Turning Insight into Action

Presented by

Don Smith

OSIsoft

What we have been doing

- Highlights of the PI System
  - Scaling
  - Reliability/HA
  - Portal, rich client
  - Partners

Insight tools

- Trends
- Analytics
- Context, PI AF, PI Batch

- Data
  - Connectivity
  - Servers
  - Data Access

- Information
  - Analytics
  - Trending
  - Graphics
  - Reports

Turning insight into action.

- Insight
  - Humans
  - Models
  - Systems

- Action
  - Autonomous
  - Workflows
  - Schedule
  - Hard work

PLANT O&M

Entergy's "big catch"

Entergy christened its Performance Monitoring and Diagnostic Center several years ago to leverage the expertise of its most senior operators and technicians across the company's entire fleet of plants. The center also makes use of advanced software tools that increase plant availability and reli-ability by identif-ages. The center last year.

By Dr. Robert Peltier, PE

Entergy has a long history in pl-formance monitoring, beginni-the first implementation of its tions Information System (OIS) ov-cade ago. The introduction of market tition for reliable, low-priced power drove the investment in new data co-and evaluation tools at the plant level

About the same time as the OIS wa-duced, Entergy embarked on a best-evaluation of its entire fleet. One n-that study was an adjustment of app-plant staffing levels that was based routine plant operations and mainten-reflect the industry's long-term readj-to a market-driven power supply syst-bottom line: Plant staffing was red-minimum levels during those early market competition.

The OIS at the time was a simple-driven program used to facilitate ac-

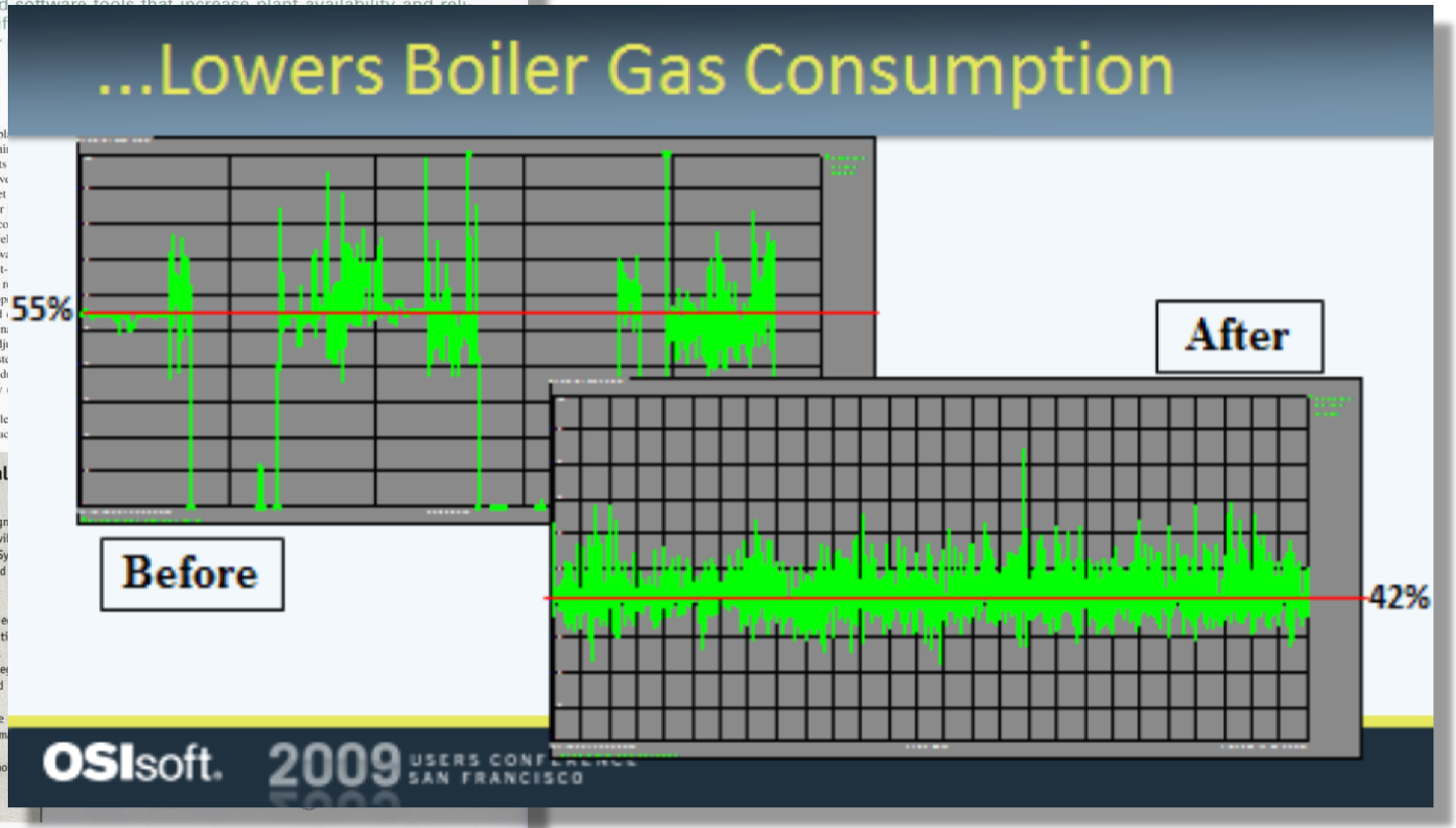
Entergy's PM&DC goal-and objects

Establish monitoring and diagn-standards and processes that wil-verage Operations Information Sy-information and achieve increased efits through:

- Early identification of changes in e-ment physical, thermal, operati-and environmental performance.
- Improved ability to mitigate de-ing equipment condition and performance.
- Improved ability to maximize value, considering current m-opportunities.
- Leveraging expertise and techno-
- Enhanced teamwork.

66 www.powermag.com POWER | October 2008

...Lowers Boiler Gas Consumption



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Business are faced with challenges

- Production and operation costs
- Sustainability in all aspects of their business
- Respond to customer demands
- Innovate on products, operations, marketing

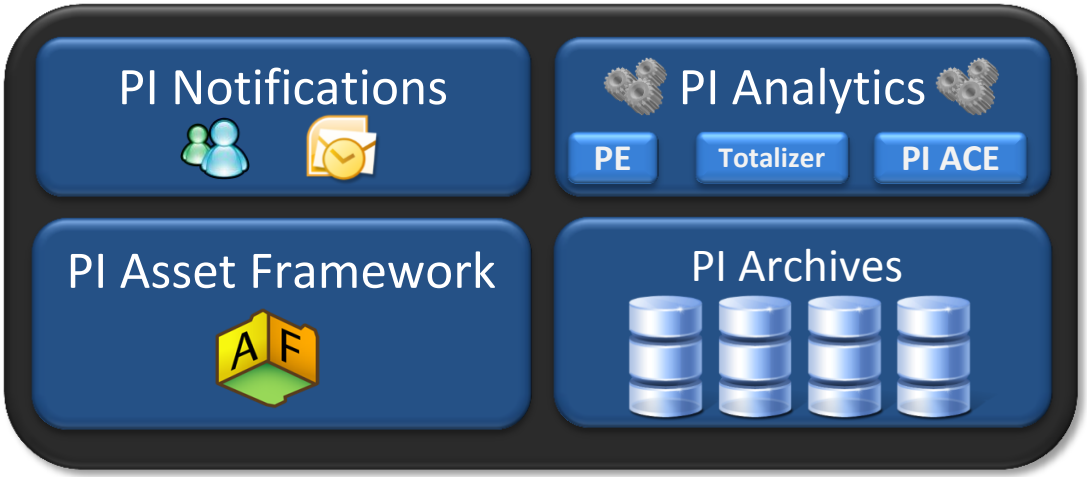
- **Act on emerging opportunities**

Today’s Business Faces

- Exponential quantities of data
- Need to respond and make decisions in real-time
- Global demand and competition
- Rapidly changing technology

- **Are you listening to your data?**

PI System 2010



Real-time Interfaces

Real-Time Data
DCS / PLC / SCADA / OPC
HISTORIANS / INTERFACES

Custom Data
APIs / SDKs

IT Data
IT MONITOR

Relational Data
OLEDB / ODBC
SQL SERVER /
ORACLE

Web Services
SOA / EXTERNAL DATA
LEGACY APPS

Windows Integrated Security

High Availability

64-bit product

Virtualization

Windows Server 2008
Hyper-V

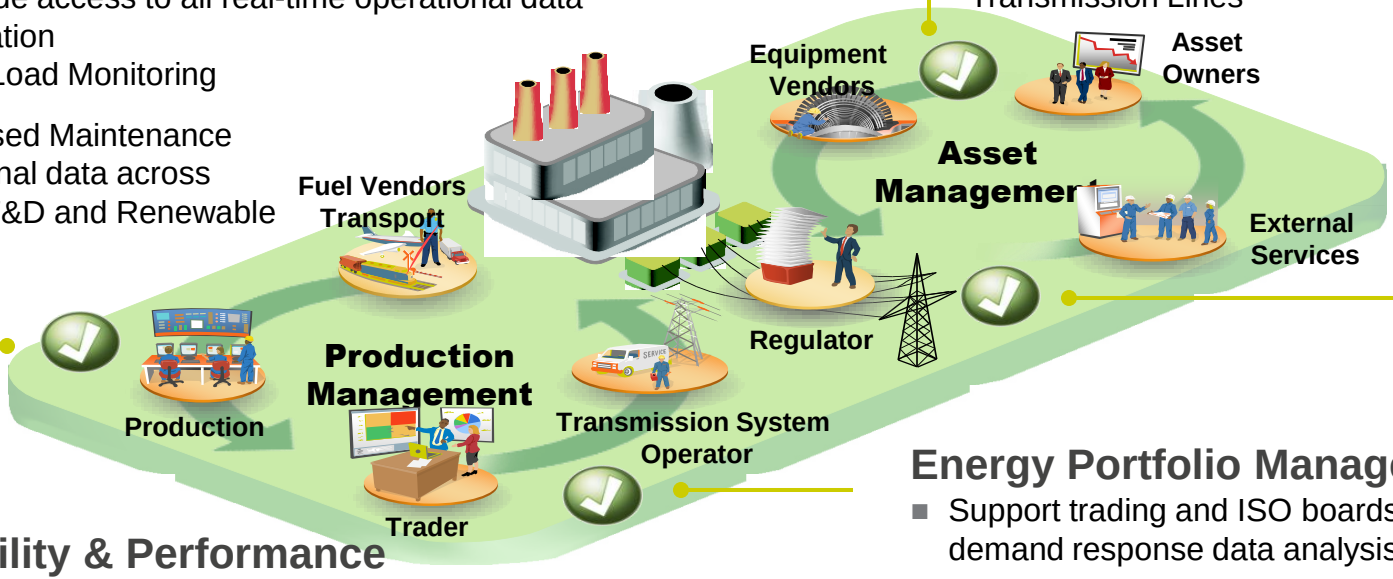
Smart Grid Enabled by Real-time Data

Optimized Asset Operations and Maintenance

- Asset operating conditions
- Enterprise-wide access to all real-time operational data
- Fuel Optimization
- Transformer Load Monitoring
- Condition Based Maintenance from operational data across Generation, T&D and Renewable

Asset Safety & Compliance

- Environmental data monitoring and alerting
- Wide Area Grid Monitoring -Phasor monitoring of Transmission Lines



Asset Visibility & Performance

- Operation decision support considering technical constraints as well demand and economic data

Energy Portfolio Management

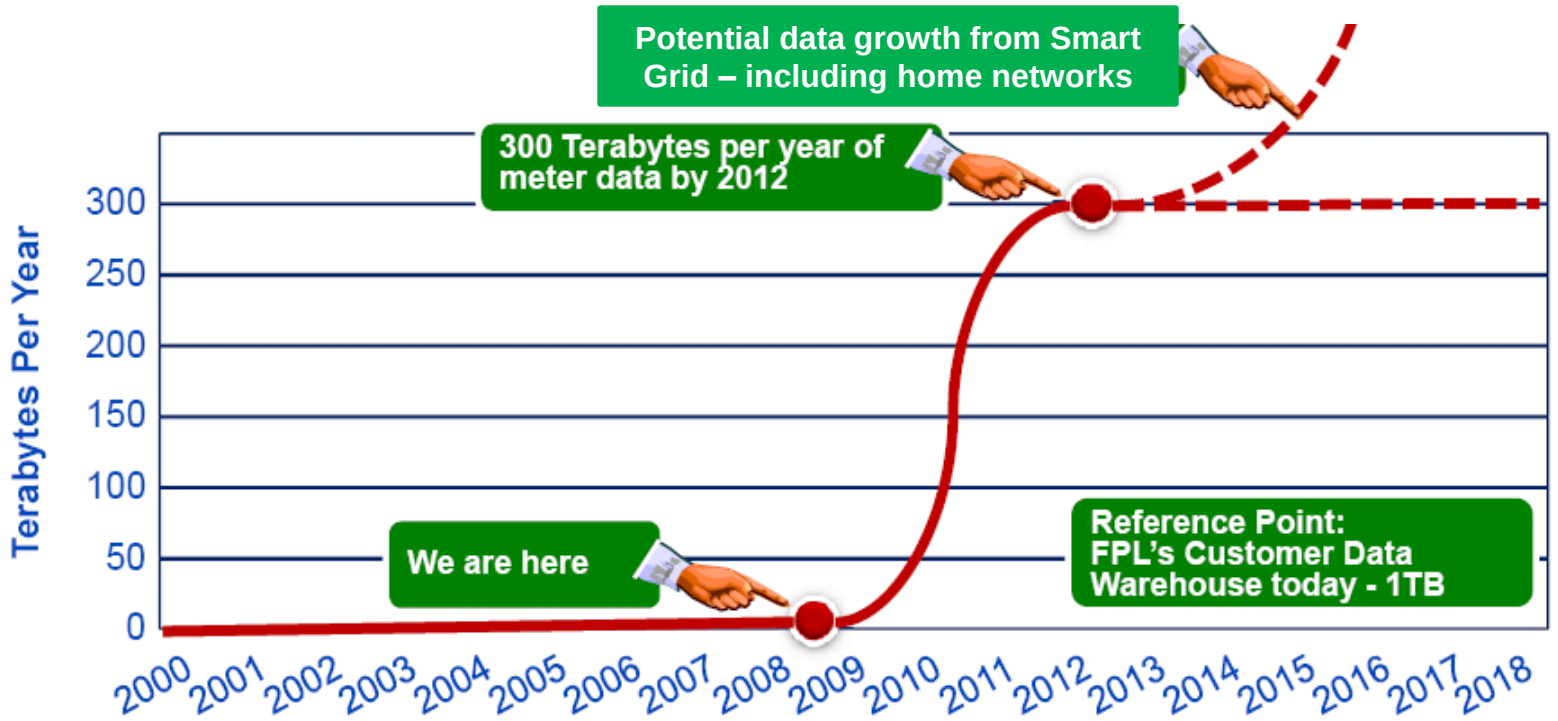
- Support trading and ISO boards for overall demand response data analysis

Utility Business Model Evolution

Energy Delivery

Energy Delivery +
Energy Information Management

Data, Data, and More Data



AMI and Smart Grid will increase the amount of measurement and control points far beyond anything we have today. How can we leverage this data to compete?

Proliferation of People & Devices

2013

There Will Be

ONE TRILLION

Devices Connected to the Network,

up from 35 BILLION in 2010

Cisco IBSG

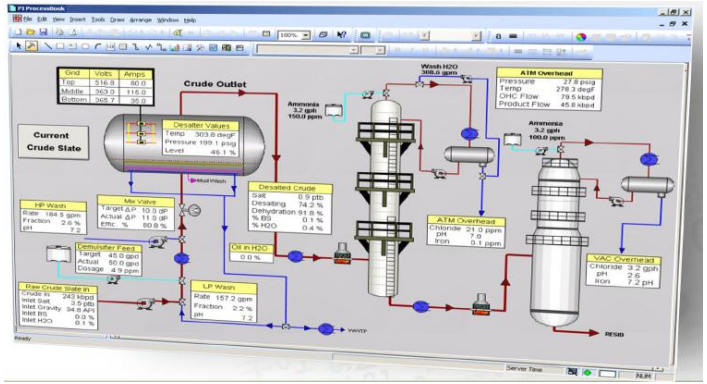
Saudi Aramco

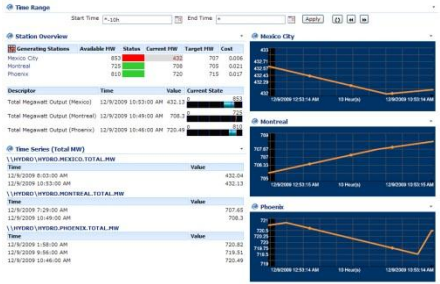
Clip from 60 Minutes depicting the "Command Center" at Saudi Aramco.

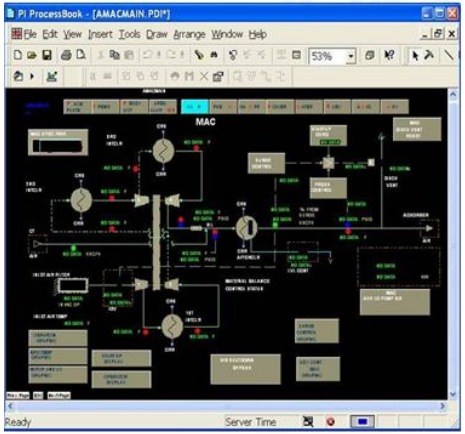
http://vimeo.com/2463494

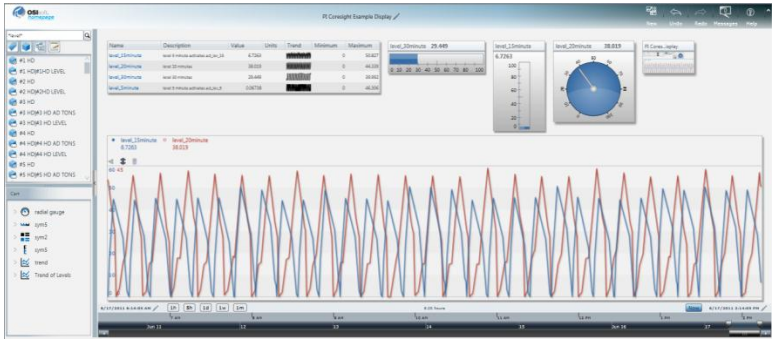
Saudi Aramco

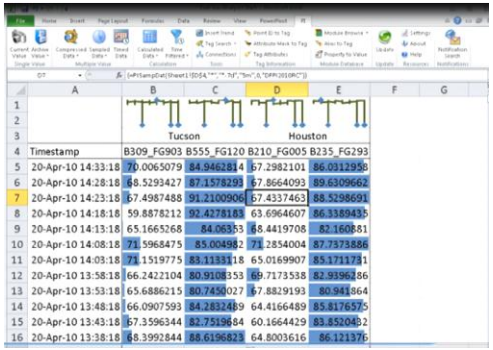
PI System Clients – Visualization Tools



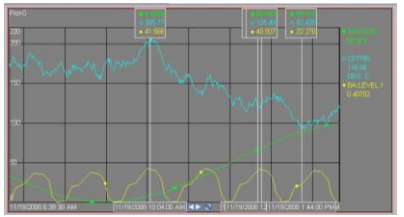








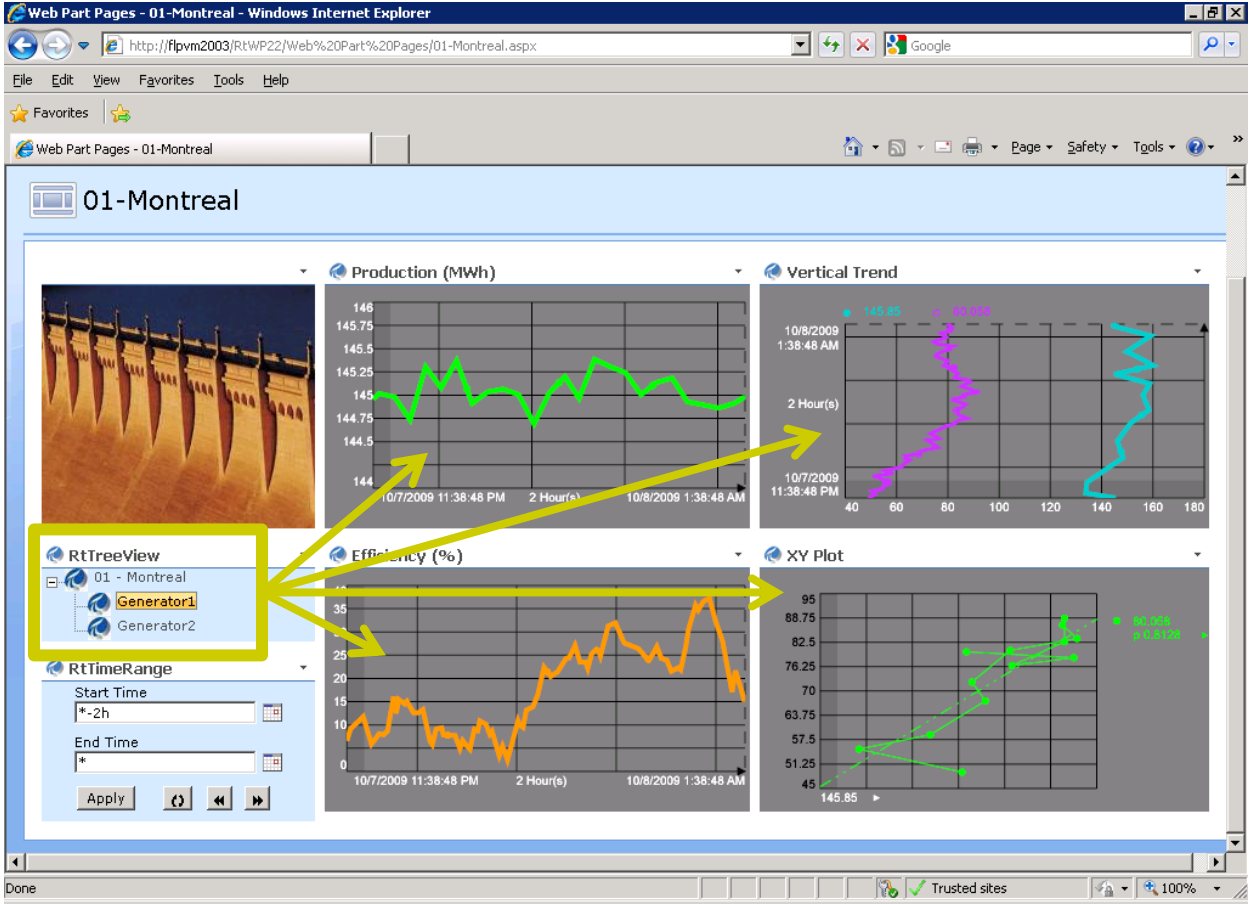
	A	B	C	D	E	F	G
1							
2							
3		Tucson			Houston		
4	Timestamp	B309_FG903	B555_FG120	B210_FG005	B235_FG293		
5	20-Apr-10 14:33:18	70.0065079	84.9462814	67.2982101	86.0312958		
6	20-Apr-10 14:28:18	68.5293427	87.1578293	67.8664093	89.6309662		
7	20-Apr-10 14:23:18	67.4987488	91.2100906	67.4337463	88.5298691		
8	20-Apr-10 14:18:18	59.8878212	92.4278183	63.6964607	86.3389435		
9	20-Apr-10 14:13:18	65.1665268	84.06353	68.4419708	82.160881		
10	20-Apr-10 14:08:18	71.5968475	85.004982	71.2854004	87.7373886		
11	20-Apr-10 14:03:18	71.1519775	83.1133118	65.0169907	85.1717731		
12	20-Apr-10 13:58:18	66.2422104	80.9108353	69.7173538	82.9396286		
13	20-Apr-10 13:53:18	65.6886215	80.7450027	67.8829193	80.941864		
14	20-Apr-10 13:48:18	66.0907593	84.2832489	64.4166489	85.8176575		
15	20-Apr-10 13:43:18	67.3596344	82.7519684	60.1664429	83.8520432		
16	20-Apr-10 13:38:18	68.3992844	88.6196823	64.8003616	86.121376		



California ISO – Monitoring Center

California ISO – Monitoring Center

Context-based Displays using PI AF

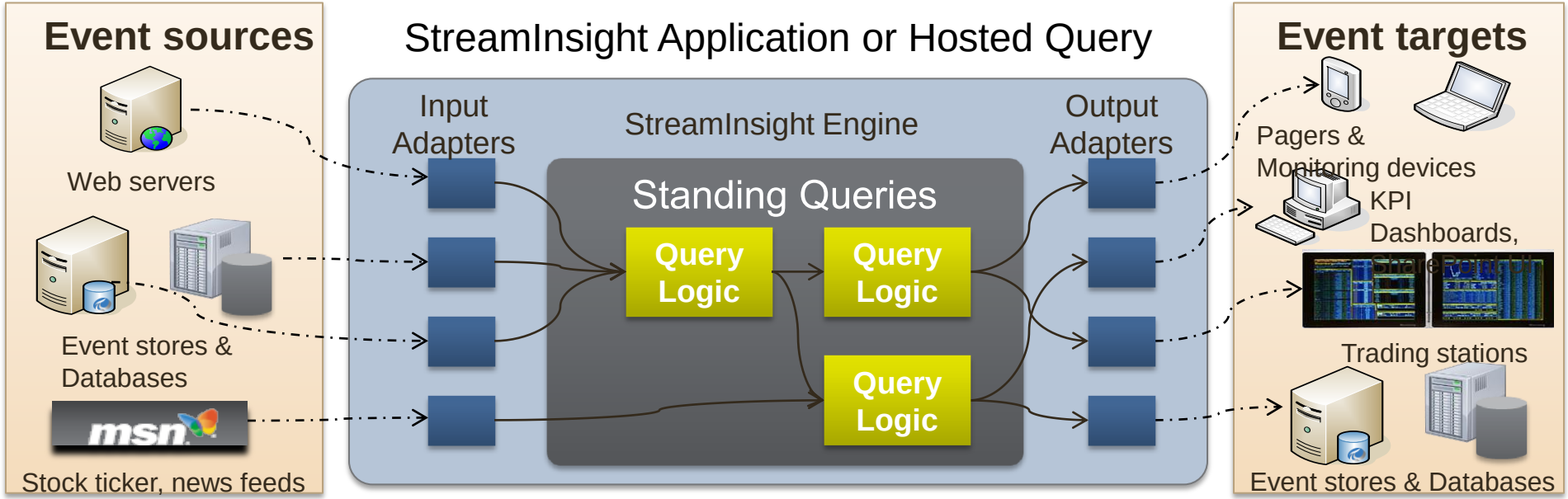


PJM

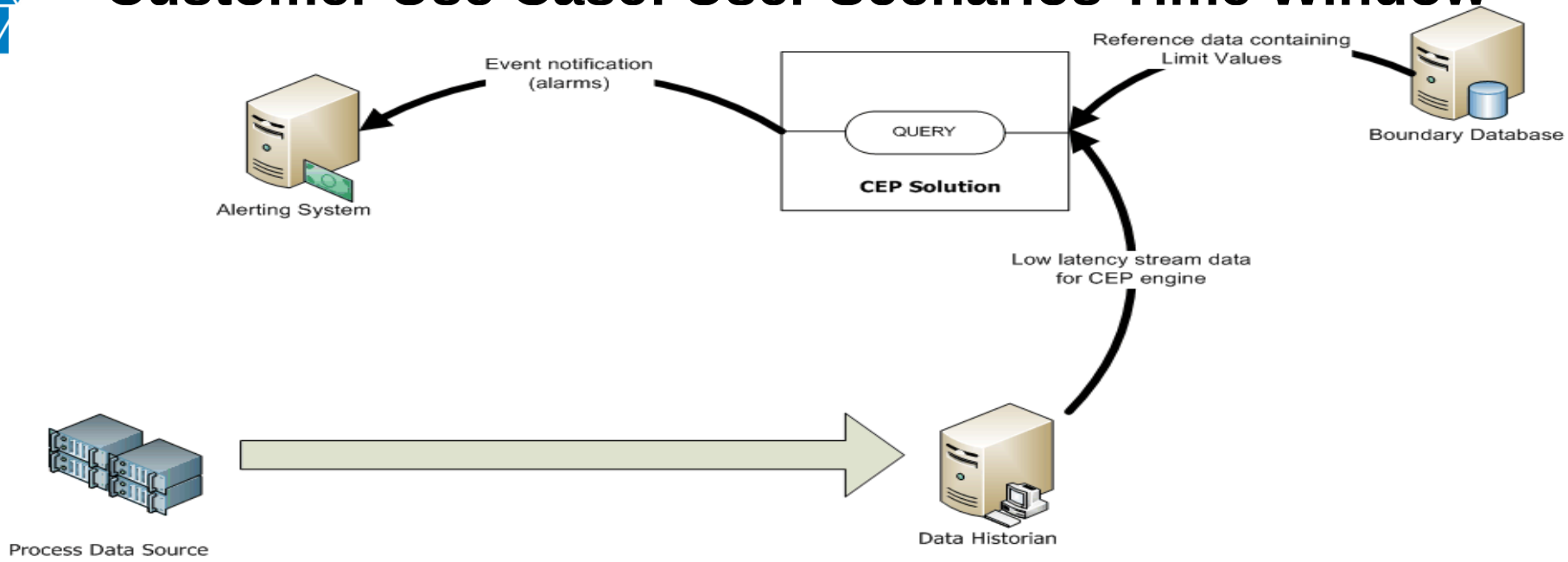
http://www.youtube.com/watch?v=vWvh9xl-oZo

Complex Event Processing (CEP)

StreamInsight
Development in C#, LINQ

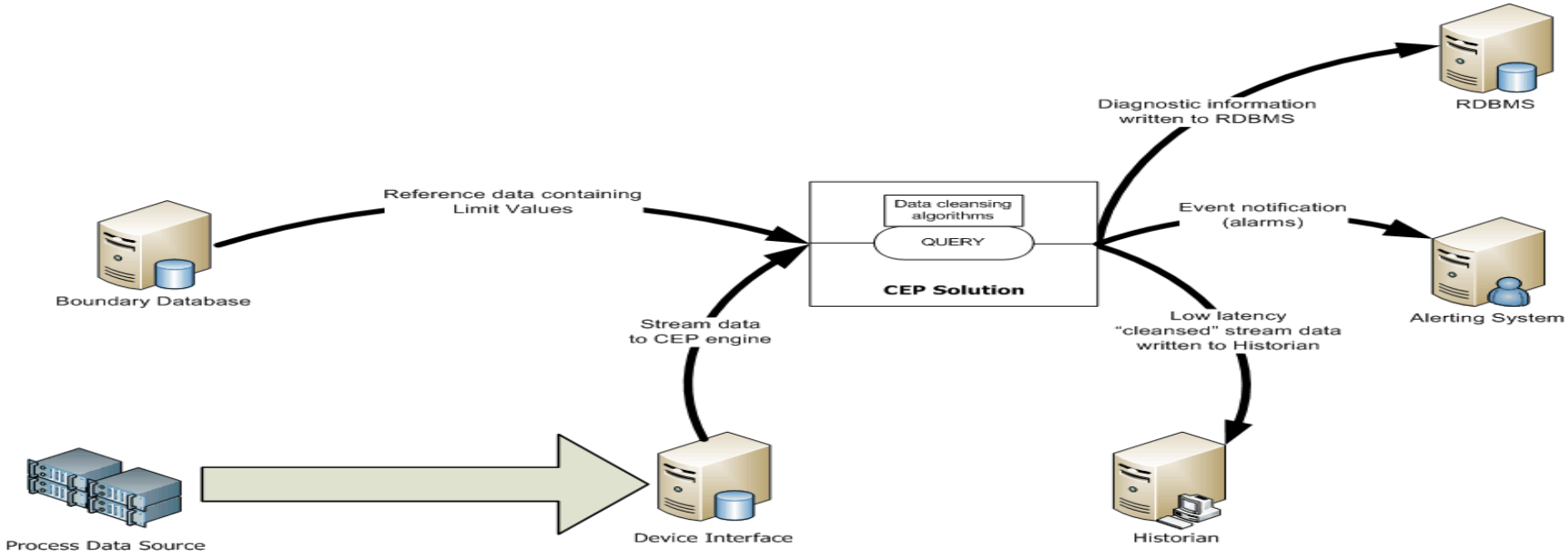


Customer Use Case: User Scenarios Time Window



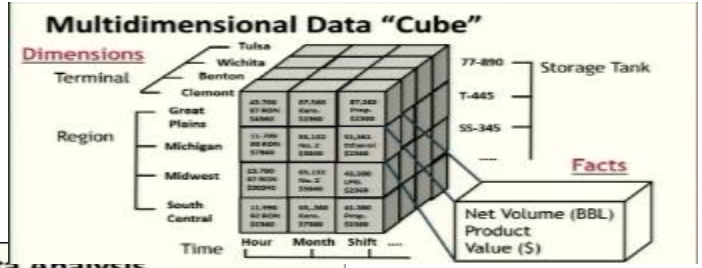
Detect pattern-based process data events (e.g. limit exceeded) in moving time windows and report the non-conformance immediately

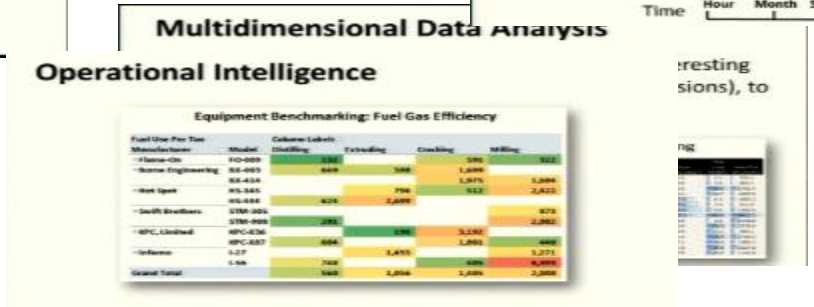
Customer Use Case: User Scenarios Data Quality



Analyze high speed process data and associated diagnostic information to identify suspect data; call routines to “cleanse” suspect data and output the processed data and diagnostic information; recognize critical events that need to be passed on immediately.

Microsoft Power Pivot





Multidimensional Data Analysis

- Optimized, memory-resident data "cubes"
- Scorecards, reports, pivot tables and charts
- Traditionally, a server-based, IT project
- Now, self-service BI for the Information Worker
- Enables Operational Intelligence

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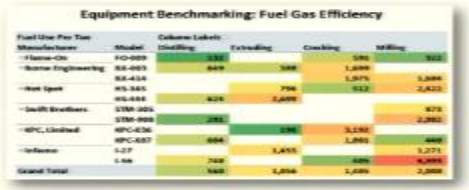
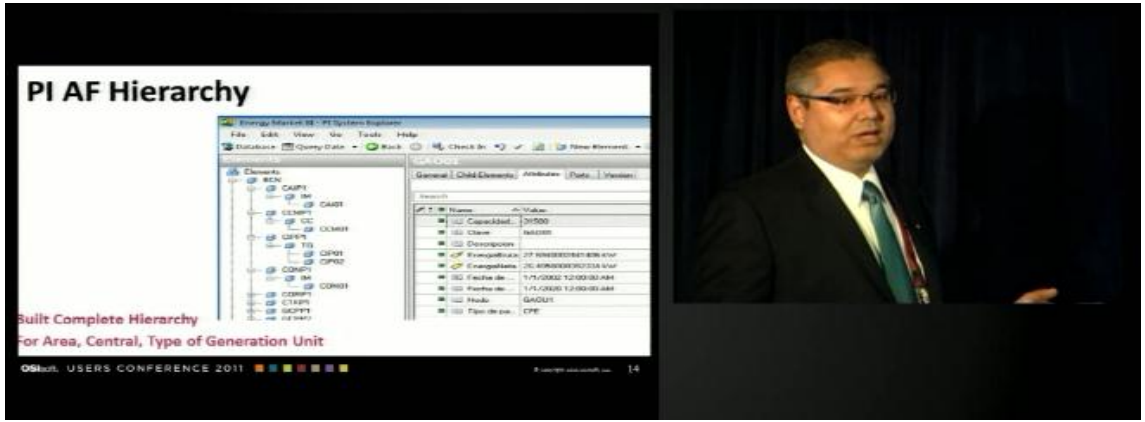
Product Inventories and Valuation

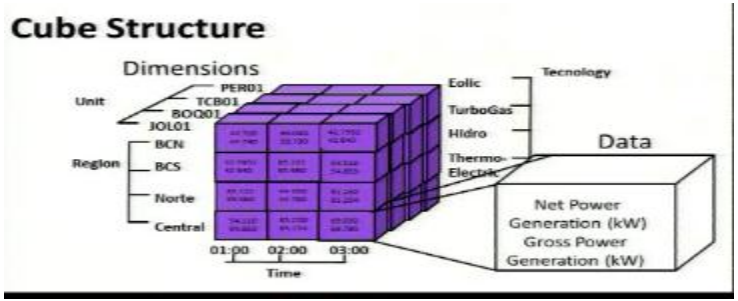
Operational Intelligence

Operational Intelligence

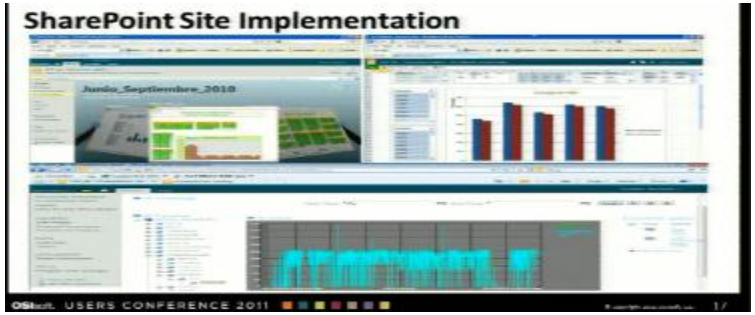


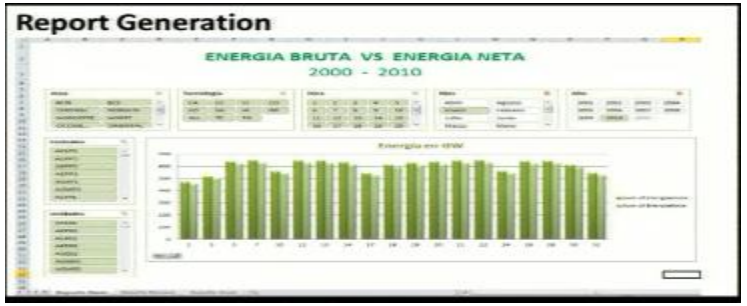
Customer Use Case : CFE





Customer Use Case : CFE Sharepoint, PowerPivot with PI System





Tangible Benefits

- Providing business awareness
- Incorporating business process knowledge
- $$$$$ SAVINGS:
  - 11,520,000 $MX pesos per unit per day
  - 42,048,000 $MX pesos a year if operation availability of one unit improved by 1%

Marginal Cost (CM) - Cost Integral (CI) * 24 hours/day * Max. Efficiency Generating Unit

Taking Petacalco Unit 7 (U7 PEO) with maximum efficiency of 640 MW

- The marginal cost is taken from a marginal unit that may be changing for 24 hrs a day
- For first time the marginal unit was 1320 $MX pesos and PEO U7 was generating 548 $MX pesos

CM (1320) - CI (548) = 772

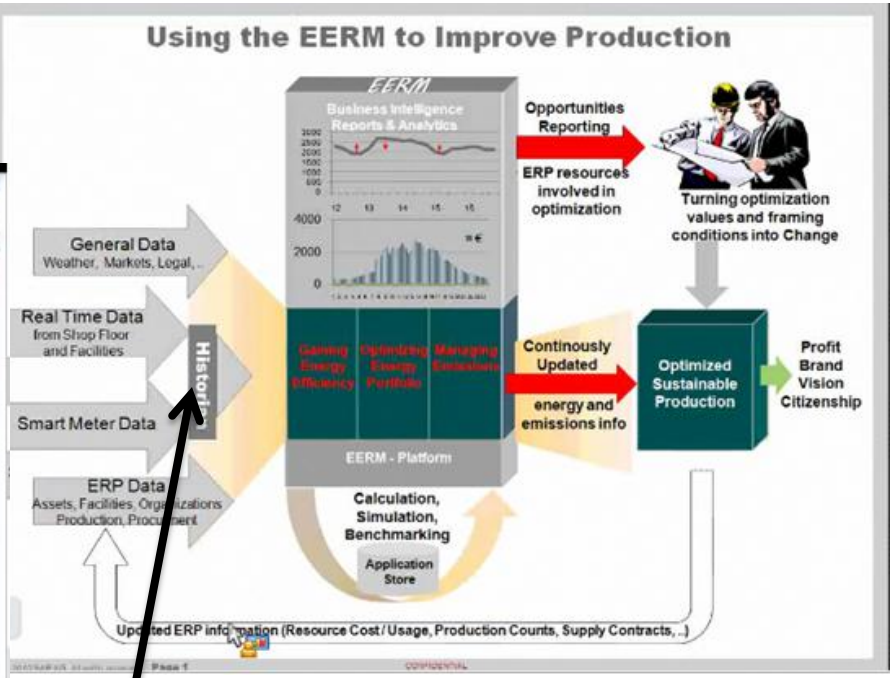
- To repeat for the remaining 23 hrs with marginals divided by 24 units per day, average CM – CI = 750

750 * 24 * 640 = 11,520,000 $MX pesos

By improving availability of one generating unit by 1% of the year (3.65 days), the savings:

42,048,000.00 $MXN (aprox. 3,446,557.00 $USD) ***CFE has 779 generation units*

In-Memory Computing SAP HANA

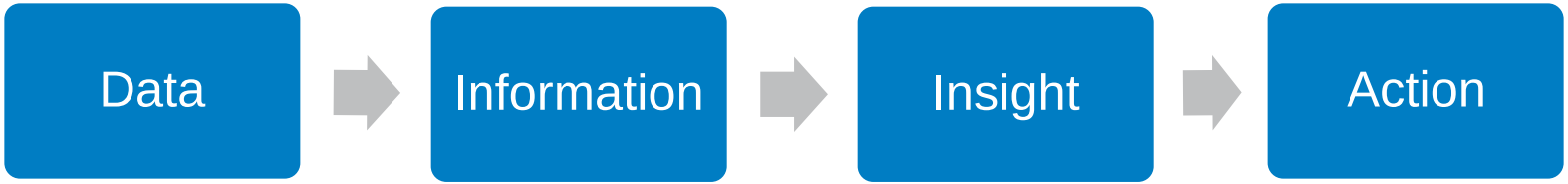


Centrica Customer analysis
Meter data for OSIsoft

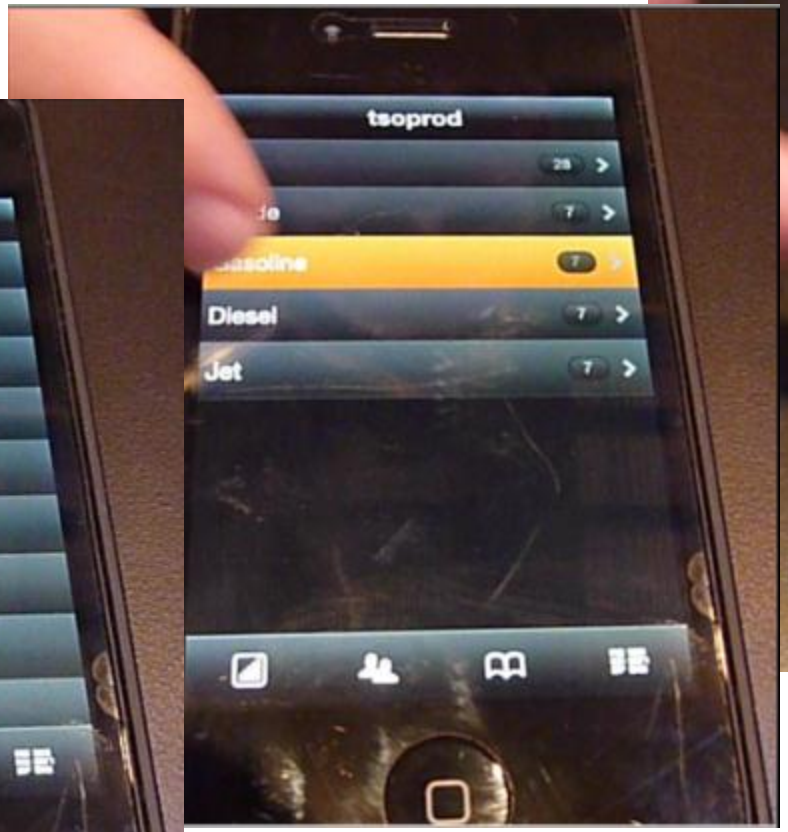
OSIsoft PI System

SAP EERM for
Energy Management

Turning Insight Into Action



Refinery Operations



PI Coresight

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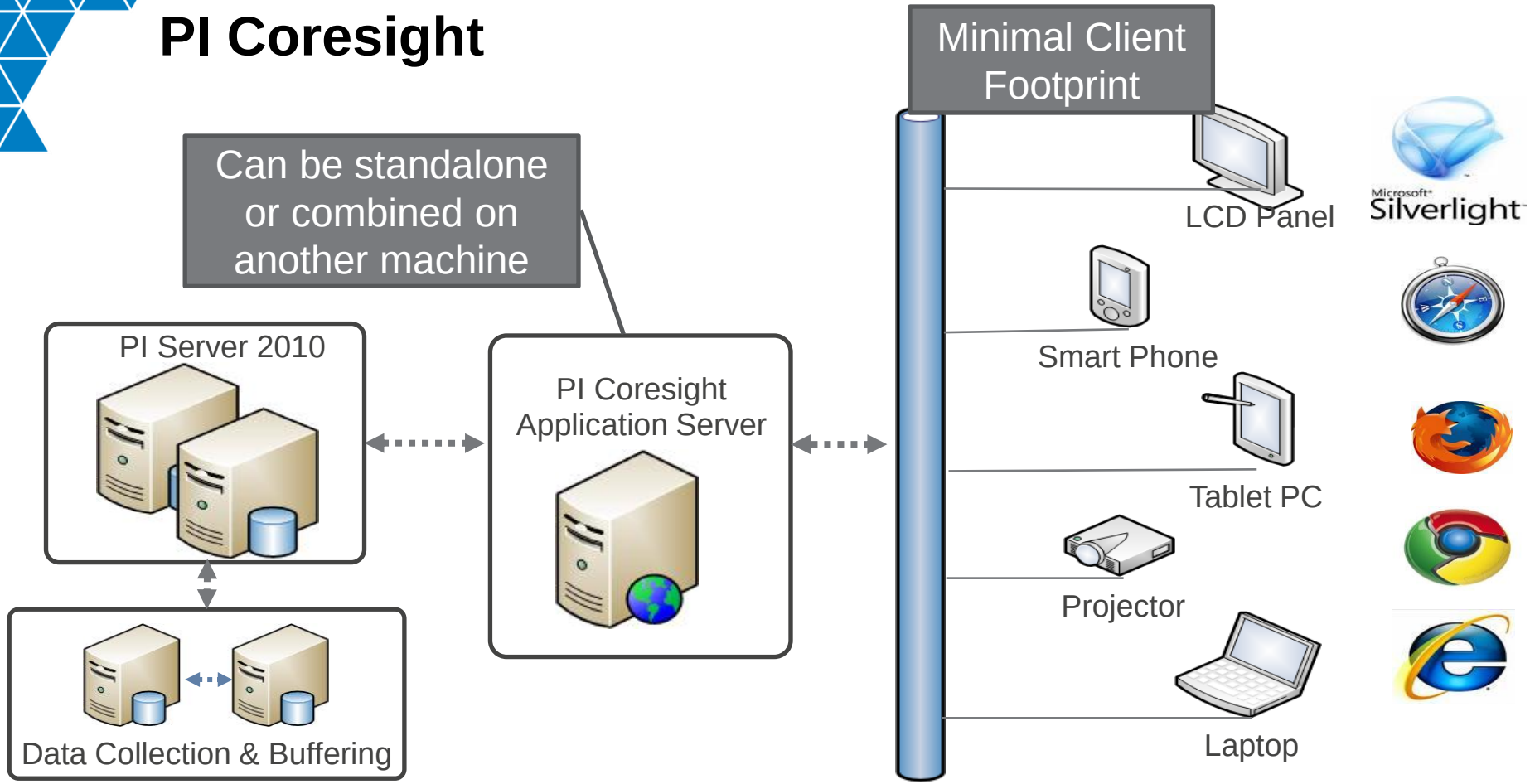


Sustainability

Real-time Data maps to Sustainability

By balancing social, environmental, and economic risks and opportunities, you can reduce waste, save money, and more importantly, protect your brand.

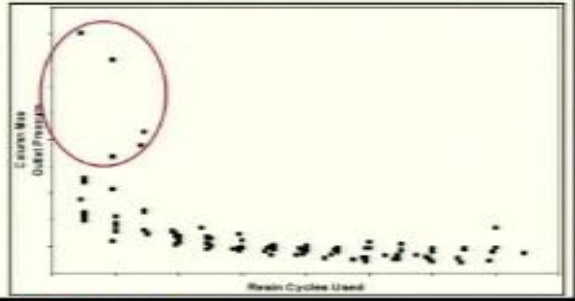
Executive Management	Benchmarking and Analytics			
Environment, Health & Safety	Environmental compliance	Process Safety		
Operations	Facilities Energy Management	Production Energy Management	Smart Grid Participation	Carbon Management
Supply Chain	Traceability and Recall	Green Logistics		
Product and Asset	Product Quality	Asset Management	Water Management	Product Carbon Footprint
Consumers	Residential Energy			
IT	Green IT	OSIsoft PI System		

Genentech Transforms Data with Statistical Modeling

Enabling Manufacturing Summary Statistics Analysis Using the PI System

Summary Statistic Example 1: Filter Fouling Issue

- Investigated 2 summary statistics tracked for a Chromatography process step: Resin Cycles Used vs. Column Max Outlet Pressure for last 2 campaigns (~100 runs)
- Observed the pressure issue only occurred when Resin Cycles Used less than threshold
- Using this information performed a multivariate analysis to find variables that had an effect on Column Max Outlet Pressure



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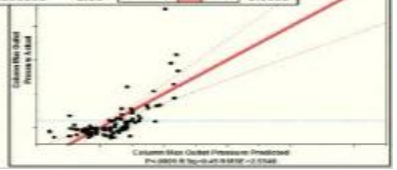
Summary Statistic Example 1: Filter Fouling Issue

Table 1: Parameter Estimates

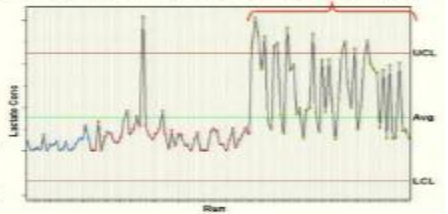
Term	Estimate	Std Error	t Ratio	Prob>|t|
Resin Cycles Used	-0.049276	0.006681	-7.38	<.0001*
Lactate Concentration	0.2178576	0.060733	3.59	0.0005*
Harv Unit[U_CENT_X474]	0.7351531	0.259398	2.83	0.0056*

- The multivariate analysis explored for changes in the response variable (Column Max Outlet Pressure) in response to 3 input variables:
  - Resin Cycles Used
  - Lactate Concentration (byproduct of cells)
  - Harvest Unit
- The input variables account for around 45% of the variation observed in the Max Outlet Pressure



Summary Statistic Example 2: Shifts in Process Step Performance

- Certain processes have increased variability around lactate generation at the production stage
- Although Lactate does not impact product quality; it appears to impact protein production so it is an important parameter to monitor
- OSIsoft tools have helped collected and monitor lactate results; they allow for better process understanding
- This is a good visual example of increase process variability



Thank you