Mining productivity improvement and performance optimization

Milan Jevremović, Industry Segment Manager, ABB Serbia
YuMi® – revolutionary cooperation between man and machine

ABB - Shaping the world through innovation
# ABB: the pioneering technology leader

## What (Offering)

| Pioneering technology | Products 58% | Systems 24% | Services & software 18% |

## For whom (Customers)

<table>
<thead>
<tr>
<th>Utilities</th>
<th>Industry</th>
<th>Transport &amp; Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>~35% of revenue</td>
<td>~40% of revenue</td>
<td>~25% of revenue</td>
</tr>
</tbody>
</table>

## Where (Geographies)

<table>
<thead>
<tr>
<th>Globally</th>
<th>Asia, Middle East, Africa 38%</th>
<th>Americas 29%</th>
<th>Europe 33%</th>
</tr>
</thead>
<tbody>
<tr>
<td>~$34 bn revenue</td>
<td>~100 countries</td>
<td>~132,000 employees</td>
<td></td>
</tr>
</tbody>
</table>
4 focused leading businesses

**Electrification**
- Low and medium voltage products,
- Electric transportation solutions,
- Solar inverters,
- Power distribution automation,
- Distribution substations, switchgears
  and apparatus, enclosers,
- LV products for protection, control
  and measurement
- Electrical installation products for
  homes and buildings

**Industrial Automation**
- Integrated, industry-specific solutions: automation (DCS),
  electrification,
  software solutions,
  measurement and analytics marine
  industry solutions and turbochargers

**Robotics & Discrete Automation**
- Machine and factory automation
  (PLC, mainly B&R), the most
  comprehensive robotics solutions
  and applications suite

**Motion**
- A comprehensive selection of
  electrical motors, generators,
  frequency converters and servicing
  and maintenance services

ABB Ability™ Customized digital solutions for customers
Shaping the world through innovation
Continuous investment in research and development

More than **1,5 billion**
Dollars annual investment

Cooperation with around **70** universities around the world

**~ 8,500**
Scientists and researchers

**7**
Corporative research centers connected to the global research center

Innovation is instilled in ABB company’s DNA
ABB in mining

600+ Mine hoist solutions
125+ Gearless mill drives systems
720+ Km of belt conveyor system
250+ Bucket-wheel excavators
200+ Patents into mining industry
80+ Turnkey electrification & automation
1200+ Distributed control system
50+ Countries references
5+ Remote diagnostics centers
Challenges faced in the mining industry today

Mining is not getting any easier

- Capital project delays and budget commodity
- Low commodity prices
- High labor cost and energy cost
- Globally connected economies and businesses
- Harder to reach the deposits
- Depleting reserves
- Complex assets and ore bodies
- Declining ore grade quality
Digital transformation

- System 800xA
- ABB Ability
- Connectivity
- On-site automation
- Power
- Service & execution system
- Connectivity & CO center
- Remote operation
- Remote supervision
- Remote diagnostics & digital twin
- Prescriptive maintenance & analytics
- Integrated systems
- Intelligent devices
- Automated control
- Cloud
- Energy storage
- Electric mine
- Fuel cells & alternative energy sources
- Automated services
- COC Center

Year:
- 2010
- 2015
- 2020
- 2025
- 2030

Operations:
- Isolated operations
- Connected operations
- Integrated operations
- Remote operations
- Autonomous operations

Services:
- On-call services
- Connectivity
- On-board sensors & servers
- Connected machinery
- Energy storage
- On-site automation
- Power

AABB
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June 24, 2019
Slide 8
Mine automation
ABB Ability™ MineOptimize

Our portfolio
- Mobile fleet management
- Production face analytics
- Automated scheduling
- Execution manager
- Analytics
- Mine remote control station
- Mine ventilation control
- Coal flow control

Bring equipment, systems and people together
How MineOptimize delivers value
Enabling high levels of visibility, agility and optimization across operations

Total mining performance, through digitalization
Complete mine hoisting systems
All types of hoists and shaft equipment

To all your needs

- Design and manufacture of complete mine hoists since 1937
- Over 700 mine hoists to more than 30 countries
- Only global supplier of complete mine hoist systems
- All types of hoists:
  - Friction type hoists (Koepe)
  - Drum type hoists: double drum hoists, single drum hoists and Blair multi rope hoists
  - Stage hoists
- Electrical equipment
- Mechanical equipment
- Shaft equipment:
  - Skips, cages & rope attachments
  - Loading & unloading systems
  - Head sheaves and deflection sheaves
  - Mine shaft layouts and guide systems
Stockyard management system
Tool to digitalizes plant processes for better quality management

Features

- **Material tracking**
  - Monitoring of the material flow including mass balance and inventory management

- **Material blending**
  - Controlled creation of desired quality

- **Quality Management and Pile Visualization**
  - Quality tracking by online instruments and automated data exchange with the laboratory system

- **Capacity management**
  - Support operator for efficient space utilization

- **Job oriented material handling**
  - Can handle jobs from planning system
  - Automated evaluation of jobs according to available space, material quality and quantity for optimization
Customer Challenges

Typical Grinding Solution

- Stabilize Load
- Stabilize Density
- Stabilize Cyc. Pressure
- Maximize Feed

Legend:

**Manipulated variables**

**Controlled variables**

**Measured disturbances**
To reach high performance levels, we need to know where each production site stands on achieving production and operational targets.

Raw data:
- Measurements, manual inputs, lab analysis, alarms

Information:
- Key values, specific energy, Pareto charts

Experience:
- If... then... -> utilize the experience from others

Knowledge:
- Analyze history, add experience and understanding

Improvement:
- Use the knowledge for continuous improvement

Solutions that empower continuous improvement
MineOptimize - GCD for medium power
Presentation contents

Gearless Conveyor Drives (GCD) for medium power

- ABB conveyor classification according power rating
- Benefits of gearless drive
- ABB solution with PM Motor for medium power
- Value proposition
- Implementation consideration
- Business model
Conveyor classification
MineOptimize – Gearless Conveyor Drive

High Power

Medium power

Low power

per conveyor

per motor

GCD for high power

GCD for medium power

>10MW

2.5 – 9MW

50 – 60rpm/ 400 – 1700kNm

3 – 10MW

0.1 – 5MW

10 – 800kNm

<4MW

0.1 – 1MW
Motivation - Provide a gearless solution for medium power ranges

MineOptimize – Gearless Conveyor Drive

- Permanent Magnet Motor for mining
- >50% lower failure rate
- >30% reduction of losses
- The cost saving solution
- Lowest OPEX/ lowest cost per ton

Key facts of GCD

- 4 flights
- 12 drives in total
- 1000kW Motors
- 8.800tph production
- 10ct/ kWh for energy
- 6.900 hours p.a. operation
The challenges of medium power conveyors

MineOptimize – Gearless Conveyor Drive for medium power

Open Pit Mining (OPM); In Pit Crushing & Conveying (IPCC)
Medium capacity overland conveyors
Conveyors are moveable or without major foundation

Requirements

- No rigid / concrete foundation possible
- Space constraints in many cases
- Drive train weight restrictions
- Fast installation and easy to align on site
- Cost efficient

- Several studies have shown, that conventional Synch Motor is not suitable for many of such conveyors
The solution: Permanent Magnet (PM) GCD motor

MineOptimize – Gearless Conveyor Drive for medium power

- Conventional low speed Synchronous Motor cannot meet requirements in the medium power range
- Another type of motor is needed
- The solution: Permanent Magnet Motor

Easy implementation because of...

- Low weight
- Compact size
- Low maintenance
- Foot or shaft mounting
- Air or liquid cooling
- Mining specific heavy duty design
- High degree of protection marking (up to IP66)
## Comparison of motor types

MineOptimize – Gearless Conveyor Drive for medium power

<table>
<thead>
<tr>
<th></th>
<th>Permanent Magnet (water jacket)</th>
<th>Synchronous (IC6A6A6; air to water)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power</strong></td>
<td>1500kW</td>
<td>1500kW</td>
</tr>
<tr>
<td><strong>Speed</strong></td>
<td>131rpm</td>
<td>131rpm</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>15 tons</td>
<td>31 tons</td>
</tr>
<tr>
<td><strong>Length</strong></td>
<td>1600mm</td>
<td>3500mm</td>
</tr>
<tr>
<td><strong>Width</strong></td>
<td>2200mm</td>
<td>2100mm</td>
</tr>
<tr>
<td><strong>Height</strong></td>
<td>2200mm</td>
<td>3300mm</td>
</tr>
</tbody>
</table>

### 50% lower weight
Construction of gearless drives

MineOptimize – Gearless Conveyor Drive for medium power

Gearless drive (advanced solution)
- Low speed coupling and disk brake
- Low speed Permanent Magnet motor
- Torque arm/swing base
- Cooler Module

Geared drive (state of the art)
- Pulley
- Geared drive
Basic installation principles
MineOptimize – Gearless Conveyor Drive for medium power

Mounted to pulley shaft

(shaft mounted with torque arm)
- Easy to align
- No axial forces
- Quick installation
- Torque arm required

Foot mounted motor

(pad mounted)
- Geared or flexible coupling needed
- Motor alignment necessary
- Motor foundation needed
- Less load on motor shaft and bearing

Different possibilities for torque arm mounting.
## Motor cooling

MineOptimize – Gearless Conveyor Drive for medium power

<table>
<thead>
<tr>
<th>Liquid cooled</th>
<th>Air cooled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water jacket motor</td>
<td>No liquid</td>
</tr>
<tr>
<td>Water with anti-freeze (N or L)</td>
<td>Higher noise level</td>
</tr>
<tr>
<td>Simple radiator cooler unit (fin fan)</td>
<td>Less compact and higher weight</td>
</tr>
<tr>
<td>More compact motor</td>
<td></td>
</tr>
<tr>
<td>Low noise level</td>
<td>Foot mounting only</td>
</tr>
</tbody>
</table>

![FinFan cooler](image1.png) ![Motor](image2.png)
Typical 1000kW Conveyor Drive

Concept - Install GCD instead of geared drive

Drive including surrounding structure and pulley

<table>
<thead>
<tr>
<th></th>
<th>Gearbox</th>
<th>Motor</th>
<th>base</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geared</td>
<td>9.359kg</td>
<td>6.100kg</td>
<td>3.500kg</td>
<td>18.959kg</td>
</tr>
<tr>
<td>Gearless</td>
<td>-------</td>
<td>16.700kg</td>
<td>2.000kg</td>
<td>18.700kg</td>
</tr>
</tbody>
</table>

Summary:
- With a little lower weight the gearless drive would fit into the same space as the typical geared drive
- If conveyor design is optimized to support gearless drive, the gearless version can be even lighter
Low or medium voltage drives

MineOptimize – Gearless Conveyor Drive for medium power

**LV drive**
- Voltage: 400 – 690V
- Cooling: air or liquid
- Single or MultiDrive
- Compact and cost efficient solution

**MV drive**
- Voltage: 3.300V, 6.000V
- Cooling: air or liquid
- Single or MultiDrive
- Fuseless design

Low voltage is the more efficient for up to ~1.500kW
Failure rate assumption
MineOptimize - Gearless Conveyor Drive for medium power

Key facts
- Elimination of gearbox
- Gearbox has shorter live time than motor
  - Life time gearbox: 15 years
  - Life time motor: 25 years
- Random failures are reduced by more than 50%

Failure simulation
- 4 conveyor flights
- 12 drives
- 1000kW motors
- 8.800tph
- 6.900 operating hours p.a.
Noise emission of typical gearboxes

MineOptimize – Gearless Conveyor Drive for medium power

Sound pressure levels of geared drives is higher than 90dB(A)

Sound frequency mix of geared drive is „unpleasant“

Geared drive has a high sound pressure level >>85dB(A)
200kW GCD motor

Noise measurement at motor factory under load

The measured sound pressure level is 66.3 dB(A)
# Highest Drive Train Efficiency

MineOptimize – Gearless Conveyor Drive for medium power

<table>
<thead>
<tr>
<th></th>
<th>Geared with Frequency Converter</th>
<th>Gearless with Frequency Converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer</td>
<td>50kW</td>
<td>42kW</td>
</tr>
<tr>
<td>Frequency converter</td>
<td>119kW</td>
<td>104kW</td>
</tr>
<tr>
<td>Motor</td>
<td>184kW</td>
<td>175kW</td>
</tr>
<tr>
<td>Motor exitation</td>
<td>0kW</td>
<td>0kW</td>
</tr>
<tr>
<td>Gearbox</td>
<td>250kW</td>
<td>0kW</td>
</tr>
<tr>
<td>Total losses</td>
<td>603kW</td>
<td>321kW</td>
</tr>
<tr>
<td>Total Efficiency</td>
<td>89,2%</td>
<td>94,00%</td>
</tr>
</tbody>
</table>

![Component efficiencies](image)

- **Squirrel Cage Induction Motor**: 96.50%
- **Converter**: Losses calculated by DrivesSize tool
- **Permanent Magnet Motor**: 96.50%*

* Motor can be designed for higher efficiency (~98% for PM)

**4.7% higher efficiency at rated power**

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Slide 30
## Highest Drive Train Efficiency - WRIM vs. GCD (PM)

**MineOptimize – Gearless Conveyor Drive for medium power**

<table>
<thead>
<tr>
<th></th>
<th>Slip Ring Motor +Resistor Starter</th>
<th>VFD+PM Motor GCD(PM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Losses in [kW]</td>
<td>Losses in [kW]</td>
</tr>
<tr>
<td>Supply power [kVA]</td>
<td>6773,0 kVA</td>
<td>6180,0 kVA</td>
</tr>
<tr>
<td>(Main Transformer primary)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transformer</td>
<td>49,1</td>
<td>47,5</td>
</tr>
<tr>
<td>Converter</td>
<td>0,0</td>
<td>116,0</td>
</tr>
<tr>
<td>Motor</td>
<td>264</td>
<td>224,0</td>
</tr>
<tr>
<td>Permanent Slip Resistors</td>
<td>100,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Power inverter cooling</td>
<td>0,0</td>
<td>20,0</td>
</tr>
<tr>
<td>Power motor cooling</td>
<td>0,0</td>
<td>20,0</td>
</tr>
<tr>
<td>Motor cooling fan</td>
<td>24,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Motor Exitation</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Reactive Power Compensation</td>
<td>20</td>
<td>0,0</td>
</tr>
<tr>
<td>Oil cooling</td>
<td>44,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Oil heating</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Gearbox</td>
<td>280</td>
<td>0,0</td>
</tr>
<tr>
<td><strong>Total losses</strong></td>
<td><strong>781,1kW</strong></td>
<td><strong>427,5kW</strong></td>
</tr>
<tr>
<td><strong>System Efficiency</strong></td>
<td><strong>87,70%</strong></td>
<td><strong>92,9%</strong></td>
</tr>
</tbody>
</table>
Principal setup of the pilot installation
- One out of two existing drives changed to gearless (retrofit)
- Geared and gearless drives running in parallel
- Perfect case for benchmarking and demonstrate advantages
- Main goal was to present running reference
- Demonstrates at the same time retrofit possibility

- Rated Power: 200kW
- Rated Speed: 80rpm
- Pole number: 18
- Rated torque: 23,8kNm
200kW GCD (PM) - Results
Efficiency - measured and projected - includes converter, motor, gearbox

Possible efficiency increase is 6 to 8% points
200kW GCD (PM) - Results

Energy balance

>5.2%...6.5% lower power consumption with gearless drive

Includes motor inverter, motor, gearbox
200kW GCD (PM) - Results

Lower motor currents

- Absolute pulley shaft torque are equal on both sides
- Motor current of PM-Motor is appr. 37A lower (25%)
- Less motor cables are required for gearless drive
- Smaller converter can be choosen

Appr. 25% lower motor current \(\rightarrow\) 25% less motor cables
200kW GCD (PM) - Results
Resume of 1.5 years operation

- No single issue, 100% availability
- 6.5% saving of energy
- 2 hours of inspection after 1 year
Cost of Total Ownership (TCO) - ROI Example 1

MineOptimize – Gearless Conveyor Drive vs. VFD drive with gearbox

The solution for
- Greenfield or brownfield
- Retrofit is needed
- OPEX Orientation
- 1… 2 years ROI

Cumulated cost benefits for each cost component

- Cost of purchase
- Energy Saving
- Maintenance
- Repair
- Production Loss
- Overhaul
- NPV

40km Conveyor System with 9 flights
- 22 Drives (CFD type) 1500kW/136rpm
- Cost of energy 6ct/kWh
- Mine life time 25 Years
- Buffer capacity 3 days

Return on investment after less than one year
Cost of Total Ownership (TCO) - ROI Example 2

MineOptimize – Gearless Conveyor Drive vs. VFD drive with gearbox

Conveyor System with 4 flights
- 12 Drives (VFD type) á 1000kW/80rpm
- Cost of energy 6ct/kWh
- Mine life time 25 Years
- Buffer capacity 10 hours
- Man hour rate 30US$
- Operating hours 6348 hours p.a.

The solution for
- Greenfield or brownfield
- OPEX Orientation
- 1... 3 years ROI

Return on investment after less than 2 years
## Value - High profitability

**MineOptimize – Gearless Conveyor Drive for medium power**

### Features
- Lower energy consumption (more than 5% higher efficiency)
- No higher frequency oscillations/vibration issues
- Reduced number of wear parts
- Less assets
- Less sensors
- No gearbox oil
- Motor lifetime 25 years, 10 years longer than gearbox
- Less motor cables due to lower motor current (better power factor)

### Benefits

<table>
<thead>
<tr>
<th>Low CAPEX threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium on price is low compared to conventional drive</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reduced OPEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced asset management</td>
</tr>
<tr>
<td>Lower cost for maintenance, energy and repair</td>
</tr>
<tr>
<td>Lower effort for monitoring and testing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Increased production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower failure rate - higher availability</td>
</tr>
</tbody>
</table>

| Reduced Total Cost of Ownership |
## Value - Certification and approvals

MineOptimize - Gearless Conveyor Drive for medium power

### Features

**More than 5% higher energy efficiency**
- Lower energy consumption
- Lower carbon dioxide (CO2) emission

**Low noise level**
- Sound pressure $\leq 80$ dB(A)
- 65 dB(A) measured for pilot motor

**No combustables, no hazardous liquids**
- No gearbox oil
- Cooling liquid is water with antifrogen (Antifrogen L for sensitive environment)

### Benefits

- Meet energy performance requirements
e.g. ISO 50001 *Energy management systems — Requirements with guidance for use*

- Meet eco design requirements
e.g. EN50598 Ecodesign for power drive systems, motor starters, power electronics & their driven applications

- Meet noise emission requirements
Value - Increased safety

MineOptimize - Gearless Conveyor Drive for medium power

**Features**
- Reduced number of wear parts
- Less sensors
- No gearbox oil
- No oil leaks

**Benefits**
- Reduced number and time of hands on activities on site decreases the probability of accidents
  - Less maintenance and repair
  - Lower effort for monitoring and testing
- Reduced fire load
- Reduced risk of fire
## Value - Less staff on site

MineOptimize - Gearless Conveyor Drive for medium power

<table>
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<tr>
<th>Features</th>
<th>Benefits</th>
</tr>
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<tr>
<td>Reduced number of wear parts</td>
<td>Reduced number and time of hands on activities on site</td>
</tr>
<tr>
<td>Less sensors</td>
<td>- Less maintenance and repair</td>
</tr>
<tr>
<td>No gearbox oil</td>
<td>- Lower effort for monitoring and testing</td>
</tr>
<tr>
<td>Less assets</td>
<td>- Reduced asset managements</td>
</tr>
</tbody>
</table>
Value proposition - “Reliable, safe and efficient”

MineOptimize – Gearless Conveyor Drive for medium power

- Low maintenance
- Easy installation
- Reduce hands on activities

- Energy performance
- Eco design guidelines
- Reduced environmental impact
- Low noise Level

- Certification and approvals

- Reduced TCO*
  - Low CAPEX threshold
  - Lower OPEX
  - Increased production

- Increased safety
- Low maintenance
- Reduce hands on activities
- No combustables
- Low noise emission

- Less staff on site
- High profitability

*TCO - Total Cost of Ownership
Engineered GCD package

MineOptimize - Gearless Conveyor Drive for medium power

Converter transformer

MCCP - PM
(conveyor drives control)

Drives Engineering:
Safety and Performance

Gearless drive
(with Permanent Magnet Motor)

Frequency Converter
(LV or MV)
ABB Ability™ Digital Powertrain
ABB Ability™ Digital Powertrain

What is it and how does it work?

What is it?

A suite of digital technologies that ABB has developed to improve the performance, reliability and efficiency of all components within the powertrain: from drives and motors, to pumps, couplings & gearboxes and bearings.

Using the capabilities of ABB Ability™ digital technology, the digital powertrain combines a range of products and services including ABB Ability™ Smart Sensors, monitoring tools and an interactive portal.

How does it work?

Data gathered from your drives, motors, bearings and pumps, can be aggregated, stored and further accessed via the cloud. The ability to gather and analyze this data can reveal information on the status and condition of your equipment, so that you can intelligently maintain and manage the performance of your powertrain.

A scalable service plan enables you to tailor monitoring and servicing precisely according to your needs, with options to include predictive maintenance, remote assistance and automated reporting.
## What are the benefits?

Digital advantage with ABB Ability™ Digital Powertrain

<table>
<thead>
<tr>
<th>Optimizes a powertrain’s performance</th>
<th>Saves time and money on maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligent analysis of the condition of your powertrain’s components enables you to reduce downtime, be smart about maintenance scheduling and increase efficiency.</td>
<td>Data from the powertrain can be gathered and assessed, revealing information that helps you schedule maintenance intelligently and lower operating costs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Provides peace of mind</th>
<th>Improves safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated reports and alerts allow you to monitor the performance of your powertrain remotely and even predict when components will need replacing depending on their specific environment.</td>
<td>Enables easy access to equipment in locations that are difficult or dangerous to access</td>
</tr>
</tbody>
</table>
Intelligent powertrain

1. Comprises drive, motor, bearing and application (e.g. pump) - equipped with sensors and cloud connectivity.

Turning data into info.

2. Data collected from drive’s inbuilt sensors, loggers and smart sensors.

Accessing data

3. Condition monitoring gives detailed information on temperature, vibration, stress levels and other parameters. Dashboards offer transparency of data.

Digital advantage

4. The right person is exposed to the right information at the right time.
What is our offer?

ABB Ability™ Digital Powertrain consists of a suite of devices, software and services

**Devices**

Choose the product or the powertrain you want to digitize - drive, motor, bearing, pump.

**Software**

Data from those products is transferred via the cloud into your monitoring portal via NETA-21 and Smart Sensor.

**Services**

Choose the basic level of service or select from optional service features.
## Devices
How we connect our powertrain components to ABB Ability™

### Motors, bearings and pumps

**ABB Ability™ Smart Sensor**, available for motors, pumps and mounted bearings
- Converts traditional motors, pumps and bearings into smart, wirelessly connected devices.
- Picks up data on vibration, temperature and other parameters
- Attached to the component’s frame, no wiring is needed.
- Battery operated
- Communication via Bluetooth

### Drives

**NETA-21**
A remote monitoring tool that provides access to drives via the Internet or local Ethernet networks.
- A built-in web server
- 24DC powered
- Compatible with standard web browsers, allowing configuring drive parameters
- Monitors drive data and faults, tracks load levels, run times, energy consumption
Monitoring and maintenance of LV motors

**ABB Ability™ Smart Sensor**

The fourth industrial revolution

ABB Ability Smart Sensor does not do anything we could not do before - it just does it more easily and cheaply. Most motors can get good monitoring for the first time with the ABB Ability Smart Sensor.

- Safe remote monitoring
- Proactive maintenance
- Fleet analytics
- Risk mitigation, e.g. warranty, uptime, transportation, etc.

**Use your Smart Sensors on**

- old motors and new
- small motors and large
- ABB motors and non-ABB
What would a fitness wristband measure on a motor?

**Motor health manifests as:**
- Bearings condition – e.g. lubrication issues, damaged elements
- Cooling condition – e.g. dirty fan cover
- Rotor condition – e.g. cracked bars or short circuit rings
- Airgap condition – e.g. eccentricity, bent shaft, soft feet

**Motor activity shows as:**
- Energy consumption
- Vibration levels
- Temperature
- Operating hours
Software

The monitoring portal: Instant access to performance information

- Integrated visualization of the powertrain performance via a monitoring portal.
- Data about components is transmitted via the cloud from the ABB Ability™ Smart Sensors / NETA-21 to the monitoring portal.
- Enables to take actions that lead to less down time, extended equipment lifetime, lower costs, safer operations and increased profitability.
- Offers full transparency of key operational parameters of individual assets as one unified system.
ABB Ability™ Digital Powertrain monitoring portal with combined views

- Aggregated simple view on powertrain assets
- Powertrain configuration management
- Combined reports
- Easy access to additional services

- Measured data on Drives, Motors, Bearings, and Customer application

Less downtime, lower safety risk, better life cycle management
Customers can configure powertrains and customize the digital service plan

1. Choose one or more assets you want to protect
2. Install the connectivity devices
3. Activate access to the Condition Monitoring basic feature
4. Pick optional features and customize
5. Start monitoring
6. Enjoy the customized service
Description and features:

- Condition Monitoring set is the basis for all digital services. The default data monitoring set includes fleet views without ability to compare separate devices with each other.
- Parameter backup (in drives) can be done once a month, or on demand with overriding last.

Benefits:

- Maintenance actions can be triggered by component condition information
- Reduce the risk of unexpected downtime
Backup Management

Optional feature set

Description and features:
- Limit downtime in case of drive exchange
  - Parameter Recovery Feature
- Protection against misuse and accidental parameter changes
  - Alert, e-mail in case of parameter change
  - Parameter backup feature
- Default feature set together with data monitoring when using NETA-21

Benefits:
- Limits downtime in case of a drive exchange or breakage
- Protects against misuse and accidental parameter changes
- Eliminates the need for time-consuming fault tracing procedures
Alarm Management
Optional feature set

Description and features:
- Plant maintenance action triggered by condition
  - Condition alerts via email, verified on portable devices enable fast resolution

Benefits:
✓ Limits downtime from wear and tear of components
✓ Maintenance actions can immediately be triggered by component condition information

Setting email alerts on temperature, vibration and other
Drive warming or motor vibrating too much
Receiving alert to email
Checking status in DP mobile version
Calling maintenance on-site to fix situation
Description and features:
- Bulk Upload
  - According to the customer’s cyber security standards
  - With local storage
  - Optimize satellite costs for mobile segment
- Mobile data collection option for ABB Ability™ Smart Sensor

Benefits:
✓ Keep cybersecurity risks within your cybersecurity standards
✓ Accessible data around the clock without internet connectivity
Asset Health
Optional feature set

Short description and features:
- Recommendations (expert reports)
  - Condition-based report with a rough asset condition estimation
- Self-service
  - Self generated reports and fleet comparison view in the portal allow to spot inconsistencies
  - Comparing major parameters on fleet level

Benefits:
✓ Combines your process know-how with analysis and recommendations by ABB professionals
✓ Reduces the risk of unexpected downtime
✓ Monitors topics that are important
Condition-based Maintenance

Optional feature set

Short description and features:

- Condition-based Maintenance provides customers with the lifetime condition of drive components.

Benefits:

✓ Helps avoid downtime
✓ Enables to plan and predict maintenance
Remote Assistance
Optional feature set

Description and features:
- For maintenance managers:
  - ABB experts are always remotely available
  - No need of highly skilled resources on site
  - Efficient resources enrollment in case of site issues
- For plant managers
  - Secure productivity
  - Meet delivery schedules

Extra value to Alarm Management feature:
- Condition alerts to ABB/partners via email
  - Faster support

Benefits:
- Available 24/7, ABB’s experts are always at hand to consult
- Quick resolution of problems with no requirement for on-site skills
Glencore Nikkelverk, Norway

ABB Ability™ Condition Monitoring for powertrains

Who is the customer?
- Glencore is a mining company, which activities include nickel refinery in Kristiansand, Norway.

What did they buy?
- ABB Ability™ Condition Monitoring for powertrains in seawater pumps system that distributes water in the factory

Why did they buy?
- The integration of ABB Ability™ gives us the possibility to collect more information on the cooling status of the drives and compare data coming from two monitoring solutions".
Siam Cement Group, Thailand

ABB Ability™ Smart Sensor and ABB Drivetune app

Who is the customer?

- Siam Cement Group (SCG), Thailand’s largest cement company that is more than 70 years old.
- Wanted to upgrade its plant in Thailand’s Tha Luang in Saraburi Province.
- In 2016, SCG was also ranked as the second largest company in Thailand and the 604th largest public company in the world by Forbes.

What did they buy?

- Installed ACS880 series drives along with ABB motors to optimize operating conditions, including a new mobile application ABB Drivetune. Users can control and monitor drives through a smartphone connected with the Bluetooth panel in ACS 880.
- ABB Ability™ solutions for drives improves performance of cement plant

Why did they buy?

- To increase their kiln, the heart of the cement making process, capacity and modernize its ABB drives system by converting from direct current (DC) to alternating current (AC) to enable better control and less maintenance of its plant.
- Better cement kiln control and reduced energy consumption achieved. Optimal capacity of kiln was managed with high operating accuracy while keeping fuel consumption in check, maintaining low running costs and meeting environmental standards.
ABB and Formula E partner to define roadmap of electric mobility

New “ABB FIA Formula E Championship" brings together global leader in electric vehicle fast charging with world’s first fully electric international motorsport class

Natural fit at the forefront of the latest electrification and digital technologies

Raise awareness of electric vehicles as a realistic and desirable alternative to fossil fuel vehicles
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