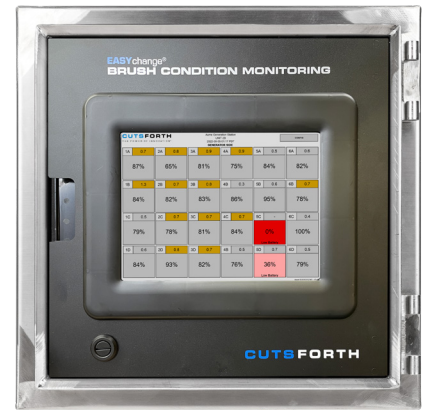


EASYchange[®]

BRUSH CONDITION MONITORING

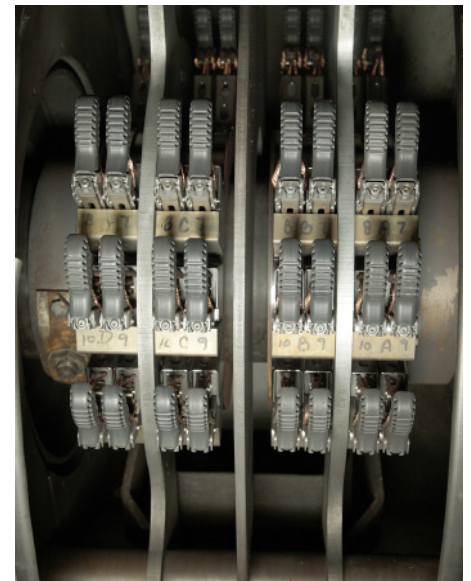


For nearly 20 years, Cutsforth™ has installed over 40,000 of the best-in-class brush holders on turbine generators worldwide. Now, with our exclusive **EASYchange[®] Brush Condition Monitoring**, Cutsforth™ offers an even better way to operate your generator's brush-type excitation.

- **Increases Safety:**
 - » Safe and easy brush changes
 - » Reduces time a technician interacts with collector rings
- **Boosts Reliability:**
 - » Fewer forced shutdowns due to collector ring maintenance
- **Reduces Cost of Maintenance:**
 - » Decreases need for truing and repairs from potential ring fires
 - » Reduces manpower costs
- **Quick and Easy Cleaning**
- **Greater Manpower Efficiency:**
 - » Shorter and less frequent inspections
- **Improves Maintenance:**
 - » Brush health analytics lead to more informed decisions
 - » Brush Health Sensor (BHS) delivers analytics to control room and local displays
- **Lengthens Time Between Maintenance**
 - » Maintenance can now be performed based on brush condition rather than a calendar

Cutsforth™ patented hardware & technology processes and transmits the following data points over a 2.4 GHz wireless link to local displays as well as via MODBUS protocol into a plant's DCS, Historian or *NI InsightCM™* system:

- **Most Recent Recorded Values:**
 - » Usable Brush Length (%)
 - » Brush Vibration (*Mils Displacement, Pk-to-Pk*)
- **Configurable Brush Health Alerts:**
 - » Brush Length Warnings
 - » High Vibrations
- **Historical Data Trending:**
 - » Usable Length
 - » Vibration
 - » Temperature



Example installation of Cutsforth™ EASYchange[®] Brush Rigging on a GE 7F Generator

BRUSH CONDITION MONITORING

User Interface Overview

At the generator, the System Controller's touchscreen user interface visually alerts users of short brushes and high vibrations, both based on plant defined thresholds.

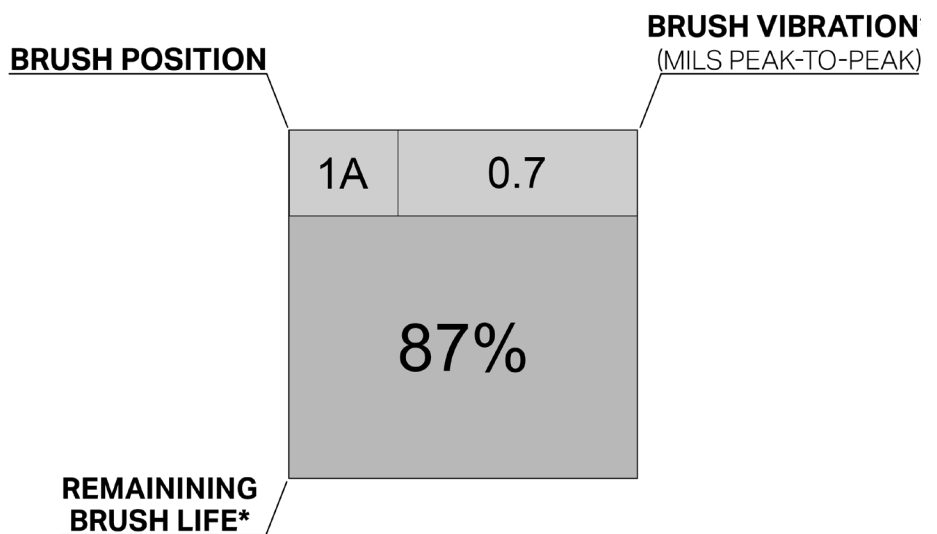
The critical data on brush length, vibrations, and temperature can also be relayed to the control room or historian, thereby reducing the number of physical inspections.

1A		2A		3A		4A		5A		6A	
0.7	0.8	0.9	0.9	0.5	0.6	87%	65%	81%	75%	84%	82%
1B		2B		3B		4B		5B		6B	
1.3	0.7	0.8	0.3	0.6	0.7	84%	82%	83%	86%	95%	78%
1C		2C		3C		4C		5C		6C	
0.5	0.7	0.7	0.7	-	0.4	79%	78%	81%	84%	0%	100%
Low Battery											
1D		2D		3D		4D		5D		6D	
0.6	0.8	0.7	0.5	0.7	0.5	84%	93%	82%	76%	36%	79%
Low Battery											

For quick reference, brush health historical analytics are logged by the system and available on the Brush Detail screen for each brush holder location.

Ultimately, the combination of recent and historical brush health analytics will improve operator efficiencies and optimize a plant's staff utilization reducing operating expenses.

The data squares represent each individual brush of the system, providing relevant data and critical threshold warnings as shown.



* = Section color changes based on plant defined alarm thresholds