Next level mining
Enabling technologies and applications – Part 1
The mining industry today
The main challenge is productivity improvement

Productivity in tons / person / year

- Manual production
- Mechanical production
- In-situ remote production
- Automated production

Four key mining industry requirements
- Productivity
- Safety
- Environment sustainability
- Reliability

Mechanization
- Standardization of processes
- Mechanization means dramatic shifts in production capabilities
- Operation of equipment still requires human interaction

Automation
- Integrated modeling and planning for higher quality yield
- Greater visibility into parts of the value chain
- More detailed information coming from equipment and plant to enable remote mining

Optimization
- More responsive demand and supply
- Higher level of automation driven by labor shortages and remote mining locations
- Limiting bottlenecks by adopting more continuous processes
- High levels of visibility across the value chain and between operations
ABB in Mining today
Fostering a one-system approach

- Extended operator workplace
- Operation, engineering and maintenance
- Process optimization
- Production management
- Headquarter ERP and business systems
  - ECS, ISA-95, OPC...

- Corporate network
- Mobile / remote operation engineering and maintenance
- Automation system network
- High integrity control safety shutdown fire and gas
- Wireless communication
- Sub-system controller AC800 M

- AC800 M process controller
- Process optimization
- Production management
- Headquarter ERP and business systems

- Main process and power control
- 800xA based integrated sub systems

- Grinding drive systems
- Automatic stockpile loading, unloading transport
- SpectraFlow on-line analyzer laboratory

- Operation, engineering and maintenance
- Mobile / remote operation engineering and maintenance
- Main process and power control
- 800xA based integrated sub systems

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Next level mining
Expanding customer value proposition beyond the simple system provider approach
Next Level mining
Through power and automation integration

Integration of equipment, systems and people...

...enabled by technology...

...to get one common view

- An infrastructure that can represent all the assets
- Embed all applications and systems
- Share information without barriers
- Bring teams together and get the best from all teams
- Empower people to perform their best

Integration of communication infrastructures
Integration of subsystems
Integration of systems at different sites
Integration of higher level applications

Aspect Objects™
- Object centric information access
- One Click to all information
- Direct navigation from any aspect to the next
- Information filtering based on job role/function
- Real-time decisions and action

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ABB in Mining solution suite
A holistic approach to the entire mine operation

Financial Layer

Planning Layer

Process Management Layer

ERP Functions

Business intelligence
Asset health center
Ellipse inventories

Consumer applications

Collaborative Production Management
Asset Monitoring – Stockyard Management – Integrated Mine Operations

Minerals control & Optimization applications
Ventilation on demand – Ore monitor – Grinding & Flotation advanced process control

Process and power control systems core
Electrification – Wireless communication – Localization

Mine → Transport → Ore processing plant → Transport → Port
Collaborative Production Management
Collaborative Production Management
Asset optimization, unleashing value towards new maintenance strategies

Maintenance effort reduction in 50%
Changes in the maintenance types distribution:

<table>
<thead>
<tr>
<th></th>
<th>Traditional</th>
<th>World Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive</td>
<td>50%</td>
<td>15%</td>
</tr>
<tr>
<td>Preventive Time</td>
<td>35%</td>
<td>30%</td>
</tr>
<tr>
<td>Prev. Condition</td>
<td>15%</td>
<td>55%</td>
</tr>
</tbody>
</table>

(1) Thomas Marketing Information Center
Collaborative Production Management

Asset Monitors, providing awareness on asset condition in real time

- Asset Monitor is a software component that monitors and promptly reports one or more conditions of an asset.
- Asset Monitors can receive data from multiple OPC data sources including 3rd party.
- Asset Optimization (AO) is fully integrated into System 800xA.
Collaborative Production Management
AssetVista dashboard, providing awareness on asset condition in real time
Collaborative Product Management
Asset monitors generate value at enterprise level

ABB Maintenance Products

ABBY Maintenance Data Flow

ERP

Finance
Supply
EAM

PIMS
MES
LIMS
PAM

HMI
Control
IO
Sensor
Device

System
800xA

800xA Asset Optimization

Condition Monitoring

On Line Maintenance Data

Off Line Maintenance Data

800xA Asset Optimization

Asset Health Center

Risk of Failure Monitoring

Expert On Line Monitoring Tools

Remote Services

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Collaborative Product Management
Asset Health Center: enterprise wide solution
Minerals control & optimization applications
Minerals control and optimization applications
Ultimate link between control and enterprise levels

- Mine Design
- Production Planning
- Assets
- Work Force
- Customers
- Investors
- Finance

- Production plan
- Asset availability
- KPI report & visualization
- Status on-line

- Plan, Dispatch and Activity follow-up
- Ore Monitor and Predict

- Work orders
- Activity report
- Machine operation data

- Control system
  - Drilling Rig
  - LHD/Trucks
  - Hoits
  - Mills
  - Flotation
  - Material Handling
  - Stockyard
  - Port
Minerals control and optimization applications
Production scheduling and dispatch

- Software package where mine operators dispatch and track operations in real time, increasing operational transparency and enabling decisions for best operations in real time.

- Functionalities
  - Visibility of all resources across the mine
  - Plan continuously updated, based on truly existent resources.
  - Optimal response to disturbances in real time
  - ISA 95 based data store holds mine’s past, present, and planned activities
  - Scheduling engine supporting optimal decision making, including constraint checking mechanisms to enforce resource availability
Minerals control and optimization applications
A cockpit to provide full visibility & enable optimization
- Predict accurate energy demand schedules to lower purchase costs and avoid penalties
- Manage complexity from varying energy price and power availability by allocating energy consumption to off-peak hours and energy production to peak hours
- Same framework can be used to manage other limiting factors such as water and fuels

Select resources to enable production schedule at minimum cost
Securing the future of mining
ABB’s vision for mining companies is now closer

- ABB portfolio provides visibility and optimization across the value chain
- ABB products and systems will drive fundamental change in the way a mining enterprise works, creating dramatic increases in
  - Process productivity
  - Predictability of operations
  - Asset reliability
  - Energy efficiency
  - Health, safety
  - Protection of the environment