The PI System – Enterprise Manufacturing Intelligence Infrastructure

Presented by

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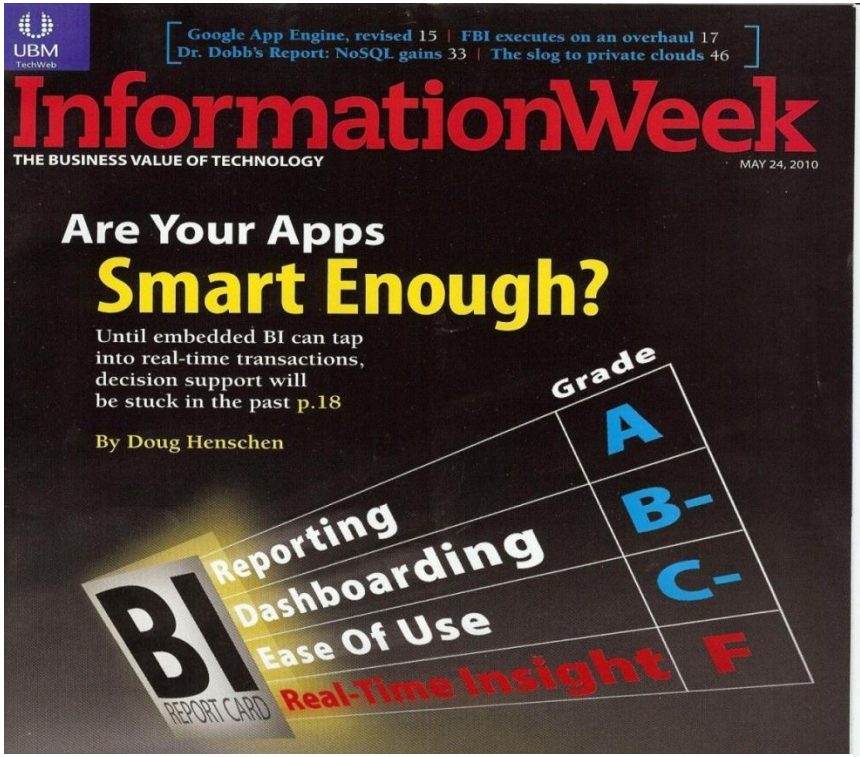
Enterprise Manufacturing Intelligence (EMI)

"Manufacturing Intelligence (MI), also known as Enterprise Manufacturing Intelligence (EMI), software **delivers real-time information about manufacturing processes** to help businesses **optimize the performance of these processes** as well as manufacturing yields. MI software **gathers and analyzes production data**, provides **role-based visualization**, and helps manufacturers **reduce waste**. The software also enables the **improvement of manufacturing processes**, **identification of best practices**, and the ability to **respond to exceptions and events**."

Source: Manufacturing Automation



"If application vendors succeed in delivering real-time transactional insight with reduced information management infrastructure, it would be a game changer."

EMI Definition Condensed

"Manufacturing Intelligence (MI), also known as Enterprise Manufacturing Intelligence (EMI), software **delivers real-time information about manufacturing processes** to help businesses **optimize the performance of these processes** as well as manufacturing yields. MI software **gathers and analyzes production data**, provides **role-based visualization**, and helps manufacturers **reduce waste**. The software also enables the **improvement of manufacturing processes**, **identification of best practices**, and the ability to **respond to exceptions and events**."

Source: Manufacturing Automation

Manufacturing Intelligence:

- Delivers real-time information about manufacturing processes
- Gathers and analyzes production data
- Provides role-based visualization

Delivered Value:

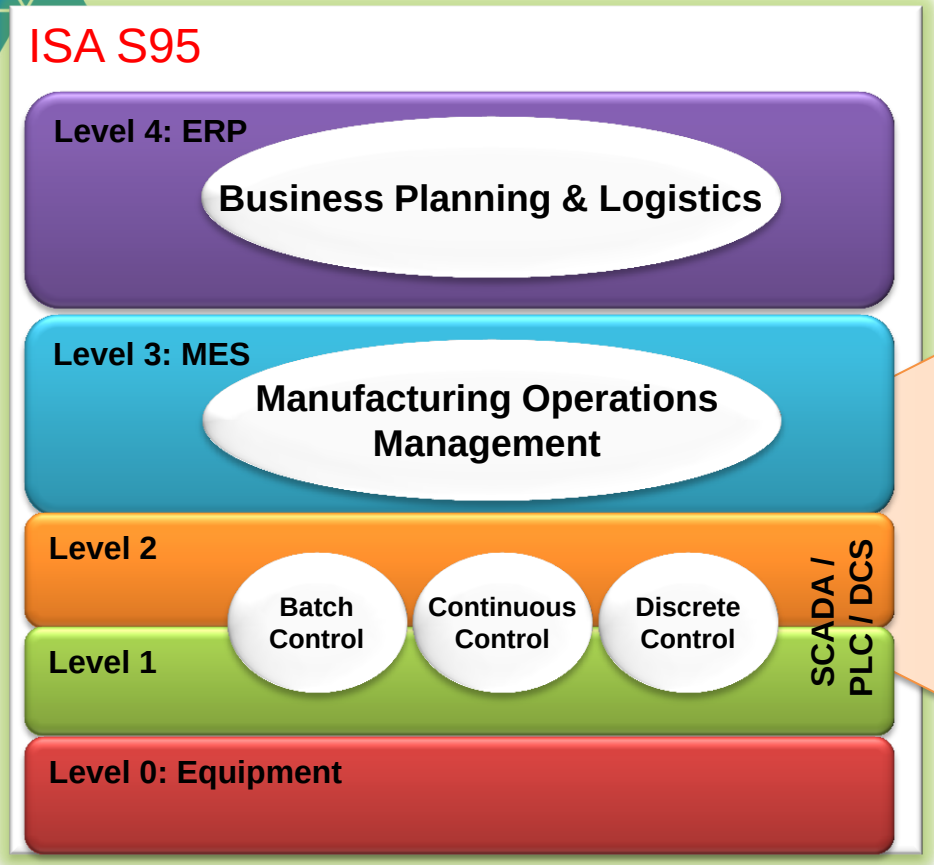
- Optimize process performance and manufacturing yields
- Reduce waste
- Improve manufacturing processes
- Identification of best practices
- Respond to exceptions and events

Core Functions of EMI

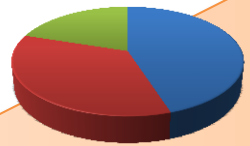
- **Aggregation:** Making available data from many sources, most often databases.
- **Contextualization:** Providing a structure, or model, for the data that will help users find what they need. Usually a folder tree utilizing a hierarchy such as the ISA-95 standard.
- **Analysis:** Enabling users to analyze data across sources and especially across production sites. This often includes the ability for true ad hoc reporting.
- **Visualization:** Providing tools to create visual summaries of the data to alert decision makers and call attention to the most important information of the moment. The most common visualization tool is the dashboard.
- **Propagation:** Automating the transfer of data from the plant-floor up to enterprise-level systems such as SAP, or vice versa.

Source: AMR Research

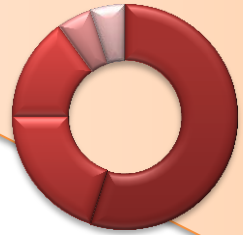
Aggregation – Enterprise Challenges



Variable Process Control System Landscape



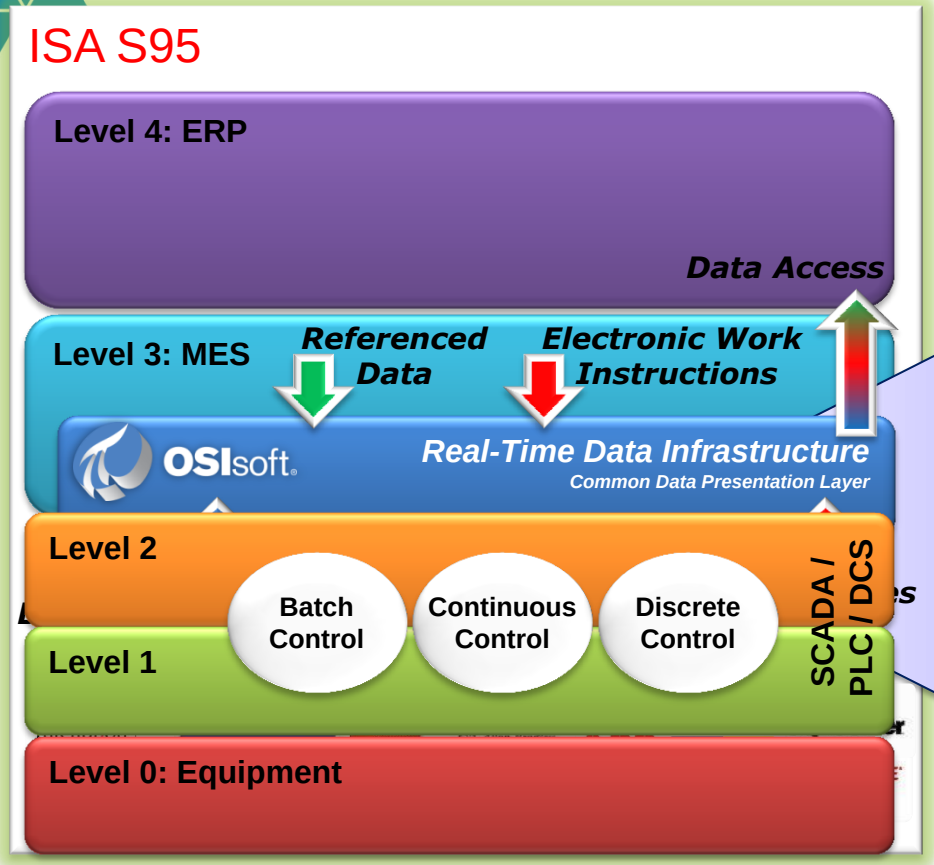
Typical PLC Vendors

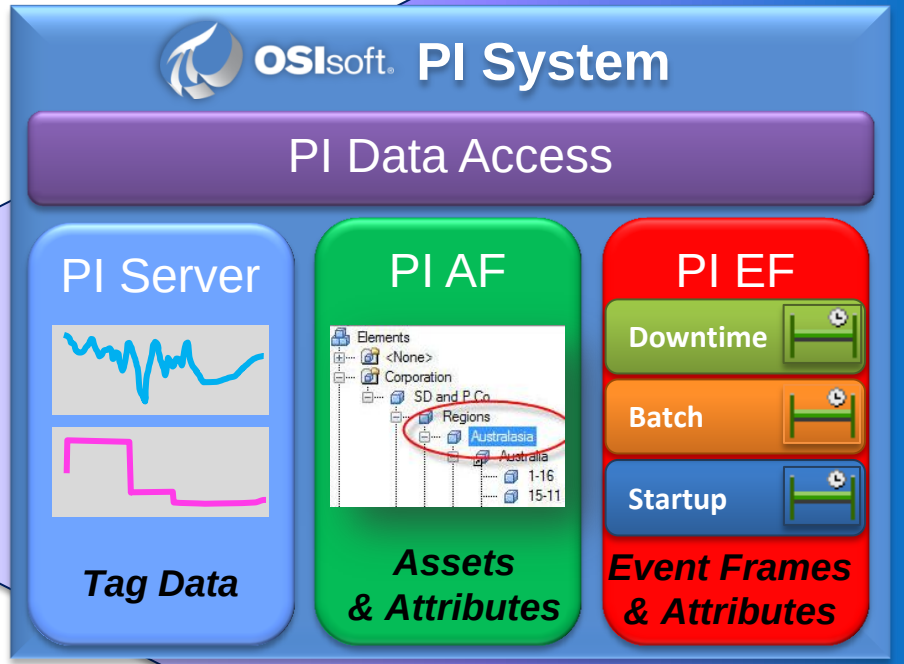


Typical DCS Vendors

Making available data from many sources, most often databases.

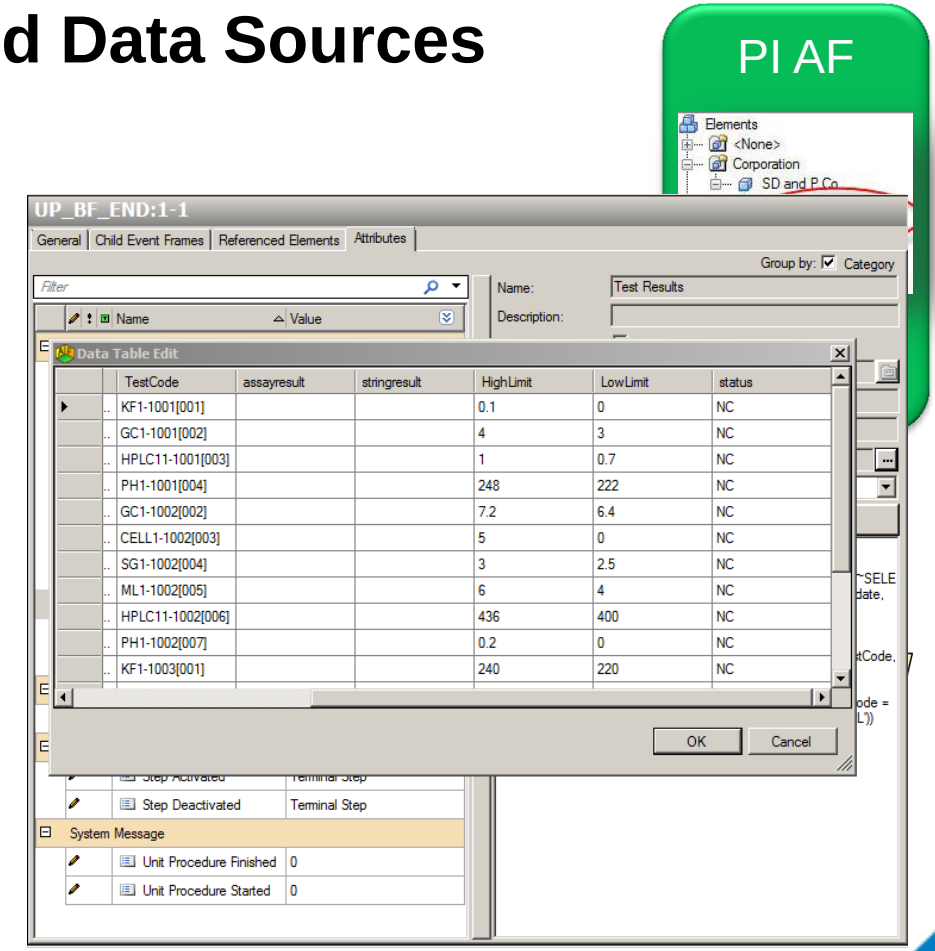
Aggregation – PI System Data Infrastructure





Aggregation – Referenced Data Sources

- PI AF allows you to tie asset properties to your data
  - Static values, PI Tags from multiple PI Servers, static or linked Tables
  - Custom data references to other data sources
    - MES, other historians, LIMS, Maximo, etc.
- PI EF leverages PI AF functionality, but will add an EF / Batch Context
  - Reference LIMS data associated with a batch.

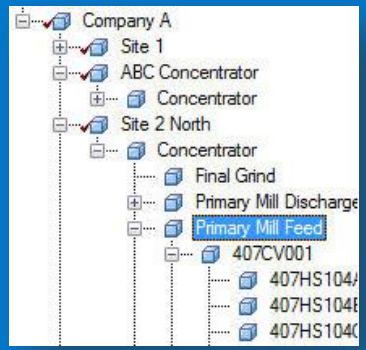


Contextualization

- PI AF provides a **configurable and flexible data abstraction model** to help different users **easily find information** they need to make decisions

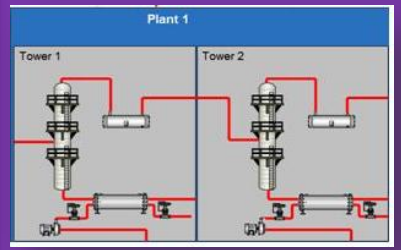
PI AF

Physical / Logical



Element Hierarchy

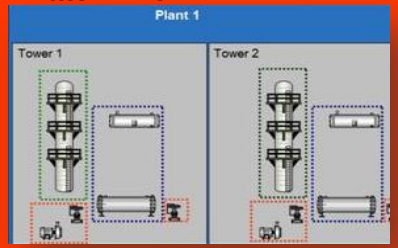
Process Connectivity



Models

Role

Pumps
Used in Report
Critical Parameters
Batch Info

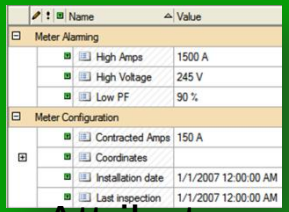


Categories

Event / Time

Event Frames

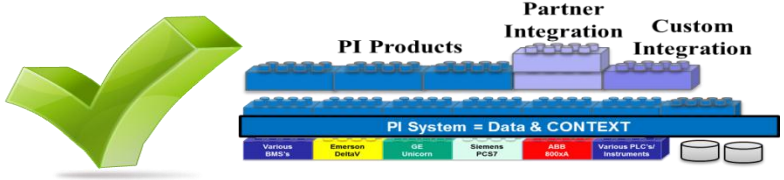
Associated Info

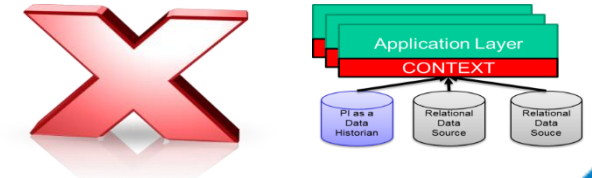


Attributes

Summary: Where to Build the Meta Data Context?

	Context in Data Infrastructure Layer	Context in Application Layer
Time Series Data	Core competency of OSIsoft	Architecture does not allow fixing scale problem against real time data
Relational Data	Architecture supports relational data access	Handles relational data
Scalability / Big Data	Scale to meet needs of EMI (many users, many composite applications)	As users and composite apps increase, can't deliver real-time data fast enough
Installation	Fast Horizontal Rollout Leading to Reduced Time to Value	Slower and Larger Projects (which still require a data infrastructure to be successful)
Interoperability	Yes - Standards & Custom	Limited – Sometimes Standards like OPC, Not Extensible
Standardized …	Behaviors (more valuable because you can count on the same answer independent of the client application)	Protocols
Solve Problems with …	80% Products, 20% Partner / Custom	Lots of Projects
Total Cost of Ownership	Lower TCO	Higher TCO

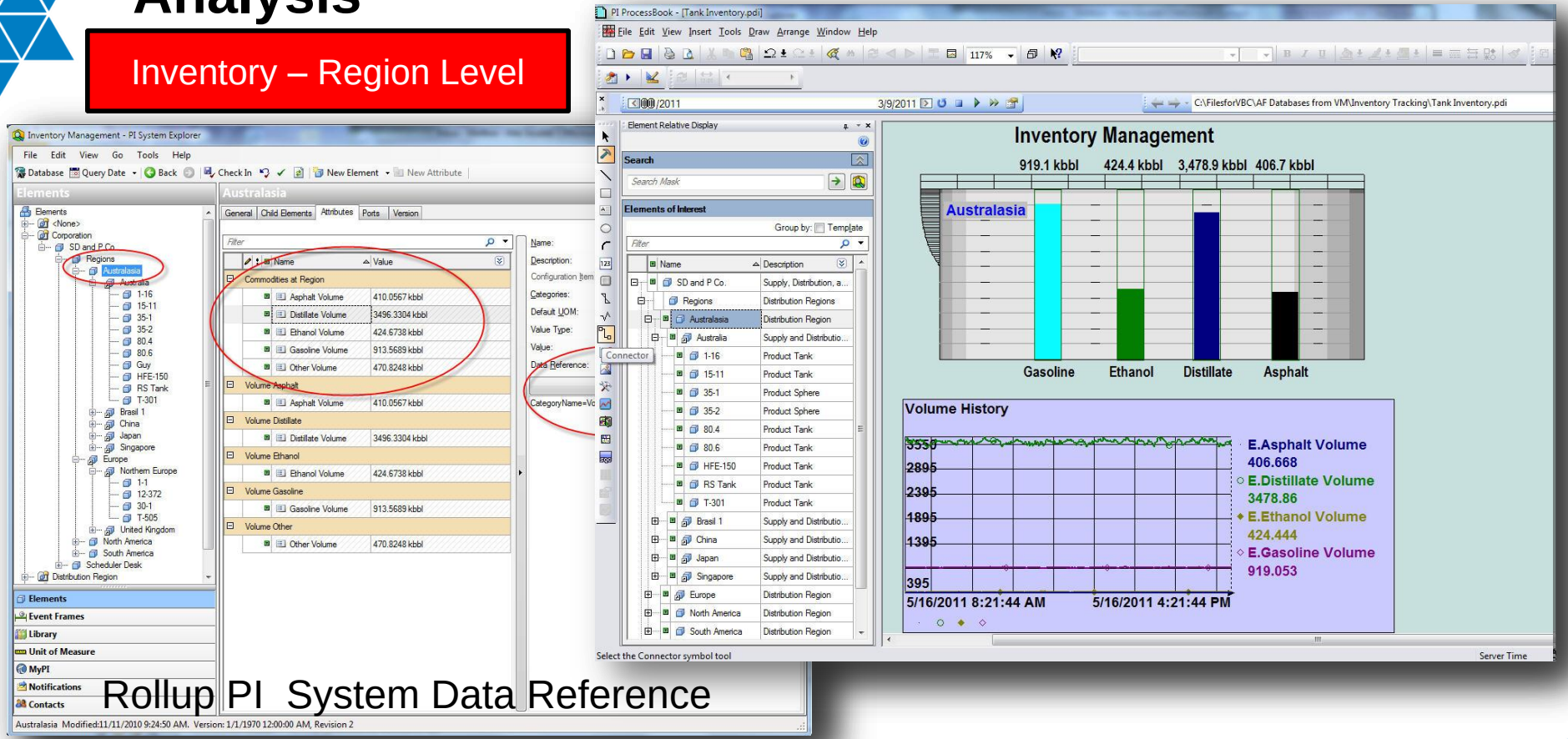




Enabling users to analyze data across sources and especially across production sites.

Analysis

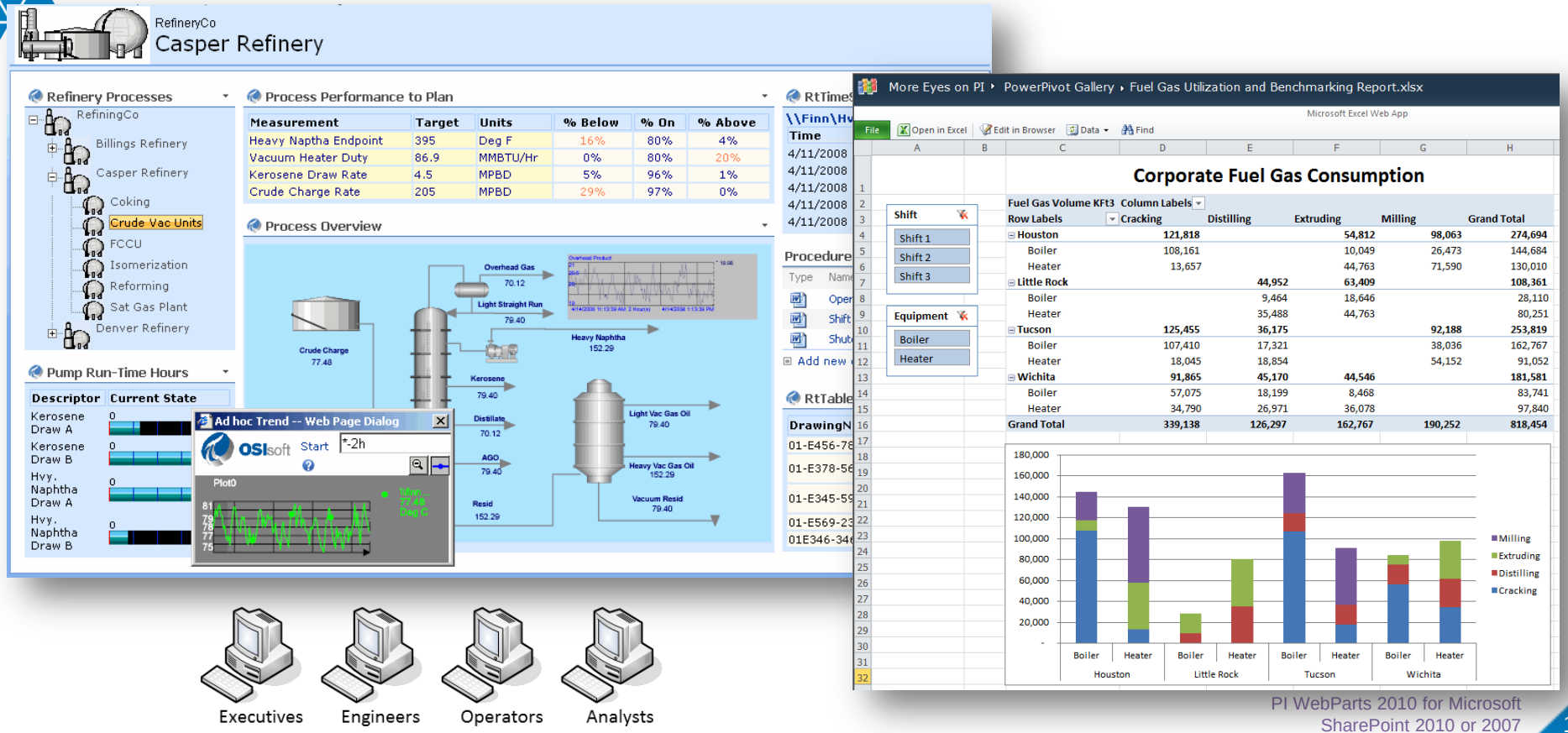
Inventory – Region Level



Rollup PI System Data Reference

Providing tools to create visual summaries of the data to alert decision makers and call attention to the most important information of the moment.

Visualization – PI WebParts & Microsoft SharePoint



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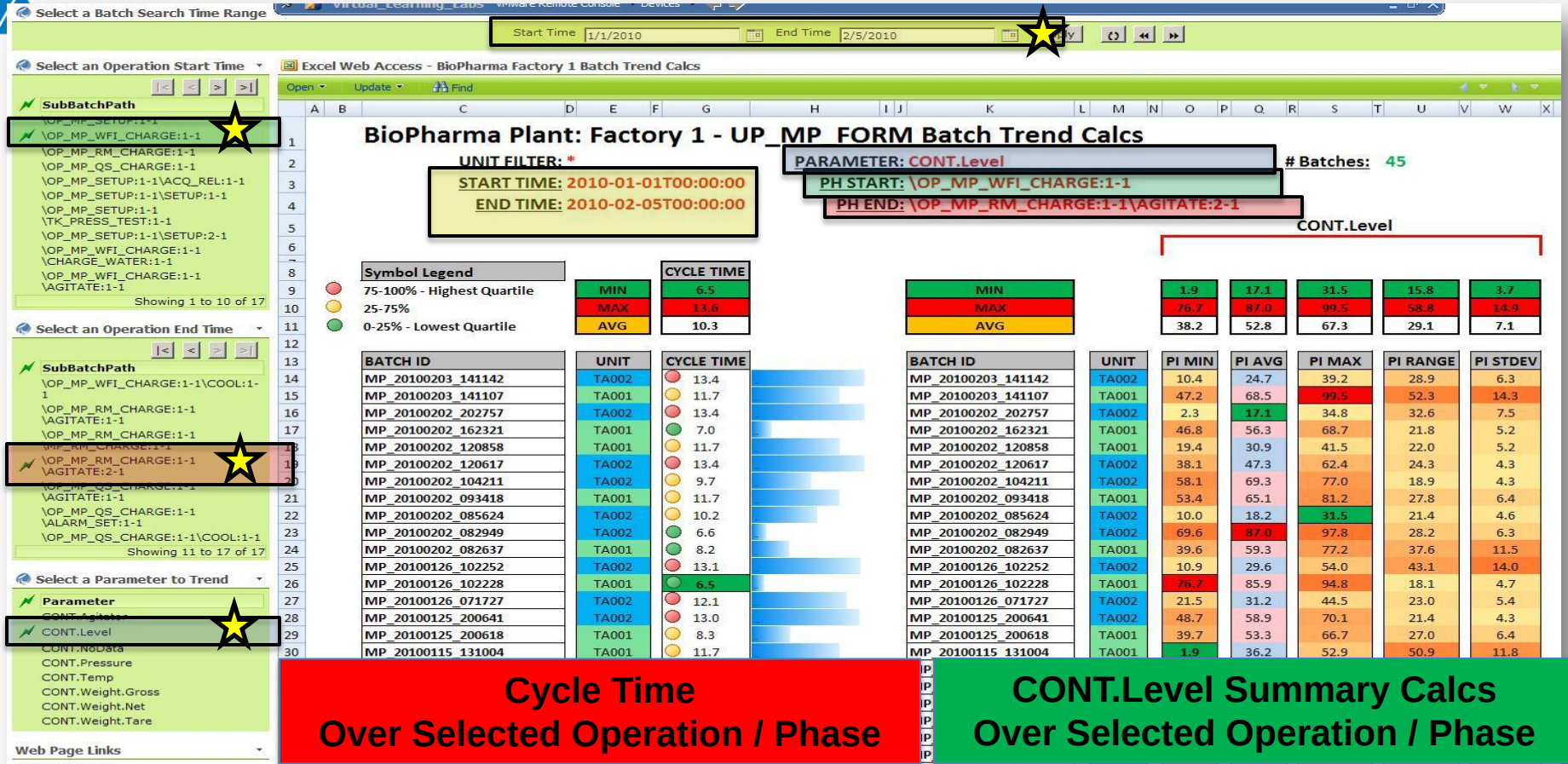
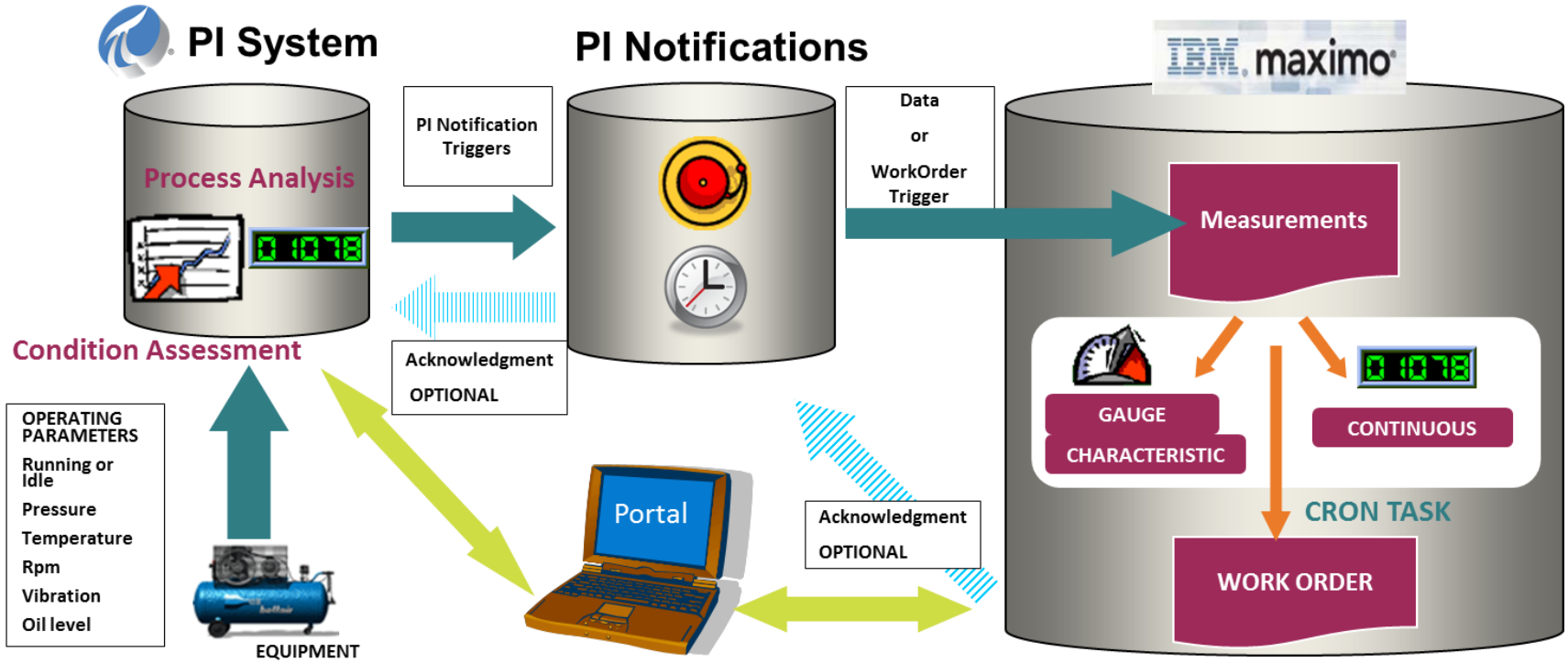


Automating the transfer of data from the plant-floor up to enterprise-level systems such as SAP & Maximo, or vice versa.

Propagation – PI AF, PI Notifications, PI Data Access

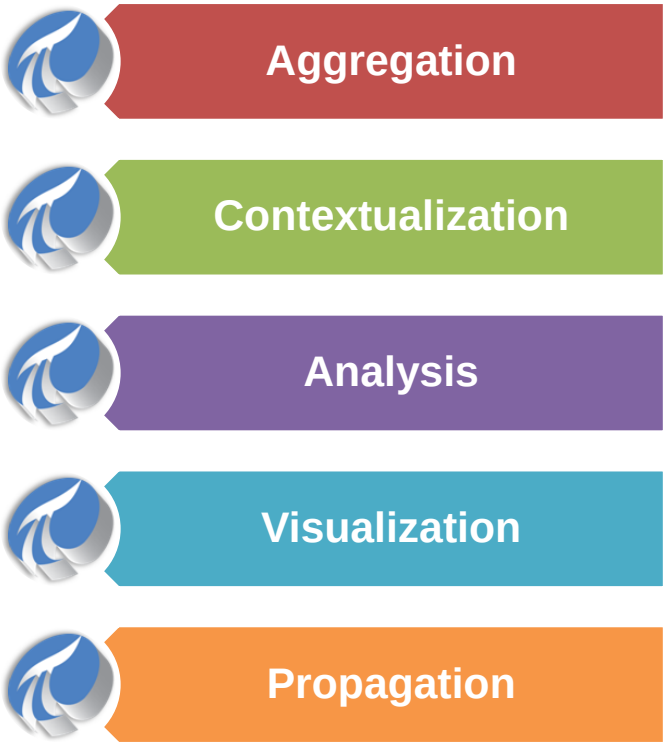


Core Functions of EMI – Satisfied by the PI System

- Aggregation
- Contextualization
- Analysis
- Visualization
- Propagation

How is the PI System different?

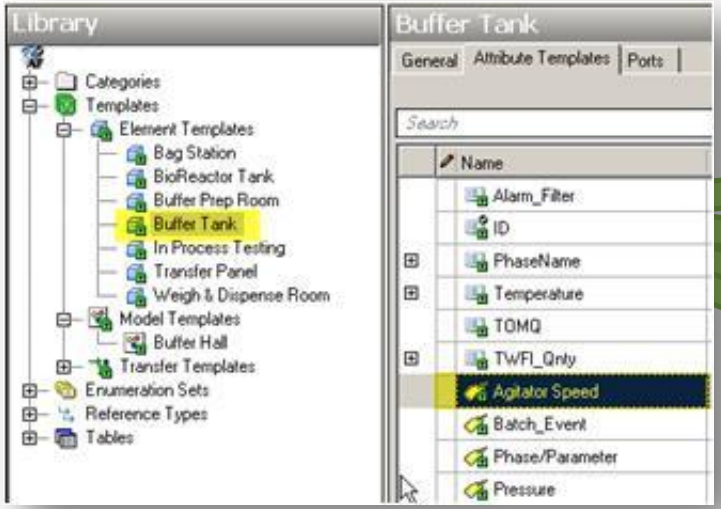
Core Functions of EMI

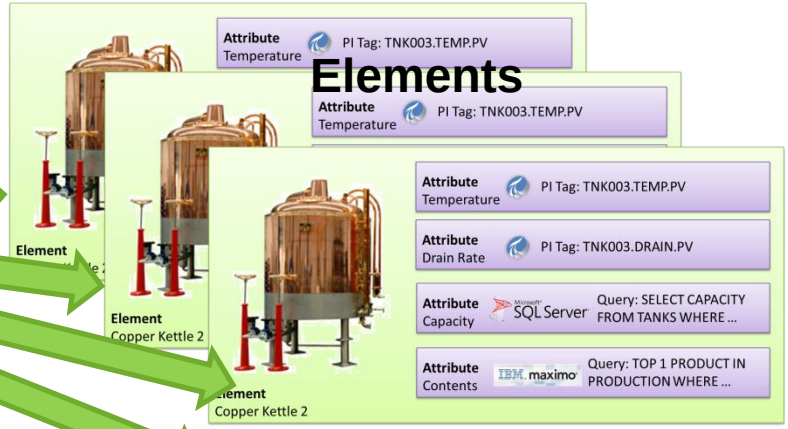


- True Enterprise View & Management
  - PI AF Element Templates
  - PI EF Templates
  - PI AF Unit of Measure
  - Enterprise Deployment Options
- Infrastructure Approach to EMI
  - Reactive vs. Proactive

Enterprise Management – PI AF Element Templates

- Standardize across your enterprise – common asset model
- Maintain many elements with your template and grow your PI AF database as an analysis tool over time
- Leverage templates in analytics/calculations, notifications, reports, visualization, and integration with other systems.

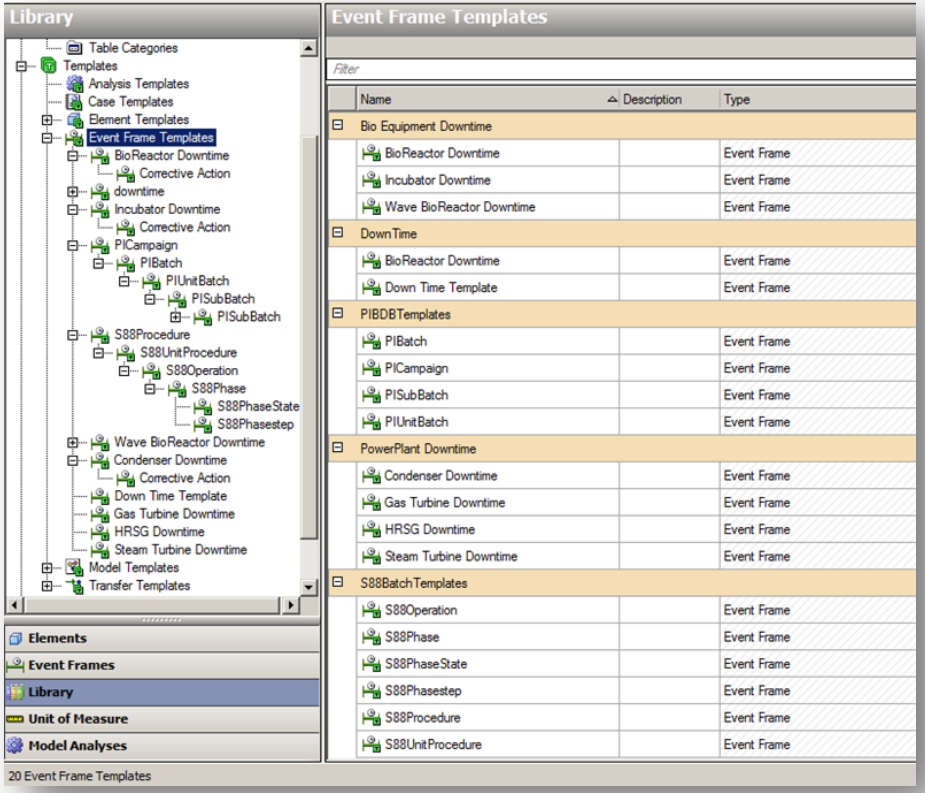




... many sites

Enterprise Management – EF Templates

- Standardize on Event Frame templates across the Enterprise for a variety of use cases:
  - Shift Analysis
  - Startup / Shutdown
  - Downtime & Overall Equipment Effectiveness (OEE)
  - Excursions
  - Alarms & Events
  - Batch



Enterprise Management – PI AF Unit of Measure

Enterprise Companies Work Collaboratively

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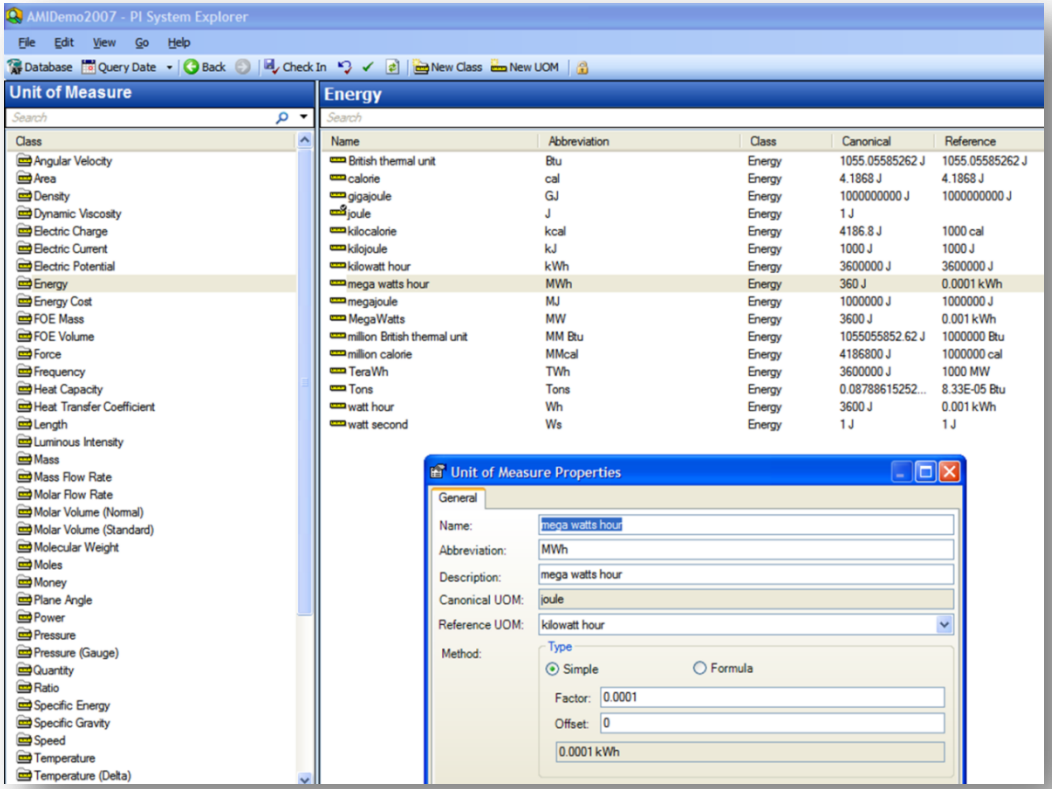
622 DegF	314 Deg C	611 K	288 Deg C

The process is the same …

The instrumentation is different

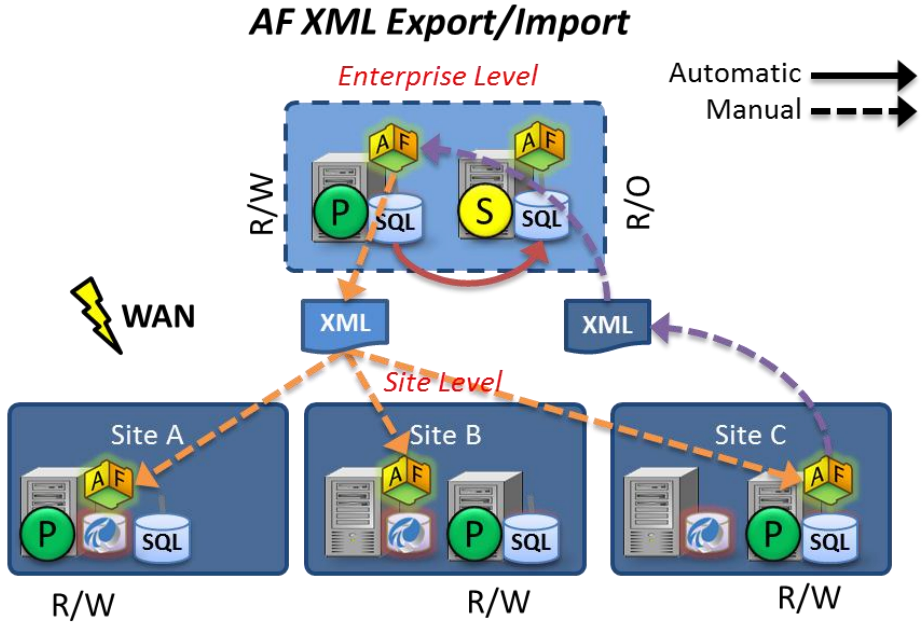
- **Automatic conversion of UOMs of the same class**
- **Enables cross site comparison**
- **UOMs are extensible (define your own through code)**



Deploy PI AF with the Enterprise in Mind

- PI AF supports referencing data across multiple PI Servers & systems
- PI AF supports both central (Enterprise) and local (Site) deployments with several synchronization options
  - AF HA (Replication)
  - AF XML Export/Import
  - AF Builder Export/Import
  - AF Data Access Custom App
  - More options in the future

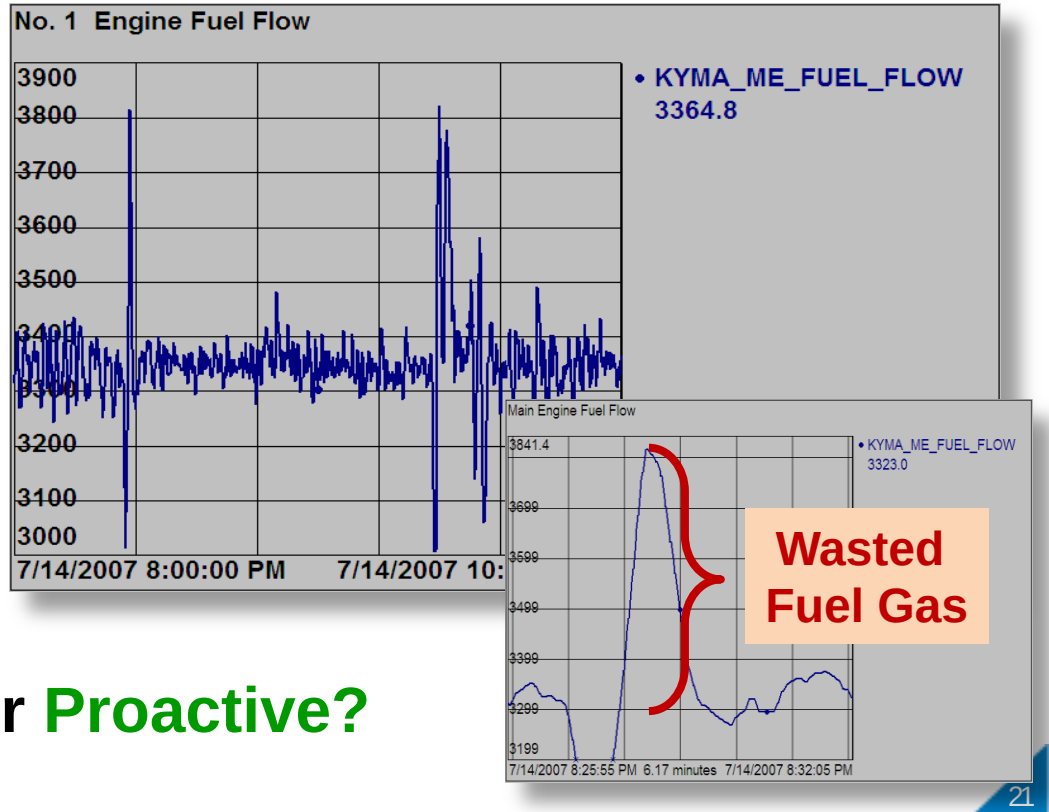
Think Globally, Implement Locally



Infrastructure Approach to EMI

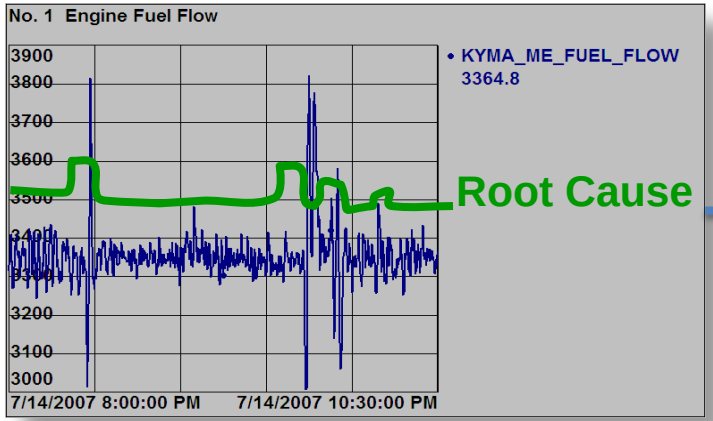
Fuel flow spikes discovered costing $93,000 / year

- Why did it take so long to notice?
- What did it take for the customer to find this trend and identify this problem?
- With tens of thousands of tags in a typical PI System, how many other opportunities are going unnoticed?



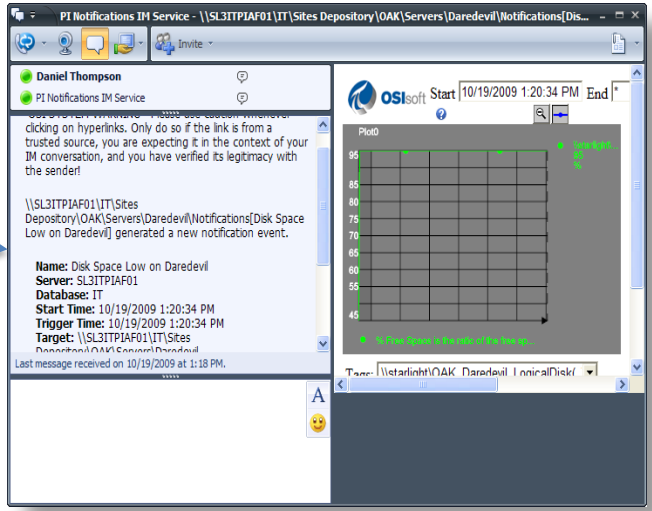
Reactive or Proactive?

Infrastructure Approach to EMI



PI Notifications

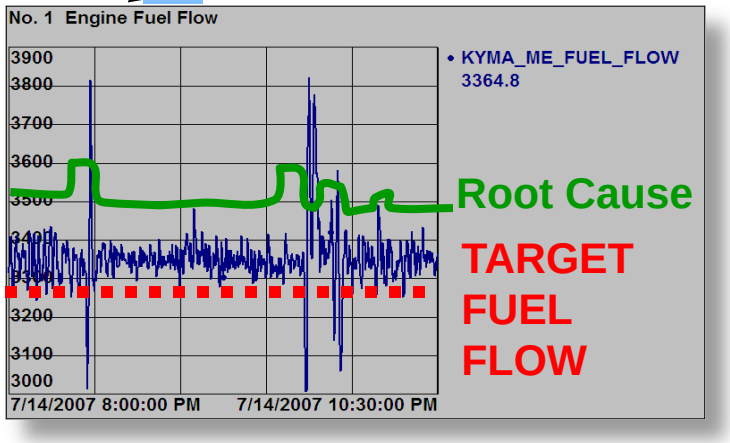
Web Service



Reactive or **Proactive?**

Infrastructure Approach to EMI

How many solutions are implemented at a single site but the 'best practice' is never formalized and replicated to other sites?



Fuel Flow
Fuel Flow.Target
Fuel Flow.[Root Cause]
Fuel Flow.[KPIs]

Process Knowledge, Transparent Accountability

Articulated, Defined, & Standardized

Scalable Across Enterprise

Reduced Information Management Infrastructure

- The “E” in *EMI* is **Enterprise**
  - How many Manufacturing Intelligence applications enable you to spread your ‘intelligence’ across the Enterprise?
- The PI System enables you to scale the EMI Infrastructure across the Enterprise.
  - Replication of solutions/applications/analytics/displays/reports/BI
  - Rollup and Enterprise views
  - Ease of accessibility to information for ALL users
- Reduced …
  - Cost of Ownership & Maintenance
  - Cost of Curiosity that enables Value Discovery across the Enterprise

Conclusions

- Value from Manufacturing Intelligence (and BI) requires Real-Time Insight
- The PI System fulfills all the required functions of Enterprise Manufacturing Intelligence

"If application vendors succeed in delivering real-time transactional insight with reduced information management infrastructure, it would be a game changer."

The PI System:

- Delivers real-time information about manufacturing processes
- Gathers and analyzes production data
- Provides role-based visualization
- Reduces the information management infrastructure for EMI

Delivered Value:

- Optimize process performance and manufacturing yields
- Reduce waste
- Improve manufacturing processes
- Identification of best practices
- Respond to exceptions and events
- Game changer!!!

Thank you