The PI System at the Heart of a Mining Integrated Operations Center

Presented by: Michel Plourde, Director Innovation & Technology
Agenda

• About ArcelorMittal mining Canada
• Our data infrastructure
• Origins of our operations management system (OMS)
• Components and philosophy of the OMS
• Vision of an IROC, results and benefits
About Us
AMEM and AMIC

• ArcelorMittal Exploitation minière Canada s.e.n.c. (AMEM) and ArcelorMittal Infrastructure Canada s.e.n.c. (AMIC) are two complementary companies operating on the north shore of the province of Québec (Canada).

• AMEM produces concentrate and iron oxyde pellets for the steel industry. AMIC provides rail and port infrastructure to transport and ship its products to four continents.

• Both are part of the ArcelorMittal mining segment, the world’s largest steel producer and among the 5 largest iron-ore producers worldwide.

• AMEM is one of the premier canadian suppliers of iron-ore products destined for the national and world steel markets.
AMEM and AMIC …

• AMEM produces some 26 million tons of concentrate per year while mining it`s Mont-Wright and Fire Lake sites. The Mont-Wright site also includes the crushing, beneficiation and large maintenance facilities.

• The concentrate produced is transported by train to Port-Cartier where part of the production is transformed at AMEM`s pellet plant. With it`s annual production capacity exceeding 10 million tons, the plant produces different pellet types to satisfy customers requirements.

• AMIC operates rail and port infrastructures in order to transport, stockpile and ship iron-ore concentrate and pellets from AMEM.

• AMIC owns and operates a world class railway spanning 420 kilometers as well as a large rail fleet to transport the 26 million tons of concentrate from Mont-Wright to Port-Cartier.
Our Value Chain

Mine
- Located in Northern Quebec
- 2 Mines – Mont Wright & Fire Lake (Northern Quebec)
- Over 30 years LOM
- Over 2+ B tonnes of Ore Reserve

Extraction
- 11 Rope Shovels
- 5x L1850 Loaders
- Mix fleet of 55 Haul Trucks (793, 797)
- 150+ MTPA Mining Capacity

Crushing
- Twin Lines
- +14 ktph capacity

Milling
- 7 Lines
- 72+ MTPA of Ore grinding capacity

Concentration
- WREC% of 33%
- Beneficiation CON @ 66.2% Fe
- Producing +26 MTPA of Concentrate

Shipping
- Largest private port
- 10+ MTPA of concentrate
- 6 grinding lines
- 2 induration furnaces
- 10 MTPA pellet capacity
Our PI Infrastructure
Our PI System

• 2 PI Servers, 140K PI Points
• PI AF, PI Analytics, PI Event Frames, PI Notifications
• PI ProcessBook, PI DataLink, PI Activeview, PI Vision, PI Manual Logger
• 7 Interface Types, 50+ instances
• PI OLEDEB Enterprise, PI OLEDB Provider
• Internal Applications
The PI System as a Single Information Source

Data
- DCS & PLC
- Mining systems & equipment
- Rail systems & equipment

Maintenance
- State and status
- Statistics & KPIs

Finance & management
- Targets & forecasts
- Health & Safety

Operations

PI Server

Context

PI AF

Information
PI Asset Framework Supplies the Context

- Unit
  - Equipment
  - Process
  - Plant
  - Company unit

- Transforms DATA and EVENTS into information

- A unique template for all historical events for all units.

- Context leads to actionable information
Origins of an OMS
An Optimisation Blitz for Our Mine Operations

• A 90 day sprint to identify our improvement opportunities and optimise mine operations.

• A multidisciplinary team:
  • Maintenance
  • Operations
  • Technology
  • Continuous improvement
The Technology Team`s Mandate

Design and implement a digital platform to assist mine operations in measuring performance and identify mine bottlenecks in real time.

Drilling
Blasting
Loading
Hauling

Deploy our mining resources and energy at the right place and the right time in order to comply with our mine plan and supply a constant high quality feed to our crushing facilities.
Assemble Information Sources

Data Sources
- Wenco FMS
- PI Data Archive
- Minesight
- CAT Terrain

Data models
- PI AF
- SQL Server Analysis Service Tabular

Visualisation
- PI Vision
- Power BI
- Sharepoint
Offer Users a Single Portal and Source of Truth

- Sharepoint Portal: Integrates access to multiple systems.
- PI Vision for dashboarding and monitoring and analysis in real-time.
- Power BI for reporting and analysis
Components & Philosophy of the OMS
Structure

3 levels, 3 audiences:

• Level 3 – Overall view of mine operations

  ➤ management, supervisors

• Level 2 – Value driver tree per process (drilling, loading, hauling).
  Reports and specialized dashboards.

  ➤ foremen, analysts

• Level 1 – Equipment level dashboards

  ➤ operators
SGO niveau 3 – Mining Operations
OMS level 2 – Value Driver Tree & KPIs

Hauling
Loading
Drilling
OMS level 2 – Mine Plan Conformity

Track IT!

• Short term weekly plans

• Monthly mine plans

• Conformity per material type and shovel face
Niveau 2 – production par fosse en temps réel

**Tracking mine plan conformity per pit:**

- Production: Drill, Load
- Haul cycle time per material type
- Inventories
- RAC Alarms
Improvements in mine road conditions

Road Analysis Control (RAC)
Improvements in mine road conditions - demo
Improvements in mine road conditions

Before

After
OMS level 1 – Performance for Truck Operators

- Real-time performance indicators for truck operators
- Comparison with the rest of the truck fleet
OMS level 1 – Performance for Shovel Operators

- Real-time performance indicators for shovel operators.

- Comparison with equivalent fleet.
IROC Vision, Results & Benefits
Integrated Operations
Results & Benefits of the OMS

• Higher conformity to mine plan! An additional increase of 5%

• Bottleneck identification: Better utilisation of our mobile haul fleet (Match Factor).

• The best decision may be to park trucks!

• You can improve only what you measure!
Results & Benefits of the IROC

• **300%** reduction in concentrator slowdowns caused by low feed at crushers.

• Efficiency increase of our loading equipment while lowering our dependence on costly front-end loaders.

• Significant increase in daily hauled tonnage related to increased truck productivity.
ArcelorMittal

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**CHALLENGE**

- Increase productivity at our Mont-Wright mine site
- Stabilize crusher feed
- Plan the mine and mine the plan
- Optimize logistics form Pit-to-Port

**SOLUTION**

- Develop a data-driven approach to assist IROC and mine operations become integrated and resilient.
  - Allow the real-time identification of bottlenecks at the mine and within the value chain.

**RESULTS**

The OMS provides the digital glue integrating systems to:

- Track to plan - conformity above 80%
- Achieve high predictability in results.
- Identify bottlenecks in real-time
- IROC becomes our digital 4.0 transformation vehicle.
Contact Information

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Questions?

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