The PI System – Enterprise Manufacturing Intelligence Infrastructure

Presented by
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OSIsoft
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
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Source: Manufacturing Automation
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*
Making available data from many sources, most often databases.

Aggregation – Enterprise Challenges

Variable Process Control System Landscape

Typical DCS Vendors

Typical PLC Vendors

Vendor A
Vendor B
Vendor C
Vendor D
Vendor E
Vendor F
Vendor G
Vendor C

Level 4: ERP
Business Planning & Logistics

Level 3: MES
Manufacturing Operations Management

Level 2
Batch Control
Continuous Control
Discrete Control

Level 1
SCADA / PLC / DCS

Level 0: Equipment

Manufacturing Operations Management

Batch Control
Continuous Control
Discrete Control

Making available data from many sources, most often databases.
Aggregation – PI System Data Infrastructure

Making available data from many sources, most often databases.
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.
Enabling users to analyze data across sources and especially across production sites.

Analysis

Inventory – Region Level

Rollup PI 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
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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<th>MIN</th>
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<td>25%-75%</td>
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**Cycle Time Over Selected Operation / Phase**

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**CONT.Level Summary Calcs Over Selected Operation / Phase**

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**Cycle Time Over Selected Operation / Phase**

- **Start Time:** 2010-01-01T00:00:00
- **End Time:** 2010-02-05T00:00:00
- **PH START:** VOP_MP_WFI_CHARGE:1-1
- **PH END:** VOP_MP_RM_CHARGE:1-1\AGITATE:2-1
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?

- 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.
Enterprise Management – PI EF Templates

- Standardize on PI 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

- 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

AF XML Export/Import

Think Globally, Implement Locally
Infrastructure Approach to EMI

- 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?

Fuel flow spikes discovered costing $93,000 / year

Reactive or Proactive?
Infrastructure Approach to EMI

Reactive or Proactive?
How many solutions are implemented at a single site but the ‘best practice’ is never formalized and replicated to other sites?

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