

GENERATORTECH, INC.

Generator Rotor Winding Shorted Turn Detection Products and Services

Air-Gap Flux Probes

Rotor Winding Shorted Turn Analysis Systems

Installation and Testing Services

On-Site Training

Shorted turns — Why do you need to know?



Figure 1: End-strap elongation has distorted the top turn of the #6 coil resulting in contact with the top turn of the #7 coil.

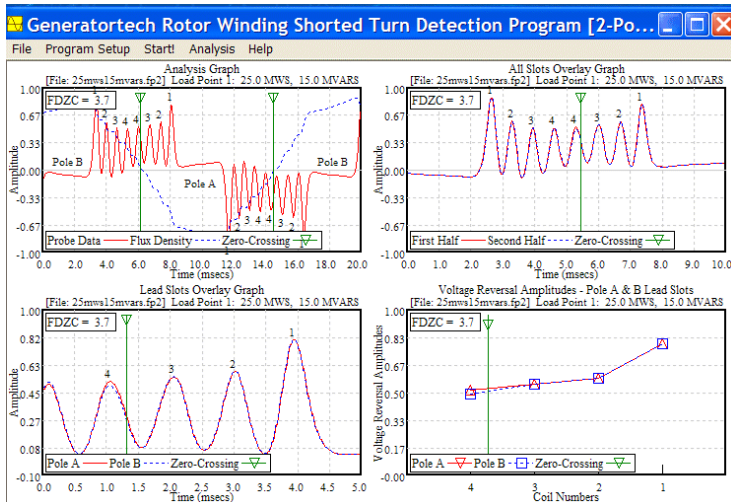
Generator problems must often be solved by process of elimination. Having an accurate assessment of your rotor windings provides an excellent starting point on the path to correctly identifying and solving generator problems.

Shorted turns are generally caused by failed insulation between individual windings in generator rotors. Stop-Start cycles, line disturbances, contamination, moisture, manufacturer error and damage during retaining ring installation are some of the reasons insulation fails.

The impact of operating with shorted turns ranges from no-problem to abnormal vibration, load limits, higher operating temperatures and forced outages. Generatortech, Inc. specializes in shorted turn detection and can help plant operators and engineers pinpoint the cause of abnormal vibration, assist in major maintenance decisions and verify the quality of new and rewound rotors.

Shorted turns often develop over time. Regular testing of your rotor windings allows you to actively monitor the field windings, providing valuable information for your predictive maintenance plans.

Generatortech Data Acquisition & Analysis Program



The Industry's Gold Standard

The **Data Acquisition & Analysis Program** is the center of Generatortech's rotor winding shorted turn diagnostic toolset. The software is extremely intuitive and easy-to-use. The analysis algorithms have been fine-tuned by over two decades of experience with field windings shorted turns. Generator manufacturers, service companies and power producers have been utilizing Generatortech's **Data Acquisition & Analysis Program** throughout the world in order to meet their rotor shorted turn detection needs.

Generatortech offers free technical support for all purchasers of the Data Acquisition & Analysis System. Customers are encouraged to forward their data to Generatortech for peer review.

Shorted Turn Testing Methodology

- A permanent air-gap flux probe is installed on a stator wedge near the turbine end of the generator. The signal cable is routed out of the generator through a casing gland which has an integral BNC test connection. (see Figure 2)
- Generatortech's portable or permanently mounted analysis system is connected to the BNC test connection for data acquisition.
- Data is taken at various loads to maximize resolution of the analysis for each coil in the rotor field winding. Optimum testing, especially for baseline tests requires taking data at approximately 12 load points ranging from 0% to 100% load.
- The Generatortech Data Acquisition and Analysis program analyzes the data which is then reviewed and evaluated by trained personnel to determine rotor winding status.
- Data is normally acquired and analyzed at six-month intervals or yearly, or more frequently if operating conditions give cause for concern or shorted turns have developed since previous testing.

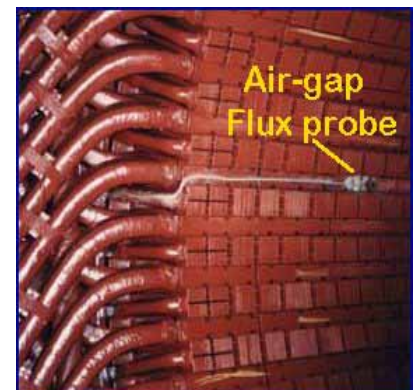


Figure 2

Generatortech Products

Permanent Air-Gap Flux Probes are custom designed and fabricated for each application. The correct flux probe dimensional and sensitivity parameters are essential for obtaining signals that can be used for analysis. A variety of available models and construction materials are used to design and build the optimum flux probe for each generator. Generatortech flux probe materials are impervious to the normally harsh environment within the generator and should last for the life of the stator. All probes come with casing glands.



Temporary Air-Gap Flux Probes are available for hydrogen and air cooled machines. Temporary probes are inserted through a stator ventilation slot into the air gap.



Portable Analysis System

The Generatortech Model 9610 Portable Analysis System has been the data collection and analysis “workhorse” for the rotor shorted turn detection field since the late 1980’s. Available with or without a portable laptop computer, the system comes packaged in a rugged, wheeled carry case for maximum protection and portability. Our newest version of the Generatortech Data Acquisition and Analysis Program provides:



- Improved graph and data charts.
- Ability to preload generator setup information for up to 14 units.
- All Charts & Graphs can be created as .JPG files.
- The analysis curve can be displayed while digitizing & acquiring test data.
- Test data can be auto-saved at optimum load points for analyzing each coil in the generator.



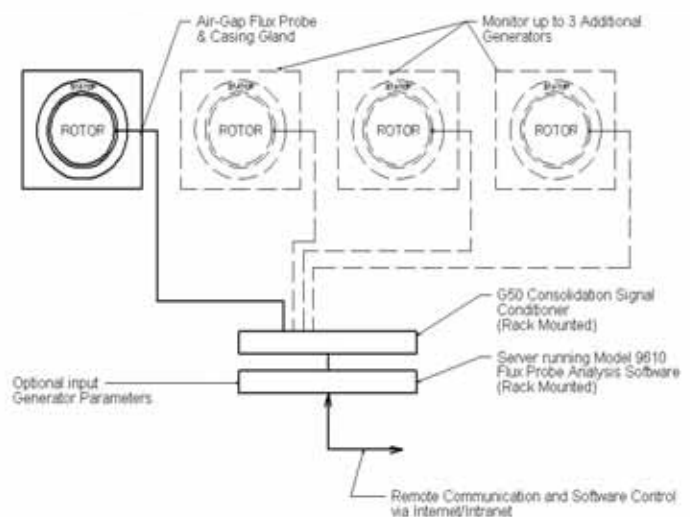
NEW! Permanent Analysis System

The Generatortech Model G50 Remote Analysis System is the latest development for rotor shorted turn detection providing for 24/7 continuous data collection.

Using the same, time-tested, Generatortech Data Acquisition and Analysis Program that our portable system uses, the Model G50 is a rack mounted system designed to simultaneously monitor up to four generators.

A generator’s flux probe is permanently connected to the G50 which can be accessed via Internet or your company intranet using a secure VPN connection. The G50 allows test data to be acquired automatically and/or manually.

No need for your staff to travel to distant power stations for testing. In fact, Generatortech can provide contracted services to be responsible for your regularly scheduled testing and analysis.



Generatortech G50 Remote Monitoring System

Generatortech Services

Today's competitive electrical power market requires data-driven, cost-effective maintenance decisions. Superior data and analysis are needed to make optimal maintenance decisions. Generatortech provides the information needed to decide when and if your generator rotor needs repair. Generatortech's varied support and equipment options can be tailored to accommodate our customer's needs.

Build & Install

- Permanent flux probes
- Temporary flux probes

On-Site Testing

- Generatortech personnel perform on-site testing and analysis which includes a formal report.
- Generatortech rents testing equipment for data acquisition by plant personnel. Data is sent to Generatortech for analysis and formal report.

Generatortech Acquisition & Analysis Packages

Purchase a complete Generatortech Acquisition & Analysis package so your engineers can test and analyze your generators.

- Purchase the Model 9610 Portable Data Acquisition & Analysis System, available with or without a laptop computer.
- Purchase the Model G50 Remote Data Analysis System. Up to four generators are permanently connected to the consolidated air-gap flux probe signal conditioner. The remote system allows monitoring via secure VPN Internet connectivity.
- Purchase the Model G50 Remote Data Analysis System *with Generatortech monitoring option*. Generatortech will provide regular testing and shorted turn analysis reporting using a VPN connection to your G50.

Training/Symposiums/Consultations

- Generatortech Air-gap Flux Probe and Shorted Turn training classes and symposiums can be scheduled for staff, engineers and management. Generatortech staff are always available for phone consultations.

Compare Testing Methods

Technique	Location of Turns	Sensitive	Quantitative	Detects Speed/Thermal Dependant Shorts
OFF-LINE TESTS				
Rotor Impedance Test	NO	LOW	NO	Yes-speed, voltage
Pole/Coil/Turn Voltage Drop Test	YES	HIGH	YES	NO
Search Coil Slot Flux Distribution Test	YES	HIGH	NO	NO
ON-LINE TESTS				
V/A Measurements	NO	LOW	NO	maybe
GENERATORTECH FLUX PROBE TEST	YES	HIGH	YES	YES

Established in 1989, Generatortech, Inc. is the world leader in the detection of rotor winding shorted turns.

Our customer list includes:

- Power generating utilities and cogeneration industries *worldwide* including turbine and hydro generators.
- Service companies, who use our probes & analysis software for spin pit testing and provide retrofit installations.
- Original Equipment Manufacturers (OEM) - install Generatortech equipment in new generators and as retrofit applications during major outages.

GENERATORTECH, INC.

support@generatortech.com 1.518.399.4646 phone 1.518.399.7562 fax

www.generatortech.com

31 Sutherland Drive
Schenectady, New York USA 12302-5421