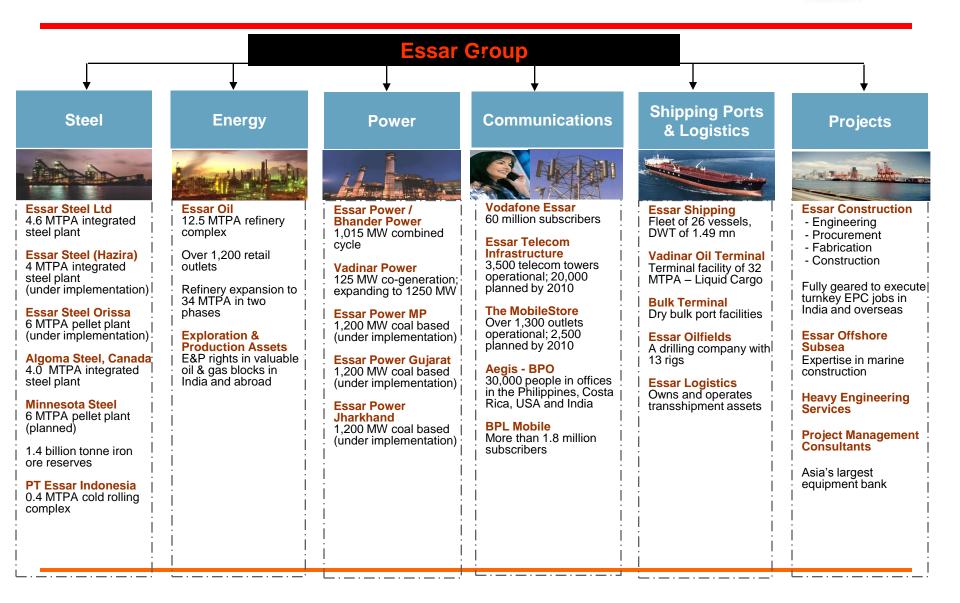


Performance Event Logging and Management in an Ironmaking Process

Abbie DiDonato Senior Technical Specialist Essar Steel Algoma Inc.







Essar Global Steel

Energy

Power

Communications

Shipping, Ports & Logistics

Projects

Steel Fully integrated producer from iron ore to ready-to-market products



INDIA ESSAR STEEL LTD 4.6 MTPA integrated steel plant

ESSAR STEEL (HAZIRA) 4 MTPA integrated steel plant (under implementation)

ESSAR STEEL (ORISSA) 6 MTPA pellet plant

OVERSEAS ESSAR STEEL ALGOMA,CANADA 4 MTPA steel complex

ESSAR STEEL MINNESOTA, U S A 6 MTPA pellet plant (under implementation) 1.5 billion tonne of iron ore reserves

INDONESIA 0.4 MTPA Cold Rolling complex

Essar Steel Algoma Inc. (Canada)



- Established in 1901 108 years of steelmaking tradition
- Situated in Sault Ste. Marie, Ontario on 2000 acres at the hub of the Great Lakes
- 70MW Cogeneration Facility commissioned in June, 2009

Fully integrated steelworks - 4 MTPA capacity

- Two blast furnaces No. 6 (idle) and No. 7 (operating)
- Two basic oxygen furnaces, LMF electric ladle and CASOB chemical reheat ladle
- Direct Strip Production Complex thin slab caster coupled with direct hot rolling
- 166" Plate Mill and 106" Strip Mill
- Captive lime plant, Material Reprocessing Facility and Port
- Downstream: Heat Treat Plate Facility, Cold Mill, First Stage Blanking Operation and large profile Welded Beams and Shapes Division.



Products and Markets



- Hot Rolled Sheet
- Cold Rolled Sheet
- As-rolled Plate
- Heat-treated Plate
- Armour Plate, Floor Plate
- First Stage Blanks
- Welded Beams, Shapes and Profiles

Applications in automotive, manufacturing, pipe and tube, construction, heavy equipment, ship/rail, oil & gas, wind power



Quality Certification



- ISO 14001:2004 (Environmental Standard)
- ISO 9001:2000 (Quality Management System)
- PED 97/23/EC (European Standard)
- TS 16949:2002 (Automotive Standard)
- ISO 17025:1999 (Laboratory Standard)
- ABS Quality Assurance Program (Marine & Offshore Product Applications)
- DIN EN 150852 (Welding Railway Vehicles)
- Lloyd's Certified

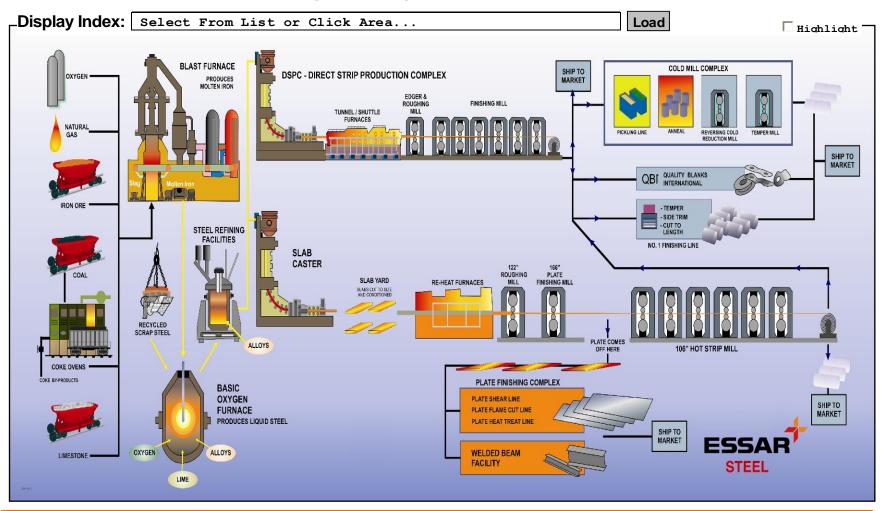
Sault Ste. Marie, Ontario Canada



Manufacturing Flow



Real Time Performance Management System



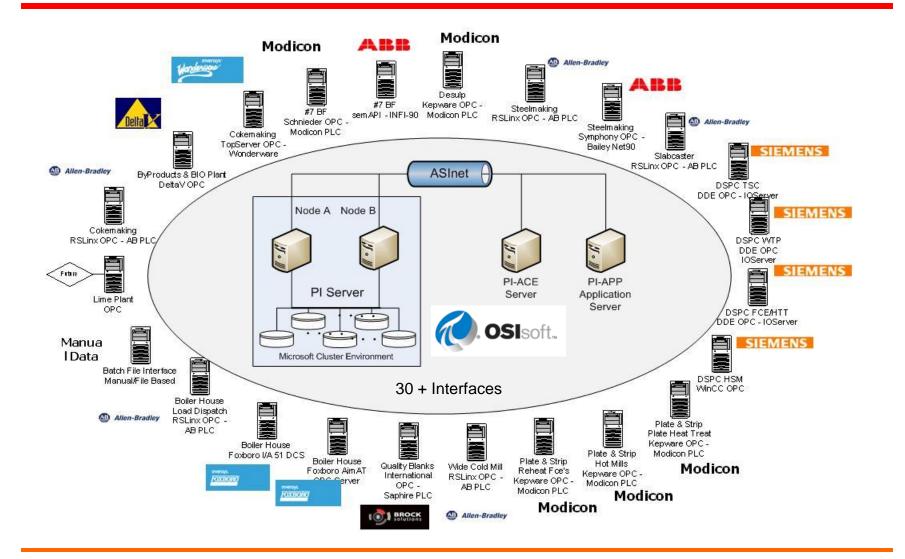
PI Infrastructure



- 50,000 tag system
- 250+ users
- PI ACE
- PI ODBC
- PI-Processbook, PI-Datalink, PI-Batchview, PI-Activeview
- RDBMS

PI System & Interfaces





PI Deployment History



- Ironmaking (1998)
- Cokemaking (2003)
- Steelmaking (2004)
- Utilities (2004)
- By-Product & BIO Plants process monitoring (2005)
- Plate & Strip (2005)
- Plate Heat Treat (2005)
- DSPC (2005) Thincaster, Furnaces, Water Treatment Plant
- Slabcaster (2006)
- DSPC (2007) Hot Strip Mill

PI Deployment Strategy



- Recognized Standard Process Information Infrastructure for Manufacturing Operations
- Successive application layers will be established as an extension of the PI Infrastructure

Create a common repository and set of tools High Performance Data Repository

Management Goals



- Provide enterprise wide *REAL-TIME* performance management system.
- Allow all stakeholders to effectively monitor and analyze all aspects of manufacturing operations.
- Enable optimization and productivity improvement opportunities.
- Create infrastructure for short & long term continuous improvement

Benefits of PI



The organizational impact includes:

- Improved decision making capability
- Improved process monitoring & optimization
- Improved root-cause analysis and problem-solving
- Improved yield, cost efficiencies, cycle time, and protection of plant equipment
- Increased safety awareness
- Increased profitability
- Identification and presentation of real-time KPI's
- Improved work processes
- Provide information flow from the shop floor to the boardroom.



Ironmaking

- Contributed to the Blast Furnace re-line extension
 from the traditional 7 year reline cycle to 12+ years
- Saving reagent costs at Desulphurization Plant
 Operation (\$750 K potential savings identified,
 \$200 K achieved)



Direct Strip Production Complex Reliability Driven Maintenance (RDM)

- achieved minimum reduction of 5% of unplanned delays
- amounting to 140,000 ton production increase



Utilities:

- Minimize natural gas usage by lowering Plate & Strip fuel demand when cogen gas supply is limited.
 - Goal is to reduce Plate & Strip natural gas usage by at least 20 % or ~ \$680,000 per year.
- Monitoring Cogeneration Plant & Boiler House equipment and energy supply & demand for downstream energy users.



- Multiple applications built using different platforms (i.e. MS Access, Custom VB App, etc...)
 - Shift Reporting, Downtime/Delay Tracking, Center Lining, etc...
- Applications developed independently by IT support and/or knowledge worker who had specific expertise
- Limited interoperability between departments
- Lack of common & consistent inter-department performance measures



Develop a Corporate Incident Reporting System

- Downtime/Delays
- Rate Loss
- Process Change Events
- Manual inputs
- Automated Reporting

All within the context of a **Consistent Application Framework** which lends itself to rapid implementation across each of the Essar Steel Algoma manufacturing divisions

Application Framework Characteristics



- Transparent integration to and an extension of the PI Process Infrastructure
- Supports key manufacturing performance functions and indicators
- Provides a common template that facilitates rapid deployment, common performance specifications and minimizes support requirements
- Supplier is an OSIsoft partner whose product development is in concert with PI product development
- Ability to integrate into existing production and quality systems
- Highly visible and near real-time



- Custom Development?
 - Pros/Cons
- Purchased Software?
 - Pros/Cons

We make Steel ...

We are NOT a software development company...

Proof of Concept Trial



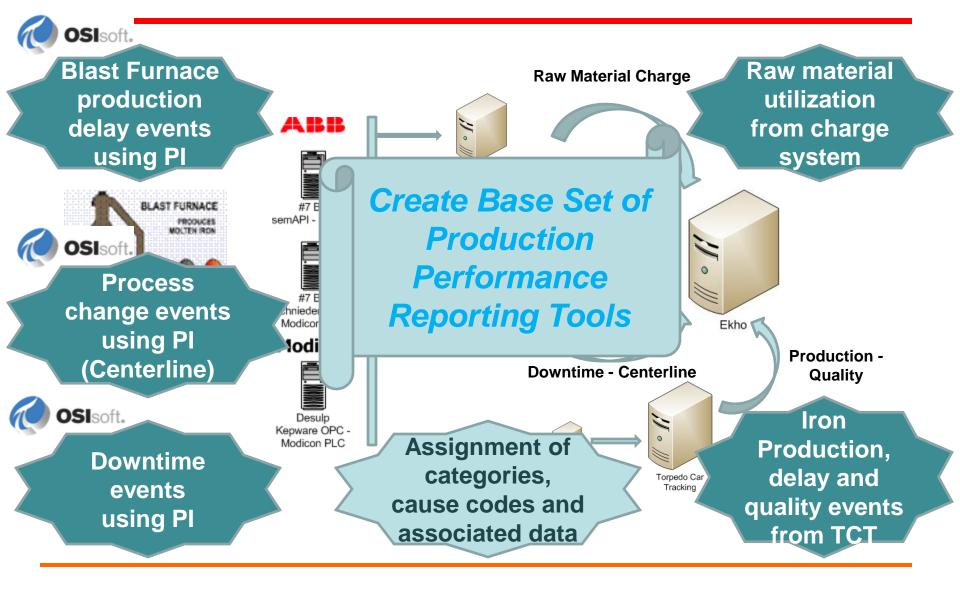
Inexcon Technologies (ITI) – Ekho Toolset

- Objective:
 - Minimize exposure cost & risk
 - Evaluate Ekho as the application infrastructure extension of PI
 - Implement a flexible, common and consistent manufacturing performance system applied across each manufacturing department.

Proof of Concept Trial Scope



Automatic Detection & Logging



Performance Monitoring

#7 Blast Furnace Operating Conditions



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Logging Performance Loss Events



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Logging Production Events



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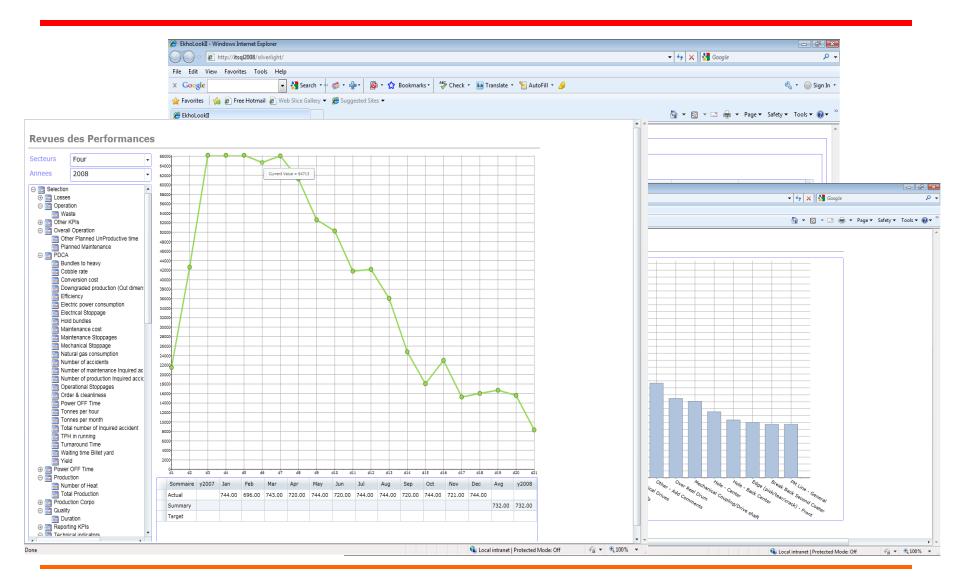
Logging Quality Events



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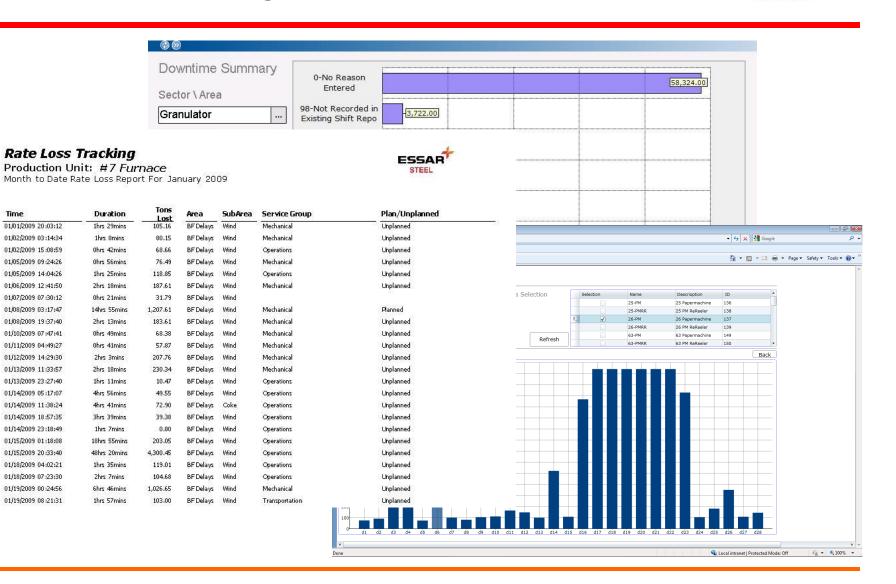
Communicating Performance





Communicating Performance







- 16-20 days were allotted for Ekho configuration
- Scope Requirements Satisfied:
 - integrate into TCT and the Material Charge System and provide basic support training.
 - Ekho configuration and system integration was less of an issue than settling on final functional specification.
 - Tuning and filtering process data used to log events to eliminate 'Event Chatter'.
- Trial was successfully completed and a subsequent project scope and funding request prepared.



- Site-Wide Performance Template was incorporated
- Based upon the PI Process Infrastructure coupled with the Ekho Application Framework.
- Defined as a **Top/Down** hierarchy template
- Creates a common set of performance measurements across department boundaries
- Provides operating departments the ability to configure applications which 'drill-down' from Site-Wide Template

Performance Management



PI & Ekho Integration

Key Performance categories:

- Production
- Quality
- Equipment Utilization & Availability
- Raw Material Utilization
 / Yield

- Energy
- Safety
- Environmental



Consists of the two basic components which follow the common OEE model

•Percentage Model

- Using KPI specification sets; managed across production unit and product groupings
- Process data is rationalized into 'Performance Percentage'
- Indices provide consistent measures of performance over time and product production
- Results in a relative index of performance over time showing trends of improvement or deterioration.



Data Model component

- Consists of the process data sourced from PI
- Contextualized around production and KPI performance loss events along with the associated data sets.
- Associated data typically includes, but is not limited to:
 - Loss Category / Cause Code Assignments
 - ≻ Crew
 - ≻ Shift
 - Theoretical Lost Production
 - Comments

Feeds directly into the improvement process by integrating reporting and analysis tools.

Specification Driven Performance Model



- Calculating KPI's evaluating actual performance data with a set of targets & associated limits/boundaries
- Ekho Event and Specification engine
 - is integrated into the PI infrastructure to create full interoperability
 - provides the ability to manage how overall performance is presented across the organization



SAP Integration

- Ensure a manufacturing performance system that provides consistent measures.
- Ensure performance specification sets are used to evaluate performance in accordance with that managed within SAP.

Ensuring a Single Version of the Truth



Moving from Information to Improvement

- Data for the sake of data does not produce improved performance.
- Must become <u>Highly Visible</u> and <u>Accessible</u> across each organizational level and function
- Must integrate into the corporate improvement processes.

Real Time Information – Currency of the New Decade –

Squeezing the Process for Profits!

Essar Steel - OSIsoft - Inexcon Technologies Partners in Performance