

ELECTRIFICATION – DISTRIBUTION SOLUTIONS BUSINESS LINE, 2022

ABB Ability™ Condition Monitoring for switchgears

SWICOM: modular diagnostic unit for your assets





By your side to optimize the performances of your plant



Technology and solutions available to move to predictive and condition based maintenance.



Implement and scale solutions according to your needs and budget



Decades of experience in all critical power sectors like utilities, industries and marine.



We studied customer needs and develop state of the art systems to fulfill them



Maintenance of the plant, a continuous process

An investment of people and resources



Preventive maintenance activities:

- Routine assets manual inspection
- Periodical change of the installed base (spares, retrofit...)
- Time based activities on assets .



©ABB

Extraordinary intervention:

- Run-to-failure
- No asset history tracking, risk of being unaware of the health status of the asset throughout its operational life
- Unplanned/unwanted costs due to downtime ٠



Choose a condition based maintenance solution

Reduce Opex, Maximize Uptime and Improve Safety



Transform preventive maintenance activities

By knowing real time asset health condition, manual inspection and preventive activities is not required. Perform maintenance when and where it is required.



Reduce probability of extraordinary events

Avoid extraordinary intervention through continuous supervision of the assets, which enable the possibility to plan the intervention in advance thus avoiding critical situation.

Reduce total cost of ownership

Optimizing maintenance

Asset type	SWAPs* level	Activities duration (h)	Activities duration with M&D (h)
Circuit	Act	2	1.4 🔪
breaker	Perform	2	1.4 🔪
	See/Watch	0.5	0.35 🍾
Switchgear	Act	0.75	0.525 🔪
	Perform	2.5	1.75 🔪

Standard conditions

Device/Year	0,5	1	1,5	2	2,5	3	3,5	4	4,5	5	5,5	6	6,5	7	7,5	8	8,5	9	9,5	10	10,5	11	11,5	12	10	13
CIRCUIT BREAKER						А				Р						А				Р						А
SWITCHGEAR				S		w		S		А				s		w		S		Ρ				S		w
RELAY				w		А		W		W		W		w		А		W		Р				w		А

Standard conditions with M&D

Device/Year	0,5	1	1,5	2	2,5	3	3,5	4	4,5	5	5,5	6	<mark>6,</mark> 5	7	7,5	8	8,5	9	9,5	10	10,5	11	11,5	12	12,5	13
CIRCUIT BREAKER						А						Ρ								А						Р
SWITCHGEAR						w				s		А						s		w						Р
RELAY				W		А		W		w		А		W		w		W		Р				w		А

Reduction of unplanned labor cost maximizing uptime

Leg	enda
S	See/Visual
W	Watch/In-dept Inspection
A	Act/Basic maintenance
Ρ	Perform/Advance maintenace

upto 40% Maintenance activities cost reduction 30%

Reduction of time to do maintenance

30%

Maintenance activities duration's reduction

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Maximize uptime

Avoid unexpected failures

Before failure happen

- Digitalization informing before the system fails
- Know-how about the current asset
- Avoid possible failures help reduce production and asset loss

Slide 6

*Copper Institute (C)

\$1.2 M PER HOUR*

AVERAGE DOWNTIME COSTS FOR AN AUTOMOTIVE INDUSTRY

\$150m per outage

AIRLINE LOST A SWITCHGEAR WITH 3.7% STOCK DROP IN 2 DAYS IN 2016

\$740k per outage*

AVERAGE DOWNTIME COSTS FOR DATA CENTERS

\$100k per panel

STEEL WORKS LOSS PER YEAR PER PANEL



120,500 BARRELS OF OIL LOST PER DAY OIL&GAS SEGMENT

\$20k PER PANEL

ANNUAL LOSS IN SEMI-CONDUCTOR PRODUCTION



*A 1999 Electric Power Research Institute (EPRI) study pegged total direct and indirect costs of an arc flash incident *news.thomasnet.com/company story/downtime-costs-auto-industry-22k-minute-survey-481017 *Cost of Data Center Outages (D) Ponemon Institute *The Economic Impact of August 2003 Blackout (E) done by ELCON

Shown: aggregated statistics for medium voltage (Source: Hartford Steam Boiler)

Improve safety

Avoid unexpected failures

Operate more safely

Keep your personnel out of the arc flash zone

Vs.

Remote communications enabled, data can

be safely transmitted to a remote location

Personnel must enter arc flash zone. 4000 injuries occur in the US each year *





ANNUAL DEATHS IN US ALONE ARE CAUSED BY ENERGIZED ELECTRICAL EQUIPMENT



OF ALL ELECTRICAL ACCIDENTS ARE CAUSED BY ARC FLASH INCIDENTS

\$1м то 15м

POTENTIAL COST OF ONE ARC FLASH INCIDENT*



19,000 °C (35,000° F) Hotter than you

can imagine Arc Flash temperatures are hotter than the sun.



1,100kmph (700 mph) Projectileproducing pressure

Arc flash can throw workers across a room. Metal and equipment become shrapnel.



+2,000 burns More than one way to burn you

Each year 2,000+ people seek treatment for serious Arc flash burns.



3 meters (10 feet) Too close for comfort

Arc flash can reach out 3 meters to take a life. Serious-injury zone is even larger.



140 dB An assault on your senses

Light and sound bursts can cause vision and hearing loss.



With SWICOM enable condition based maintenance for your plant

An integrated scalable system to monitor your assets.



SCADA.

advanced maintenance

asset condition

An integrated scalable system to monitor your assets.









Breaker diagnostic

Discover in advance mechanical or eletrical abnomalies that can lead to a breaker failure

Partial discharges detection

- Prevent arc flash
- Prevent catastrophic equipment failure.

Temperature diagnostic

- Detect loose joints
- Identify load unbalance
- Prevent temperature related failures.

Data visualization

- Verify the overall status of the plant,
- Schedule maintenance activities wherever your are

Available offerings:

- 1. Breaker monitoring through Relion relays
- 2. Partial Discharge detection through PDCOM
 - I. Capacitive coupling methodology
 - II. Most cost effective PD solution available in the market (1 PDCOM for up to 10 panels)
 - III. Suitable for IEC and ANSI, AIS and GIS, ABB and non-ABB, green and brown field switchgear
 - IV. UHF possible in case coupler are not present
- 3. Wireless Temperature monitoring
 - I. Suitable for IEC and ANSI, AIS and GIS-(cables), ABB and non-ABB, green and brown field switchgear
- 4. Infrared Temperature monitoring
 - I. Suitable for IEC and ANSI, ABB green field switchgear
 - II. Engineered solution for UniGear ZS1 and SafeGear/Advance
- 5. Data visualization
 - I. SCADA
 - II. ABB Ability and Asset manager
 - III. Local HMI/Mobile APP



1. Breaker diagnostic

2. Partial discharge detection







1 SWICOM can be connected up to 14 numbers RE_615/620/640 Relays are acting as sensor



Monitored parameters:

- Opening and closing times,
- spring charging time,
- slipping and failed spring charging attempt,
- number of operations,
- inactivity days,
- remaining life estimation,
- Contact wear,
- SF6 pressure,
- trip coil supervision
- ambient temperature and humidity (through Swicom)

3. Temperature diagnostic

4. Data visualization

SWICOM, the intelligent hub for breaker diagnostic.

Monitor your circuit breakers through retrieving rough data from RE_615-20-40 protection relay (after checking SSBR node presence). Connection is achieved simply by using IEC61850 protocol through ethernet cable.









1.

2.

3.

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With SWICOM it's possibile to constantly check the asset health status by using the local HMI and the APP mobile, you can download it in Google Play Store or in the Apple Store Play Store, Apple Store

2. Partial discharge detection

Breaker diagnostic

1.

- 3. Temperature diagnostic
- **Data visualization**



Monitor your plant





Control room



Cloud



ABB BAY_A ABB BAY_A ABB BAY_A Fleet # of Assets: 2 ■ 0 11 🗢 🗘 İn 🛈 Ф lı. ٢

BAY_A	BAY_B		CB trip circuit supervision		1
BAY C			CB operation cycles	18	
	Entrinonment		CB inactivity time	100	3/4
			CB Contact Quality	32	
			CB remaining life	48	2
/BAY_B/Measurem	ents	 t	<pre> CB CALL /pre>		
/BAY_B/Measurem	ents 95 ms		<pre>COntrol Control C</pre>		
CB Open Time	ents 95 ms 85 ms	<	<pre> Control Cont</pre>		<
CB Open Time CB Close Time CB Close Time CB Spring Charge Time	ents 95 ms 85 ms 6.999 s	< 4/4	<pre></pre>		2/4
CB Open Time CB Open Time CB Close Time CB Spring Charge Time CB Remaining Life (ph. A)	ents 95 ms 85 ms 6.999 s 4753	< 4/4	C/BAY_A/CM Status Relay MultiTemp MultiTemp Temp		2/4

SWICOM local Wi-fi Connection via Smartphone/Tablet Data visualization enabled wherever I am in the cabinet

Local HMI to visualize: diagnostic, health status, measurements, KPIs and sensors connectivity status



With SWICOM it's possibile to provide all the Key Performance Indexes and measurements to your control room, optimizing data transmission network capability, using Modbus over TCP/IP or IEC61850 protocols



Breaker diagnostic

1.

With cloud prognostic



With ABB Ability Energy and Asset Manager it's possibile to evaluate overall plant health status by remote, checking each asset condition, planning maintenance activities, performing advanced maintenance and having ABB Experts support in case of need.

Monitor your plant 2. Partial discharge 000 detection 3G/4G/5G TCP/IP In loco 3. Temperature 0 diagnostic Mobile **Data visualization** 4 In locale 呷 Cloud



Enable Cloud solution with advanced alghorithms Multiplant data visualization, optimized asset management Dashboard, reports and alert notifications real time Cybersecurity proof network

Breaker diagnostic

1.





Applications

Sector and real cases

Energy distribution companies

Utility



Industries in which process continuity is vital

Industry



Other Critical Power Sectors and infrastructure in which it's necessary to maximize efficiency of the plants, e.g. marine Solution for new and existing switchgears



Why ABB

Technical advantages

Breaker diagnostic without

any additional sensor

We are the forefront in our sector, using protection relays already installed in the switchgear



First to propose partial discharge detection through a cost effective solution accessible for everyone

Balance between costs and benefits, with a competitive price



Wireless sensors and without batteries

Lifecycle up to 30 years Inspection free (every 15 years)



How do we work

ABB work philosophy







Ask us for plant assessment to understand how to implement an advanced maintenance solution:

We will guide you starting from tailoring the solution until installation, commissioning, and continuous support and services for your needs

