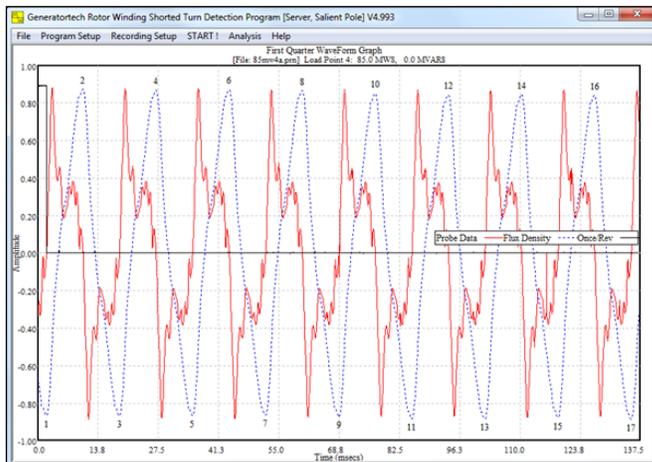


SALIENT POLE ROTOR WINDING SHORTED TURN DETECTION SYSTEM



Salient Pole Flux Probe Data - Raw flux probe data (red) and the associated flux density curve (blue) for each pole. Magnetic field strength (flux density) is proportional to amp-turns produced by the pole.



Example of a Thinline Flux Probe for use in Salient Pole Rotors.

GENERAL INFORMATION

Generatortech has developed a complete solution for monitoring the integrity of the rotor winding insulation of salient pole generators.

Shorted turns in salient pole rotor windings result in an asymmetric distribution of magnetic flux around the rotor. This asymmetry can produce vibrations that may affect the unit's ability to reach full load and can accelerate wear on bearings and other generator components. Additionally, a rotor with shorted turns requires an increase in field current to maintain the same magnetic field strength, leading to higher pole temperatures and increased thermal expansion.

The Generatortech **Data Acquisition & Analysis Program** detects turn shorts while the unit is running under normal operating conditions. This is important since turn shorts affecting the winding during operation can sometimes clear after the unit is brought off-line. The clearing can occur because the centrifugal forces that compress the turns in the winding and the thermal expansion forces that distort the geometry of the turns are both removed when the unit is shutdown. These speed and temperature-dependent turn shorts are very difficult to locate and repair when testing is done at stand-still.

The Generatortech **Data Acquisition & Analysis Program** utilizes a magnetic flux probe to measure the magnetic field close to the rotor's surface while the unit is operating. By calculating the strength of the magnetic field over each rotor pole, the **Data Acquisition & Analysis Program** identifies poles with shorted turns AND determines the number of shorted turns in the affected poles.

The required magnetic flux probe is installed on a stator wedge without needing to remove the rotor. The system also uses a Once/Revolution signal that can be taken from an existing source or by installing a dedicated Once/Rev sensor. The flux probe data is acquired with the machine on-line, allowing plant personnel to immediately investigate unusual operating conditions, such as changes in vibration or excitation requirements.

Regular testing of your rotor windings allows you to actively monitor the field windings, providing valuable information for your predictive maintenance plans.

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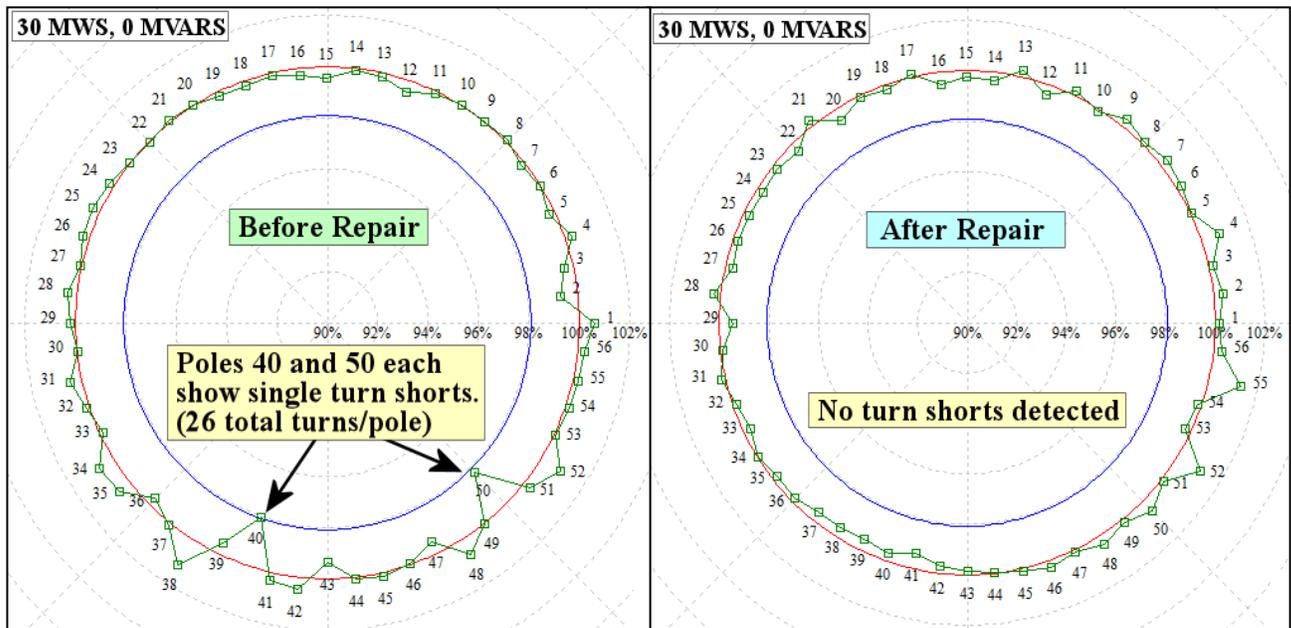
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Polar Graph before repairs show the effects of single turn shorts in both Poles 40 and 50. The polar graph on the right shows the successful repair of the turn shorts. **Green curve:** measured magnetic field strength over each pole, **Red circle:** average magnetic field strength over all poles, **Blue circle:** expected field strength in poles with one turn short.

Two Analysis System Options:

The **Model 9610-SP Data Acquisition & Analysis Program** provides an integrated data acquisition and analysis in an easily portable package. Our full package includes:

- Windows OS notebook computer
- Three channel Signal Conditioner
- High speed 16-bit data acquisition hardware
- Data Acquisition and Analysis Program
- All necessary cables, power supplies and instructions are included in a **rugged custom-fitted wheeled carrying case**

The **Model G50-SP Data Acquisition & Analysis Program** provides a permanent connection and continuous on-line monitoring which can monitor up to 6 generators simultaneously. It is rack mounted and can be accessed via your company's intranet or via VPN over the Internet. A history of the flux probe waveforms are saved for each unit.

The Generatortech **Data Acquisition & Analysis Program** allows the user to quickly and easily acquire, analyze and save data from the air-gap flux probe. The program provides an oscilloscope-like display during data acquisition. Once a satisfactory waveform has been selected, analyzing the data for indications of shorted turns is performed immediately. The analysis has been entirely automated.

The program provides multiple displays of the analysis results. The graphs display the raw data and magnetic flux density waveforms for the rotor during operation. Polar graphs (see above) provide a plot of the relative magnetic strengths associated with each rotor pole. Any shorted turns are seen as dips in the pole's magnitude below the average of the other poles. Quantitative data is also presented in a table format and summarizes the shorted turn indications for each coil.

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