



OSIsoft®
REGIONAL SEMINARS 2012
The **Power of Data**



**PI System Calculations
operate, maintain and improve.**

**PI Notifications
know when key events occur.**

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PI System Calculations

Configured

- PI AF Formula Data Reference
- PI AF Point Data Reference Summary
- PI Client calculations

On-demand

Programmed

- PI Performance Equations
- PI Totalizers
- PI Statistical Quality Control (SQC)

- PI Advanced Computing Engine (PI ACE)

Scheduled & historized

Can I smooth out some of the data?



Have



Category: Pressure	
	Input Pressure
	Output Pressure

+

Need

Category: Calculation	
	Input Pressure 5m Average
	Output Pressure 5m Average

“The raw pressure numbers are too noisy.”

Data smoothing and averaging



PI Point statistics

- + On-demand. No recalculation needed
- + Leverages PI AF Templates for easy rollout
- Not for long time ranges or dense datasets



PI Totalizer tags

- + Efficient
- + Can be templated and built by PI AF
- Tricky to configure, no recalculation



PI Performance Equation tags

(stay tuned)

\\LOTH\Threadneedle Industries - PI System Explorer

File Edit View Go Tools Help

Database Query Date Back Check In Refresh New Element Search

Elements

- Elements
 - Houston
 - Line 1
 - Feed
 - KF30**
 - KF38
 - Reprocess
 - Line 2
 - Line 3
 - Line 4
 - Line 5
 - Line 6
 - Line 7
 - Line 8
 - Perth

KF30

General Child Elements Attributes Ports Version

Name:

Description:

Template: Type:

Categories:

Default Attribute:



[Extended Properties](#)

Find: [Parents](#) [Models](#) [Layers](#) [Connections](#) [Analyses](#) [Notifications](#) [Event Frames](#)

Elements
Event Frames
Library


How hard are the units working?

Have

Category: Calculation	
	Input Pressure 5m Average
	Output Pressure 5m Average

+

Need

Category: Calculation	
	Differential Pressure 5m Average

“What’s the true pressure
across each compressor?”

Simple formula calculations



PI AF Formulas

- + On-demand. No recalculation needed
- + Supports Units of Measure
- + Leverages PI AF Templates for easy rollout
- Not for use with strings, only numbers



PI Performance Equation tags

- + 100+ function library
- + Universal PI PE syntax
- + Can be templated and built by PI AF
- PI Data Archive tag inputs only

Elements

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 - Line 4
 - Feed
 - KF33
 - KF41
 - Reprocess
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 - Line 6
 - Line 7
 - Line 8
 - Perth

Elements

Event Frames

Library



KF30

- General Child Elements Attributes Ports Version

Filter

Name	Value
Category: Description	
Installation Date	21-Jul-06 22:00:00
Manufacturer	Dresser-Rand
Model	ESH1
Rating	100 hp
Category: Operation	
Power Draw	5.53396 kW
Speed	12.41241 rpm
Status	on
Category: Pressure	
Input Pressure	1.214484 kPa
Input Pressure 5m Average	0.149511124845405 kPa
Output Pressure	124.3474 kPa
Output Pressure 5m Average	116.151251753372 kPa
Category: Temperature	
Casing Temperature	41.10413 °C
Oil Temperature	38.79719 °C

Group by: Category Template

Name: Output Pressure 5m Average

Description:

Configuration Item:

Categories: Pressure

Default UOM: kilopascal

Value Type: Double

Value: 116.151251753372 kPa

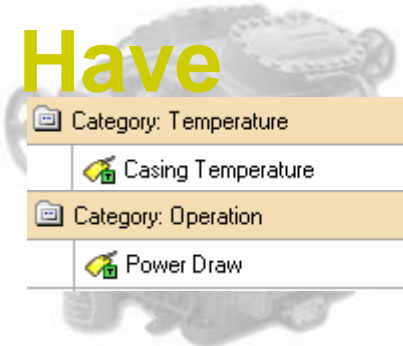
Data Reference: PI Point

Settings...

Output Pressure;TimeMethod=TimeRangeOverride;RelativeTime=-5m;TimeRangeMethod=Average;UOM=kPa

Are the units cooling to spec?

Have



Category: Temperature
Casing Temperature
Category: Operation
Power Draw

+

Need

Category: Calculation
Cooling Power Ratio

“What is the hourly temperature average per total power draw that hour?”

Conditional/filtered statistics



PI Performance Equation tags

- + 100+ function library
- + Universal PI PE syntax
- + Can be templated and built by PI AF
- PI Data Archive tag inputs only



PI Totalizer tags

- + Efficient
- + Uses universal PI PE syntax for filters/conditions
- + Can be templated and built by PI AF
- Tricky to configure, no recalculation



PI Advanced Computing Engine

(stay tuned)

PI Performance Equation syntax

Cooling to Power Ratio

$\text{TagAvg}(\text{'CaseTemp'}, '*-1h', '**') / (\text{TagTot}(\text{'PowerDraw'}, '*-1h', '**') * 24)$

Daily run hours when power > 20A

$\text{TimeGE}(\text{'PowerDraw'}, '*-24h', '**', 20) / 3600$

PI Performance Equation syntax

Hourly power draw, compensating for bad data

IF

PctGood('PowerDraw' , '*-1h' , '*') > 50

THEN

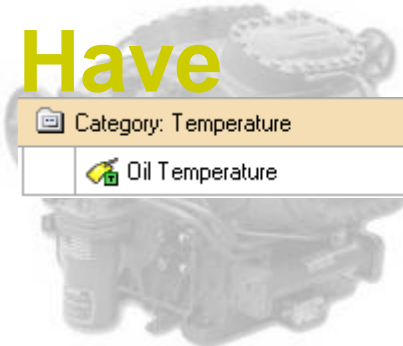
TagTot('PowerDraw' , '*-1h' , '*') * 24

ELSE

NoOutput()

Compare performance between assets

Have



Category: Temperature
Oil Temperature

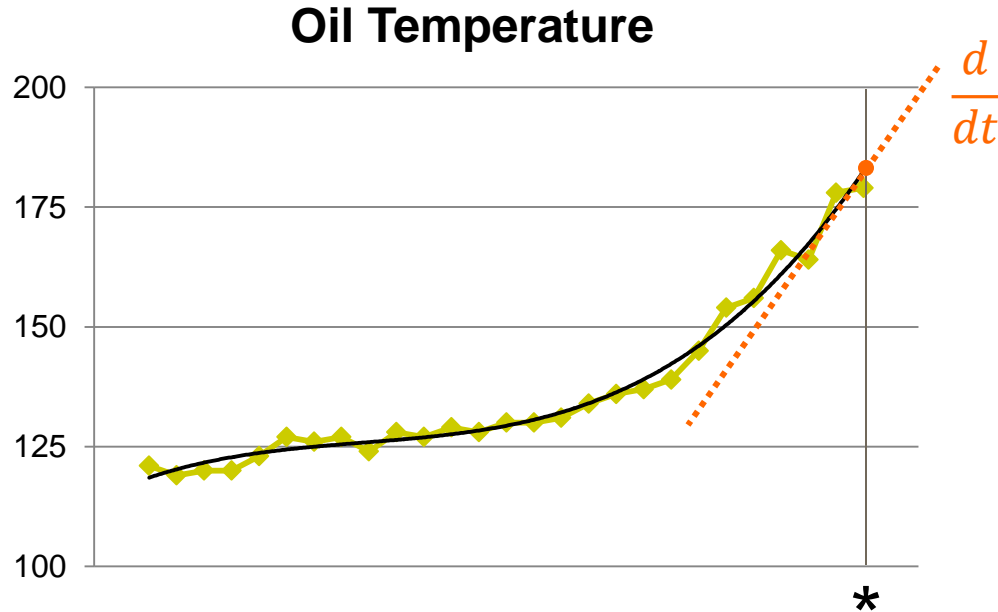
+

Need

Category: Calculation
Oil Temperature Rate of Change

“How fast is this thing heating up?”

Calculating rate of change



A Alglib

`barycentricbuild()`
`barycentricdiff1()`

Complex calculations



PI Advanced Computing Engine

- + Power of .NET with ease of a wizard
- + Write for one asset, apply to many assets
- + Manual and automatic recalculation
- Indirect support for PI AF via AF Link
- Requires Visual Studio license

General Guidelines



PI AF Formulas and PI AF PI Point summaries

- Simple on demand calculations
- Small time range and data value summarization



PI Performance equations

- Simple scheduled calculations – 2 or 3 nested IF/THEN levels



PI Totalizers

- Efficient scheduled summarizations



PI Advanced Computing Engine

- Flexible programming environment for scheduled calculations

General Guidelines - Summary

	Simple	Complex
Calculations	PI AF Formulas PI Performance Equations	PI ACE
Statistics	AF PI Point Stats	PI Totalizer PI Performance Equations PI ACE



PI Notifications

Why PI Notifications?



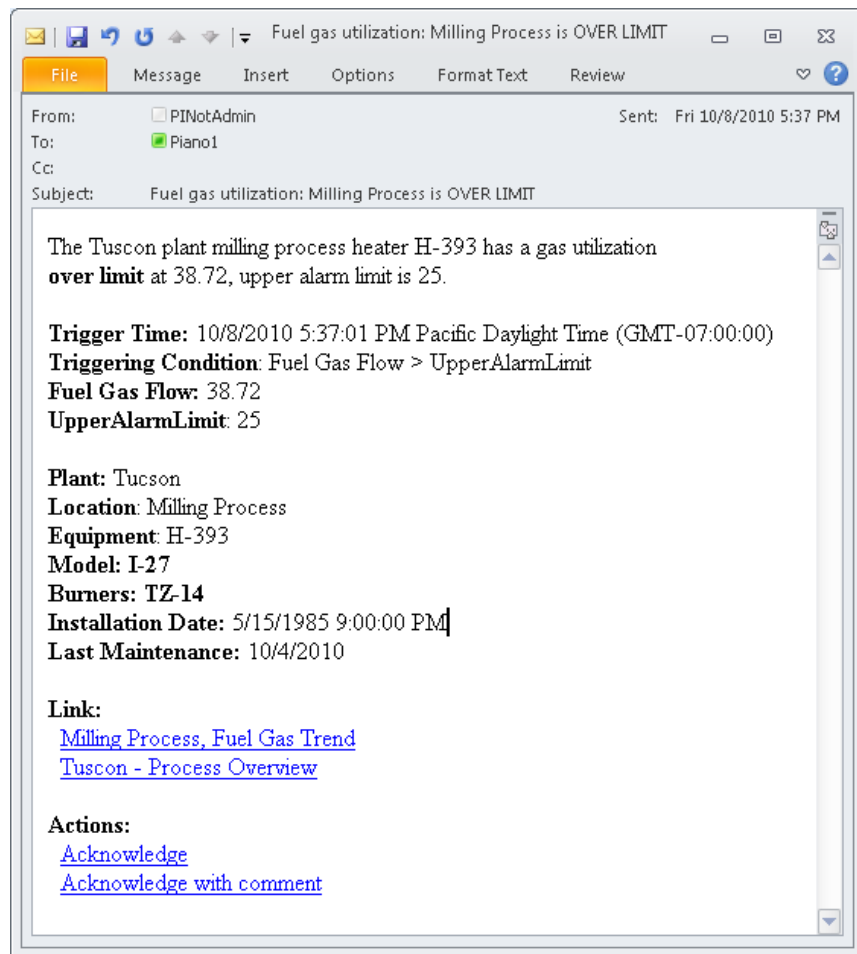
Can't watch all your data all the time

You know the rules that define actionable events



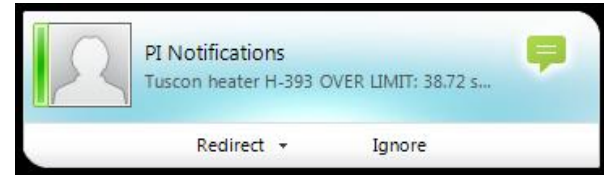
Be alerted

- Receive information
- Details on the event
- Where to get more information



Customer examples

- Maintain compliance
 - Production thresholds



- Interact with maintenance systems
 - Initiate a work order



- Escalate as required for potential asset issues
 - Discharge outlet temperature exceeded



Demo!

Elements

- Elements
 - Big Creek Power Plant
 - 2x2x1 Flow Model
 - Condenser
 - Gas Turbine 1
 - Gas Turbine 2
 - Gas Turbine 3
 - HRSG 1
 - HRSG 2
 - Steam Turbine
 - Little Creek Power Plant
 - System Configuration

- Elements
- Event Frames
- Library
- Unit of Measure
- MyPI
- Notifications
- Contacts

27 Attributes

HRSG 1

- General
- Child Elements
- Attributes
- Parts
- Version

Group by: Category Template

Filter

Name	Value
Category: Asset Detail	
Category: HRSG HP Economizer	
HRSG HP Economizer Gas Inlet Temp	191 °C
HRSG HP Economizer Gas Outlet Temp	231 °C
HRSG HP Economizer Water Inlet Temp	164 °C
HRSG HP Economizer Gas Temp Diff. Limit	50 °C
Category: Metrics	
Category: Status	
Status	Running



Who can receive a PI Notification?



Email recipient



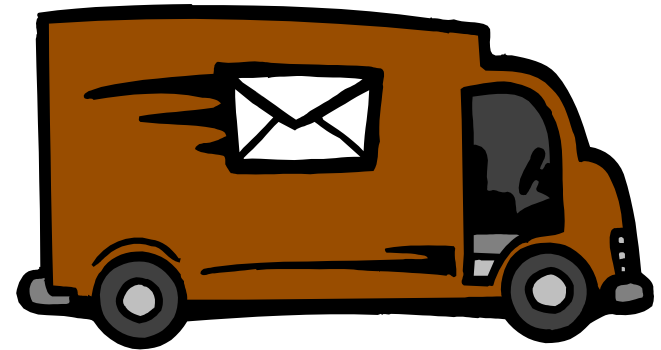
Microsoft Office Communications Server
Microsoft Lync



Web Service

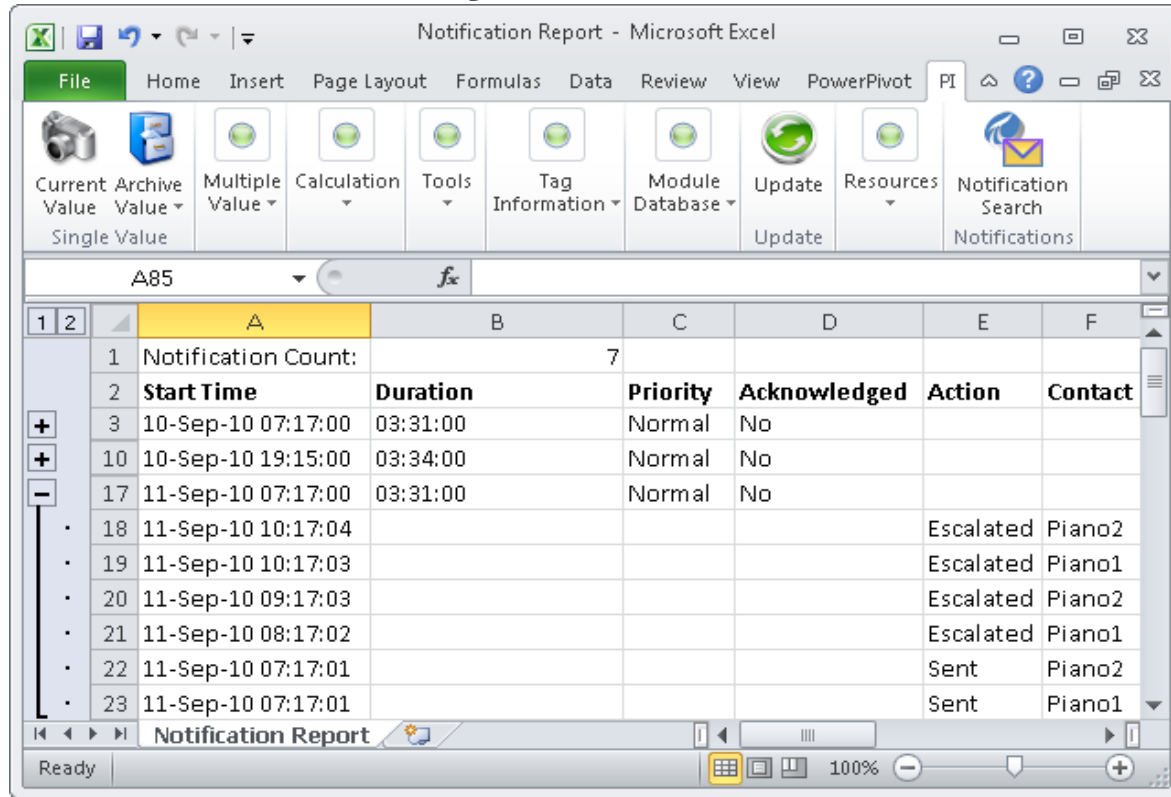
Who can receive a PI Notification?

- Extensible with custom delivery channels
 - PI Notification developer kit
 - HTTP example
 - OSISOFT Virtual Campus sample
 - XML example
- Partner delivery channels
 - Amitec - SMS delivery channel



Mine Notification history

- Clients for
PI ProcessBook
PI DataLink
Desktop App
- Investigate
problem assets



Notification Report - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View PowerPivot PI

Current Value Single Value Archive Value Multiple Value Calculation Tools Tag Information Module Database Update Resources Notification Search Notifications

A85 fx

	A	B	C	D	E	F
1	Notification Count:		7			
2	Start Time	Duration	Priority	Acknowledged	Action	Contact
3	10-Sep-10 07:17:00	03:31:00	Normal	No		
10	10-Sep-10 19:15:00	03:34:00	Normal	No		
17	11-Sep-10 07:17:00	03:31:00	Normal	No		
18	11-Sep-10 10:17:04				Escalated	Piano2
19	11-Sep-10 10:17:03				Escalated	Piano1
20	11-Sep-10 09:17:03				Escalated	Piano2
21	11-Sep-10 08:17:02				Escalated	Piano1
22	11-Sep-10 07:17:01				Sent	Piano2
23	11-Sep-10 07:17:01				Sent	Piano1

Notification Report

Ready 100%

PI Notifications

- Define key events
- Customize message content
- Send to people and systems
- Acknowledge and escalate
- Simplify deployment with templates



Fuel Gas Flow is 38.72 scf/h



PI Interfaces



Third Party



Partner or Custom



PI Clients

**PI Coresight
PI WebParts
PI DataLink
PI ProcessBook**



THANK YOU

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