IRIS POWER ENGINEERING

DIAGNOSTIC NEWS

Iris Power Engineering
SUMMER 2003

The Newsletter on Monitoring the Reliability of Electrical Equipment

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Iris Receives ISO 9001:2000 Certification

We are pleased to announce that Iris was recommended for the certification of ISO 9001-2000 systems on June 12, 2003.

The successful conversion from ISO 9005:1994 is a result of dedication from all levels at Iris. Everyone put forth extensive work and effort into the project; employees contributed their ideas and time to make a smooth conversion. Now it is time to focus on continual improvement, with a heavy focus on communication, both within Iris and with our customers.

Have you registered for Iris' Partial Discharge Course?

See Page 3 for details

CORPORATE CHANGES AT IRIS

Joseph Mbuyi

We are pleased to announce the promotion of Joseph Mbuyi to President of Iris Power Engineering. Joseph graduated in Mechanical Engineering from Queen Mary College, University of London and obtained an MBA from University of Stirling in Scotland. Prior to joining Iris he was with Alstom and Future Electronics, and has been with Iris for 6 years as Vice President of Marketing, then Executive Vice President. Joseph replaces Greg Stone as President. Greg wishes to concentrate on the more technical aspects of Iris. He will be involved in R&D, as well as continue in the role of V.P., Business Development.

Derek Mitchell has been promoted to Supervisor of Domestic Sales in the Toronto Office. He will be responsible for overseeing the domestic sales team working out of head office. While maintaining his own territory, Derek will work closely with each member of the team to support and guide them in order to better serve our customers.

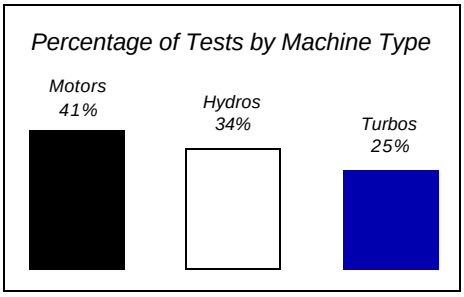
PARTIAL DISCHARGE TESTING:
A PROGRESS REPORT EFFECT OF INSULATION TYPE & SETTING TRAC ALARMS

V. Warren, Iris Power Engineering

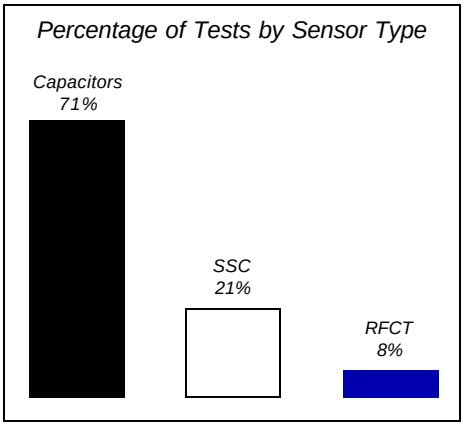
It has long been known that comparing the partial discharge results obtained from a single machine is a valuable tool enabling companies to observe the gradual deterioration of a machine stator winding and thus plan appropriate maintenance for the machine. In 1998, at the annual Iris Rotating Machines Conference (IRMC), a paper was presented that compared thousands of PD test results to establish the criteria for comparing results from different machines and the expected PD levels. At subsequent annual Iris conferences, using similar analytical procedures, papers were presented that supported the previous criteria and evaluated the effects on PD results of sensor location, insulation type, age, manufacturer, and operating hydrogen pressure.

As a continuation of the process, this paper summarizes over 43,000 PD test results collected through to 2002 and compares the on-line PD results of similar windings and installations. Calibration of on-line PD test results is impractical; therefore, only results obtained using the same method of data collection and noise separation techniques are compared. For this paper, all the data were obtained with either a PDA-IV or TGA test instrument. The results show there are some differences between PD levels based on the bonding resin.

Continued on page 2



Number of FLH Tests by Machine Type		
Motors	4863	41%
Hydros	4121	34%
Turbos	3047	25%



Number of FLH Tests by Sensor Type		
Capacitors	4447	71%
SSCs	2579	21%
RFCTs	1005	8%

ANALYSIS BY RESIN TYPE

In previous papers, the impact of the type of bonding resin was studied. Now with a larger database, it was time to revisit this topic. To do so, the data for 13-15kV air-cooled machines was further separated based on type of bonding resin: asphaltic, polyester and epoxy. Though each of these categories includes a variety of compositions, further division is beyond the scope of this paper. Since directional (Bus) and differential (PDA) installations treat data differently, they are discussed separately.

Table 1. 13-15kV Machines - Air-cooled Bus Installs

	Asphaltic	Polyester	Epoxy
25%	36	55	38
50%	78	146	100
75%	130	443	239
90%	231	786	514
Avg	205	321	214
Max	3123	2493	3200

Based on the results in Table 1 for 13-15kV air-cooled machines with 80pF capacitors in a Bus directional configuration, some observations can be made about the effect of resin type to expected PD levels. Though the polyester resin windings tend to run higher then the others, the difference is not appreciable until the upper 25th percentile. It is possible the reason for the higher PD activity with polyester is due to other insulation components common to these systems, such as large flake mica products, and not the polyester. The reason for the lower values for the asphaltic resins is not obvious, but we speculate it is due to both conservative design and operation, in addition to the fact that the poorly manufactured windings have already failed. Similar results were obtained for the PDA differential configurations.

In general, for air-cooled windings of this voltage class regardless of resin or sensor configuration, expected PD levels are less than 200mV, while windings with PD higher than 400-500mV should be closely monitored for upward trends.

CONCLUSION

Though it is always recommended that you trend the results for one machine over time and thus monitor the degradation of the stator winding, it is also possible to compare results from similar machines provided certain conditions are the same: voltage, gas pressures, test instrument, and sensor configuration.

The time of winding failure is normally the result of a deteriorated winding being subjected to an extreme stress such as a lightning strike, out-of-phase synchronization, excessive starts, or system imbalance. As these are unpredictable, it is impossible to forecast when a failure will occur. However, by monitoring the PD characteristics of a stator winding, it is often possible to determine which machines are more susceptible to failure and therefore which require maintenance.

HydroX to be Released

Current technology advances in condition monitoring are employing an increasing number of on-line sensors to automatically monitor the status and performance of the complex systems required for power generation. Specifically for hydrogenerators, monitors for airgap, vibration, partial discharge, air gap flux - as well as conventional operating point and process data are often utilized. Proper use of this information is projected to save operating and maintenance expenses, in addition to helping reduce unscheduled outages and catastrophic failures. However, the large volume of available data from these sensors and systems can overwhelm personnel and often require extensive interpretation for conclusions to be drawn. Correctly handling this information requires expertise in machine design and operating limits, sophisticated on-line monitoring instrumentation, and alarm processing and interpretation.

To meet this need, the development team at Iris Power Engineering continues to work with New York Power Authority to deliver a knowledge based hydro generator monitoring and diagnostic system called HydroX. HydroX will utilize Bently Nevada's System 1™ Plant Asset Management software with embedded Decision Support capabilities to combine vibration, temperature, speed, and air gap data acquired by Bently Nevada's 3500 series machinery protection system with data from Iris' HydroTrac™ partial discharge monitoring instrument. System 1™ will also be used to collect and process variable data from the unit through interface with the plant's control and SCADA systems.

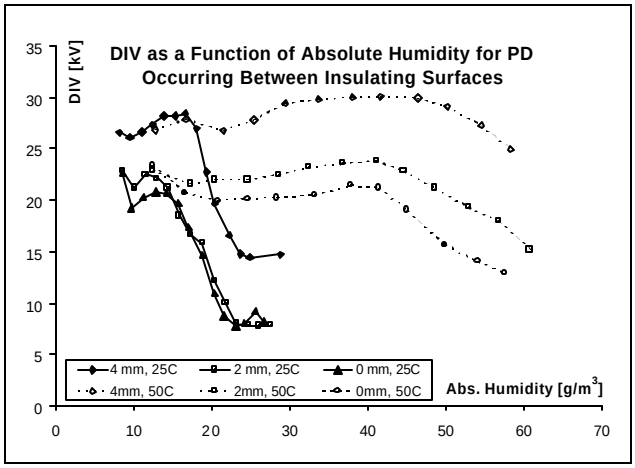
A prototype of this diagnostic system is scheduled to be completed by year- end and installed on one unit at the New York Powers Authority's St. Lawrence FDR Power Project early in 2004. Iris expects to bring HydroX to market during 2004.

LABORATORY RESULTS ON THE EFFECT OF HUMIDITY ON PD

G. Stone, Iris Power Engineering

In the Spring 2002 issue of this Newsletter, we discussed that PD results from operating motors and generators tended to be affected by humidity if the PD was occurring in the stator endwinding. With the help of Jens Hansen, a student from the Technical University of Denmark, laboratory experiments have been conducted to study this effect in a more controlled way.

The understanding of the impact of humidity on PD has grown in importance over the past few years. Automated continuous on-line PD monitors, being remotely accessible via the Internet for example, have gained a foothold in the marketplace. One of the advantages of continuous PD monitors is that they can be programmed to setoff alarms when specific PD levels (Magnitude Alarms) are calculated or when the PD activity increases by a given factor (Trend alarm). However, this requires the PD monitor to trend the PD activity at given operating conditions. In the past, users of our PD technology would typically acquire data at specific operating conditions based on stator winding temperature, voltage and load only. However, the application of continuous on-line PD monitors has proven the need for considering the impact of ambient temperature and humidity for implementation of reliable trend alarms.



A chamber was built where the humidity and temperature could be independently controlled. Stator endwindings were simulated with two 25 kV unshielded power cables, one of which was grounded, and the other energized by a 60 Hz AC voltage supply. Figure 1 shows the impact of the humidity on the PD. As found in actual machines, the PD tends to increase as the humidity decreases, especially at high humidities. By varying relative humidity and the temperature, we were able to determine that the absolute humidity seems to be more important that the relative humidity.

Since the results are highly dependent on the experimental arrangement, it is unlikely that a 'humidity correction factor' could ever be reliably developed for PD. However, knowing this effect, one can better assess if an increase in PD in a particular stator is due to increased insulation deterioration, or due to atmospheric effects. A more complete description of the experiment will be presented at the IEEE Electrical Insulation Conference, in Indianapolis, this September.

PDLitePro™ RELEASE

PDLitePro™ is Iris Power's new testing and database management software application (replacing PDLite 4.3™). This software package complements and enhances Iris Power Engineering's Portable Instruments (TGA-B™, PDA-IV™ & TGA-S™) in their ability to periodically monitor partial discharge activity in motors, generators, switchgear and air-cored transformers. PDLitePro™ is the data acquisition software for these instruments. It contains modules for sensor configuration, measurement acquisition control, and viewing measurements. With PDLitePro™, test results from your instrument can be displayed and interpreted through the use of the supporting application PDView3™, viewing and reporting software.

PDLitePro™ will be released before the end of 2003. For those customers who already own a portable instrument, watch for your letter in the mail explaining how to upgrade to PDLitePro™. If you have any questions or you would like more information, please call us at 416-620-5600.

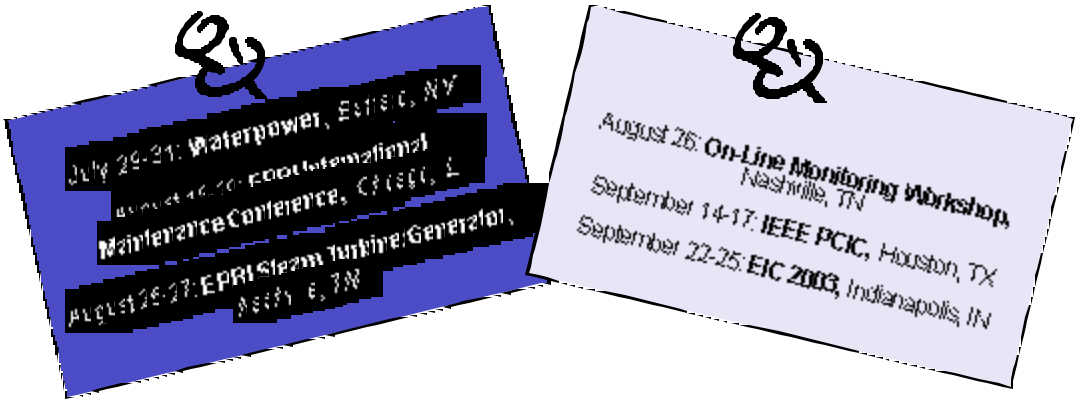
EMC BOOT UPDATE

The EMC BOOT™ is designed for use exclusively with all voltage classes of Iris' epoxy-mica capacitors and is made of preformed silicone rubber. It forms a tight seal over the high voltage cable and the first shed of the coupler, protecting the EMC and high-voltage cable from moisture and contamination. The BOOT™ has been independently tested with lightning impulse tests and hipot tests on both 16kV and 25kV epoxy mica capacitors. The EMC BOOT™ will be shipped out with all orders of EMCs starting in September 2003. Silicone Tape (specification available upon request) will also be shipped with the BOOT™ to use as electrical insulation between the BOOT™ and the high-voltage cable.

Visit our website for more information including technical papers and industry information

www.irispower.com

UPCOMING EVENTS



IRMC - A HUGE SUCCESS

The annual Iris Rotating Machine Conference (IRMC) was held this year in Santa Monica, California. In light of the current economic situations, SARS, and the restrictions on travel, there was a relatively good turnout. Many of the delegates took advantage of the venue and spent the weekend walking along the boardwalk checking out the many sites at Muscle Beach, Venice, the Pier as well as a side trip to Universal Studios.

The program was divided into two training sessions and two technical sessions, breakout sessions and a walk-in clinic. As is customary, the training sessions were full; customers were given a demo of the newly released PDTracPro and the soon to be released PDLitePro software in the users group meeting and at the walk-in clinic machines were given a clean bill of health.

These sessions are a great opportunity to learn all about condition-based maintenance and Partial Discharge theory for both new and seasoned users of the technology.

We would like to thank all the authors for their time and effort in presenting very informative technical papers; the session chairs for maintaining the flow of the program; and most of all thank you to all those who attended.

Next year's conference will return to that vibrant city - New Orleans, LA. Keep an eye on the website for further details. Anyone interested in presenting a paper next year, please email kzarb@irispower.com. Registration fees for authors are waived.

TracCheck PROMOTIONAL OFFER!

Iris is offering all existing Trac customers the TracCheck Promotion. This promotion includes one Trac PD Data Assessment Report per Trac installed and commissioned. When you send in your Trac data we will provide you with a report which will give you a look into the health of your stator winding, 2D and trend analysis and a diagnostic report on the Trac instrument itself. If you are interested in this Trac Promotion please contact your Sales Representative at Iris.

Register Now for Iris' Partial Discharge Course

This course is designed to help you monitor the condition of the stator winding insulation used in your motors and generators, and to plan maintenance based on that condition.

The course is directed at engineering and maintenance personnel who either purchase, install, test, maintain, and/or repair machines. Consultants, manufacturers and repair shop personnel are also welcome.

It is to be held from Tuesday November 18 to Thursday November 20, 2003 at The Sheraton World Resort – Orlando Florida ~ Reservations: 800-327-0363.
To register for the seminar please call, fax, mail or e-mail Michelle Harris at 416-620-5600 ext 241 or email mharris@irispower.com. You can also print a registration form off our web site, www.irispower.com.