Motor and Generator Services
Availability, reliability, and optimization
Contents

- BU service global overview
- SG local service key milestone
- Key service highlights
- Summary
- Contact information
How ABB is organized
Five global divisions

<table>
<thead>
<tr>
<th>Division</th>
<th>Revenue</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Products</td>
<td>$10 billion</td>
<td>34,000 employees</td>
</tr>
<tr>
<td>Power Systems</td>
<td>$6.8 billion</td>
<td>18,000 employees</td>
</tr>
<tr>
<td>Discrete Automation and Motion</td>
<td>$5.6 billion</td>
<td>25,800 employees</td>
</tr>
<tr>
<td>Low Voltage Products</td>
<td>$4.5 billion</td>
<td>21,000 employees</td>
</tr>
<tr>
<td>Process Automation</td>
<td>$7.4 billion</td>
<td>28,100 employees</td>
</tr>
</tbody>
</table>

(2010 revenues)

**ABB’s portfolio covers:**

- Electricals, automation, controls and instrumentation for power generation and industrial processes
- Power transmission
- Distribution solutions
- Low-voltage products
- Motors and drives
- Intelligent building systems
- Robots and robot systems
- Services to improve customers productivity and reliability
Discrete Automation and Motion division: Business units
Together, we drive our customer’s industrial productivity and energy efficiency

- Low voltage AC drives from 0.12 to 5600 kW
- DC drives from 4 kW to 15000 kW
- Wind turbine drives
- Solar converters
- PLCs, HMs, and wireless sensors and actuators
- Software tools
- Energy saving tools
- Service

- Advanced power electronics
- Converter products
- Excitation and synchronizing systems
- High power rectifiers
- Power quality products
- Traction converters
- Medium voltage drives from 315 kW to more than 100 MW
- Service
- EV charging infrastructure

- Low voltage motors from 0.25 to 1000 kW
- High voltage motors and generators up to 70 MW
- High speed motors
- Traction motors
- Wind power generators
- Diesel generators
- Gas and steam turbine generators
- Hydro generators, tidal waves, etc
- Service

- Industrial robots
- Robot controllers and software
- Industrial software products
- Application equipment and accessories
- Robot automation systems for automotive, foundry, packaging, metal, solar, wood, plastics, etc. industries
- Service

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Customer needs

ABB Service solutions

What are the customer needs?

To solve problems quickly and effectively to restore its operation

To increase process reliability to avoid unplanned interruption in its operation

To optimize operation to increase production capacity

Availability

ABB Service solutions

- Technical support
- Emergency field service resources
- Spares availability
- Onsite and workshop repair
- Training
- Service contract

Reliability

- Installation and commissioning
- Preventive maintenance
- Diagnosis, condition monitoring
- Service contract

Optimization

- Engineering and consulting
- Spares rationalization
- Energy, performance and reliability appraisal
- Upgrade – replacement
- Life cycle costing
- Risk management
Service operations, Motor and Generator
ABB’s service network

- ABB Global Technical Support Centers
- ABB Local Service Centers and third party Service Partners

Locations:
- Västerås, Sweden
- Helsinki, Finland
- Birr, Switzerland
- Vittuone, Italy
- Champagne, France
- Mumbai, India
- Shanghai, China
- Alrode, South-Africa
- Betim, Brazil
- Osasco, Brazil
- Singapore

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SG local service key milestone
History of local understanding, ready for new era

Two prestige service workshops from ASEA and BBC

ABB workshop merged from ASEA and BBC
Combined knowledge and experience

1987

Upgraded workshop with enhanced service capability
Support increased demand for key industries

2011

Predicative service
Remote service
Precise reliability and optimization
Complete service portfolio

2012...

Early 1970s’
Key service highlights

Availabilities

Facilities:
- Rightly equipped expanded workshop (up to 1120mm machine)
- VPI system (up to 2.4m x 4m)
- 8MW MV motor no loading testing
- 400KW LV motor load testing

Expertise:
- Major overhaul, repair and upgrade service for LV/MV motor/generators
- Certified Ex machine service from ABB, IEC, and UL
- ISO 9001 certified workshop
Key service highlights

Availabilities

- Low ceiling: 36x12 = 432 m²
  - Lifting height: 5 meters
- High ceiling: 55x29 = 1610 m²
  - Lifting height: 9 meters
Key service highlights
Availabilities
Key service highlight
Reliability, Leap

Unique Life expectation analysis on any MV(>3.3kV) machine Insulation

- DC Measurements
  - Polarization current
  - De-Polarization current

- AC Measurements
  - Non Linear Behavior
  - Tan δ and Capacitance
  - Partial Discharge

- ABB unique insulation analysis
  - Identify and calculate the abnormal stress
  - Lifetime is estimated with confident level (80% and above) base on test package
  - Clear plane for possible further inspection, maintenance, or replacement.
Key service highlights
Reliability, Machsense

**Equipment**
- A single analyzer for the mechanical and electrical measurements
- Powerful tool for induction motor condition and performance evaluation

**Measurements**
- 4 Vibration Sensors
- 3 Voltage clamps
- 3 Current clamps
- Temperature sensors (optional)
- Speed sensor (optional)
Key service highlights
Optimization, Engineering and consulting service

Life cost of motor

TCO includes:
- Purchase price
- Specification
- Transportation
- Storage
- Installation
- Quality
- Assurance
- Reliability
- Electricity
- Repairs
- Administration
- Inventory
- and others

* Information provided by Machine Monitor based on survey of 6000 motors
To optimize energy, reliability and performance costs, and subsequently life cycle costs, motor owners can examine how their assets are operating.

Motor status can be evaluated on the basis of:
- Energy efficiency appraisals
- Reliability assessments
- Performance analyses

The process involves careful inspection of motors during operation using ABB’s unique, purpose-designed analysis tools.
Key service highlights
Optimization, Engineering and consulting service

Customer: Reliance Industries
Motor ID: XY56HG-1
Date: 17.11.2011

Energy savings
- 87 MWh/yr
- 12.5 kUSD
- 103 tons CO2 reductions

Energy cost over 25 years (MWh)
- Existing motor
- Replacement motor

Energy cost over 25 years (kUSD)
- Existing motor
- Replacement motor

CO2 emissions over 25 years (tons)
- Existing motor
- Replacement motor
Key service highlights
Optimization, Engineering and consulting service

<table>
<thead>
<tr>
<th>Payback (years)</th>
<th>Without downtime cost</th>
<th>With downtime cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace motor today</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

**Total cash flow due to replacement (kUSD)**
Key service highlights
Contract service, Motor Care

- Huge reliability cost from breakdown and repair
- High stress level and inefficiency from time base shut down turn around exercise
- Sourcing for external support at rush with unsatisfied solution
- High volatility in maintenance cost and effectiveness
Key service highlights
Contract service, Complete care for LV motors

- Motor care is a multi-level service coverage
- Simple and effective LV motors (<= 690V) complete reliability solution
- Flexible/expandable levels to chose base on customer available in house resource and needs
- Fix annual fee base, easy for maintenance planning and budgeting
- Assured reliability for large quantity of motors and knowledge support/sharing

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Workshop remediation for reliability restoration</td>
<td>Half yearly site walk around for</td>
<td>Half yearly site walk around for</td>
</tr>
<tr>
<td></td>
<td>• Initial one round site fine tune if any for optimal motor performance (Like realignment and etc)</td>
<td>• General motor external inspection for abnormalities</td>
<td>• General motor external inspection for abnormalities</td>
</tr>
<tr>
<td></td>
<td>• Workshop overhaul and bearing replacement if needed identified from site condition monitoring</td>
<td>• Motor running parameters record and review</td>
<td>• Motor running parameters record and review</td>
</tr>
<tr>
<td></td>
<td>• Workshop rewind and other major repair in case failure happens</td>
<td>• Motor vibration measurement and review</td>
<td>• Motor vibration measurement and review</td>
</tr>
<tr>
<td></td>
<td>• Workshop replacement with equivalent motor for beyond repair if any</td>
<td>• Site trouble shooting if any OR</td>
<td>• Site trouble shooting if any OR</td>
</tr>
<tr>
<td></td>
<td>• Local transportation for pick up and delivery between ABB workshop and customer warehouse</td>
<td>Site removal and reinstallation</td>
<td>Site removal and reinstallation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Remove motor from base and transfer to lorry pick up points at customer site</td>
<td>• Remove motor from base and transfer to lorry pick up points at customer site</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transfer motor from lorry drop off point at customer site to base</td>
<td>• Transfer motor from lorry drop off point at customer site to base</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reinstallation of motor on base and start up</td>
<td>• Reinstallation of motor on base and start up</td>
</tr>
</tbody>
</table>

Option: Guaranteed site response time
Option: Critical spare motor pool access
Key service highlights
Contract service, easy yet comprehensive

- Globalized service contract meeting customer needs
- Comprehensive portfolio services
- Fixed price agreement, premium service agreement
- Inspiration and seriousness in partnership
Summary

- Complete service portfolio/capability for motor and generator
- Quality and effective service planning and implementation
- Excellent OHS competence
- Committed continuous investment and R&D efforts
- Strong value on Reliability, Efficiency, Performance and Safety
- World wide service network and resources
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