Next Level mining

ABB Ability for integrated mine operations

Eduardo Lima, Global Product Manager
Agenda

1. Collaboration
2. Integrated Mine Operations
   - ABB Ability products, devices and sensors
   - ABB Ability automation and control systems
   - ABB Ability plant and enterprise solutions
   - ABB Ability cloud platform and services
3. Conclusion
Digital transformation landscape
Underground mine

- **Services & Execution Systems**
  - 2010: Isolated Operations
  - 2015: Connected Operations
  - 2020: Integrated Operations
  - 2025: Remote Operations
  - 2030: Autonomous Operations

- **Connectivity & Software**
  - 2010: Connectivity
  - 2015: On-Call Services
  - 2020: Remote Diagnostics & Digital Twin
  - 2025: Prescriptive maintenance & Analytics
  - 2030: Automated services

- **On-site Automation**
  - 2010: Onboard sensors & servers
  - 2015: Integrated Systems
  - 2020: Intelligent Devices
  - 2025: Automated Control

- **Power**
  - 2010: Connected Machinery
  - 2015: Energy Storage
  - 2020: Electric mine
  - 2025: Fuel Cells and Alternative Energy Sources

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Boliden Mineral - Garpenberg 2.5

Many autonomous systems for different purposes in Garpenberg

ABB Ability 800xA System integration platform
Production in focus
The user in center, using one system only

An integrated, unified and efficient operator environment

Stop reporting
Maintenance system
Documents Drawings

Operator notebook

Process displays
History & Trends
Alarms and Events

The base - the process control system - 800xA
Boliden Garpenberg
Planned to be shutdown – now the world’s most effective zink mine
Boliden Aitik
The world’s most effective open pit copper mine

Copper - open pit with mill 2014

(Mine+ mill+ G&A) Brook Hunt data 2014
Always access to correct information - everywhere
Everyone shares the same information - in real time
It’s all about Collaboration
ABB Ability

ABB Ability™: creating one common offering for digital end-to-end solutions

ABB Ability categories:

**ABB Ability cloud platform and services:**
Integrated Operations centers, Remote monitoring solutions
EV fast-charging apps

**ABB Ability plant and enterprise solutions:**
Mining solutions, Marine solutions, power generation solutions
Network management systems, Substations, HVDC stations

**ABB Ability automation and control systems:**
DCS systems: 800xA, Symphony+
Substation automation systems

**ABB Ability products, devices and sensors:**
Robots, motors, drives, solar converters, EV charging stations
MV breakers, LV breakers, Transformers, GIS, Generator circuit breaker, HV breaker
Sensors, analyzers
ABB Ability Platform

Architecture Overview

Levels

Global cloud
Connections
Local / Enterprise
Cloud / Datacenter
Aggregation
Plant Level
Device / Process

Cloud SW (e.g. database, simulation, analytics)

GW = gateway
ABB Ability for Integrated Mine Operations
On-site, multi-site, collaborative and remote working place

ABB Ability product offering in underground mining:

- 800xA system – extended process automation & integration platform
- Extended workplace – control room layouts
- Execution and fleet manager – mobile fleet management and control
- Localization – 3D resource visualization and search engine
- Process and power control as mine ventilation, dewatering, substation
ABB Ability – Execution and Fleet Manager

Execution Manager
- Scheduler
- Production execution
- Material tracking
- Production performance reporting

Fleet Manager
- Dispatch & work order management
- On-board machine reporting
- Remote monitoring
- Equipment performance reporting
ISA 95 Process Model

ISA-95 covers a set of specifications (or models) and terminology that capture the manufacturing process. Users can configure the ISA-95 classes and define instances for:

- Process segments: loading, drilling, blasting, bolting
- Equipment classes: drifts, loaders, drilling, machine
- Materials: electricity, water, ore, final product
ABB Ability - Execution and Fleet Manager

Short term scheduling in closed loop

Real-time visualization of actual status and on-line replanning

A predictive production from the beginning of the value chain - replanning in seconds
# ABB Ability – Execution Manager

Real-time control Gantt and schedule engine

![Gantt chart image](image-url)
ABB Ability - Fleet Manager

On-board activity reporting
Bolting identified as the critical process
Resulted in depth analysis of bolting activity
..based on machine data measurements
Change of the bolting process
Potential 20% increase of bolting efficiency
ABB Ability - Fleet Manager

Remote monitoring

Interface to 3rd party on-board system servers

On-board data logger module supporting standard interfaces like J1939, Modbus, RS232, I/O or other standard fieldbus protocol.

Data is stored on board and forwarded to the MineInsight server.
ABB Ability – Production face analytics
Real-time visualization of face status in 800xA system
# ABB Ability - Fleet Manager

## Machine Performance reporting

### Equipment effectiveness (OEE)

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**ABB Ability - Execution Manager**

Production performance monitoring

- Process and production monitoring
- Calculations and data consolidation
- Multiple periods like shift, daily, weekly, monthly

**KPI overview**
- Throughput, actual vs. planned, productive time, efficiencies

**Electrical energy cost tracking:**
- Individual equipment counters
- Plant sections totals
- Plant totals

**Specific energy consumption calculations per**
- Production unit (e.g., tons)
- Product
Mining localization intelligence
ABB Ability – Mine ventilation control

- Three levels of function
- Basic control as remote, event, sensor and time control
- Ventilation on demand control
- Energy optimization of fans for autonomy
- Use case showed 54% reduction of energy consumption and
- 21% reduction of heating
Power Control
Process control

G1A_PU9501_CTR

PumpInfo

Uppfördningshöjd
-4.0 m

Densitet
1.20 kg/dm³

Effekt
60.8 kW

Flöde
735 m³/h

Tryck
2.4 bar

Varvtal
73.1 %

Minflöde: 560 m³/h
Minvarvtal: 55.7 %

ES kWh/m³ senaste timmen: 0.082 kW
Effekt från omriktare: 61 kW
Axelleffekt motor: 58 kW
Hydr Effekt: -10 kW
Nuvarande total verkningsgrad: 85.3 %
Beräknad påMottryck

Medelvärde total verkningsgrad: 81.5 %
Beräknat på mätområde min/max

Drivsystem verkningsgrad: 95.6 %
PumpRörsystem verkningsgrad: 88.6 %
Beräknat på Mottryck

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ABB Ability - Collaborative services

Portfolio

Remote Diagnostics
Condition Monitoring
Performance Monitoring
Advanced Process Control
Fleet Intelligence
Condition-based Maintenance
Cyber Security
ARMOR Room
Manufacturing Execution System
Asset Portal
Analytics
Control Room
ABB Ability - Collaborative services

Performance Analytics
**ABB Ability - Mine ventilation control**

Function as a service

Basic services
- The service is managed from a central location by specialist on control
- Flexibility to modify and improve needed models to maintain efficiency
- Customers use the service as needed
- Monitoring of performance
- Faster deployment

Extended services
- Monitor ventilation data from across different mine sites
- Visualization of ventilation-related data to assist decision makings, e.g., historical data, real-time data, and KPI tracking, etc.
- Increased information sharing and decision support with coordinated and integrated mine operation services in the value chain
- i.e, Low energy operation as a service from ABB through or CO Centres
Collaborative Operations within ABB

Centers in strategic locations.
Collaborative operations

Closing the loop
Ore Factory

Benefits

- Increased production through fast replanning, 10-20% increase in weekly blasting
- Measurement based identification of bottlenecks
- Real-time measurement and logging of process activity variability
- Balanced production between activities on shift-, week/month and value chain
- Adjust production to resource constraints as electricity, water etc
- On-line reporting of disturbances creating event alarm.
- Real-time visualization for current status over the value chain
Q&A and Contact information

If you have questions, please contact me further

Speakers

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