



GENERATOR & MOTOR SERVICES, LLC  
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# GMS NEWS

## GMS Expands Capabilities to Increase Brushless Exciter Availability and Reliability

### CONTACT GMS

If you want to eliminate tooth-top cracking on your rotors, replace retaining rings, obtain field service on your stator or overhaul your brushless exciter contact:

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### GMS GENERATOR & EXCITER SERVICES:

- Condition Assessment
- Stator and Rotor Repairs and Rewinds
- Generator and Exciter Overhaul and Repair
- Positive Pressure Exciter Housing
- Life Extension Programs
- Monitoring and Diagnostics

Visit our web site at

[www.gmsinternational.com](http://www.gmsinternational.com)

GMS has become an industry leader in demonstrating that brushless exciters, some in operation for up to 40 years, can be overhauled and retrofitted to allow 20 years of extended, reliable operation. This is an attractive option to users who are faced with the prospect of replacing existing equipment with expensive static excitation systems that use brushes and slip rings to transfer very large DC currents to the generator field windings. The slip ring system impacts the vibrational behavior of the entire turbine generator shaft and may cause operational problems.

During the past three years GMS has overhauled, repaired and rewound over 20 Westinghouse brushless exciters with outputs ranging from 250 kW to 4.2 MW.

The main components of a brushless exciter are the stationary DC field windings, the rotating 3-phase armature winding, and the diode wheel with electrical components. The diode wheel supports rotating diodes, capacitors and fuses. The armature winding and phase leads are supported against centrifugal forces by glass banding. Cooling is achieved using air or hydrogen in a closed circuit. GMS can overhaul, modify and/or replace all exciter components.

In a recent project, GMS completely refurbished a Westinghouse 4.2 MW brushless exciter that had experienced an operating failure caused by improperly secured hardware. Arcing below the diode wheel destroyed the diode wheel and many electrical components. With extensive engineering and manufacturing experience, GMS used an in-stock steel forging to replace the diode wheel and repair the entire exciter in 11 weeks, starting with only 24 hours advance notice.



New Diode Wheel after Machining

In addition to replacement of the diode wheel, the overhaul included replacement of diode wheel components, redesign and modification of the phase leads, a complete rewind of the rotor and stator, replacement of the base wiring, high speed balance/over-speed testing. In parallel with work on the exciter, a Positive Pressure Ventilation Modification (PPVM) was installed on the exciter house to avoid contamination of the exciter during future operation.

The rewind included an engineering modification of the phase leads and balance resistors. All work was performed in accordance with GMS quality procedures.



Installation of Coils during Rewind

GMS Engineering also redesigned the phase lead support blocks to include axial band support, which allowed the completion of the polyester banding process without use of additional tooling.



Phase Lead Modification

New tooling prepared for this project included a lathe mounted radiant heater box, designed to allow all curing and banding operations to be completed at a single work station. This configuration gave improved control of heat and restricted heating to only affected zones during the banding process.

Project completion schedules were maintained using continuous project management oversight and adjustment of technician work hours as required to prevent delays. *Our 8 to 11 week exciter rewind program provides the generating industry with a valuable tool for maintaining brushless exciters.*

### BASE WIRING UP-GRADES

Base wiring on many older exciters contains asbestos insulation. During exciter overhauls GMS tests and replaces connections, terminal blocks and wiring with improved material.



New Terminals and Wiring

### HIGH SPEED BALANCE AND OVER-SPEED TESTING

GMS has developed a close working relationship with two well-established contractors in the Pittsburgh area who operate spin pits capable of handling the exciters we overhaul. Because of the different discrete components the exciter shaft must carry, the shaft acts as a flexible element with multiple mode shapes. Typically exciter rotors are balanced (up to seven planes) at 3600 rpm and over-speed test at 3960 rpm after overhauls. Experienced GMS balancing engineers can reliably balance even the largest of rotors within two days.



Exciter Loaded in High Speed Spin Pit

### PMG OUTPUT TESTING

The primary purpose of high speed testing to record displacement data that is used to balance the exciter rotor. During the past outage season GMS strengthened its impressive list of exciter testing capabilities by adding PMG output testing, which is also conducted with the unit running at rated speed while under load.



PMG Output Testing @ 3600 RPM

This running test can be done after the high speed balance with the PMG attached to the exciter shaft as shown or with the PMG removed from the exciter shaft using a tooling shaft. The purpose of this testing is to verify adequacy of all repairs completed on the PMG stator or magnets to insure trouble free start up.

### COOLER REPAIRS

Forced outages can be caused by water leaks caused by pipe corrosion and joint deterioration in exciter coolers. GMS performs extensive inspection and tests of exciter coolers. When required, coolers are refurbished to avoid cooler-induced outages.



Installation of Refurbished Cooler

### REPLACEMENT ELECTRICAL COMPONENTS

GMS recently entered into a formal agreement with an established after-market supplier to provide new diodes, capacitors and fuses for exciters. This eliminates need for customers to procure only OEM replacement electrical parts, reducing costs and repair cycle time delays.

**GMS HAS NOW PROVEN MANY TIMES THAT BRUSHLESS EXCITERS CAN BE REFURBISHED IN AN ECONOMICAL WAY AND WITHIN THE TIME WINDOW OF A STANDARD PLANNED OUTAGE.**

**EXCITERS ARE RETURNED TO CUSTOMERS READY TO RUN FOR AN ADDITIONAL 20 YEARS - AND MORE.**

**GMS Can Provide Emergency Service for Generators, Exciters and PMG's**