

# Hydrogenerator Monitoring Course

November 29 to December 1, 2023

Seattle, Washington



## OVERVIEW

On-line monitoring systems installed in hydro power plants is a critical step toward predicting machine behaviour. The real benefit of this predictive capability of malfunctions and identification of irregularities in system behaviour can significantly improve repair planning and scheduling and also prevent additional damage from occurring.

Stator winding problems have been identified in over 40% of all hydraulic

generators having modern thermoset windings. This coupled with less frequent but equally expensive rotor winding failures means that almost 50% of hydrogenerator failures are caused by the deterioration of rotor and stator windings. To capture additional failures related to the fixation of mechanical components (bearings, rim, poles, foundations joints) modern monitoring systems include vibration and air gap monitoring along with electrical parameters and process parameters (temperatures, pressures, flow) for a broad understanding of machine behavior during operation, both electrically and mechanically.

Preventing machine failures involves a thorough understanding and appreciation of the design, function and interaction of all major components that make up typical machine. Proper training and education on machine component function, specification, testing, monitoring, maintenance and preparing effective repair specifications is the first step in prevention.

## SEMINAR OBJECTIVES

The course focuses on hydro-electric generators. Although much of the discussion relates to synchronous machines rated greater than 10MVA and 6.9kV the principles apply equally to generators of all sizes down to 4kV. Discussion will concentrate on stators (frames, windings and laminated cores), rotors (windings, rims and spiders), as well as brackets, bearings and cooling. The course is presented from an end user perspective, rather than that of a machine designer.

## WHO SHOULD ATTEND?

This course is directed at engineering and maintenance personnel responsible for the purchase, installation, maintenance, testing and repair of hydrogenerators.

## Course Instructors

**Nick Stranges** completed his PhD in Electrical Engineering at the Power Research Laboratory at McMaster University in Hamilton, Canada in 2001. He gained more than 20 years of experience in the design and development of high voltage motors at the GE Large Motors Plant in Peterborough, Canada where he was a Principal Engineer. This was followed by a few years as a hydrogenerator Design Engineer at the Andritz facilities also in Peterborough before he joined Iris Power. Nick has authored or coauthored over 35 transactions and conference papers. He has been and active member of the IEEE Standards Association and has participated in the development and revision of various standards. He served as the working group (WG) chair for the latest revision of IEEE 112, and has been a WG member of IEEE 115 and 1812. He is currently a WG member of IEEE 1665. Nick is also a Standards Council of Canada Committee member of IEC/TC2 – Rotating Machinery.

**Ozren Husnjak** has more than 10 years of experience in vibration data collection, processing and analysis. Ozren has a degree from Departments of Physics, Faculty of Science where he worked as assistant teacher. Since 2006, Ozren worked for VESKI, Zagreb, providing expertise in signal analysis and software development. Ozren conducted a number of training courses in this area and was involved in installation of vibration and air gap sensors, and provided data interpretation services.

## AGENDA - 2-1/2 days

Machine design and monitoring technologies

- Introduction
  - Component Overview
- Rotor design and potential failure mechanisms
- Rotor types (two and three bearings)

- Rim types and pole assembly
  - Rotor pole problems
  - Bearing and foundation joints
- Stator design and potential failure mechanisms

- Stator core frame
  - Endwinding problems
  - Stator bar problems
- Introduction to monitoring systems
- Vibration monitoring (theory and application)

Air gap and flux monitoring (theory and application)

Electrical monitoring practices

- PD and Ozone monitoring
- Load angle and Power quality

Hydraulic monitoring practices

Case studies

- Air gap, Vibration, Electrical quantities, Hydraulic quantities

**Registration form on page 2**

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To register for the seminar please send completed registration form and e-mail to [khoward@qualitrolcorp.com](mailto:khoward@qualitrolcorp.com).

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

City & Province/State: \_\_\_\_\_

Postal/Zip Code: \_\_\_\_\_

Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_

E-mail: \_\_\_\_\_

Special Dietary needs: \_\_\_\_\_

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Card Holder Name: \_\_\_\_\_

Signature: \_\_\_\_\_

## **REGISTRATION** Only 15 seats available, so register now.

Registration includes lunch and breaks daily.

A complete set of notes is also included.

## **PRICE DOES NOT INCLUDE HOTEL ACCOMMODATIONS.**

Confirmation will be issued upon receipt of payment.

## **COST**

**\$1730.00 USD**

Send registration to:

Karen Howard

[khoward@qualitrolcorp.com](mailto:khoward@qualitrolcorp.com)

Tel.: 905-364-4568

## **Location of Venue**

COURTYARD SEATTLE DOWNTOWN/  
LAKE UNION  
925 Westlake Ave N  
Seattle, WA 98109  
+1 206-213-0100

## **CANCELLATION POLICY**

Cancellation received one month prior to seminar will result in a \$75.00 USD processing fee. Withdrawal received up to one week prior to the seminar will be subjected to a charge of \$150.00 USD. There will be no refunds a week prior to the seminar. Delegations substitution is permitted.