

MOTOR & GENERATOR  
MAINTENANCE SERVICES



A COMPLETE  
SERVICE OFFER



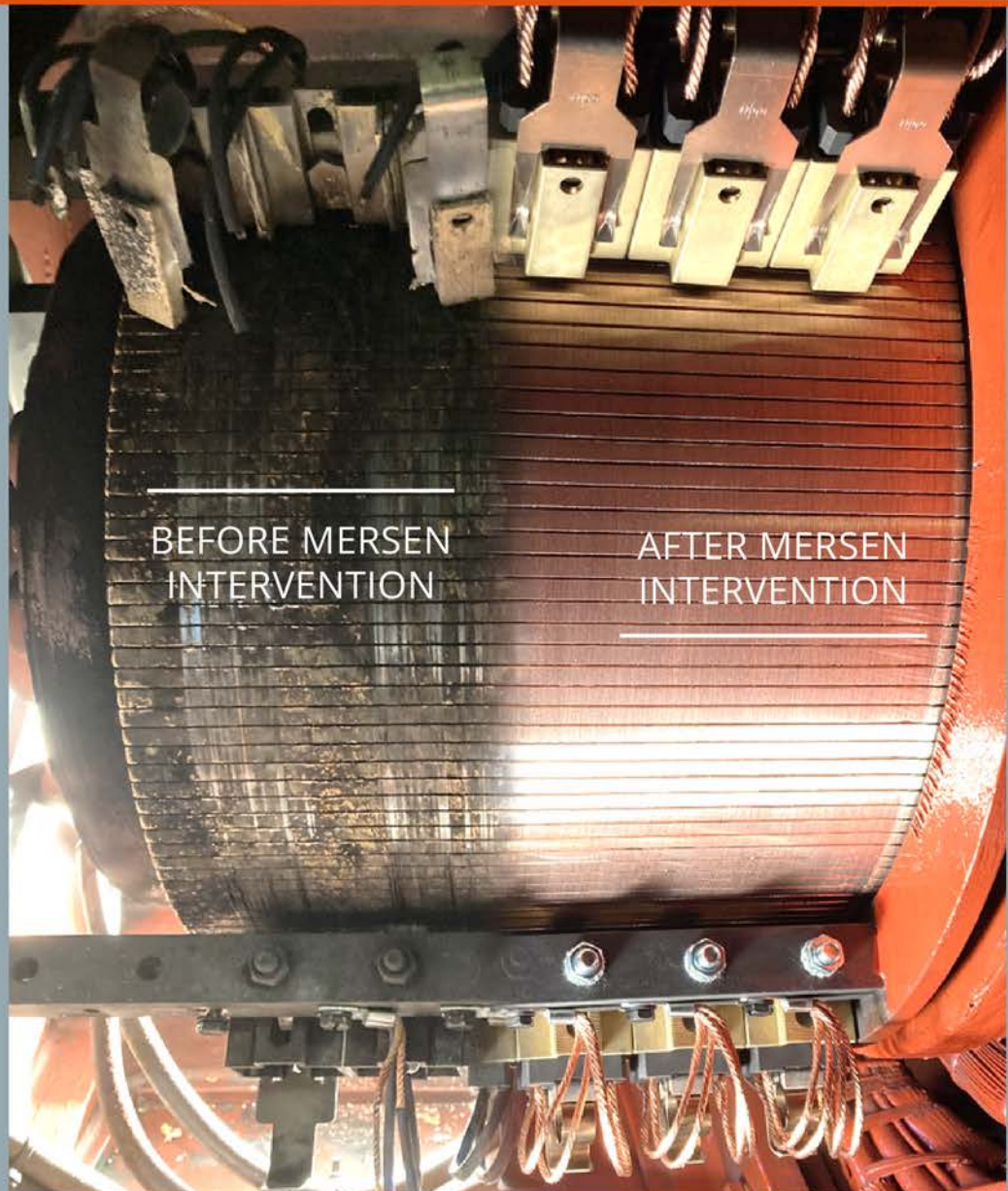
EQUIPMENT  
PERFORMANCE  
OPTIMIZATION

PRODUCTIVITY  
INCREASE

MAINTENANCE COST  
REDUCTION

EXPERTISE

- ✓ All markets
- ✓ All types of brushed electrical machines







Services



Engineering



R&D



Knowledge development

# THE MERSEN SERVICES PORTFOLIO

Services & Training	Description
<b>SERVICES</b>  <b>ON-SITE OR AT MERSEN</b>	1 Visual inspection
	2 Diagnostic
	3 Expertise
	4 Interventions
	Emergency intervention management
<b>ENGINEERING</b>	Re-design and re-engineering of components
	Technical assistance
<b>R&amp;D</b>	Numerical simulation
	Testing capabilities
	Material analysis
<b>KNOWLEDGE DEVELOPMENT</b>	Training and technical seminars

## Did you know?

Our Motor Maintenance Services experts are qualified to check your electrical equipment and operate on all kinds of motors and machines, on various applications.

They will perform technical diagnostics in order to optimize their performance, and if necessary, replace the required components.





# A COMPLETE OFFER - INTERVENTIONS

## 4 DIFFERENT INTERVENTION LEVELS

MOTORS & GENERATORS	1 Visual inspection	2 Diagnostic	3 Expertise	4 Interventions
Operating condition assessment	●	●	●	A LA CARTE
Carbon brush inspection, function and design analysis, identification of the grade	●	●	●	
Slip ring assembly / Commutator film analysis	●	●	●	
Slip ring assembly / Commutator condition analysis	●	●	●	
Slip ring assembly / Commutator surface roughness		●	●	
Slip ring / Commutator geometry		●	●	
Brush-holder pressure measurement, visual analysis and adaptation		●	●	
Carbon brush arm position equidistance control		●	●	
Measurement of the current load in the brushes			●	
Neutral line control and adjustment			●	
Analysis of external environment parameters			●	
Temperature measurement of carbon brushes, slip rings/ commutator and winding			●	
Insulation measurement and control			●	
Electric circuit control			●	
Transient voltage and HF-Measurement				
<b>SIGNAL &amp; POWER TRANSFER SYSTEMS</b>				
Checking of external and internal condition				A LA CARTE
Electrical Incoming & Outgoing tests				
Repair & Maintenance				
<b>DELIVERABLE</b>				
Check list	●			
Technical report		●		
Expertise report			●	●



Various applications



All types of machines (motors and generators)



## WHY CALL ON MERSEN?

### TO MAXIMISE YOUR PERFORMANCE USING OUR RECOGNIZED STRONG TECHNICAL EXPERTISE!

The advantages of Mersen's services:

#### A UNIQUE OFFER OF SOLUTIONS & ON-SITE SERVICES

- Allow the in-situ rectification of the motor's commutator or slip ring surface without dismantling the motor from its working environment
- Reduce downtime and therefore overall maintenance costs
- Optimization of your equipment's performance
- Spot interventions or long-term contracts
- Emergency interventions whenever required
- Adaptation of the service call date and duration depending on your needs (week end, night...)
- A whole range of tools for maintenance of slip rings and commutators, selected or developed by our expert teams

#### A RECOGNIZED STRONG TECHNICAL EXPERTISE

- Development and test of innovative solutions with numerical simulation
- Climatic testing (various environmental conditions)
- Tests on customized benches
- Design and re-engineering of components
- Complete retrofit solutions
- Technical assistance



### SAFETY IS OUR PRIORITY

All our field service specialists have the appropriate Safety & Health qualifications:



**Electrical works**



**Chemical environment**



**Working at height**



**GWO On & Offshore**



**First aid / CPR**



**Specific customers' safety authorizations**

# 1. VISUAL INSPECTION

## MERSEN'S ACTIONS

### GENERAL

Machine operating condition assessment

### BRUSHES AND BRUSH-HOLDERS

General condition inspection (shunts, terminal parts, lateral faces, contact surface)

Function and design analysis

Identification of the grade

Film and condition analysis (picture)

### SLIP RING ASSEMBLIES / COMMUTATORS

Condition analysis

Film analysis



#### Deliverable

- Check list
- Basic recommendations



## 2. DIAGNOSTIC

### MERSEN'S ACTIONS

#### VISUAL INSPECTION (page 6)

#### + BRUSHES AND BRUSH-HOLDERS

- Visual analysis of the carbon brush condition (shunts, terminal parts, contact surface)
- Visual analysis of the brush-holder condition (adaptation, condition, pressure measurement, clearance to carbon brush measurement)

#### + SLIP RING ASSEMBLIES / COMMUTATORS

- Visual analysis (film, marks...)
- Inspection of the commutation process
- Surface roughness measurement
- Out-of-round measurement

#### SIGNAL AND POWER TRANSFER SYSTEMS

- Checking of external and internal condition
- Cleaning of the unit
- Start-up of the system



#### Deliverable

- Technical report
- Advice on curative maintenance, including our hypotheses for the machine operation and our recommendations

### 3. EXPERTISE

#### MERSEN'S ACTIONS

##### DIAGNOSTIC (page 7)



#### BRUSHES AND BRUSH-HOLDERS

Carbon brush arm position equidistance and alignment control

Measurement of the current load in the brushes

Temperature measurement

Neutral line control and adjustment



#### SLIP RING ASSEMBLIES / COMMUTATORS

Analysis of external environment parameters

Measurement of external environment parameters (hygrometry, pollutants...) that may affect commutation

Temperature measurement

Insulation measurement and control

Electric circuit control

#### Other expertise skills available

HF-measurements, grounding system upgrade...



#### Deliverable

- Expertise report with final dimensional inspection
- Advice on curative maintenance, including our diagnosis for the machine operation and our recommendations



## 4. INTERVENTIONS

### MERSEN'S ACTIONS

#### EXPERTISE (page 8)



#### BRUSHES AND BRUSH-HOLDERS

Replacement and adjustment



#### SLIP RING ASSEMBLIES / COMMUTATORS

Refurbishment of slip ring assemblies and commutators:

- Diamond or ceramic machining, stone grinding
- Mica undercutting
- Bar edge and groove edge chamfering
- Contact surface seating

Machine improvement modification

Installation of Mersen's innovative solutions (MERSEN DustCollector, Mersen Total Monitoring...)

#### SIGNAL AND POWER TRANSFER SYSTEMS

Electrical Incoming & Outgoing tests

Inspection

Repair & Maintenance



#### Deliverable

- Expertise report with measurements "before" and "after"
- Technical guidance for equipment performance optimization
- General advice for performance improvement

## MAINTENANCE CONTRACTS



Spot interventions



Long-term contracts



Emergency

### We propose standard maintenance contracts integrating different service options:

- Follow-up of the machine's condition
- Maintenance of your assets
- Different levels of technical support through our diagnostic offers
- Installation and maintenance of our innovative solutions
- Carbon brush / Brush-holder replacement
- Technical assistance
- And much more...

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#### **+** Confidence

A recognized expertise to protect your assets

Availability adapted to your requirements

**Minimized downtimes, Cost reduction** Planned maintenance tasks

**Performance improvement** Early detection of defects and efficient diagnostics

**Secured production** Optimum reliability  
Longevity of your equipment



**RE-DESIGN AND RE-ENGINEERING OF COMPONENTS**



Re-design to reduce brush wear, maintenance and downtime



Complete retrofit solutions



Plug & play solutions

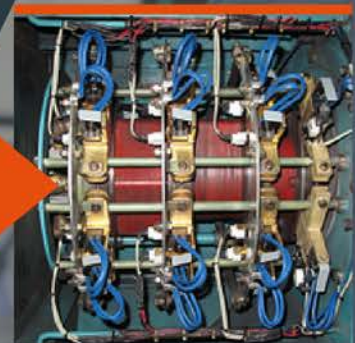
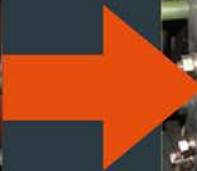


No machine modifications required



EcoDesign solutions

- COMPLETE MACHINE DIAGNOSTIC
- SUPPORT FROM R&D AND APPLICATIONS EXPERTS
- ANALYSIS AND RECOMMENDATIONS
- REENGINEERED SOLUTION MANUFACTURING
- TOOLING DESIGN AND MANUFACTURING
- PROTOTYPING
- FIELD TESTS OR LAB TEST ON TEST BENCHES
- PERFORMANCE FOLLOW-UP AND AFTER SALES SERVICES
- TECHNICAL ASSISTANCE



# NUMERICAL SIMULATION

A POWERFUL TOOL TO PREDICT, UNDERSTAND, OPTIMIZE & INNOVATE FASTER!



Virtual testing



Reactivity to tackle the issue



Shorter prototyping phase



Get an insight of the behaviour of your system  
(better understanding of your system)

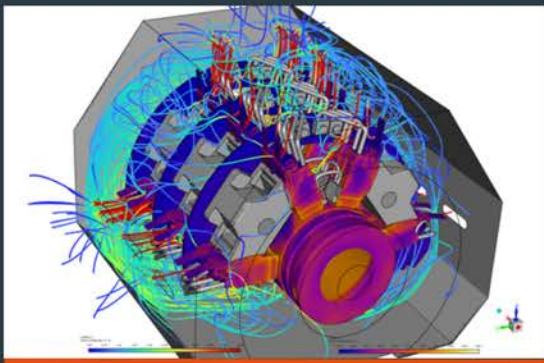


Use this leading-edge technology to improve the performance of your equipment!

You face a problem, you have an improvement wish, a challenge to take up? Mersen will use the power of numerical simulation to offer you a solution.



We can show the complete sequence with designs, simulations, prototyping and testing for validation, then detail the possibilities



Simulation of velocities and temperatures within a slip ring



Heating simulation within a slip ring



## TESTING CAPABILITIES



Development project support



Development of Engineering test plans



Large range of existing test benches and power supply



Construction of custom test bench possible



Wide range of test chamber environments: temperature, humidity...

### ENVIRONMENTAL CHAMBER

To validate prototypes in all kinds of configurations:

Temperature: - 40°C / + 150°C

Humidity: 5% to 98% RH

Altitude: 0 to 2,000 m ( $\Delta$  790 mbar)

Dimensions: (2.70 x 2.40 x 2.20 m / 9 x 8 x 7 ft)

### TURBO GENERATOR TEST BENCH

Ring diameter: 480 mm (19.0")

Ring grooves: 0.3 cm (0.12") wide with 1.3 cm (0.5") pitch

Ring material: 4140 Alloy steel

Ring peripheral speed: 0 to 100 m/s

Current density: 0 to 1,200 A DC

### SLIP RING TEST BENCH

Speed: 0 to 2,900 rpm

Maximum weight: 500 kg

Maximum current: 3000 A AC (according to the current density and number of carbon brushes)

### CORROSION TEST BENCH

### DEVELOPMENT OF CUSTOMIZED TEST BENCHES



# MATERIAL ANALYSIS



In addition to other Mersen diagnostics



New development project support



Electrical machines diagnosis support



Large variety of material analysis



Cutting-edge equipment



Comprehensive reports



Micrography test equipment



Flexural strength test equipment



Copper content analysis

## GRADE ANALYSIS

Carbon brushes & current collectors

Physical characteristics testing

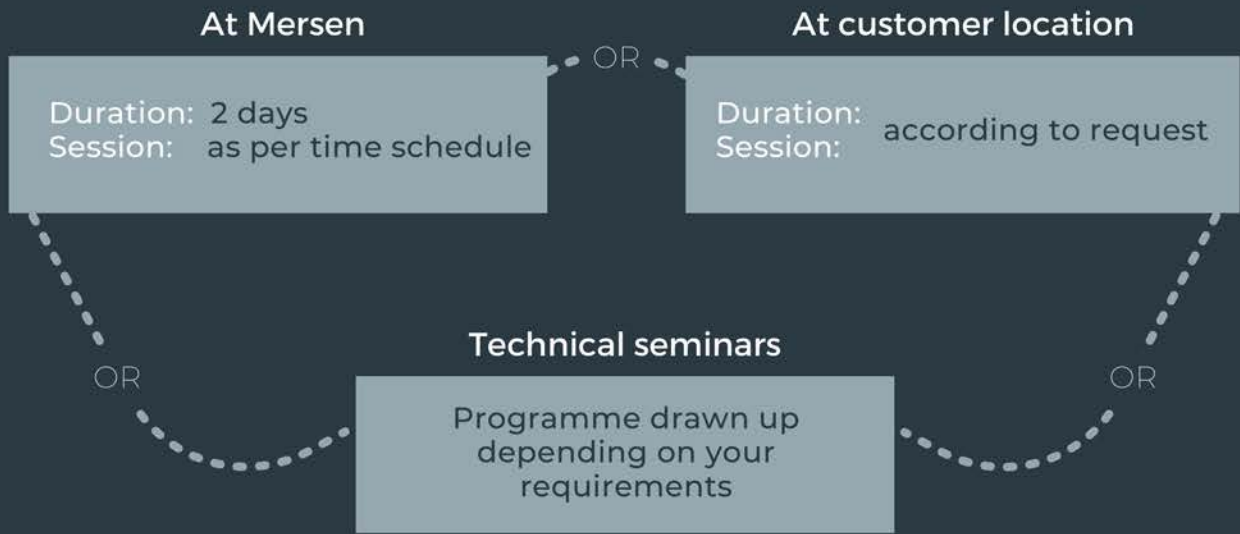
Chemical analysis

Micrography : microstructure and raw materials analysis





# TRAINING AND TECHNICAL SEMINARS



**High quality Technical Training** to help you to maximize the technical skills of your staff and give them the analysis capacities for a more adapted maintenance



With a **variety of training solutions** and highly qualified Mersen specialists, we can customize a learning solution that works for you



**Customized Training Curriculum:** dedicated program specially for your staff needs and experience level to optimize your time and learning



Training at customer's site or in our **Training facilities** located in Europe, India and USA



**Who should participate?** Engineers, technicians and electrical maintenance personnel

## MOTORS, GENERATORS, SIGNAL & POWER TRANSFER SYSTEMS

Production of raw materials for carbon brushes	Parameters influencing the carbon brush behaviour
Brush grade groups and corresponding applications	Using diagnostic and control equipment
Manufacture of carbon brushes, brush-holders, slip rings and signal & power transfer systems	Analyzing malfunctions by observing: <ul style="list-style-type: none"> <li>• for machines: the condition of the carbon brushes, commutators and slip ring assemblies</li> <li>• for signal &amp; power transfer systems: the condition of contacts and slip rings</li> </ul>
Understanding the basic rules and functions of the carbon brush	Practical examples to improve preventive and corrective maintenance





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**MERSEN**  
SERVICES

MERSEN IS A GLOBAL EXPERT IN  
ELECTRICAL POWER AND ADVANCED  
MATERIALS



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