



# Medium Voltage Service Maintenance and refurbishment



# Table of contents

- Maintenance strategies - Concepts.....4
- Preventative maintenance/testing .....6
- Preventative maintenance/refurbishment .....7
- Risk-based maintenance .....8
- Condition-based maintenance.....9
- Notes .....10

# Maintenance strategies

## Concepts



### Corrective maintenance

**Maintenance carried out following detection of an anomaly and aimed at restoring normal operating conditions.**

This approach is based on the belief that the costs sustained for downtime and repair in case of fault are lower than the investment required for a maintenance program.

This strategy may be cost-effective until catastrophic faults occur.

**ABB does not support a corrective maintenance approach due to high safety risk for operators.**



### Preventive maintenance

**Maintenance carried out at predetermined intervals or according to prescribed criteria, aimed at reducing the failure risk or performance degradation of the equipment.**

This method is based on scheduled activities performed on out-of-service equipment including: visual checks, apparatus cleaning, mechanical components lubrication, worn parts replacement and routine test execution.

The maintenance cycles are planned according to the need to take the device out of service. The incidence of operating faults is reduced.

# Maintenance strategies

## Concepts



### Risk-based maintenance

**Maintenance carried out by integrating analysis, measurement and periodic test activities with standard preventive maintenance.**

The information gathered is viewed in the context of the environmental, operational and process conditions of the equipment in the system. The objective is to perform the asset condition and risk assessment to define the appropriate maintenance program.

All equipment displaying abnormal values is refurbished or replaced. In this way, it is possible to extend the useful life and guarantee, over time, high levels of plant reliability, safety and efficiency.

### Condition-based maintenance

**Maintenance based on equipment performance monitoring and control of the corrective actions taken as a result.**

The actual equipment condition is assessed by on-line detection of significant working device parameters and their automatic comparison with average values and performance. Maintenance is carried out when certain factors indicate that the equipment is deteriorating and failure probability is increasing.

This strategy, in the long term, significantly reduces the costs associated with maintenance, minimizing the occurrence of serious faults and optimizing available economic resource management.

# Maintenance strategies

## Preventive maintenance/testing

Scheduled periodic preventive maintenance of electrical equipment is vital to avoid emergency outages and the associated high costs. Plants continuously operate under heavy environmental pollution (dirt, dust, or aggressive pollutant gases), making preventive maintenance crucial for increasing service life and reliability. While individual components might be maintenance-free, parts may have a limited useful life.

Critical environmental conditions can damage components, jeopardizing isolating distances, possibly resulting in consequential damage. The longer components are used, the higher the probability of failure, which can also lead to unscheduled repairs and production stoppages. As an OEM, ABB has the expertise and experience necessary to conduct preventive maintenance on MV equipment.

Equipment type	Why maintenance is important	Scope of service
	<p>A circuit breaker is intended to switch on and off electric currents on power transmission and distribution networks for routine operations and protection of other equipment. Electric transmission system failures and equipment destruction can occur if a circuit breaker fails to operate because of a lack of preventive maintenance.</p>	<ul style="list-style-type: none"> <li>• Visual inspection and operational testing</li> <li>• Cleaning and lubrication</li> <li>• Testing: contact resistance, insulation resistance, vacuum bottle integrity (on vacuum circuit breakers)</li> <li>• Optional: test package which includes control wiring test, shunt trip test, closing coil test, spring charging motor test, under voltage trip</li> </ul>
	<p>When switchgear malfunctions, the consequences are often catastrophic. Potential hazards to staff, corollary damage and damage to the switchgear itself can be extremely expensive. Implementing an effective switchgear testing, inspection and maintenance program is essential.</p>	<ul style="list-style-type: none"> <li>• Visual inspection of switchgear and all components for deterioration or signs of heating</li> <li>• Cleaning of switchgear</li> <li>• Secondary equipment check</li> <li>• Functional checks</li> <li>• Optional: electrical checks, CPT, CT or PT testing can be performed</li> </ul>
	<p>Appropriate transformer testing reduces the risk of failures, lowering overall operational costs. Maximum performance and availability of transformers ensures productivity.</p>	<ul style="list-style-type: none"> <li>• Visual inspection</li> <li>• TTR (Transformer-Turns-Ratio) test at "as found" tap position</li> <li>• Insulation resistance</li> <li>• Check fans and auxiliary equipment</li> </ul>

# Maintenance strategies

## Preventive maintenance/refurbishment

Refurbishment is a restorative and maintenance measure that can enhance equipment performance while reducing the potential for malfunction and downtime. Refurbishment can be performed during a planned outage so there is no disruption in service, making the procedure more economical.

### Refurbishment Level-1

ABB has the expertise to refurbish both ABB and other manufacturers' circuit breakers. Refurbishment Level-1 offers an in-depth analysis of circuit breaker condition based on inspection, disassembly, cleaning, lubrication and testing. This analysis helps ensure trouble-free operation for years to come.

#### Scope of Service

- Visual inspection and operational testing
- Incoming test
- Disassembly of circuit breaker mechanism to sub-assembly level
- Refurbishment
- Reassembly
- Final inspection, testing and report

### Refurbishment Level-2

ABB offers an exclusive refurbishment program for ABB lineage circuit breakers. The program provides a complete circuit breaker refurbishment to restore the circuit breaker to "like new" condition. It is strongly recommended that ABB lineage circuit breakers be refurbished by ABB, the original equipment manufacturer, since detailed drawings, procedures, trained personnel, equipment and facilities to maintain breaker safety and quality are readily available. Components that need to be replaced are identified during disassembly and inspection.

#### Scope of Service

- Visual inspection and operational testing
- Incoming test
- Disassembly of circuit breaker to component level
- Refurbishment
- Re-plating of silver contacts
- Re-plating of zinc (if required)
- Replacement of wear & tear parts as per "Refurbishment Kit"
- Reassembly
- Final inspection, testing and report



# Maintenance strategies

## Risk-based maintenance

Risk assessments help to evaluate and assess the reliability of electrical network equipment, in order to mitigate asset risks. Knowing and improving the condition of equipment is a key factor in reducing the likelihood of failure, damage, and injury.

Knowing the condition of installed equipment, and where to spend the operational budget to grow reliability, is an issue of increasing importance in today's electrical network operations due to the aging installed base.

ABB supports making the right decision by assessing:

- Importance of the equipment
- Actual equipment condition
- Critical points in the network
- Operator and equipment safety

After the assessment is conducted, the collected data is carefully analyzed and factored by an engineered algorithm technique to evaluate the risks and consequences of a failure.

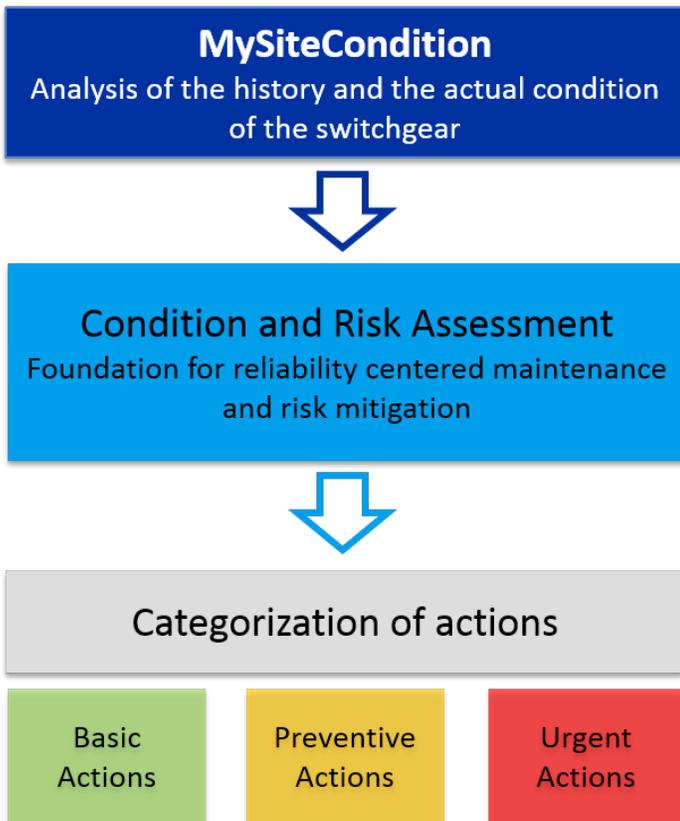
The assessment outcomes are detailed in reports and illustrations explaining and visualizing the actual status of overall plant condition, each asset, and how performance and safety can be improved by prioritizing maintenance needs.

The documented and transparent decision-making framework supports operators using the risk-based maintenance approach when know-how is decreasing, and switchgear line-ups are reaching a critical age.

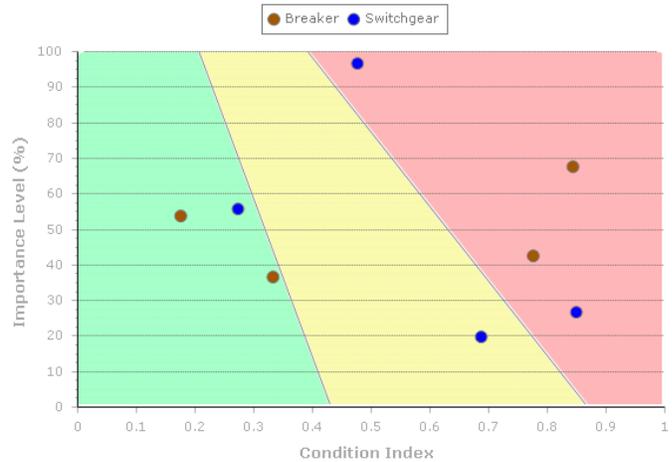
The assumption that all assets are fit for reliable future service can be a dangerous gamble.

Identifying increased future risks and the mitigating effects of various intervention strategies is mandatory information for a safe and reliable operation.

### Process of MySiteCondition methodology



### Importance/condition matrix



# Maintenance strategies

## Condition-based maintenance

Condition-based maintenance guarantees maintenance process optimization by providing a root cause analysis of asset condition and suggesting proper maintenance actions.

Continuous monitoring, as used for condition-based maintenance, is the most sophisticated maintenance approach for electrical networks, guaranteeing high uptime, immediate response, focused maintenance, and reduced life cycle costs. MyRemoteCare is ABB's remote condition monitoring system.

The most important benefits of condition monitoring are:

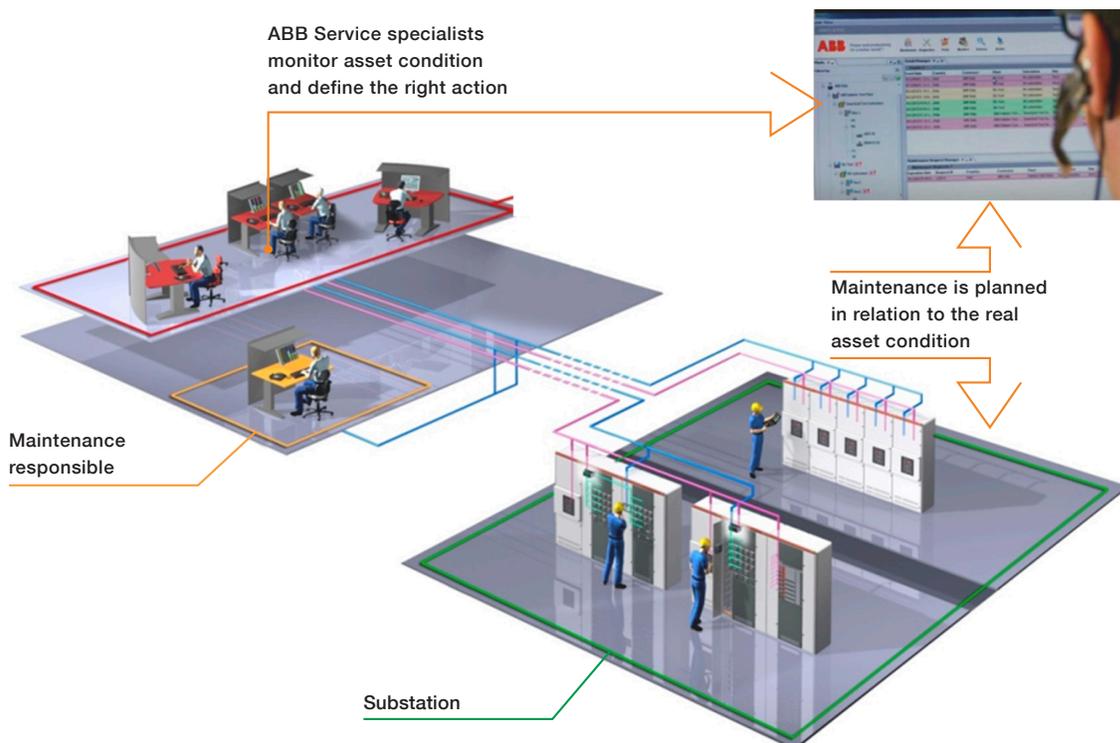
- Reduces unscheduled downtime and operational costs
- Increases asset availability and linked production

MyRemoteCare enables maintenance and operation teams to have continuous supervision of circuit breaker conditions, alarms (sent as text message to an operator), events, and performance trends. ABB service engineers analyze this data and define the proper maintenance, at the right time, for each asset.

This allows maintenance to be planned only when it is required, reducing the need for schedule-based maintenance activities.

With MyRemoteCare, the following circuit breaker information characteristics are continuously monitored:

- Opening/closing time
- Closing signaling contact quality
- Position error
- Number of operations and fault current operations
- Inactivity timer
- Operating mechanism springs charging time
- Operating mechanism springs failure to attempt
- Circuit breaker compartment air temperature
- Auxiliary voltage quality
- Power contacts wear ( $I_k t$ )



# Notes

# Notes

# Contact us

For more information about ABB services, please contact your sales representative or call one of the numbers listed below:

**ABB Inc.**

**Medium Voltage Service**

2300 Mechanicsville Road

Florence, South Carolina 29501

Phone: +1 800 HELP 365 (option 7)

[www.abb.us/mvservice](http://www.abb.us/mvservice)

The information contained in this document is for general information purposes only. While ABB strives to keep the information up to date and correct, it makes no representations or warranties of any kind, express or implied, about the completeness, accuracy, reliability, suitability or availability with respect to the information, products, services, or related graphics contained in the document for any purpose. Any reliance placed on such information is therefore strictly at your own risk. ABB reserves the right to discontinue any product or service at any time.

© Copyright 2016 ABB. All rights reserved.