IRIS POWER

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Iris Power AGTracII™

Continuous On-Line Air Gap Monitoring for Hydro Generators

A USER'S PERSPECTIVE:

WHY MONITOR AIR GAP?

In a typical scenario a 35 year old hydrogenerator is at a point where it may fail soon, the stator deformation has reduced the air gap between the rotor and the stator to critical proportions. The generator has to be put into an unscheduled shut down, costing thousands of dollars. On-line monitoring of the air gap in the hydro generator could have provided significant and timely information about its physical condition as it changed over years. The Iris Power AGTracII makes it possible to monitor the units status dynamically while it is in operation. Air gap issues can be identified and corrective action taken well before a failure.

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IMPORTANCE OF AIR GAP MEASUREMENTS

Air gap is the distance between the outside diameter of the rotor and the inside diameter of the stator. Monitoring of air gap in hydro generators is important as both the stator and the rotor can be quite flexible, and their shape and location are influenced by operating centrifugal forces, thermal effects, magnetic forces and mechanical system failure. Off-center or out-of-round conditions will at least reduce operating efficiency and, in more severe cases, can lead to damage from magnetically induced heating or a rotor-to-stator rub.

Generated energy is transferred from rotor to stator through air gap, which makes identification of conditions in the air gap one of most important tasks in order to control machine behaviour and provide reliability, efficiency and quality of electric power generation.

Air gap measurement is an important component of machine condition monitoring, reliably providing specific information which cannot be simply obtained by some other method.

IRIS POWER AGTracII APPLICATION

The Iris Power AGTracII is an efficient tool for online monitoring of the air gap. It uses low profile capacitive sensors designed for accurate distance measurement. It provides complete real time analysis, alarm management and trending and can provide protective functionality.

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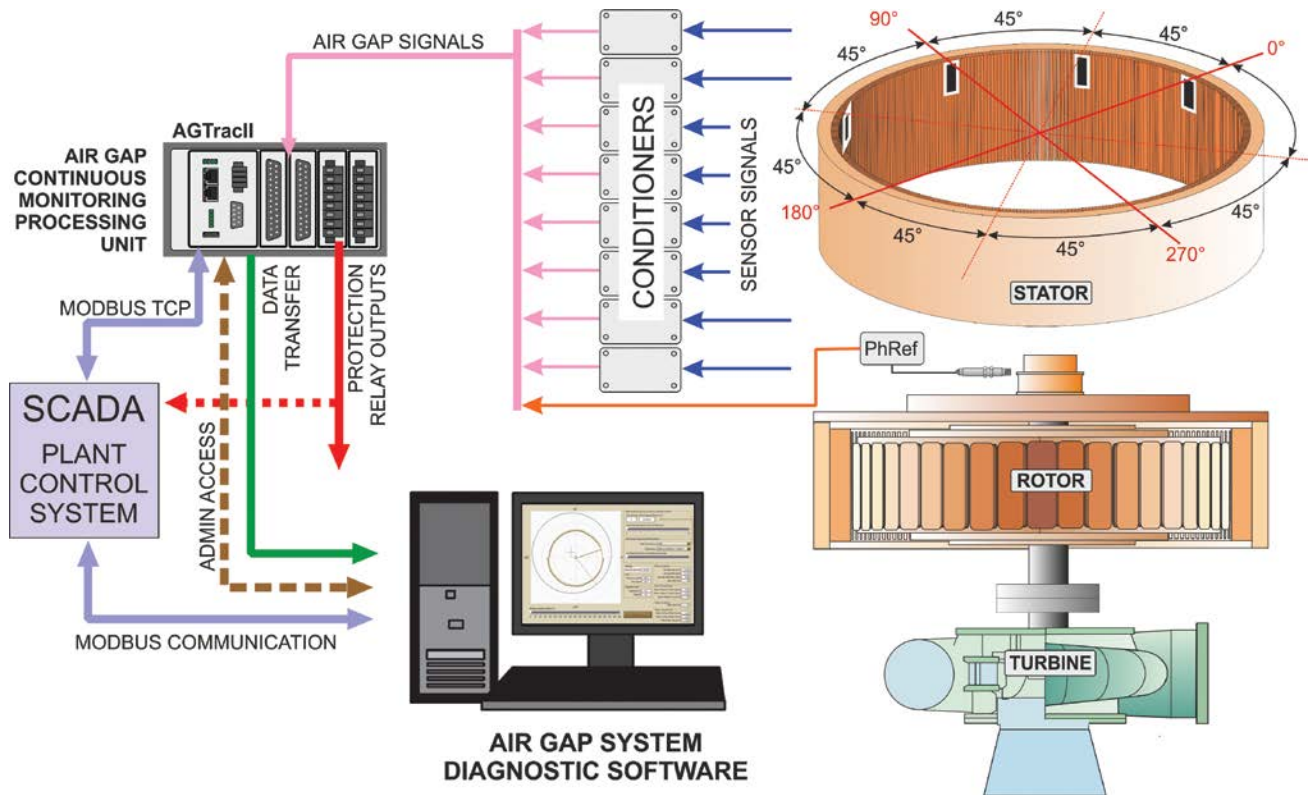
IRIS POWER AGTracII

IRIS POWER AGTracII SYSTEM

The Iris Power AGTracII system is a machine monitoring system capable of monitoring air gap, and processing parameters. The system can be used to capture the data as a permanent online monitoring system with protection capability as well as being used with a computer to view data in real-time during commissioning, operation and/or maintenance. The air gap system comprises 5 parts;

- Air Gap Capacitive Sensors (4 to 16 sensors)
- Sensor Signal Conditioners
- Sync Sensor (1 sensor)
- Continuous Monitoring Instrument
- Data Management Software.

4 to 16 Air Gap Capacitive Sensors are specifically designed for the application. The sensor is made from a printed circuit board and affixed to the stator core bore using an application specific epoxy resin. Linear measurement range of the sensors is 2–50 mm.

AIR GAP SENSOR SPECIFICATIONS

TYPE	AGS-10	AGS-15	AGS-25	AGS-50
DIM.	93x32x 1.2mm	135x32x 1.2mm	232x32x 2.3mm	175x60x 2.3mm
CABLE	10m	10m	12m	12m
OPERATING TEMP.	0…125°C	0…125°C	0…125°C	0…125°C
RANGE	2–10mm	3–15mm	5–25mm	10–50mm
TOLERANCE	±1% at 6mm	±1% at 8mm	±1,5% at 15mm	±3% at 30mm
LINEARITY	<±1.5%	<+±1.5%	<±3%	<±5%
REPEATABILITY	<±0.3%	<±0.3%	<±0.3%	<±0.3%

The **AGTracII** digitizes the signals from various types of sensors.

- Processes the acquired signals in real time.
- Detects the various machine modes of operation;
  - Stationary
  - Run up
  - Normal operation
  - Transient
  - Coast down.
- Determines alarm conditions and sends alerts to the plant SCADA system.
- Communicates with the plant SCADA system.
- Transfers condition data to the Data Management Software.

The Data Management Software provides the following:

- Receive data as a condition vector from the real time (RT) module in pre-set time sequences and checks operating conditions.
- During transient mode of operation, condition vectors are recorded with increased time resolution.
- Duplex communication with the AGTracII.
- Alarm occurrence and alerts.
- Waveform data recording, processing and saving to a database which can be used for off line analysis.

Iris Power Air Gap Capacitive Sensor

Sensor Conditioner converts the sensor output to a common industrial format for collection in the Continuous Monitoring Instrument.

Sync Sensor produces a once-per-revolution pulse reference signal. This can be shared with FLUX and/or vibration monitoring systems.

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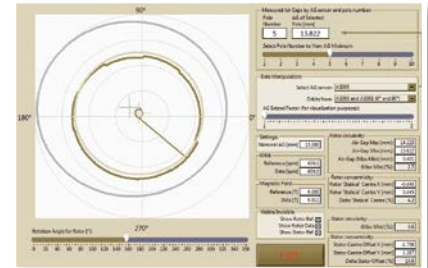# IRIS POWER AGTracII

DATA MANAGEMENT SOFTWARE

The Data Management Software will allow the operator to perform, as a minimum, the following:

- Display and print data
- Set up and configuration according to the unit data
- On-line continuous diagnostic monitoring of all measured signals
- Set up database based on unit number
- Machine data set-up

- Provide data to a local area network
- Communicate with plant SCADA system
- Set and provide alarm and trip conditions
- Set up and accept synchronized time signals
- Identify malfunctioning sensors
- Software supplies numerous diagnostic tools

DATA ANALYSIS SOFTWARE

- Rotor pole profile/rotor geometry
- Stator and rotor shape with eccentricity
- Dynamic analysis of rotor
- Pole movement detection

Sample of a polar plot of the data
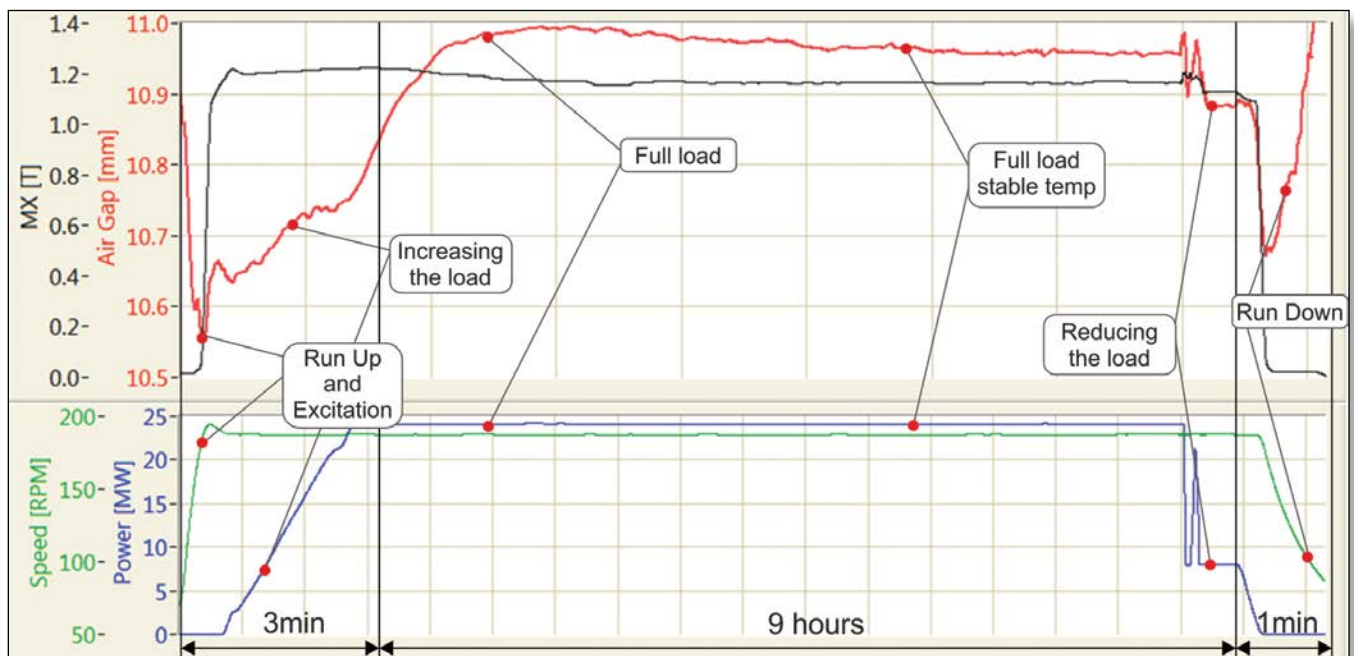
Sample of air gap over time plot

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QUALITROL-IRIS POWER HAS BEEN THE WORLD LEADER IN MOTOR AND GENERATOR WINDING DIAGNOSTICS SINCE 1990, PROVIDING A FULL LINE OF ON-LINE AND OFF-LINE TOOLS, AS WELL AS COMMISSIONING AND CONSULTING SERVICES.

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