

Visualizing PI Data with Dashboards and Reports

Jay Lakumb, Product Manager

Experience



What's New with Visualization in PI System 2010?



Excel spreadsheet showing data for Tucson. The table has columns for Timestamp, B309_FG903, B555_FG120, B210_FG00, and Ho. The data is as follows:

Timestamp	B309_FG903	B555_FG120	B210_FG00	Ho
20-Apr-10 14:33:18	70.0065079	84.9462814	67.298210	
20-Apr-10 14:28:18	68.5299	87.1578293	67.866409	
20-Apr-10 14:18:18	67.418	91.2100906	67.433746	
		8183	63.6964607	86.3389435
			67.4419708	82.160881
			71.2854004	87.7373886
			69.116	85.1711731
			69.7173538	82.9396286
			80.7450027	80.941864
			84.2832489	85.8176575
			60.1664429	83.8520432
			64.8003616	86.121376

Reports

Milling Process - Windows Internet Explorer

http://dfpweb2010/nuGreen/Engineering/Process/2010/04/20/Milling0420Process.aspx

Milling Process

Site Admin: Laurie Diennenbach

Engineering

NuGreen Operations Manufacturing Engineering Reports Marketing Sales Accounting

Milling Assets

Milling Process

Equipment

B-737

B-954

F-200

F-770

H-248

H-393

K-394

T-008

F-509

PI Trend

Equipment Documents

Equipment Benchmarking Report

Fuel Gas Rates

Fuel Gas Utilization Report

Milling Production Schedule

Production	Production		Inventories			Today's Performance					
	Rate (Tons/Hr)	Target (Tons/Hr)	Capacity (Tons/Hr)	Raw Material Available (Tons)	Days	Product Sales (Tons/Day)	Available (Tons)	Days	Energy 2%	Reliability 95%	Quality 98%
Houston	32.9	35.0	50	30,128	35.9	1,300	10,638	8.9	98206%	99557%	99847%

Dashboards

Notification Delivery

DF PI Notifications

Fuel gas utilization: Milling Process is Over

Name: Fuel gas utilization: Milling Process

Server: DFPI2010RC

Database: NuGreen

Start Time: 4/16/2010 11:24:10 AM

Trigger Time: 4/16/2010 11:24:10 AM

Target: \\DFPI2010RC\NuGreen\N

Value: High

Priority: Normal

Link: [Milling Process, Fuel Gas Trend](#)

[Tucson - Process Overview](#)

Actions: [Acknowledge](#)

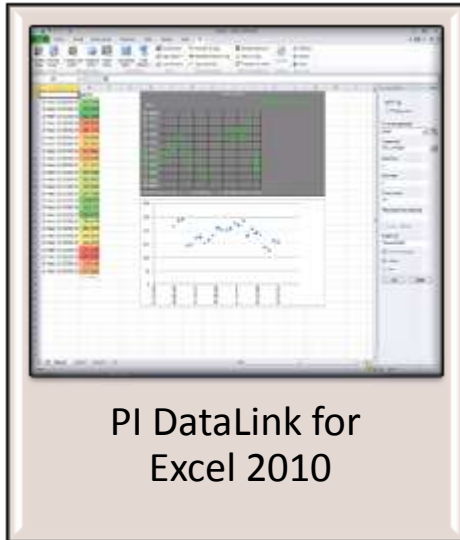
[Acknowledge with Comment](#)

Operations Performance Scorecard

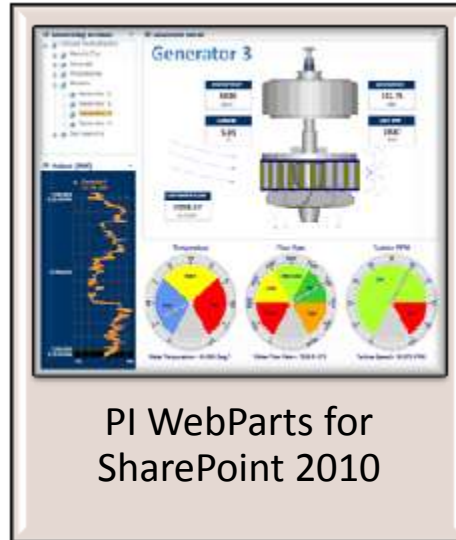
	Houston				Little Rock				Tucson			
	This Month	Today	Target	Trend	This Month	Today	Target	Trend	This Month	Today	Target	Trend
Safety	0	0	0	—	0	0	0	—	0	0	0	—
Environment	97.0	97.1	97.0	—	98.6	99.0	98.6	—	97.0	97.1	97.0	—
Energy Use	363594	11998	11998	▲	111526	3646	3646	—	96.7	96.7	96.7	—
Quality	97.6	97.9	97.6	—	97.3	97.6	97.3	—	97.6	97.6	97.6	—
Reliability	95.7	96.4	95.7	—	95.6	96.3	95.6	—	96.7	97.1	96.7	—

Scorecards

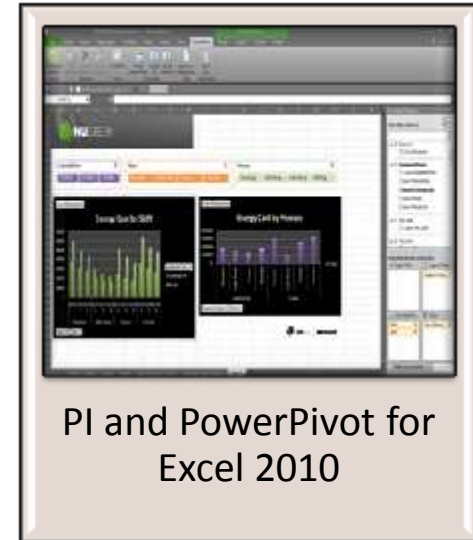
Visualization for PI System 2010



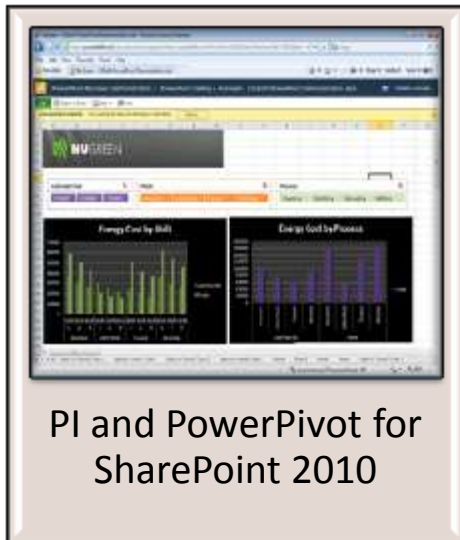
PI DataLink for
Excel 2010



PI WebParts for
SharePoint 2010



PI and PowerPivot for
Excel 2010

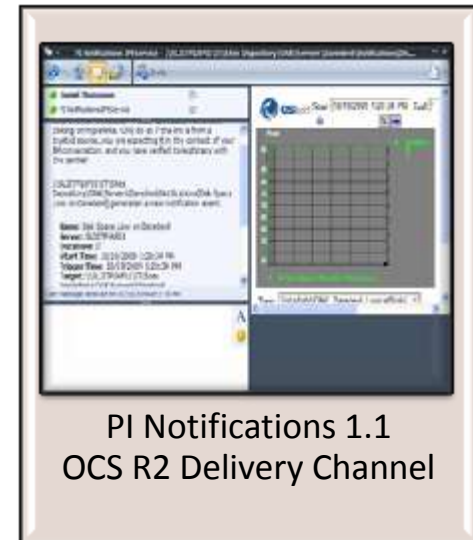


PI and PowerPivot for
SharePoint 2010

PI OLEDB
Enterprise 2010

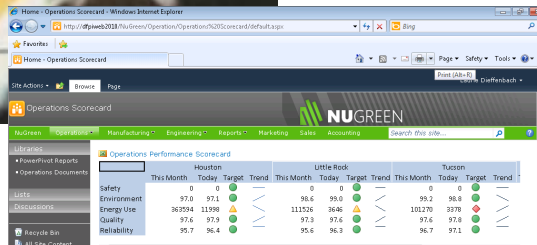
PI Web Services
2010

PI Data Access
Technologies



PI Notifications 1.1
OCS R2 Delivery Channel

Management



Knowledge Worker



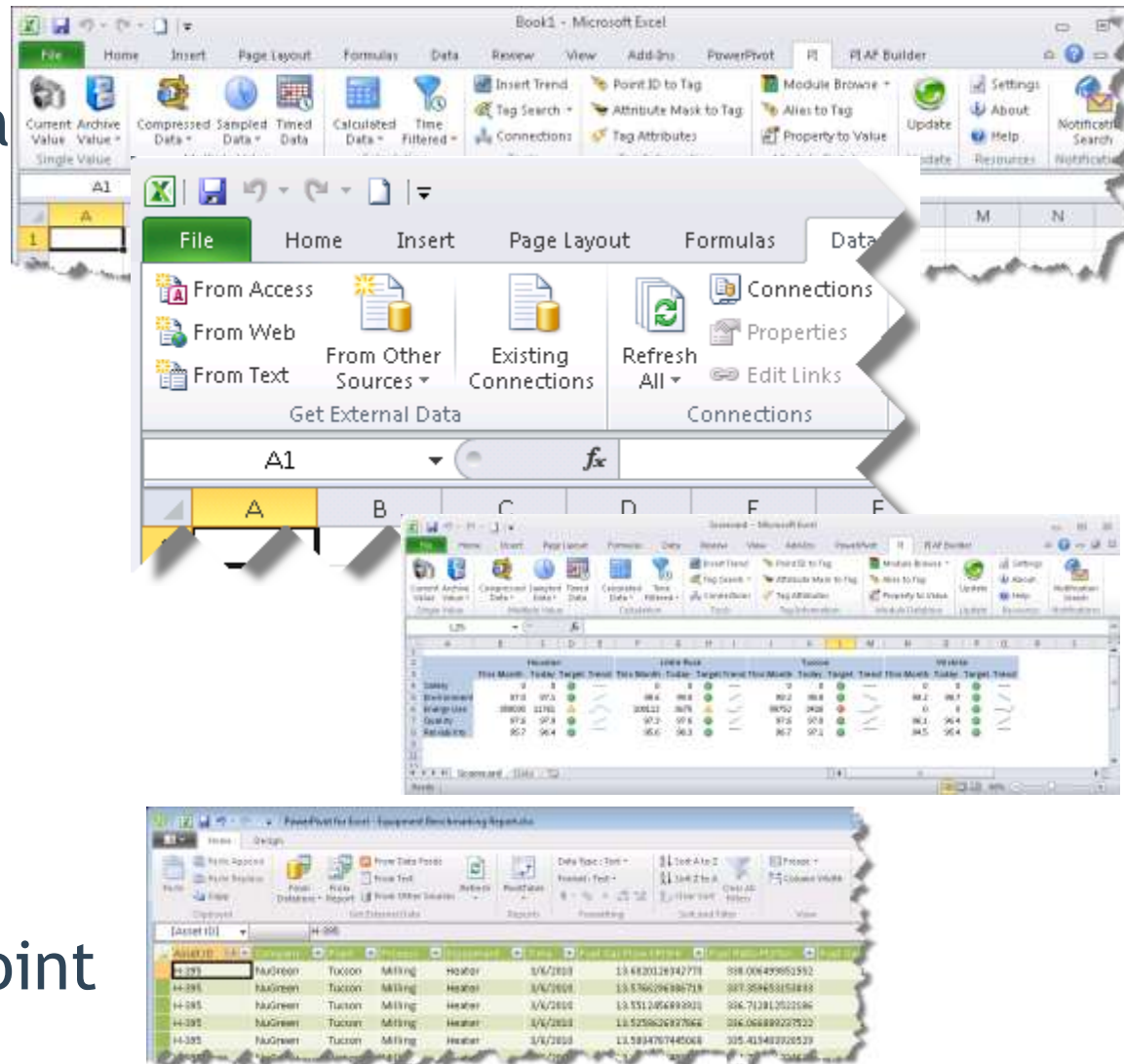
Reduction				Inventories				Product				Today's Performance		
Target	Capacity	Raw Material	Available	Sales	Product	Available	Energy	Reliability	Quality	Energy	Reliability	Quality		
(Tons/Hr)	(Tons/Hr)	(Tons)	(Days)	(Tons/Day)	(Tons/Day)	(Days)	2%	95%	98%	98200%	99557%	99847%		
35.0	50	30,128	35.9	1,200	10,638	6.9								



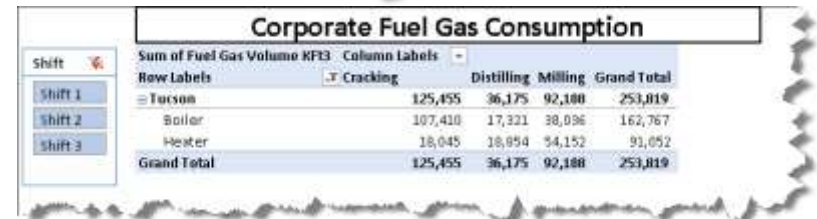
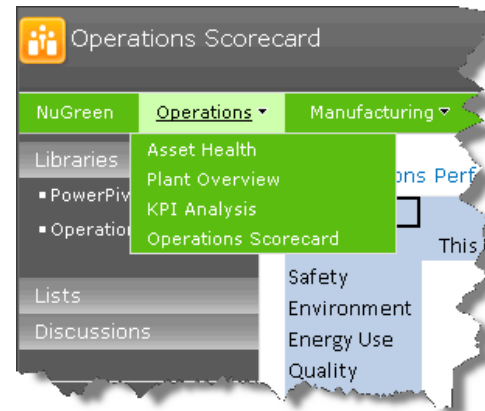
Content Creator



- Use different data sources
- Create scorecards
- Create multidimensional reports
- Publish to SharePoint

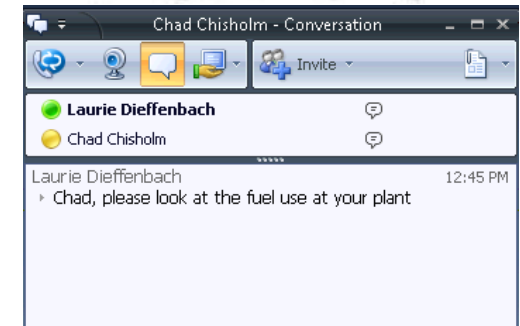


- Easy navigation to needed information
- Content is already built, but can interact with it to focus on an issue
- Easy access to assistance from experts



The screenshot shows a table titled 'Corporate Fuel Gas Consumption'. The table has columns for 'Shift', 'Row Labels', 'Cracking', 'Distilling', 'Milling', and 'Grand Total'. The data is as follows:

Shift	Row Labels	Cracking	Distilling	Milling	Grand Total
Shift 1	Tucson	125,455	36,175	92,188	253,819
Shift 2	Boiler	107,410	17,321	38,096	162,767
Shift 3	Heater	18,045	18,854	54,152	91,052
	Grand Total	125,455	36,175	92,188	253,819



- Access to all needed tools
- Contribute material for use by others
- Act to resolve problems and prevent recurrence



Equipment Benchmarking: Fuel Gas Efficiency

Equipment	Average of Fuel Ratio F331m
Home Engineering	
BD-414	1,683
Flame-On	
FO-029	323
Hot Spot	
HS-345	2,439
Inferno	
I-27	1,283
I-56	6,454
KPC, Limited	
KPC-387	433
Swift Brothers	
STM-305	878
STM-300	2,972
Average of Fuel Ratio F331m	2,000

Process Overview

Notification Limit Change

Use this form to change notification limit values.

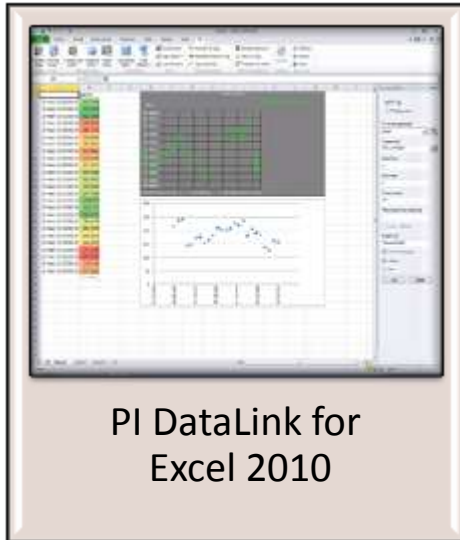
Please enter the effective date for changes:
Target Date: 4/16/2010 5:52:17 AM

Please select the appropriate unit:
Heater:
Heater 395: FG Limit
Heater 393: FG Limit
Heater 148: FG Limit

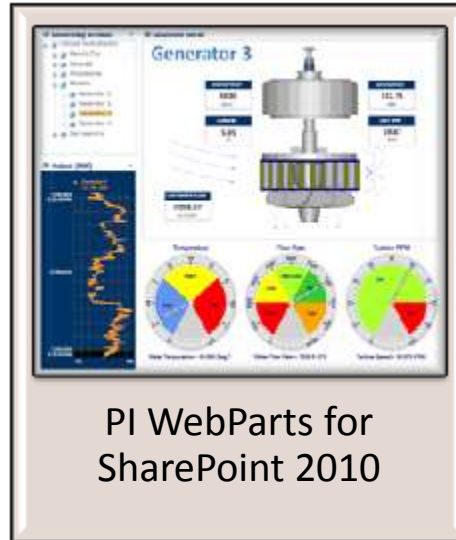
Please enter a new value Notification trigger limit:
Trigger Limit:

Change settings

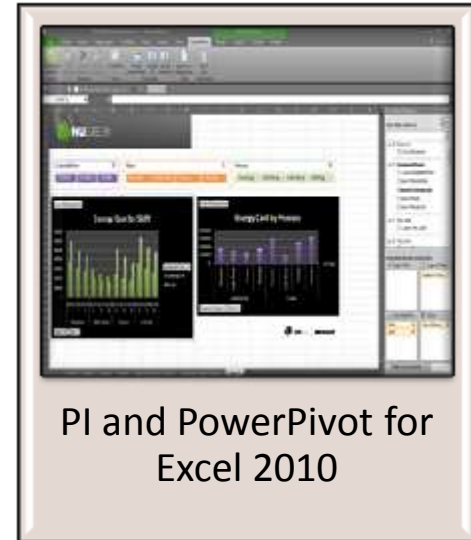
Visualization for PI System 2010



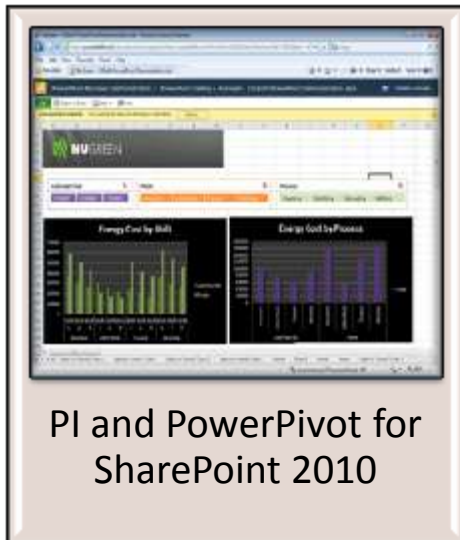
PI DataLink for
Excel 2010



PI WebParts for
SharePoint 2010



PI and PowerPivot for
Excel 2010

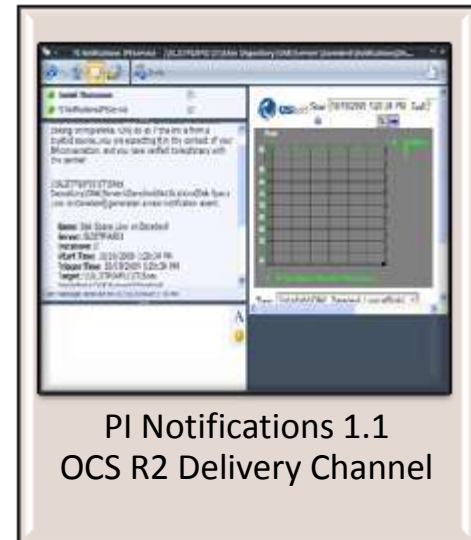


PI and PowerPivot for
SharePoint 2010

PI OLEDB
Enterprise 2010

PI Web Services
2010

PI Data Access
Technologies



PI Notifications 1.1
OCS R2 Delivery Channel

File Home Insert Page Layout Formulas Data Review View PowerPivot PI

Calibri 11 A A

B I U

Font

Alignment

General

\$ %

Number

Conditional Formatting

Format as Table

Cell Styles

Insert

Delete

Format

Cells

Σ

Sort & Filter

Find & Select

Editing

	Tucson	Houston
Timestamp	B309_FG903	B555_FG120
	B210_FG005	B235_FG293

File Home Insert Page Layout Formulas Data Review View PowerPivot PI PIAF Builder

Clipboard Font Alignment Number Styles Cells Editing

Calibri 11 A A Bold Italic Underline Conditional Formatting Format as Table Cell Styles

General \$ % .00 .00

Insert Delete Format Sort & Filter Find & Select

F3

	A	B	C	D	E	F	G	
1	Bighorn Basin Transformers							
2	Transformer	Top Oil	LTC Oil	Bottom Oil	Load			
3	TR2003	77.48888397	65.28782654	58.39207077	22.31632042			
4	TR5620	71.17529297	60.75416565	80.14664459	22.04483223			
5	TR3045	74.77812195	70.24856567	61.76383209	20.0871563			
6	TR0842	84.53770447	64.9520874	53.26625061	19.83138657			
7	TR9124	75.75057983	55.71472931	46.30812454	20.72727394			
8								
9								
10								
11								
12								
13								

- Supports Microsoft Office 2010 (32-bit)
(Office 2007 and Office 2003 as well)

- Internationalization and Localization

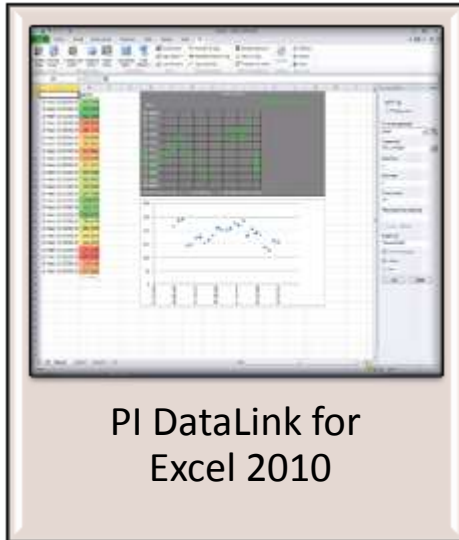
English, French, German, Spanish, Portuguese, Russian, Simplified Chinese, Japanese, Korean

- Supports SharePoint 2010 (64-bit)
(Microsoft Office SharePoint Server 2007 as well)

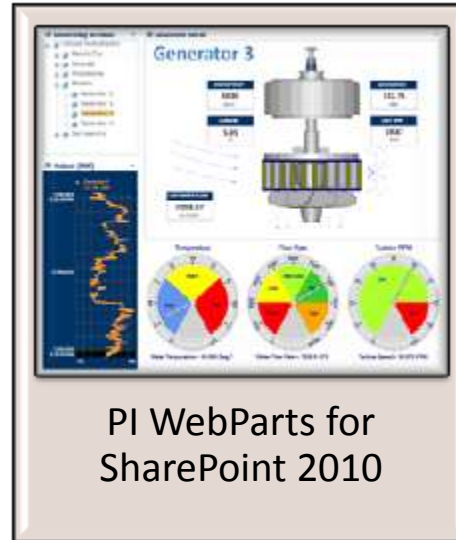
- Internationalization and Localization

English, French, German, Spanish, Portuguese, Russian, Simplified Chinese, Japanese, Korean

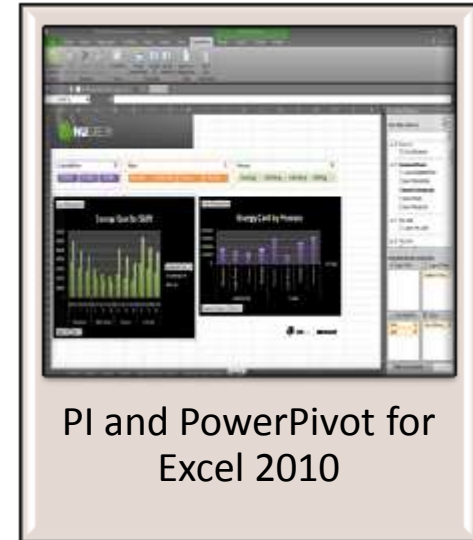
Visualization for PI System 2010



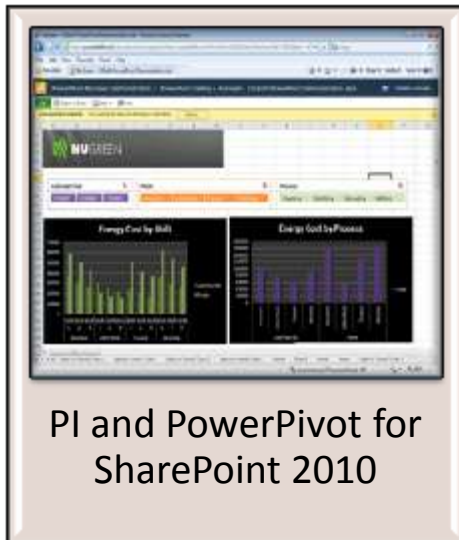
PI DataLink for
Excel 2010



PI WebParts for
SharePoint 2010



PI and PowerPivot for
Excel 2010

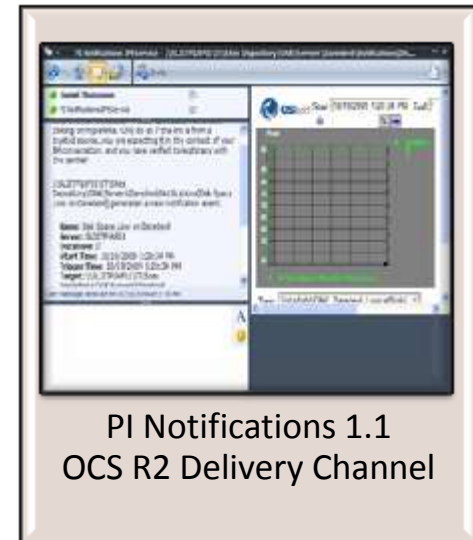


PI and PowerPivot for
SharePoint 2010

PI OLEDB
Enterprise 2010

PI Web Services
2010

PI Data Access
Technologies



PI Notifications 1.1
OCS R2 Delivery Channel

Scorecards in SharePoint



Home - Operations Scorecard - Windows Internet Explorer

http://dfpiweb2010/NuGreen/Operation/Operations%20Scorecard/default.aspx

Home - Operations Scorecard

Print (Alt+R) Laune Dieffenbach

Operations Scorecard

NuGreen Operations Manufacturing Engineering Reports Marketing Sales Accounting Search this site...

Libraries

- PowerPivot Reports
- Operations Documents

Lists

Discussions

Recycle Bin

All Site Content

Operations Performance Scorecard

	Houston				Little Rock				Tucson			
	This Month	Today	Target	Trend	This Month	Today	Target	Trend	This Month	Today	Target	Trend
Safety	0	0	●	—	0	0	●	—	0	0	●	—
Environment	97.0	97.1	●	↘	98.6	99.0	●	↘	99.2	98.8	●	↘
Energy Use	363594	11998	▲	↘	111526	3646	▲	↘	101270	3378	◆	↘
Quality	97.6	97.9	●	↗	97.3	97.6	●	↗	97.6	97.8	●	↗
Reliability	95.7	96.4	●	—	95.6	96.3	●	—	96.7	97.1	●	—

Operations Documents

Type	Name	Modified
	Asset_Health	4/13/2010 2:39 PM
	Fuel_Gas_Utilization_and_Benchmarking_Report	4/13/2010 2:39 PM
	KPI_Analysis	4/13/2010 2:39 PM
	Plant_Overview	4/13/2010 2:39 PM
	Production_Schedule	4/13/2010 2:31 PM

+ Add document

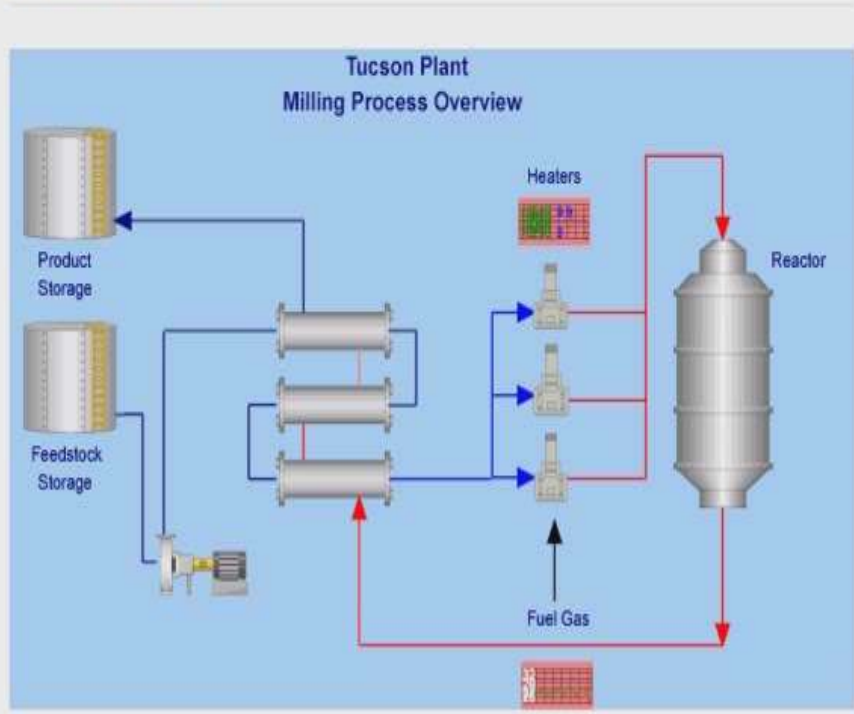
Done Trusted sites | Protected Mode: Off 100%

Page Time Range Start Time *8h End Time Apply

- Tucson Assets
 - Tucson
 - Cracking Process
 - Distilling Process
 - Milling Process**

- Process Support Team
 - Engineering
 - Chad Chisholm
 - James Spainhower
 - Operations
 - Laurie Dieffenbach
 - Andre Downey
 - Production Logistics
 - John Maytum
 - Janelle Minich

Process Overview



Fuel Use





Favorites

Tucson Plant

Site Actions ▾



Browse

Page



Manufacturing ▾

NuGreen

Operations ▾

Manufacturing ▾

Engineering ▾

Reports ▾

Market

Page Time Range

Tucson Assets

Cracking Process

Extruding Process

Milling Process

Data Entry

Process Overview

- Milling Assets
 - Milling Process
 - Equipment
 - B-737
 - B-914
 - F-200
 - F-770
 - H-148
 - H-393
 - H-395
 - K-384
 - P-009
 - P-509
- Production Schedule



- Equipment Documents
- | Type | Name |
|------|---|
| | Equipment Benchmarking Report |
| | Fuel Gas Ratio |
| | Fuel Gas Utilization Report |
- [Add document](#)

Milling Production Schedule

	Production			Inventories			Today's Performance				
	Rate (Tons\Hr)	Target (Tons\Hr)	Capacity (Tons\Hr)	Raw Material		Product			Energy 2%	Reliability 95%	Quality 98%
				Available Tons	Days	Sales (Tons\Day)	Available Tons	Days			
Houston	32.9	35.0	50	30,128	35.9	1,200	10,638	8.9	86208%	8557%	9847%
Tucson	33.7	29.0	30	24,236	34.8	750	18,900	25.3	34410%	9671%	9671%



Legacy maintenance software

- Functional
- Maintenance staff is trained on it
- Company has made a large investment in it and has created a web front end for it



Excel Reports



- Reports that engineers and managers rely on



Manuals, Safety, Maps

- Key data that is stored online
 - Safety
 - Equipment manuals
 - Weather
 - Maps

Integrate PI with existing investments



Transformer

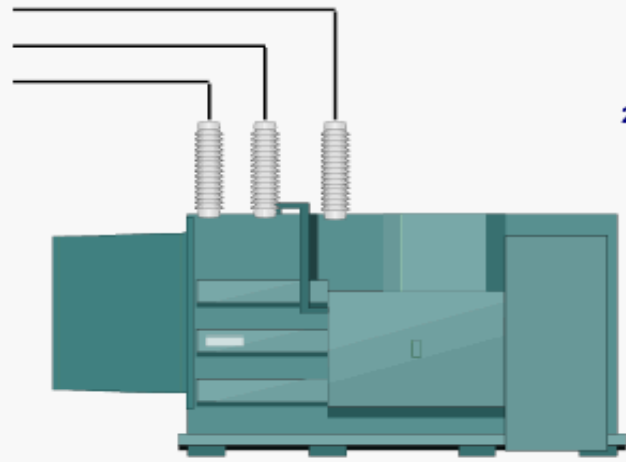
Station: **Bighorn Basin**
Asset ID: **TR0842**

Oil Temperatures (C)

Top Oil
84.1 Deg C

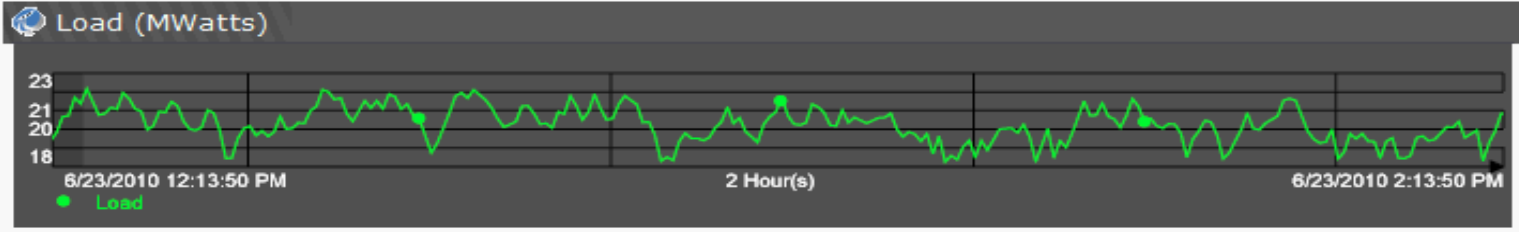
LTC Oil
63.5 Deg C

Bottom Oil
52.4 Deg C



LTC Motor
21.8 Amps **STOP**
Cooling Fans
21.8 Amps **STAGE 1**

Load (MWatts)
20.8 Mwatts



bing
Maps

Search bar

2D 3D Road Aerial

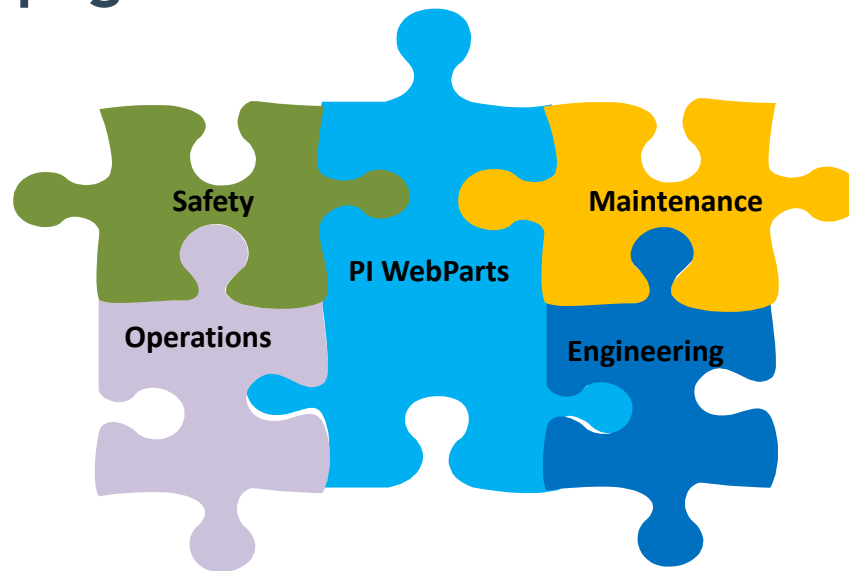


Latitude 25.9506 N
Longitude 102.3302 W
Altitude 3,514 feet
600 miles

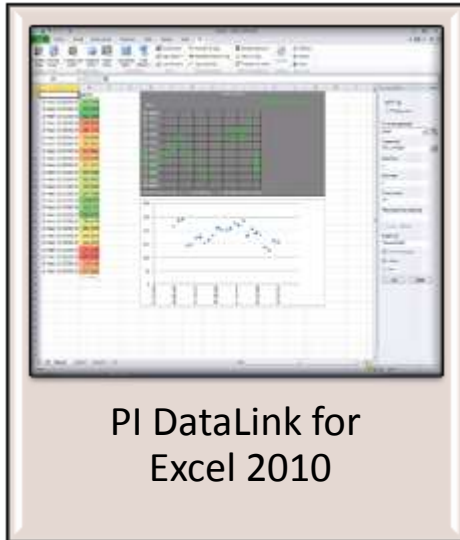
Value of PI WebParts 2010



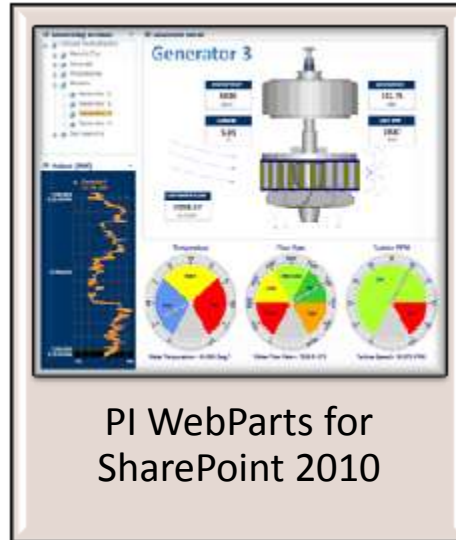
- Aligns with
 - PI for Office 2010 (2007 still supported)
 - PI Server 2010
- **Easy configuration, no code programming**
- **Leverage existing applications**
- **Fewer pages to maintain**



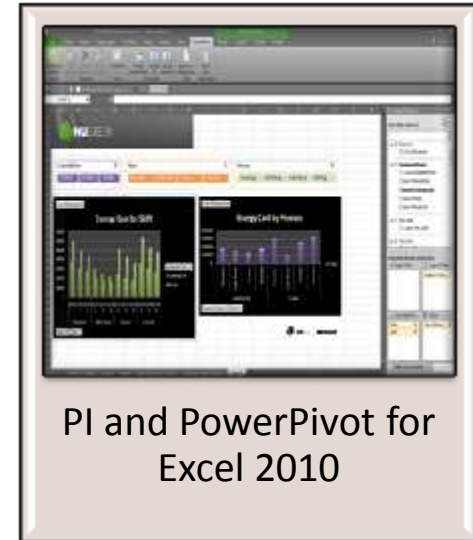
Visualization for PI System 2010



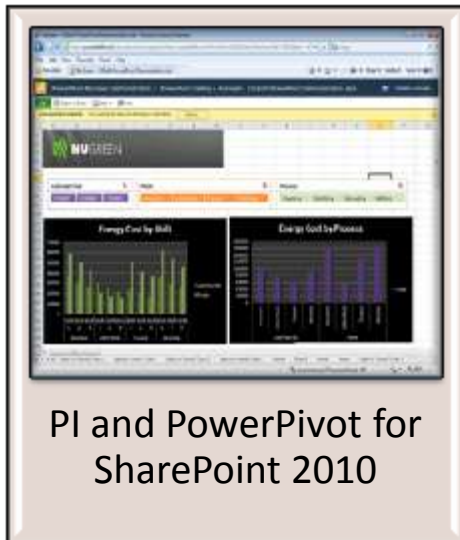
PI DataLink for
Excel 2010



PI WebParts for
SharePoint 2010



PI and PowerPivot for
Excel 2010

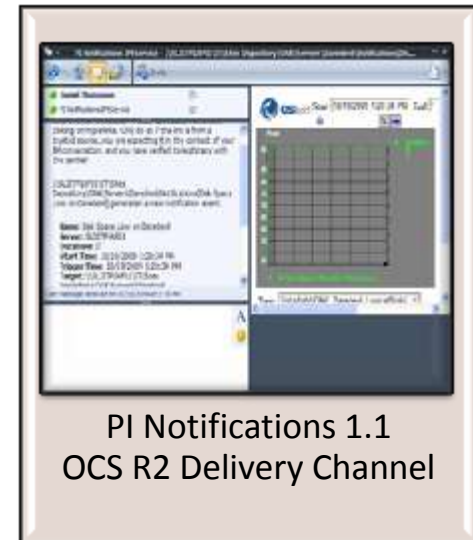


PI and PowerPivot for
SharePoint 2010

PI OLEDB
Enterprise 2010

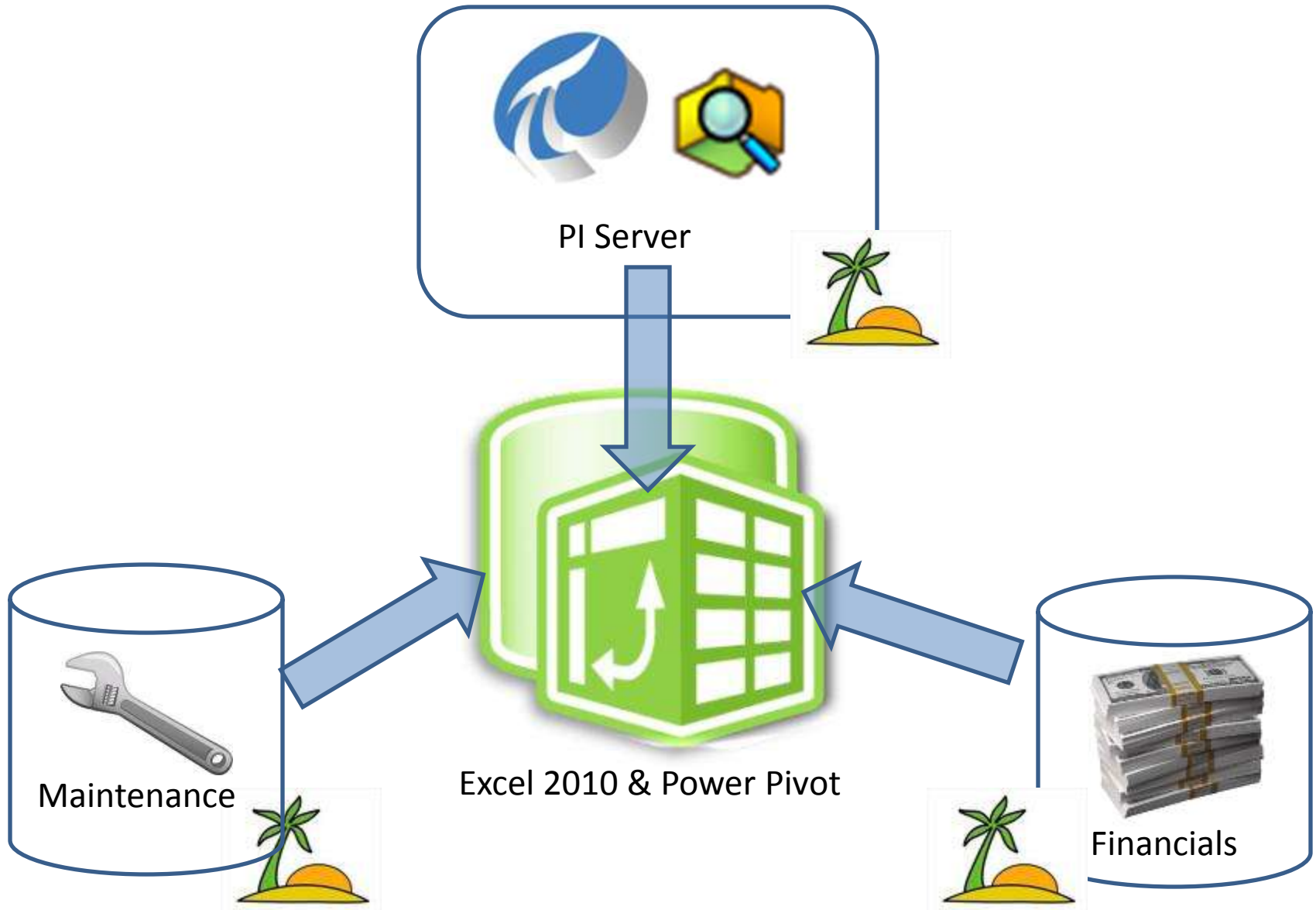
PI Web Services
2010

PI Data Access
Technologies



PI Notifications 1.1
OCS R2 Delivery Channel

User-driven Reporting



PowerPivot for Excel



Microsoft
Excel 2010

PowerPivot for SharePoint



Microsoft
SharePoint 2010

Microsoft
SQL Server 2008 R2



30 Day Corporate Fuel Gas Consumption

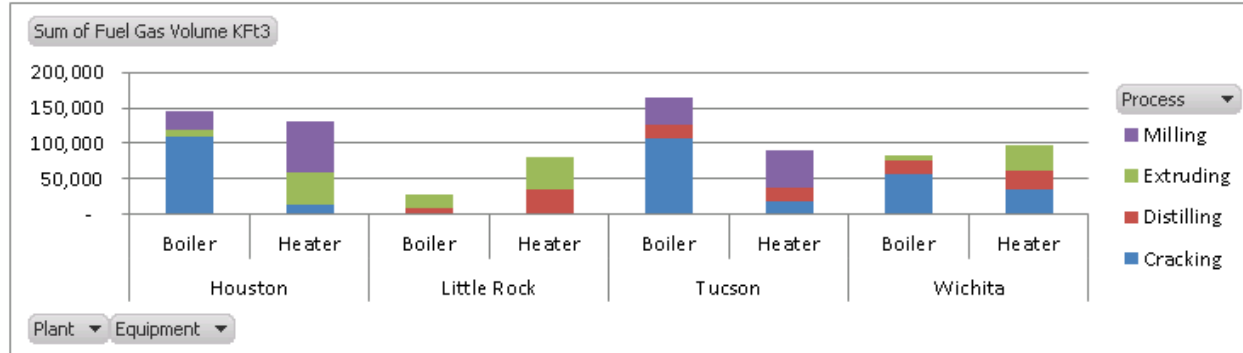
- Fuel Man**
- [-] Fla
- [-] Bo
- [-] Ho
- [-] Sw
- [-] KP
- [-] Inf
- Gran**

shift

- Shift 1
- Shift 2
- Shift 3

Sum of Fuel Gas Volume Column Lab					
Row Labels	Cracking	Distilling	Extruding	Milling	Grand Total
[-] Houston	121,929		54,828	98,453	275,210
Boiler	108,315		10,023	26,842	145,180
Heater	13,614		44,804	71,611	130,029
[-] Little Rock		45,024	63,146		108,169
Boiler		9,559	18,341		27,900
Heater		35,465	44,804		80,269
[-] Tucson	126,003	36,492		92,282	254,777
Boiler	107,830	17,662		38,106	163,598
Heater	18,173	18,829		54,176	91,178
[-] Wichita	91,736	45,233	44,704		181,673
Boiler	56,933	18,295	8,628		83,856
Heater	34,803	26,938	36,076		97,817
Grand Total	339,668	126,748	162,677	190,735	819,829

- 275,210
- 322
- 1,684
- 2,422
- 873
- 2,902



- 440
- 1,271
- 6,393
- 2,000

PI DataLink + Excel 2010 + PowerPivot



FuelEfficiencyAnalysis - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View PowerPivot PI Design Layout Format Analyze

Chart 1

Plant	Tucson
Row Labels	Average of Fuel Ratio
TZ-14	1409.798566
B-555	3972.94785
B-737	865.6271644
H-393	670.0664234
H-690	130.5528252
XG-40	395.931077
B-117	285.6060103
H-736	723.5415203
H-960	178.6457004
Grand Total	975.2839277

PivotTable Field List

Show fields related to: (All)

- Company
- Equipment
- Fuel Rate
- Fuel Ratio
- Hour
- Plant
- Process
- Time

Shift_Schedule

Drag fields between areas below:

Report Filter Legend Fields ...

Plant

Axis Fields (Ca... Σ Values

Burners Average of F...
Asset ID

Defer Layout Update Update

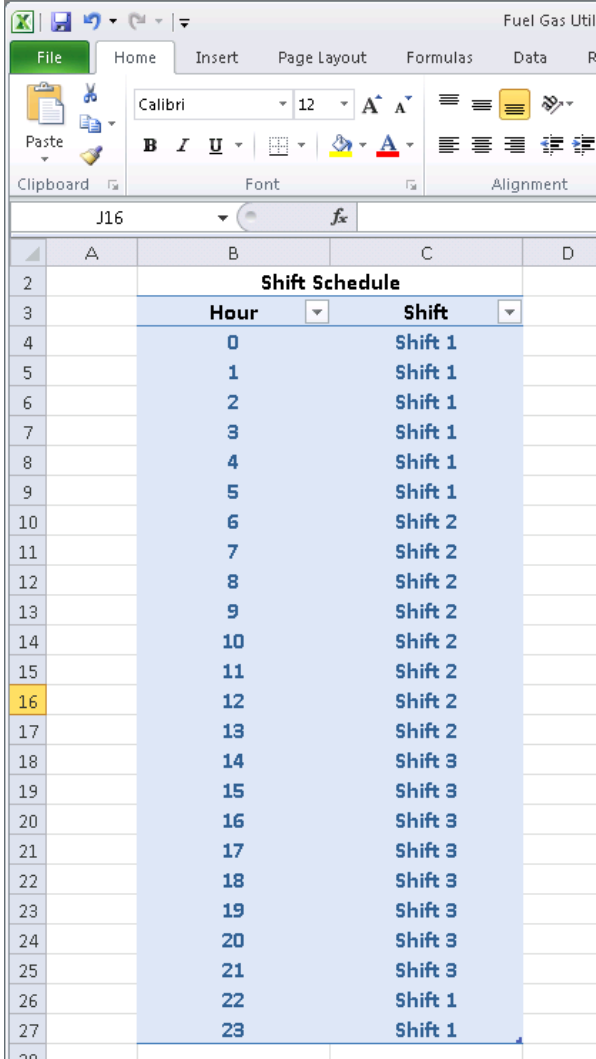
Slicing Data by Shifts

- Link in an Excel Table containing shift schedule
- Use DAX¹ to add an “Hour” column to the “Fuel Use” table;

=HOUR([Time])

- Create a Relationship between the “Hour” columns in each table.

1. Data Analysis Expression Language



The screenshot shows an Excel spreadsheet with a table titled "Shift Schedule". The table has two columns: "Hour" and "Shift". The "Hour" column contains values from 0 to 23, and the "Shift" column contains values "Shift 1", "Shift 2", and "Shift 3". The table is highlighted in blue.

Hour	Shift
0	Shift 1
1	Shift 1
2	Shift 1
3	Shift 1
4	Shift 1
5	Shift 1
6	Shift 2
7	Shift 2
8	Shift 2
9	Shift 2
10	Shift 2
11	Shift 2
12	Shift 2
13	Shift 2
14	Shift 3
15	Shift 3
16	Shift 3
17	Shift 3
18	Shift 3
19	Shift 3
20	Shift 3
21	Shift 3
22	Shift 1
23	Shift 1

File Home Insert Page Layout Formulas Data Review View PowerPivot PI

Calibri 11 A⁺ A⁻ General

B *I* U Font Alignment Number

Conditional Formatting Format as Table Cell Styles

Insert Delete Format Cells

Σ Sort & Filter Find & Select Editing

A1

fx

A

B

C

D

E

F

G

H

I

J

K

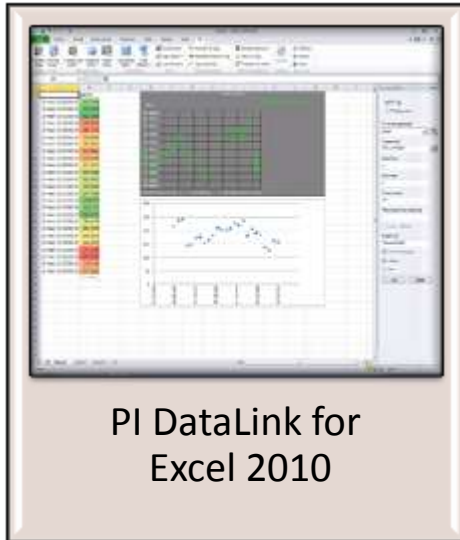
L

M

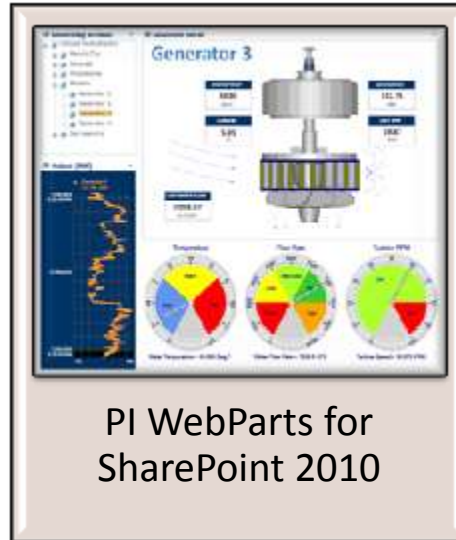
N

O

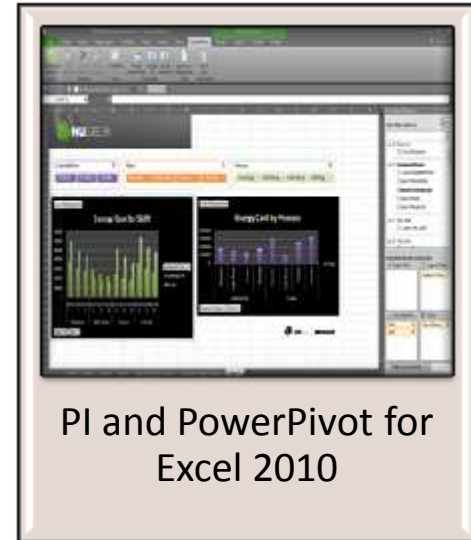
Visualization for PI System 2010



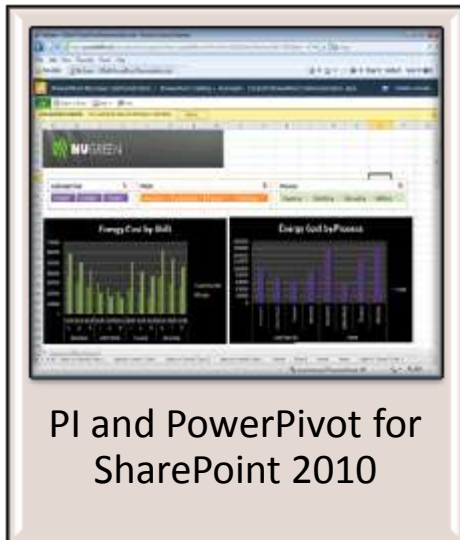
PI DataLink for
Excel 2010



PI WebParts for
SharePoint 2010



PI and PowerPivot for
Excel 2010

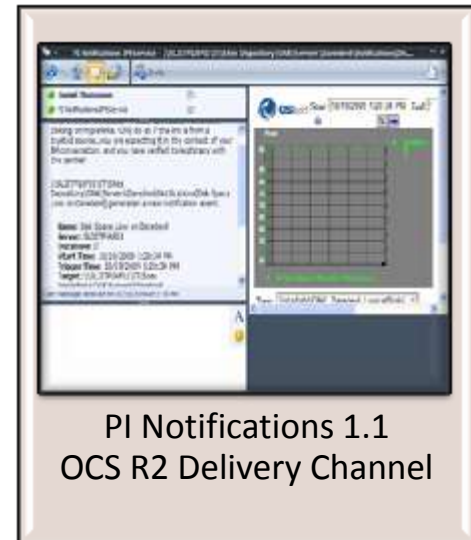


PI and PowerPivot for
SharePoint 2010

PI OLEDB
Enterprise 2010

PI Web Services
2010

PI Data Access
Technologies



PI Notifications 1.1
OCS R2 Delivery Channel

Keeping Insights Up to Date



Refreshing Data in SharePoint 2010

SharePoint can refresh the data from the specified data sources over the Web, in the cloud, from internal databases, PI System 2010, Excel files, and any other location with network connectivity.

Fuel Gas Analysis Start - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View PowerPivot PI Design Layout Format Analyze

Calibri (Body) 10 A A

B I U

Font Alignment

General

\$ %

Number

Conditional Formatting as Table Cell Styles

Styles

Cells

Insert Delete Format

Sort & Filter Find & Select

Editing

Chart 1

Row Labels	Count of R-B309_FG903	Count of R-B555_FG120	Count of R-B210_FG005	Count of R-B235_FG293
Calendar 201	43201	43201	43201	43201
Quarter 1,	11616	11616	11616	11616
3/1/2010	11616	11616	11616	11616
Week	5856	5856	5856	5856
Week				5760
Quarter 2,				31585
4/1/2010				31585
Week				4320
Week				10080
Week				10080
Week				7105
Grand Total	43201			43201
Row Labels	Count			
Sunday				
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				
Grand Total	43201			



PowerPivot Field List

Choose fields to add to report:

Search

- DayOfMonthName
- DayOfWeek
- DayOfWeekName
- WeekOfYear
- WeekOfYearName
- MonthOfYear
- MonthOfYearName
- MonthOfQuarter
- MonthOfQuarterName
- QuarterOfYear
- QuarterOfYearName
- Tag Data**
- Timestamp

Slicers Vertical Slicers Horizontal

Report Filter Legend Fields

Axis Fields (Cat... Σ Values

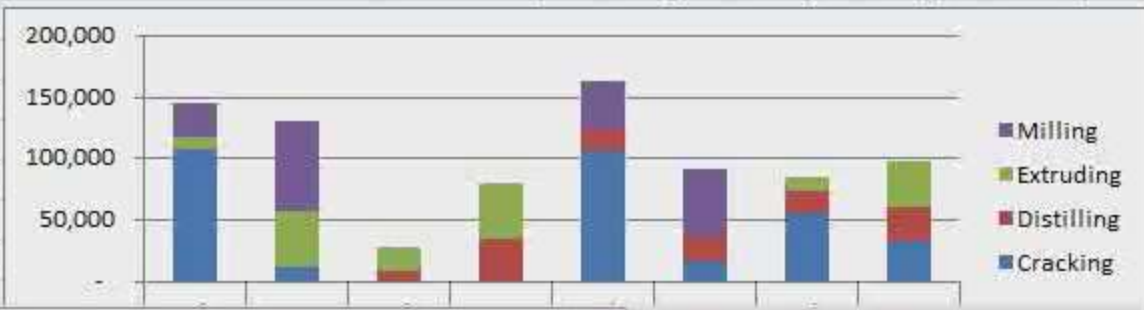
DayOfWeekName Count of R-B309...

Corporate Fuel Gas Consumption

Sum of Fuel Gas Volume Kft3	Column Labels	Cracking	Distilling	Extruding	Milling	Grand Total
Houston		121,818		54,812	98,063	274,694
Boiler		108,161		10,049	26,473	144,684
Heater		13,657		44,763	71,590	130,010
Little Rock			44,952	63,409		108,361
Boiler			9,464	18,646		28,110
Heater			35,488	44,763		80,251
Tucson		125,455	36,175		92,188	253,819
Boiler		107,410	17,321		38,036	162,767
Heater		18,045	18,854		54,152	91,052
Wichita		91,865	45,170	44,546		181,581
Boiler		57,075	18,199	8,468		83,741
Heater		34,790	26,971	36,078		97,840
Grand Total		339,138	126,297	162,767	190,252	818,454

Shift

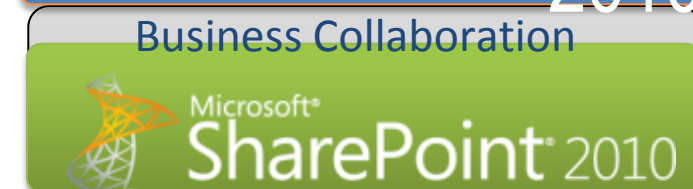
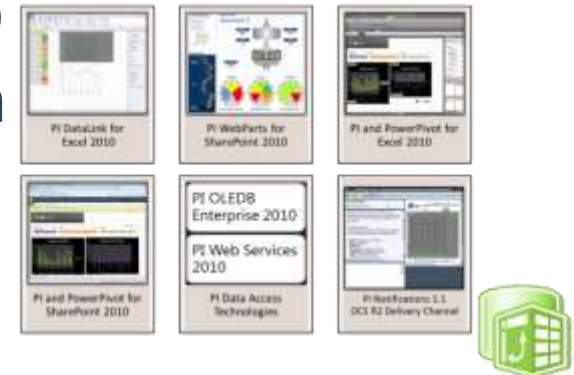
- Shift 1
- Shift 2
- Shift 3



Self-service BI Toolkit for the PI System



- Dimensions and Facts
 - PI Asset Framework (PI Server 2010)
- Datasets for BI Data Extraction
 - PI OLEDB Enterprise 2010 (PI for Office 2010)
- Desktop Analysis and Cube Configuration
 - Microsoft PowerPivot for Excel 2010
- Enterprise Accountability
 - Microsoft PowerPivot for SharePoint 2010
 - Microsoft SharePoint 2010
 - Microsoft SQL Server 2008 R2



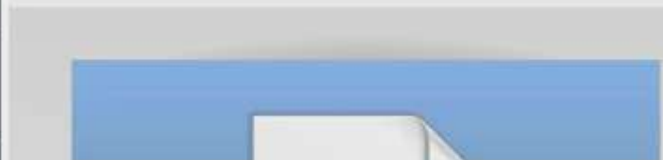
PowerPivot Site > PowerPivot Gallery
Share a document with the team by adding it to this document library.

PowerPivot Site | Search this site...

- Libraries
- Site Pages
- Shared Documents
- PowerPivot Gallery
- Multidimensional Data and PI
- Nalco Displays
- Lists
- Calendar
- Tasks
- Discussions
- Team Discussion
- Sites
- People and Groups
- Recycle Bin
- All Site Content

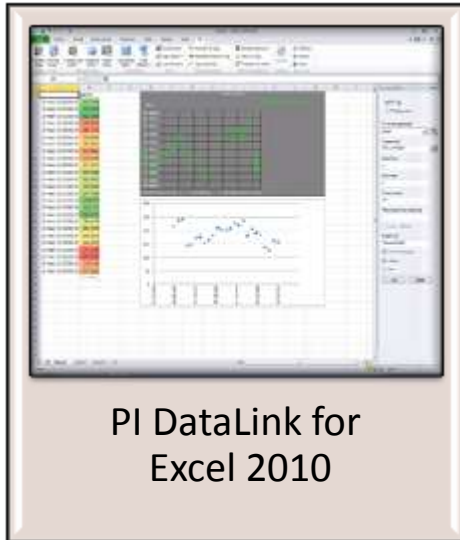


Fuel Gas Utilization and Benchmarking R
 Last Modified By: System Account, Date: 4/16/2010
 Created By: Curt Hertler

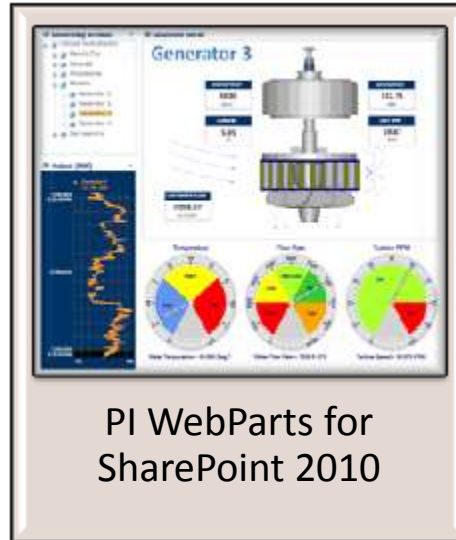


PPTest
 Last Modified By: John K. Maytum, Date: 4/19/2010
 Created By: John K. Maytum

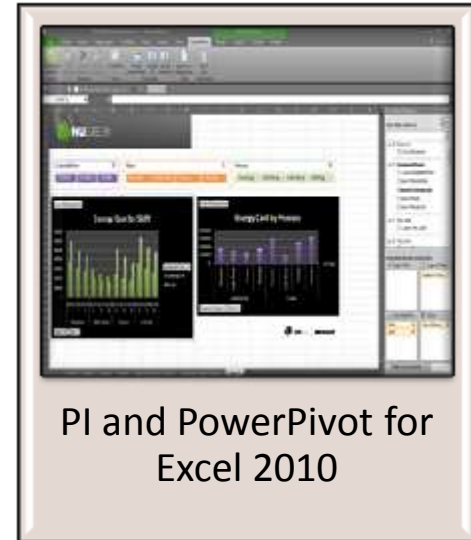
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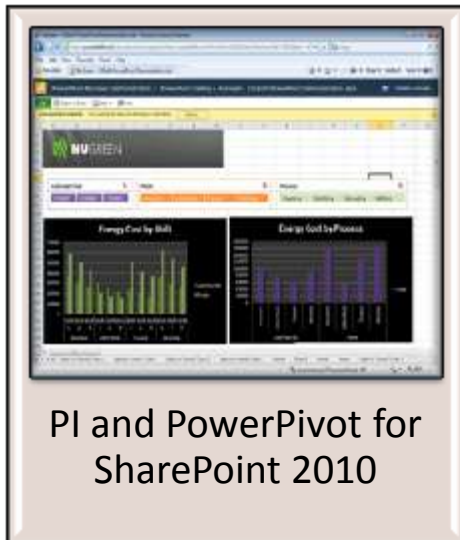
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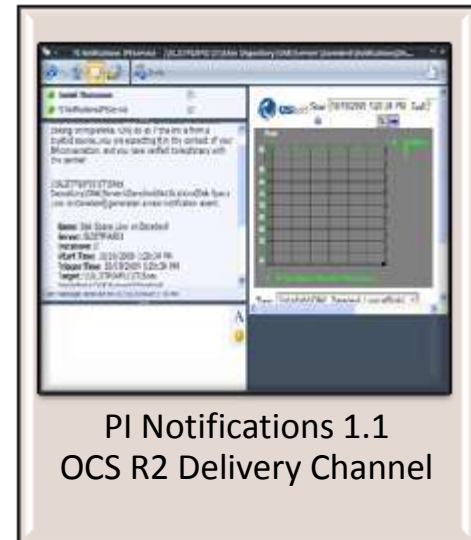


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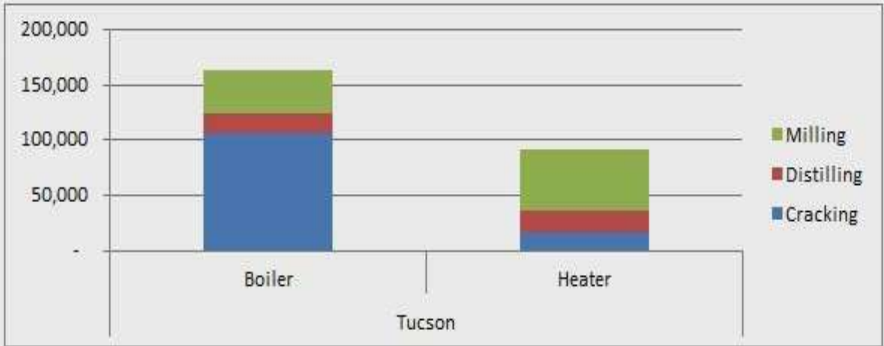


PI Notifications 1.1
OCS R2 Delivery Channel

Corporate Fuel Gas Consumption

- Shift 1
- Shift 2
- Shift 3

Sum of Fuel Gas Volume KFE3	Column Labels			
Row Labels	Cracking	Distilling	Milling	Grand Total
Tucson	125,455	36,175	92,188	253,819
Boiler	107,410	17,321	38,036	162,767
Heater	18,045	18,854	54,152	91,052
Grand Total	125,455	36,175	92,188	253,819



- Process Support.
- Engineering
 - Chad Chisholm
 - James Spainhower
- Operations
 - Laurie Dieffenbach
 - Andre Downey
 - Steve Jones
- Production Logistics
 - John Maytum
 - Janelle Minich



Recycle Bin



Camtasia Studio 7

Laurie Dieffenbach - Conversation

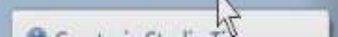
Chad Chisholm
Laurie Dieffenbach

Laurie Dieffenbach
Chad, please look at the energy consumption at your plant, there seems to be an issue with Miling. 11:14 AM

Chad Chisholm
I'll look at that now. 11:14 AM

Last message received on 4/16/2010 at 11:14 AM.

A
😊



Notification Limit Change

Use this form to change notification limit values.

Please enter the effective date for changes:

Target Date: 

Please select the appropriate unit:

Heater:

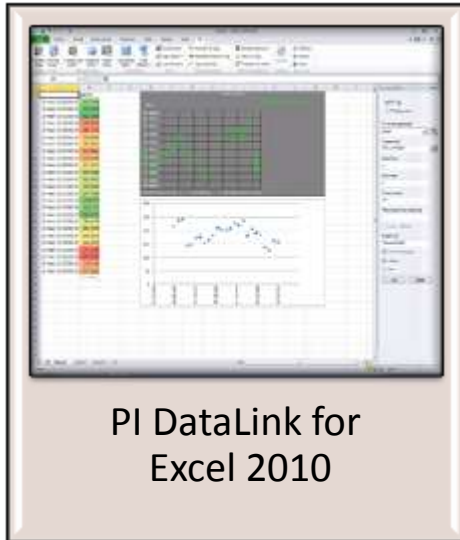
Heater 395: FG Limit
Heater 393: FG Limit
Heater 148: FG Limit

Please enter a new value Notification trigger limit:

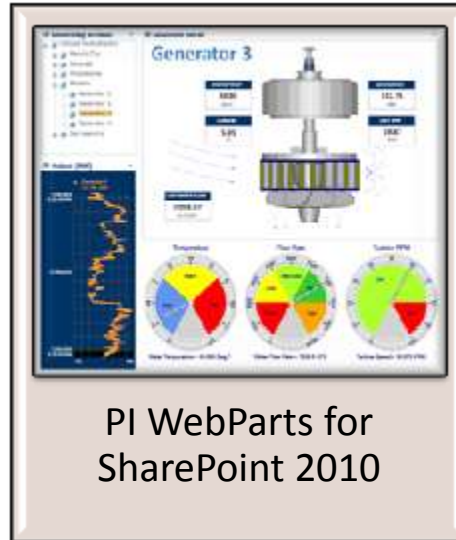
Trigger Limit:

Change setpoint

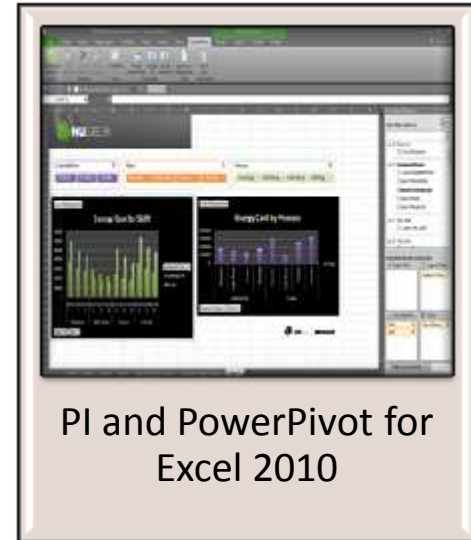
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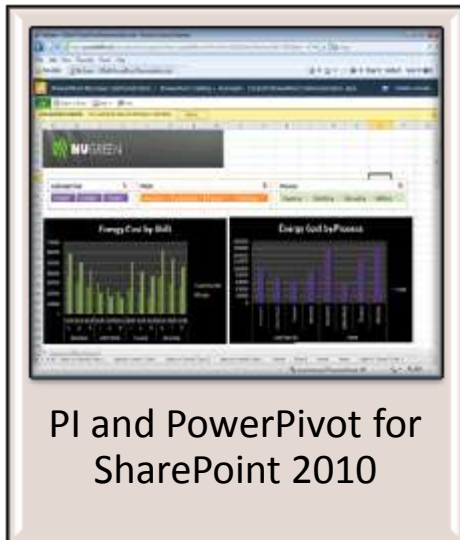
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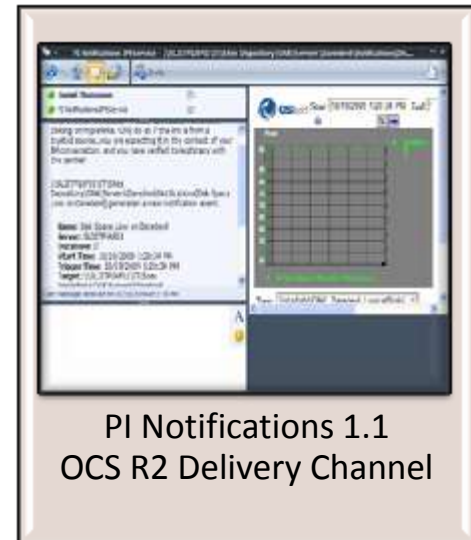


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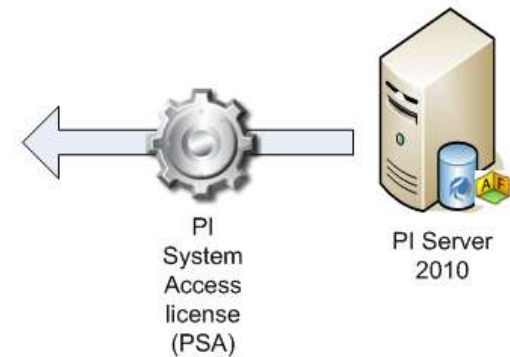
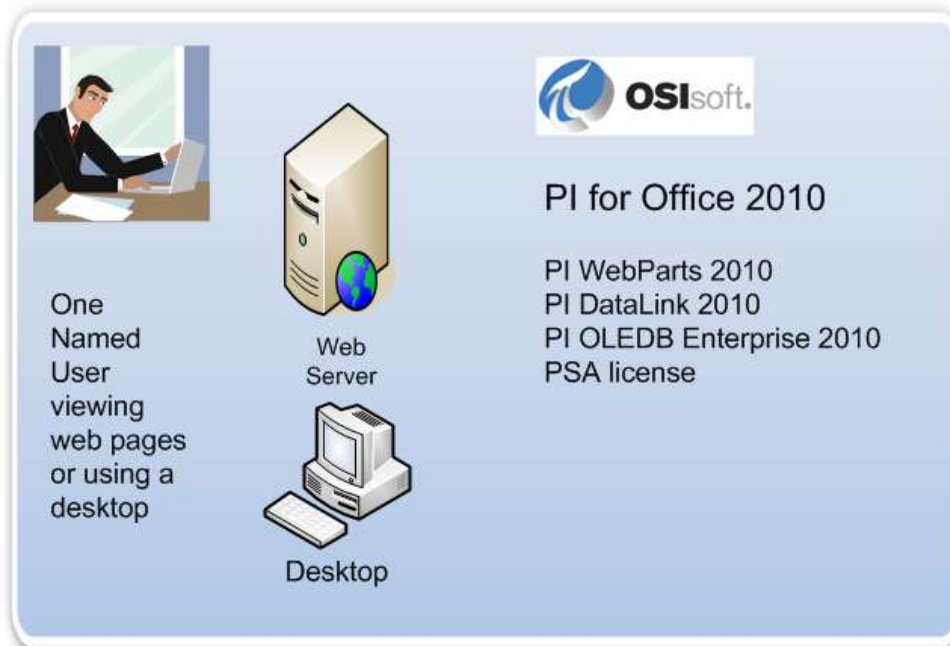
PI Web Services
2010

PI Data Access
Technologies



PI Notifications 1.1
OCS R2 Delivery Channel

- Pairs with Microsoft Office and SharePoint





Thank you

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