Process Optimization in the Mining Industry

Helping Mining Companies achieve levels of efficiency not thought possible before

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June 12th, 2008
Agenda

- Trends in the Mining Industry
- The quest for efficiency: a practical example
- Process integration and optimization: The Component Business Modeling technique
The global mining industry is going through a major transformation resulting in challenges and opportunities

**Industry Consolidation**
- Ongoing global industry consolidation requiring adjustment in the business model and flexible information systems to support the operations in a global scale

**Strong Demand**
- Industrialization in Asia creating strong demand for commodities (e.g. copper, nickel, aluminium and iron ore)
- Rise of Asian mining and metals conglomerates

**Increase Production with Tight Supply**
- In response to increased demand, existing operations are running at maximum capacity
- Expansion projects have to be executed
- Tight supply situation for consumables (e.g. tires, explosives) and for heavy equipments

**Price Volatility**
- Management of commodity prices, exchange risks and capacity constraints increasing in complexity and importance

**Corporate Social Responsibility**
- Manage impact of mining activities on the community, the environment and people

**Skills shortages**
- The number of skilled resources continues to decline and costs are increasing
- A globally dispersed workforce that needs to apply expertise locally and regionally
- Different expectations of newer employees; generation gaps that must be taken seriously
Iron Ore Supply Chain - Challenges

MINING COMPLEXES
- Mine 1
- Mine 2
- Mine m
- Mine n
- Mine o

RAILROAD SYSTEM
- Car Dumpers

PORT COMPLEX
- Homogenized Ore Stockpiles
- Different Types of Pellets
- Conveyor System

Homogenized Ore Stockpiles
- Lump Stockpiles

Screening Facilities

DOMESTIC MARKET

Iron Ore Refinement Process
- Lump Feeds
- Sinter Feeds

For Each Mine
Iron Ore Supply Chain – Optimization Approach

- **MINING COMPLEXES**
  - Mine 1
  - Mine 2
  - Mine m

- **RAILROAD SYSTEM**
  - Car Dumpers
  - Homogenized Ore Stockpiles
  - Conveyor System

- **PORT COMPLEX**
  - Pellets Mills
  - Different Types of Pellets
  - Homogenized Ore Stockpiles
  - Conveyor System

- **DOMESTIC MARKET**

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**PUSH**

- Extract raw materials from the mines
- Maximize production

**PULL**

- "Assemble" raw materials into ore and pellet products
- Just in time delivery

**Iron Ore Supply Chain – Optimization Approach**

- Extract raw materials from the mines
- Maximize production
- "Assemble" raw materials into ore and pellet products
- Just in time delivery
Iron Ore Supply Chain – Optimization Approach

**Upstream Optimization**
- Allocates recipes for each order by choosing an optimal recipe from a large number of pre-generated recipes for each product
- Generate schedules for mines and loading sites, trying to satisfy required dates at port delivery times

**Downstream Initial Optimization**
- Generate an initial solution for the pellet mills, domestic customer deliveries, piers and ships
Iron Ore Supply Chain – Optimization Approach

Upstream Optimization
- Allocates recipes for each order by choosing an optimal recipe from a large number of pre-generated recipes for each product
- Generate schedules for mines and loading sites, trying to satisfy required dates at port delivery times

Downstream Final Optimization
- Generate a final solution for the pellet mills, domestic customer deliveries, piers and ships, using the Upstream Optimization solution as an input to restore feasibility
A company can follow a three-step approach to become more efficient and successful.

**Step 1**
Decide which markets and which customers the company will serve

Which markets and customers around the world offer the greatest profit and revenue potential?

**Step 2**
Look at the different important functions of the company

A component business model (CBM) is a useful tool to get a view into all the major functions of a company

**Step 3**
For each important company function, ask five questions

1. Where should it be done?
2. Who does it?
3. What enablers are used?
4. How well does it all integrate together?
5. Is it innovative?
Component Business Modeling (CBM) supplies a framework to identify the company’s important components, as well as identifying the components that can provide differentiation.

Consider the major functional areas of a company:

Across 3 dimensions:
A Business Component is a part of an enterprise that has the potential to operate independently, in the extreme as a separate company, or as part of another company.

A business component is a logical view of part of an enterprise that includes the resources, people, technology and know-how necessary to deliver some value.

An Accountability Level characterizes the scope and intent of activity and decision-making. The three levels used in CBM are Directing, Controlling and Executing.

- Directing is about strategy, overall direction and policy.
- Controlling is about monitoring, managing exceptions and tactical decision making.
- Executing is about doing the work.
For example, we can use evaluation criteria to produce a ‘heat map’ to help select and prioritise improvement projects.

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<th>Servicing &amp; Sales</th>
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**Target Competency**
- B = Base
- C = Competitive
- D = Differentiated

**Revenue / Cost**
- Revenue
- Cost
- (H, M, or L)

**“Hot” Component**
- Revenue/Profit improvement opportunity
- Cost control opportunity
Improved processes can help leading mining companies achieve levels of efficiency not thought possible before.

Just some examples:

- Management of globally integrated enterprises
- End-to-end mining supply chain optimization
- Safety, security and regulatory compliance
- Integration of ERP-MES solutions for mining
- Workforce management for mining
- End-to-end fleet and asset monitoring
- Process consistency and standardization
- Port & shipping optimization
Thank You
Obrigado
Gracias