	Heat Exchangers	Wet Gas Compressors
Anacortes							Overall U 198 Btu/h/ft2/F Heat Exchanger-013	
Baton Rouge							Overall U 219 Btu/h/ft2/F Heat Exchanger-014	
Houston							Overall U 198 Btu/h/ft2/F Heat Exchanger-015	
Martinez							Overall U 198 Btu/h/ft2/F Heat Exchanger-013	
Sarnia							Overall U 219 Btu/h/ft2/F Heat Exchanger-014	

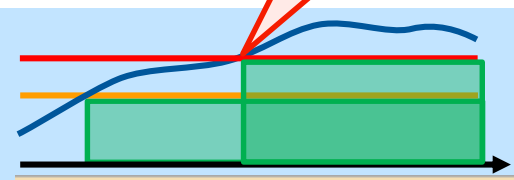
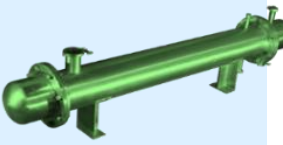


Ad Hoc Workspace



	Name	Description	Value	Units	Average	Minimum	Maximum	Top	Bottom
<input checked="" type="checkbox"/>	SLTC Floor Temp_Average	Average Floor Temperature	72.713	deg F	73.526	71.881	75.77	90	40
<input checked="" type="checkbox"/>	AC Unit 2 Discharge Air Temperature Active	Discharge Air Temperature Active	53.589	°F	61.788	47.686	85.463	90	40
<input checked="" type="checkbox"/>	AC Unit 2 Outdoor Air Temperature	Present Value	54.837	°F	56.839	44.002	74.604	90	40
<input checked="" type="checkbox"/>	AC Unit 2 Outdoor Air Flow	Present Value	16,282	ft3/m	4,974.4	0	19,680	20000	0
<input type="checkbox"/>	AC Unit 2 Cool Output 3	Present Value		1	1.1354	1	2		

# PI System Infrastructure - Enhancement

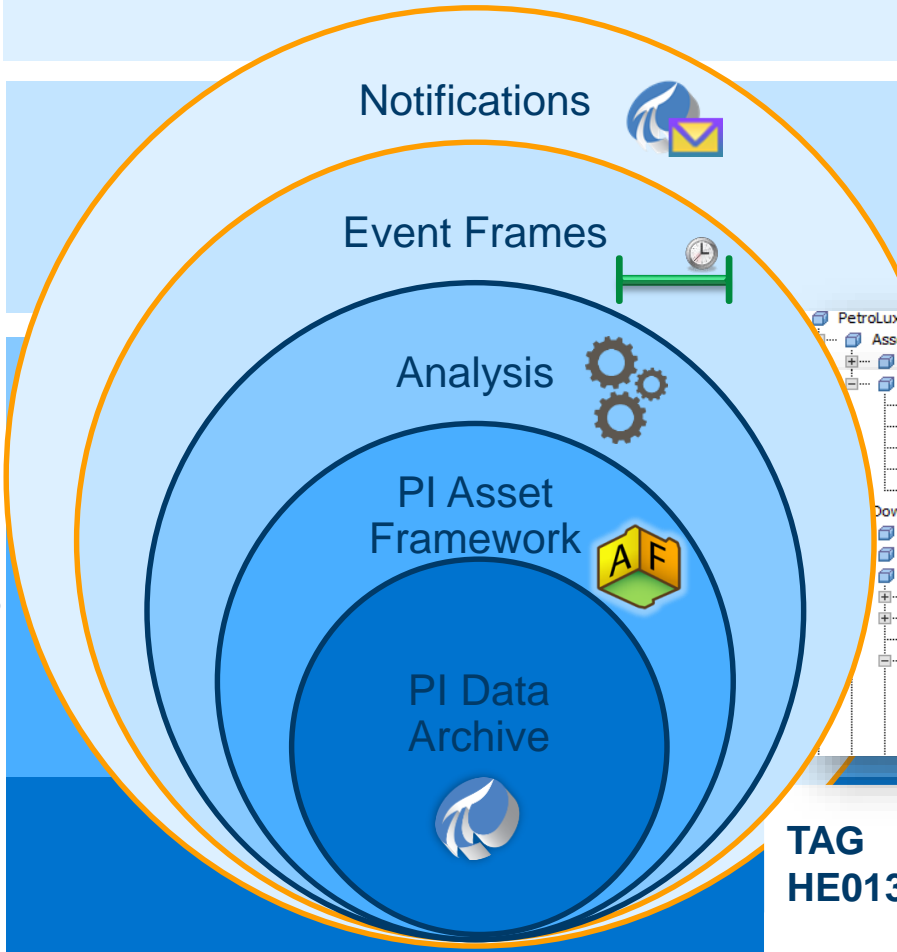


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- PetroLux Corporation
- Asset Lists
- Compressor Stations
- Heat Exchangers
  - Heat Exchanger-013
  - Heat Exchanger-014
  - Heat Exchanger-015
  - Heat Exchanger-1001
  - Heat Exchanger-701
- Downstream
  - Gas Distribution System
  - Marine Terminals
  - Refineries
    - Anacortes Refinery
    - Baton Rouge Refinery
    - Catlettsburg Refinery
    - Houston Refinery
  - Alkylation
    - Heat Exchanger-013
    - Heat Exchanger-014
    - Heat Exchanger-015

PI Interfaces & PI Connectors

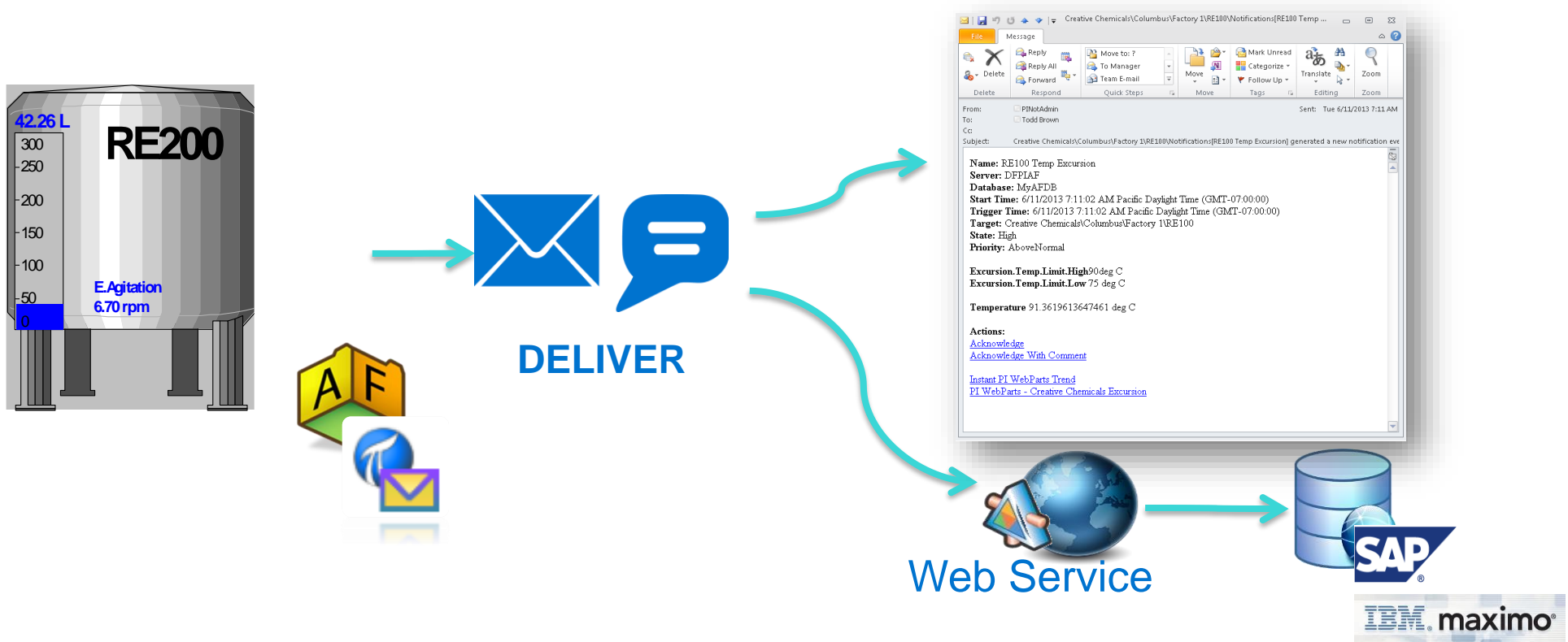
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# PI Notifications Keeps You Informed of Event/Asset Condition

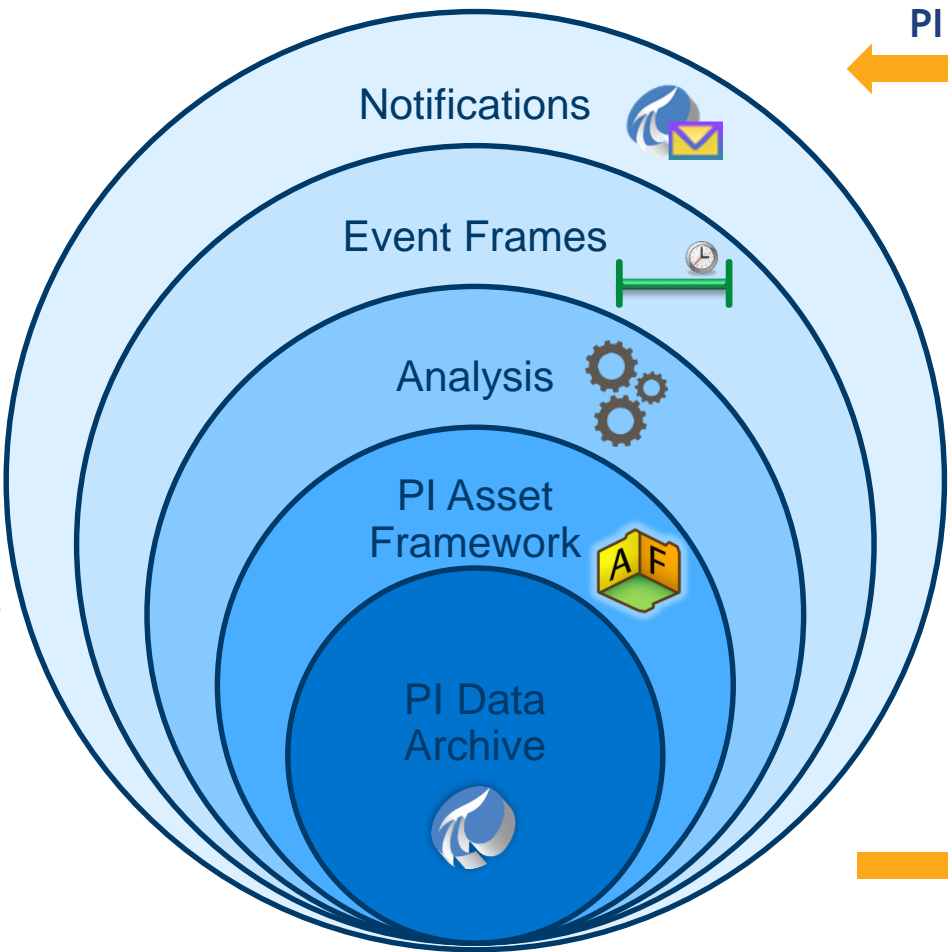
“One of turbine’s exhaust thermocouples has been acting up... Let’s keep an eye on it and create a work order for maintenance **if it fluctuates more than 5% in 5 seconds**. Make sure Bob is notified of this also.”



# PI System Infrastructure



PI Interfaces & PI Connectors



PI System Access



Line of Business Systems

PI Cloud Services



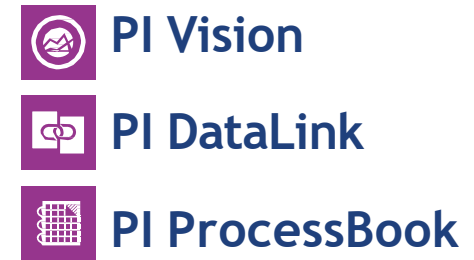
PI Cloud Connect

PI Integrators

Business Analytics

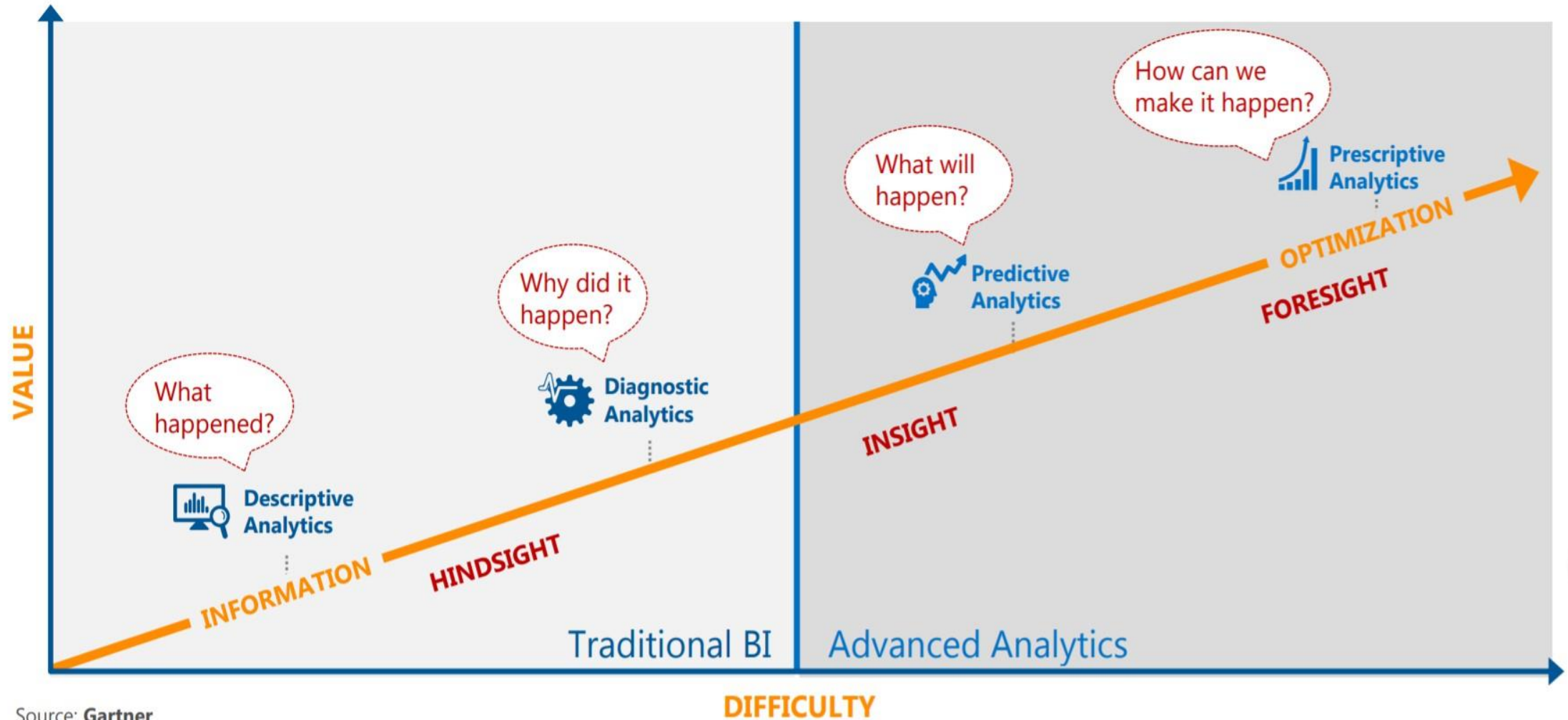


Visualization Tools



PI Server

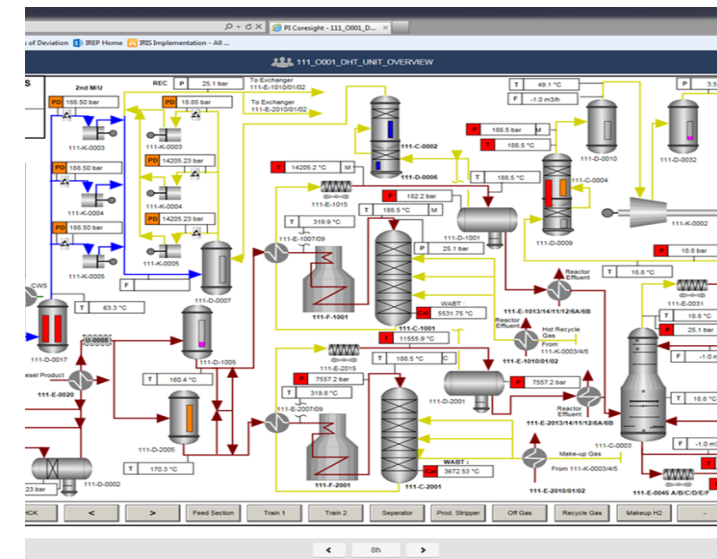
# The Analytics Evolution



# Most Advanced Refinery in the World

YASREF (Yanbu Aramco Sinopec refinery JV)

*“Selecting the PI System and EA early supported a smooth refinery start up and set the foundation for an integrated, collaborative data based decision making culture that supports YASREFs vision of being the most advanced refinery in the world by 2020.”*



Mahmoud M. Madani, IRIS Lead Project Engineer

## CHALLENGES

- 23 separate applications from a variety of vendors including DCS; aggressive grassroots schedule
- Lack of collaborative, data based decision making using standard DCS supplier approach
- Weak data and analytical foundation to enable OpEx and continuous improvement

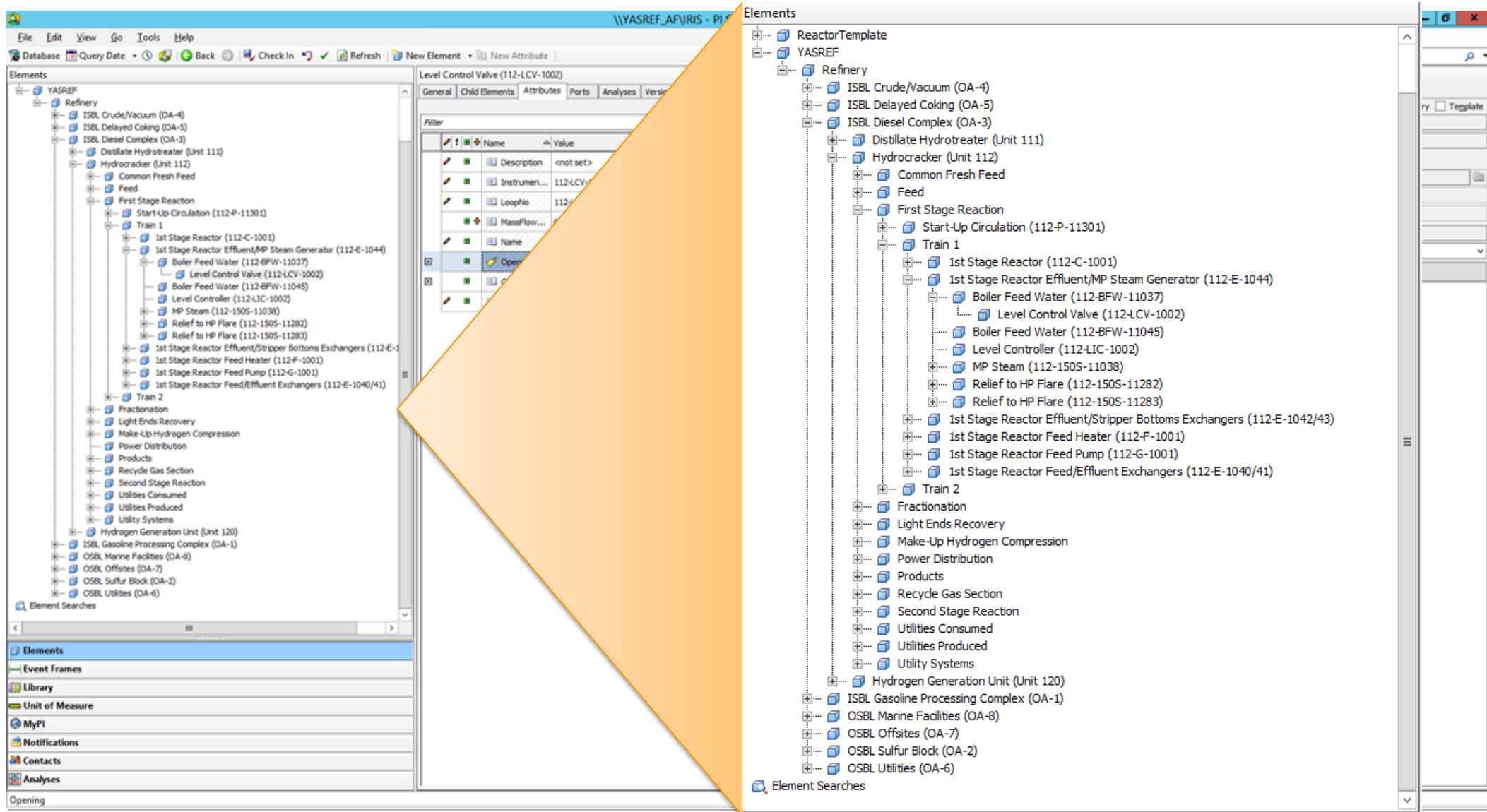
## SOLUTION

- YASREF strategically chose the PI System as an integration and applications infrastructure applications
- Migrated standalone applications to the infrastructure with PI AF
  - Used Microsoft platform to provide advanced web based reporting and decision support

## RESULTS

- Enabled a smooth refinery startup, reduction of over 50% of the standard applications
- All calculations and analytics done once in the infrastructure
  - Provided KPIs and performance reporting foundation for OpEx

# Asset Analytics with AF



The screenshot displays the AF (Asset Framework) software interface. The main window is titled "YASREF\_AF\IRIS - PI". The interface is divided into several panes:

- Left Pane (Elements):** A hierarchical tree view of the refinery assets. The "Refinery" node is expanded, showing sub-nodes like "ISBL Crude/Vacuum (OA-4)", "ISBL Diesel Complex (OA-3)", "Hydrocracker (Unit 112)", "Distillate Hydrotreater (Unit 111)", "Hydrogen Generation Unit (Unit 120)", and "ISBL Gasoline Processing Complex (OA-1)".
- Center Pane (Level Control Valve (112-LCV-1002)):** A detailed view of the selected element. It includes a "Filter" section and a table with columns "Name" and "Value". The table contains several rows of data, including "Description", "Instrument", "LoopNo", "MassFlow...", and "Name".
- Right Pane (Elements):** A second hierarchical tree view, similar to the left pane, showing the same refinery structure from a different perspective or with different filters applied.



# Multi-step Data Quality Assurance with AF

Data Quality is particularly important for regulatory and compliance reporting parameters. Users must be aware of the quality of the data they are basing their decisions on.

1

### Cleanse Raw Data

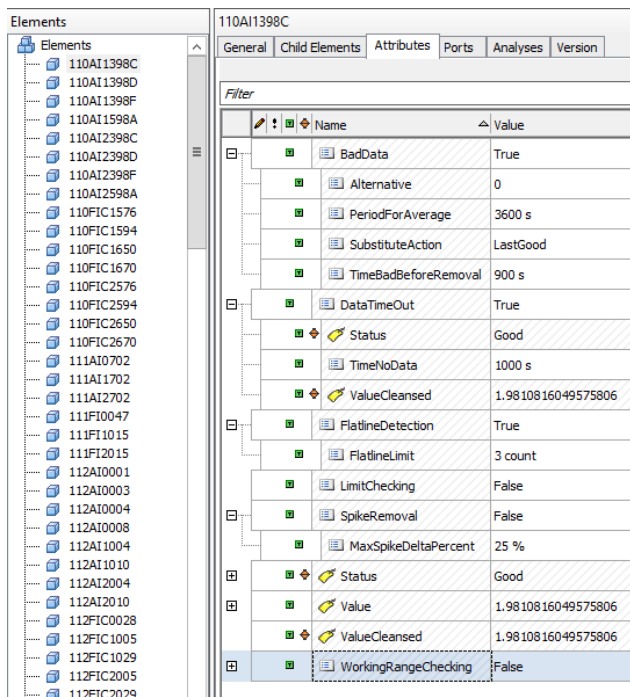
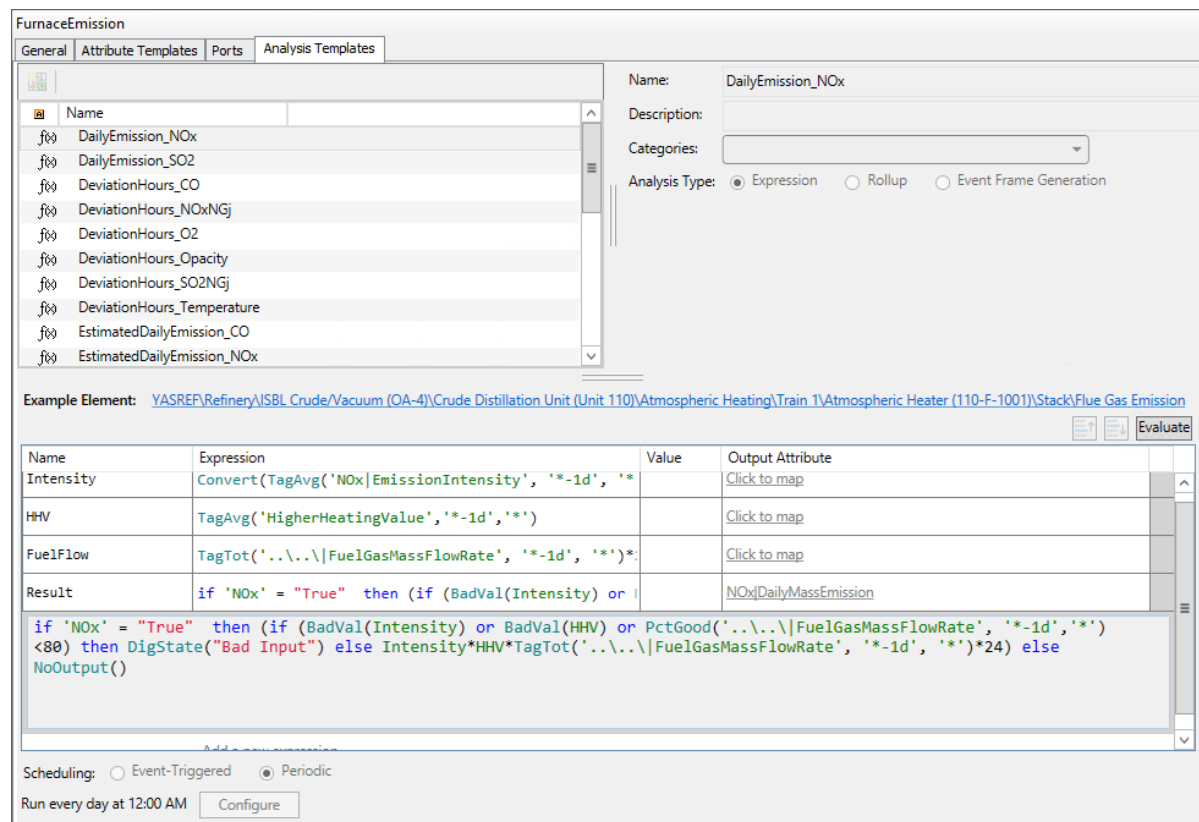
- Remove Spikes
- Check range
- Detect flat line
- Use alt source for bad data

2

Calculate confidence level based on percent of good data of all input parameters

3

Reject Calculated results with the Confidence level below a threshold (e.g. 80%)

Name	Expression	Value	Output Attribute
Intensity	Convert(TagAvg('NOx EmissionIntensity', '*-1d', '*'))		Click to map
HHV	TagAvg('HigherHeatingValue', '*-1d', '*')		Click to map
FuelFlow	TagTot('FuelGasMassFlowRate', '*-1d', '*')		Click to map
Result	if 'NOx' = "True" then (if (BadVal(Intensity) or BadVal(HHV) or PctGood('FuelGasMassFlowRate', '*-1d', '*') < 80) then DigState("Bad Input") else Intensity*HHV*TagTot('FuelGasMassFlowRate', '*-1d', '*')*24) else NoOutput()		NOx DailyMassEmission

# Emission Monitoring with AF (1 of 2)

Environmental



\\YASREF\_AF\IRIS - PI System Explorer (Administrator)

File Edit View Go Tools Help

Database Query Date Back Check In Refresh New Element

Flue Gas Emission

Elements

- YASREF
  - Refinery
    - ISBL Crude/Vacuum (OA-4)
    - ISBL Delayed Coking (OA-5)
      - Delayed Coker Unit (Unit 113)
        - Absorption/Stripping
        - Closed Blowdown
        - Coking
          - Anti-foam System (113-U-0022)
          - Coke Drum (113-D-0001)
          - Coke Drum (113-D-0002)
          - Coke Drum (113-D-0003)
          - Coke Drum (113-D-0004)
          - Coke Drum (113-D-0005)
          - Coke Drum (113-D-0006)
          - Coke Drum Unheating System (113-U-0031)
          - Coker Furnace (113-F-0001)
          - Coker Furnace (113-F-0002)
          - Coker Furnace (113-F-0003)
          - Air Preheater (113-E-0053)
            - Cell 1 (113-F-0003A)
            - Cell 2 (113-F-0003B)
            - Cell 3 (113-F-0003C)
            - Cell 4 (113-F-0003D)
          - Feed from Charge Pumps (113-P-13001)
          - Forced Draft Fan (113-K-0015)
          - Induced Draft Fan (113-K-0016)
          - Pilot Gas Feed (113-PTG-17306)
          - Stack
            - Flue Gas Emission
              - Lower Section
              - Upper Section
              - Velocity Steam
            - Drum Pressure Steam Purge Header (113-1505-16436)
            - Fractionator Pressure Steam Puger Header (113-1505-16437)
            - Fuel Gas Coalescer (113-D-0072)
            - Fuel Gas KO Drum (113-D-0020)
            - Furnace Charge Pumps (113-G-0001)
            - HP Velocity Steam Header (113-6005-16273)
            - Hydraulic Decoking System (113-U-0010)
            - Propane from Refinery (113-PTG-17306)
          - Debutanizing
          - Feed
          - LCGO and HCGO Production
          - Main Fractionation

Flue Gas Emission

General Child Elements Attributes Ports Analyses Version

Name	Backfilling
EstimatedDailyEmission_...	✓
EstimatedDailyEmission_...	✓
EstimatedDailyEmission_...	✓
EstimatedDailyEmission_...	✓
HourlyAverage_CO	✓
HourlyAverage_NOxNGj	✓
HourlyAverage_O2	✓
HourlyAverage_Opacity	✓
HourlyAverage_SO2NGj	✓
HourlyAverage_Tempera...	✓
PPMtoNGj_NOx	✓
PPMtoNGj_SO2	✓

Name: PPMtoNGj\_NOx

Description:

Categories:

Analysis Type:  Expression  Rollup  Event Frame Generation

Name	Expression	Value	Output Attribute
FD	'\\YASREF_AF\IRIS\YASREF\Refinery\OSBL Utilities (OA-6)\Fuel Gas System (U	2.75E-07 scm/J	<a href="#">Click to map</a>
M	'NOx EmissionIntensity ConversionFactor'	1.91E+06	<a href="#">Click to map</a>
O2	'O2 MolarFractionDryBasis'	2.3163 mole%	<a href="#">Click to map</a>
NOx	'NOx VolumeFraction'	59.629 ppmv	<a href="#">Click to map</a>
Result	if 'NOx' = "True" and 'NOx VolumeFraction' <>-1 then (if (BadVal(FD) or Bad	35.224	NOx EmissionIntensity

```

if 'NOx' = "True" and 'NOx|VolumeFraction' <>-1 then (if (BadVal(FD) or BadVal(M) or BadVal(O2) or BadVal('NOx|VolumeFraction'))
then DigState("Bad Input") else NOx*M*FD*(20.9/(20.9-02))) else NoOutput()
    
```

Add a new expression

Evaluated at 3/23/2015 5:02:03 PM

Scheduling:  Event-Triggered  Periodic

Trigger on: Any Input

Functions

Insert functions into the expression

All

- Abs
- Acos
- And
- Ascii
- Asin
- Atn
- Atn2
- Avg
- BadVal
- Bod
- Bom
- Bonn
- Ceiling
- Char
- Compare
- Concat
- Concat
- Count

Abs(number x)  
Return the absolute value of an integer or real number.  
Example: Abs(1)

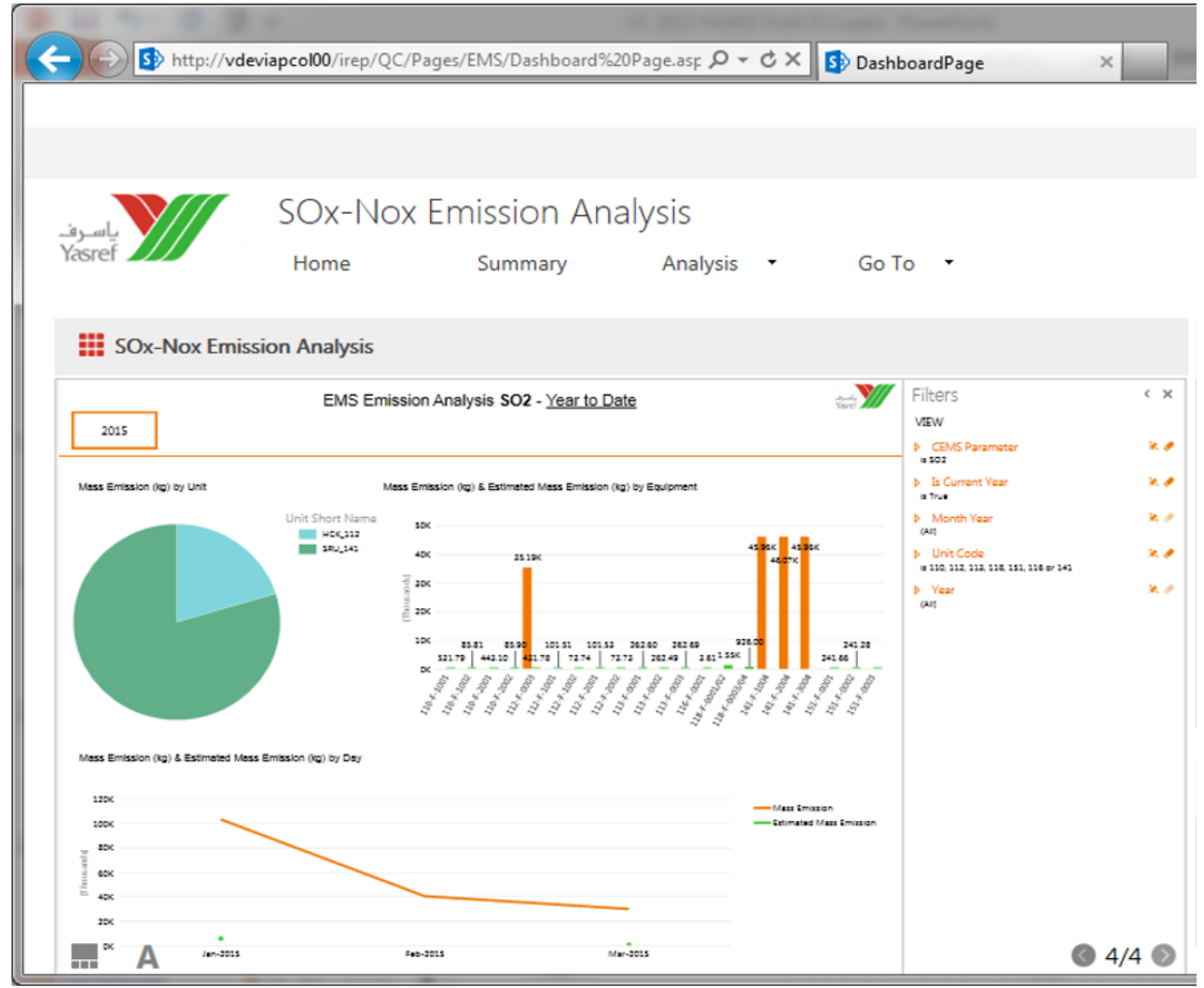
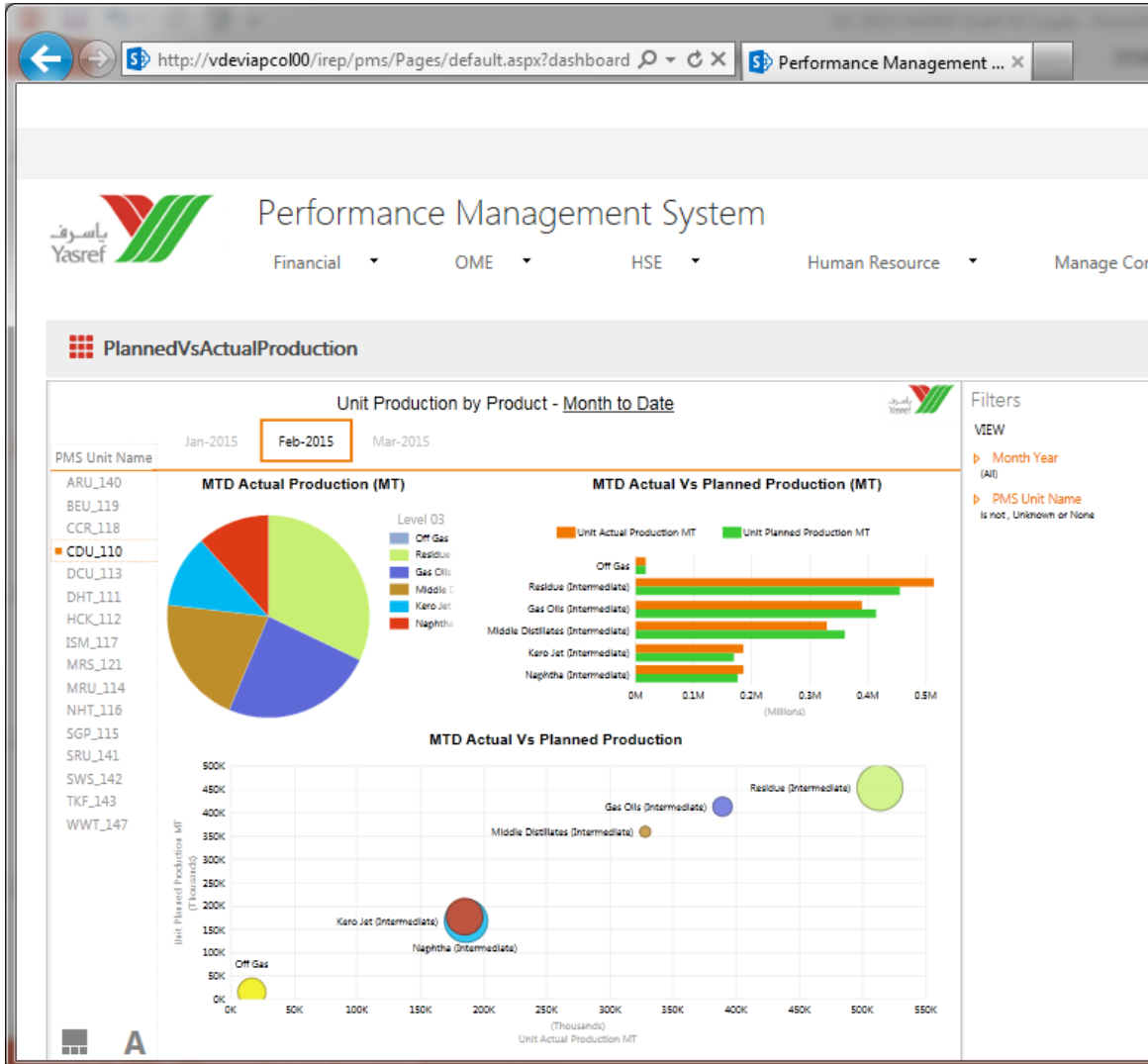
Attributes

Connected to the PI Analysis Service.

Flue Gas Emission Modified:1/27/2015 11:04:30 AM. Version: 1/1/1970 12:00:00 AM, Revision 4

# Dashboards

## Performance Management & Emission Analysis



# Thank You

When and what is your PI AF/Analytics Journey?

THANKYOU

謝謝

DZIĘKUJĘ CI

NGIYABONGA

TEŞEKKÜR EDERİM

DANKIE

TERIMA KASIH

GRACIES

WHAKAWHETAI KOE

DANKON

TANK

TAPADH LEAT

SALAMAT

KÖSZÖNÖM

SPASIBO

GRAZIE

MATUR NUWUN

ХВАЛА ВАМ

MULTUMESC

PAKMET CIZGE

고맙습니다

GRAZIE

شكرا

HVALA

FAAFETAI

ESKERRIK ASKO

GO RAIBH MAITH AGAT

БЛАГОДАРЯ

GRACIAS

MAHADSANID

TI BLAGODARAM

MAHALO IĀ 'OE

TEŞEKKÜR EDERİM

HVALA

OBRIGADO

TAK DANKE

DANK JE

EΥΧΑΡΙΣΤΩ

GRATIAS TIBI

ДЗЯКУЙ

RAHMAT

MERCI

AČIŮ

SALAMAT

MAHALO IĀ 'OE

TAKK SKAL DU HA

MERCI

DI OU MÈSI

ĎAKUJEM

GRAZZI

PAKKA PÉR

ありがとうございました

HATUR NUHUN

PAXMAT CAĞA

SIPAS JI WERE

TERIMA KASIH

CẢM ƠN BẠN

UA TSAUG RAU KOJ

TI BLAGODARAM

СИПОС

WAZVIITA

FALEMINDERIT