Leveraging the OSIsoft Infrastructure as an Enabler for Operational Excellence

Presented by Lance Fountaine
OSIsoft Mining and Metals Industry Principal
Session Agenda

• OSIsoft Customer Footprint

• Defining 21st Century Operational Excellence: Living in a Digital World

• The OSIsoft ‘PI System’ as an Enterprise Information Infrastructure

• Summary / Lead-in to Customer Use Cases

• Participant Q&A
OSIsoft Customer Footprint
Where is the ‘PI System’ Used in Metals and Mining?

<table>
<thead>
<tr>
<th>Coal and Energy</th>
<th>Iron Ore</th>
<th>Copper</th>
<th>Nickel, Zinc, Lead and Silver</th>
<th>PGM and Gold</th>
<th>Diversified and Other Mining Companies</th>
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<tr>
<td>Alpha Natural Resources</td>
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**Upstream**
- Mining

**Midstream**
- Concentration of Minerals
- Metal Processing

**Downstream**
- Product Manufacturing
Who is the ‘OSIsoft PI’ Customer Base?

- Oil & Gas
  - Transportation
- Power Generation, Transmission & Distribution
  - Utilities
  - Facilities
  - Smart City
- Mining, Metals, Metallurgy & Materials
  - Discrete Manufacturing
  - Transportation
- Pulp & Paper
  - Discrete Manufacturing
- Pharmaceuticals
  - Food and Beverage
Defining 21st Century Operational Excellence: Living in a Digital World
What Challenges / Opportunities does OSIsoft Recognize as Critical to the Metals and Mining Business?

**Challenge – Market Conditions**
- Commodity Market Prices
- New or Improved Operations / Known Technology Competition
- New, Competitive Manufacturing Technologies

**Challenge – Cost Headwinds**
- Energy Costs
- Raw Materials Costs
- Labor Costs
- Logistics / Transportation Costs
- Aging Assets / Sustaining Capital Requirements

**Other Challenges**
- Geology – Decreasing Yields on Known Mine Reserves
- Environmental Regulations / Reporting Requirements
- Slow Global Economic Recovery

**Opportunities**
- Commodity Market Growth in Developing Countries
- Market Pull for New Materials / Alloys (Strength, Weight)
- Sustainable Materials
What If Your Company had the Ability to Leverage Its Current Data Assets to…

<table>
<thead>
<tr>
<th>Improve Enterprise Visibility and Management (Operating System)</th>
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<tr>
<td>• Establish and Automatically Report Standard KPIs to Measure Performance</td>
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<tr>
<td>• Support Operations through Global and Regional CoEs (Centers of Excellence)</td>
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<td>• Drive Real-time Action in Support of Operational Excellence</td>
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<td>• Rapidly Identify and Leverage Best Practices</td>
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<td>• Increase Employee Engagement with Continuous Improvement Innovation</td>
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<tr>
<th>Improve Awareness and Forecasted Impact of Uncontrollable Factors</th>
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<tr>
<td>• Rising Energy Rates</td>
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<tr>
<td>• Rising Raw Material Costs, Reduced Raw Material Quality</td>
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<tr>
<td>• Rising Water Rates</td>
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<tr>
<td>• Rising Labor Rates</td>
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<tr>
<td>• Cost of Environmental Regulation / Mandates</td>
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<tr>
<th>More Directly Impact Controllable Costs / Performance</th>
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<tr>
<td>• Continuously Improve Process Productivity / OEE</td>
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<tr>
<td>• Better Control Product Quality / Improve Genealogy Tracking</td>
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<tr>
<td>• Extend Life of Critical Assets / Reduce Maintenance Costs</td>
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<tr>
<td>• Reduce Energy / Raw Material / Natural Resource Consumption</td>
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<tr>
<td>• Continuously Improved Environmental Performance to Meet Regulatory Compliance and Reporting Requirements</td>
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How Does Data Drive Results?

- **Daily / Real-Time Operations**
  - Actionable Information
  - Frequency: Real-time to Daily

- **Process Stability / Improvement**
  - Analysis
  - Frequency: Daily to Annually

- **Production & Operations Management**
  - Reporting
  - Frequency: Daily to Monthly

**Learnings Applied:** Manual or Closed Loop

**Visualization Tools**
- Audience:
  - Operators
  - Craftsmen
  - Supervisors

- Objectives:
  - Achieve Daily Targets (DMS)
  - Resolve Immediate Issues (RCA/Problem Resolution)
  - Maintain Schedule/Plan
  - Safe Operations

**Analysis Tools**
- Audience:
  - Process Engineers (Location)
  - Production Superintendents
  - CoE Experts (Regional/Global)

- Objectives:
  - Detect Excursions (Leading)
  - Maintain Process Stability
  - Improve Productivity
  - Improve Quality

**Reporting Tools**
- Audience:
  - Location Managers
  - Regional/Global Operations
  - Business Leadership

- Objectives:
  - Understand/Grade Performance
  - Adjust Expectations
  - Establish Plans
  - Calculate Forecasts

**The PI System Infrastructure (AF Asset Model, Event Frames and Data History)**
What would be the Results?

**Improve Operating Cost Position**
- Reduce Sustaining Operations Cost / Improve Productivity
- Reduce Working Capital (Inventory)
- Improve Supply Chain Options / Performance

**Increase Revenue Stream**
- Improve Overall Production Capacity / Quality
- Improve Capacity / Mix of Higher Margin Products
- Increase Asset Availability

**Reduce Capital Requirements**
- Reduce Sustaining Capital Requirements
- Reduce Capital Requirements for Information Solutions / System Integration
21st Century Operational Excellence: Leveraging Information as the Foundation for the Business Operating System

The Language of Business Operating Systems

- SPC (Statistical Process Control)
- Lean Manufacturing / Six Sigma
- TPS (Toyota Production System)
- Continuous Improvement / Deming Cycle

Improving Plant / Enterprise Performance Management

- Established / Managed KPIs
- Visibility into Uncontrollable Impacts (e.g., Energy Rate, Raw Material Rate, Metal Prices, etc.)
- Engaged Workforce driving Collective Innovation
- Enabling Platform for Process CoEs (Centers of Excellence)
- Leverage / Adoption of Best Practice
The OSIsoft ‘PI System’ as an Enterprise Information Infrastructure
OSIsoft is a company with a focus on one system and singular focus.

- Founded in 1980
- 20% of revenue invested in R&D
- 65% of Global Fortune 500
- 16,000 sites
The Evolution of the OSIsoft ‘PI System’

- Deployed in Support of Defined Process / Project Initiatives
- Provides Process Historian Functionality
- Component Pricing / Purchases
- Provides an Information Infrastructure
- Deployed as Data Foundation for the Plant / Enterprise Operating System
- Software / Services Purchased as Enterprise Agreements

What is Driving the Growth with Existing Customers?

Growth in the Adoption of PI

PI Deployments

Time

A Value Add Information Infrastructure – The ‘PI System’
Supporting the Business Operating System

Competitive Advantage through *Reduction of Controllable Cost* or
*Delivery of Additional Revenue Opportunities*

- Improved Enterprise Visibility and Performance Measurement
- Delivery of Bottom Line Results through Proven Value Streams:
  - ✔ Process Productivity / OEE
  - ✔ Product Genealogy / Quality
  - ✔ Optimize Asset Life / Reduce Maintenance Cost
  - ✔ Environmental, Health, and Safety Compliance and Reporting
  - ✔ Reduce Energy / Raw Material / Natural Resource Consumption
Examples Driving Business Success

Enterprise Visibility

Controllable

Revenue

Operating Costs

Capital

Uncontrollable

(not discussed here)

Quality

Process Productivity (Product Volume)

Process Productivity (Efficiency)

Asset Management (Reduce Maintenance Cost)

Asset Management (Increase Asset Life)

Environmental Health And Safety

Energy / Natural Resource Management

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Establishing an Enterprise Information Architecture

**Definition:**
The integration of data with process expertise to enable proactive and intelligent manufacturing decisions in dynamic environments.

**Key Components:**
1. Common Applications for Manufacturing Execution (MES)
2. REAL TIME and HISTORICAL data capabilities
3. Network / Data integration from shop floor to the enterprise
4. Comprehensive analysis toolset

The Architecture Ties Together Information from All Sources within a Plant and Across the Enterprise.
Evolution of the Data Infrastructure
Revolutionizing the Collaborative Space

Everyone works with the same information, rules and tools!
PI System as an Enterprise Integration and Applications Infrastructure

Applications and Solutions “Functionality”
Value Creation–an Infrastructure Approach

*Value Now, Value Overtime*

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**Value**

**TIME**

**VALUE NOW**

**VALUE OVER TIME**

---

**Initial Investment**

**Incremental Value**

**Infrastructure Value**

**Value Now, Value Overtime**

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**Application Benefits**

- Performance Management
- Environmental Reporting
- Equipment Health Mgmt.
- Operations Management

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**Value Creation**

**Infrastructure Value**

**Initial Investment**

---

**Value Now, Value Overtime**

---

**Value Creation**

**Infrastructure Value**

**Initial Investment**
**PI Architecture Functional Reference**

### "Managed PI" - Best Practices

1. **PI Agent** - Each Managed node should use PI Agent to directly talk to NOC where possible, otherwise use PI Agent with Cross-linked relay node.
2. If a PI Agent Cross-linked node is used, there should be no more than one PI System (and the managed nodes associated with it) feeding mPI through it.
3. There can be any number of cross-linked agents.
4. Place Interface nodes at the end of a cross-linked chain. Do not put downstream cross-link partners on PI Interface nodes.
5. Allocate disk space for the caching of download packages to downstream cross-linked agents.
6. Dedicate PI Agents that are intended to service multiple physical sites for Internet connectivity or multiple Managed PI sites to that task. Virtual machines are acceptable for this purpose.
7. Avoid using Windows XP SP3 as a cross-link target.
Enterprise PI System Reference Architecture

“Designing for the Enterprise”
- The data flow for plant floor data flows up from the Control PI System to the Site PI System to the Enterprise PI System. However, not all the data located in each level are in all levels above it. Likewise, there could be different calculations and analyses being performed at each level in the enterprise.
- There is data flow that could originate from the Enterprise level and flow downward to the Site and Control level PI Systems. These data flows could be standardization efforts such as AF Templates that need to be synchronized between PI Systems.

Real-Time
- PI to PI Interface
- AF Context (Templates, Element Hierarchies, etc.)
- HA Collectives
- XML Export/Import
- PI AF Builder Export/Import
- PI AF Data Access Custom Application

Batch Data
- The PI System function within any one of the layers (Control, Site, and Enterprise) is fundamentally the same.
- When applying the Tier concept within a single PI System (Interfaces Tier, Data Services Tier, Client Access Tier) to multiple layers in the Enterprise (Control, Site, Enterprise), you see that the PI Systems actually overlap with each other.
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Data Integration and Visualization Toolset

Plant SMART SharePoint Portal
(Data publication, DMS Dashboard, Excel reports, etc…)

Adhoc data consumption (EXCEL)

Manufacturing Intelligence

Data Analysis and Mining Tools
(MS SSRS, SSIS & SSAS)

SMART Data Warehouse

Real Time Data Visualisation and Analysis (PB)

Historian Databases

Process equipment/systems

MES Data Transfer to Historan

MES and LIMS Databases
Alignment with IT Strategy and Priorities

**Industry Trends**

- Information Infrastructure is a Key Component of ‘Big Data’ / ‘Internet of Things’
- Infrastructure Enables IT / OT Convergence
- Data Platform / Tools to Support Analytics and Advanced Analytics
- Supports Cloud and Mobility Opportunities

**Technology**

- Enables / Simplifies Data Integration
- Reduces Manual Data Entry
- Reduces Infrastructure Complexity
IT Megatrends

- IT/OT Convergence – “Eliminating Boundaries”
- Cloud – “Host Anywhere”
- Internet of Things – “Sensors Everywhere”
- Mobility – “Access Anytime”
- Big Data – “Analyze Everything”
The World of Enterprise “Big Data” and Analytics

External Data Sources

- Geospatial
- Wiki
- Partners
- Suppliers

‘Big Data’ Warehousing / Statistical Analysis Tools

- Hadoop
- Hive
- Cloudera
- SAP Hana

Business Data Warehouse

Operational Data Warehouse

ERP (Business)

Production / Process Data

CAST

Unified Real-time Data Infrastructure – PI Data Archive

- Shop Floor Systems
- Manufacturing Execution (MES)
- Manufacturing Operation Management (MOM)
- LIMS

Process Control Data Historian

PCS

DCS

PLC

Networked I/O

BI / MI Visualization Tools

- Microsoft BI / MI
- Oracle (OBIEE)
- Spotfire (Big Data)
- Cognos (Big Data)
- Tableau (Big Data)

Process Analysis

- MatLab
- SAS
- PI AF (Abacus)
- PI Data Link
- PI Process Book

Corporate / Plant Data and Solutions

Internet of Things

External Data Sources

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Corporate / Plant Data and Solutions

Internet of Things
Integration with Analytics

**System of Record**
- Guaranteed Delivery & Storage
- Full Fidelity of Sensor
- Optimized for Real-Time
- Backup/Restore
- HA
- Security

**Needs:**
- Cleanse
- Augment
- Shape
- Transmit

**Visual Analytics**

**Statistical Analytics**

**Analytics Packages**
- Designed to Analyze Large Sets
- Expects that the Data Exists
- Problem Defines Data Shape
- Typically Evenly Spaced in Time
Summary and Take-Aways
Further Consideration on Today’s Agenda

• Examples of the Value Message will be Highlighted in Today’s Customer Presentations

• Overview of Customer Speakers

Meridian Energy’s use of PI System from an Asset Management Point of View
Henrico Van Niekerk, Reliability Engineer, Meridian Energy

Utilizing the PI AF Structure for New Zealand Customers
David Parker, Managing Director, Dimension Software

Bringing Space and Time Together
Matt Lythe, Sales Manager, Eagle Technologies (ESRI)

• Content Represents Specific Examples of the OSIsoft PI Infrastructure Being Leveraged in Support of Operational Excellence
Participant Q & A
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Industry Principal: Mining, Metals and Materials

OSIsoft, LLC
THANK YOU

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