ARC INSIGHTS

SEPTEMBER 1, 2016

ArcelorMittal Optimizes Supply Chain Logistics with Predictive Analytics

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Keywords

Mining Supply Chain, Supply Chain Visualization, Supply Chain Analytics, Railway, Shipping, OSIsoft PI System

Overview

In addition to other global assets, ArcelorMittal, the world's number one steelmaker, operates two interdependent companies in Quebec: ArcelorMittal Mines Canada and ArcelorMittal Infrastructure Canada. Following a recent expansion project and subsequent ramp-up in 2013-14, the company's Canadian operations now extract, process, haul, and ship roughly 26 million metric tons of iron ore products yearly to support steel production.

This ARC Insight discusses how ArcelorMittal helped solve its logistics bottleneck in Canada using OSIsoft's PI System to increase visibility. The project was implemented without a major capital expenditure. The company was able to add business context and visibility to its raw data to provide actionable intelligence. The technology has helped the company achieve its performance and production targets.

ArcelorMittal's geographically dispersed operations in Quebec include open pit iron ore mines and associated processing facilities in Mont-Wright and Fire Lake; a pelletizing plant and private shipping port in Port-Cartier, Quebec; and a 420 km railway connecting the mines and the port.

At the time of the expansion project, ArcelorMittal had already been using the OSIsoft PI System for over 15 years. However, when the company expanded production of iron ore pellets by 10 million metric tons (Mt), a bottleneck emerged in the supply chain logistics. By implementing a new information strategy to support the expansion project, ArcelorMittal was able to improve visibility to make its supply chain more resilient to change and eliminate the bottlenecks. Significantly, this new information strategy, enabled by the company's OSIsoft PI System, did not require a major capital expenditure.

The Challenge

Michel Plourde, Systems Director at ArcelorMittal Canada, recently briefed ARC Advisory Group about the supply chain challenges surrounding the company's decision in 2012 to expand its iron ore pellet production in Canada by 10 million Mt, from 16 million to 26 million Mt. These challenges largely involved eliminating logistics bottlenecks created by an inability to adapt quickly to disruptions and changes to plan.

ArcelorMittal has long used the PI System as its core database for collecting real-time data and transforming data into actionable information. To help remove the logistics bottlenecks and improve resiliency, ArcelorMittal used the PI System to transform and correlate data from its disparate systems to produce intelligence to support both strategic decisions and day-to-day operational and logistical decisions related to optimizing the use of the company's heavy mining equipment, railways, and port transportation infrastructure.

Mining and Transport Operations

At its expansive open pit mining operation in Mont-Wright, the company extracts iron ore using a huge electric excavator and a fleet of 50 Caterpillar 240-ton and 400-ton haul trucks.

ArcelorMittal processes the ore at the mines and then loads the iron ore concentrate onto rail cars to transport it to the company's pelletizing plant located at its port facility in Port-Cartier, Quebec. This railway is over 420 kilometers and passes through some very demanding geographical areas. The company operates approximately 36 GE and EMD locomotives and over 1,200 ore cars and tracks this rolling stock on a daily basis.

The port, excavated out of rock and built in the late 50s, has only 54 feet of water at high tide. Loading facilities at the port can only allow loading one ship at a time. Getting the ship in and out based on tides represents yet another logistics challenge.

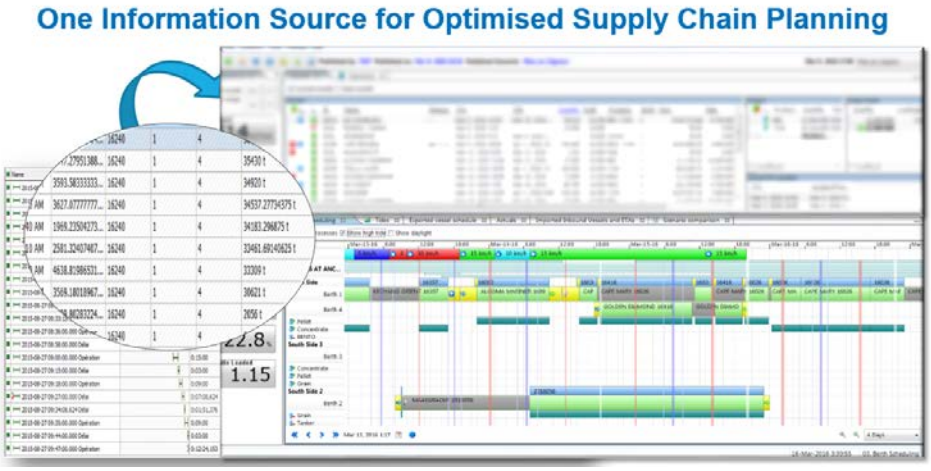
Obviously, the rail and port operations needed to support ArcelorMittal's Canadian mining operations are critical for the company's success.

De-bottlenecking Supply Chain Logistics

In 2012, competitive pressures required the company to increase production tonnage and reduce ongoing operating costs across its Canadian operations. In addition to expanding its physical infrastructure, the company realized it also had to improve the associated information architecture, and do so with minimal capital expenditure.

The project goal was to be able to determine when production targets were met, when ore was being delivered, the right ships onto which to load the iron ore products, the right tonnage to load, and the optimum times to do so. Workers needed to know when something went wrong and receive actionable intelligence to help resolve the issues quickly and efficiently.

Prior to the capacity expansion, the company had over 20 years of data stored in its PI System, encompassing over 50,000 data points (from DCS and PLC systems), PI ProcessBook, PI DataLink, and PI Active View. The company was good at integrating, diagnosing, and analyzing data from an operational perspective; but needed additional visibility to be able to predict and confirm what it wanted to happen along the supply chain. In other words, the company wanted to move more to a predictive environment for its critical logistics.



Because its logistics supply chain was only geared for 16 million Mt, the company ran into severe bottlenecks at the port following the expansion to 26 Mt., requiring loading an additional 150 ships per year…one ship at a time.

Increasing Visibility

ArcelorMittal was able to optimize its mining and rail operations, but encountered bottlenecks at its port because workers there didn't have adequate visibility into the tonnage being produced and transported to

Port-Cartier via rail. The company needed to align its business metrics with mining and logistics operations so that workers could understand the plan, budget and determine the tonnage that would need to be extracted, processed, transported via rail, then shipped from the port in a given month.

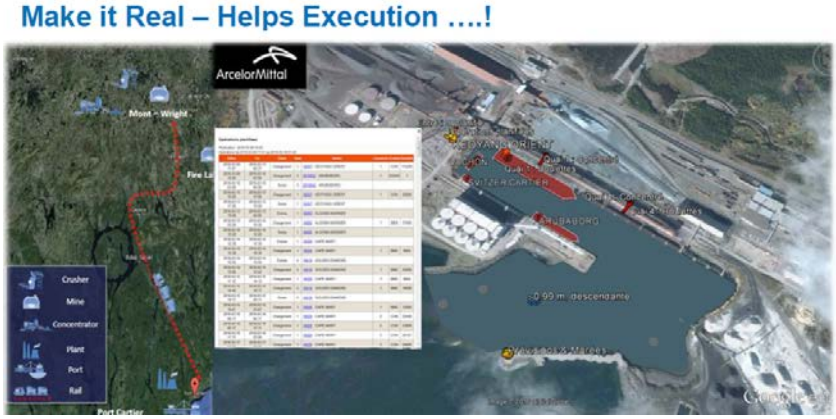
ArcelorMittal used the OSIsoft architecture already in place to add business context and visibility to the data to provide actionable intelligence. This included using Event Frames to implement automatic and consistent supply chain tracking.

Converting Data into Actionable Intelligence

The company wisely decided to stop using proprietary applications and, instead, integrate to commercial off-the-shelf (COTS) systems and applications to enable it to focus on core business problems. It used the PI System infrastructure as the consistent information enterprise HUB to integrate data from its many systems and contextualize the data into actionable information to support KPI-based planning, drive business goals, and help schedule maintenance at the right time based on market requirements.

The PI System Infrastructure now includes 140,000 points. ArcelorMittal added the PI Visualization Suite along with PI Coresight, PI ProcessBook, PI DataLink, PI Manual Logger, Notifications and Event Frames, which improved visualization, integrated the data context, and made workers more collaborative and engaged.

Operational and logistics-related information from the DCS and PLCs was integrated from the mine to the railway to the port systems and for equipment dispatching systems so workers could make informed decisions, for example, such as whether to adjust production rates, stockpile ore or pellets, or send it along the supply chain. Asset and event data were also integrated into the maintenance systems to optimize maintenance scheduling for its fixed and moveable assets.



Optimizing the Port

The company uses a dynamic enterprise data model, combining the information with a visual representation of the port to optimize constraints and parameters, increasing prof-

itability. Workers can look at the port dashboard, collaborate and determine schedules and plans for loading different ships. Workers can tell what is operating, whether the process is running, needs maintenance, what equipment is down, etc. and can match information with the right cost figures and reduce operational costs.

Users can answer questions such as, "How do I push the load to the right ships at the right time?" and "How do inefficiencies in the process affect income?" The model is used to determine real-time data targets and costs. Events generated initiate actions. According to Mr. Plourde, "The data now leads us to clear and precise decisions with information to the right people at the right time in the right context."

The company integrates data from the shipboard automatic identification system (AIS) systems with PI System data and then graphically overlays the information on Google Earth, enabling port personnel to easily visualize the port and ship traffic and trigger ship loading, equipment maintenance, and other activities as needed. The colors on the graphical port display change as events occur.

By using this geographical port visualization, the company can see all ship movements, manage the associated tugboat and loading operations, and combine this intelligence with tidal information to optimize port efficiencies. They can also get railway updates, see what tonnage is coming in, and what the downstream crushers in production are doing and more.

"Management views the dashboards every day and integrates their comments. The operations dashboards show what happened. Logs are made as to why targets are met, not met or exceeded," stated Mr. Plourde.

Benefits

ArcelorMittal increased its shipping capacity from 13 million Mt to 26 million Mt, to meet its new throughput targets. The company has met its targets for increased throughput and gained visibility into all strategic, tactical, and operational planning operations. The company estimates that, in 2015, the additional 10-million metric tons shipped was equivalent to $120 million USD in additional revenue based on current commodity prices.

According to Mr. Plourde, "It was amazing to see how operators viewed the data, wanted to help, and even asked for additional information." With minimal investments, the company was able to solve its supply chain bot-

tlenecks and develop a new collaborative mindset with more engaged employees. The company's success with this project is influencing other projects across its supply chain. For additional information readers can view the presentation.

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