

A photograph of a large concrete hydroelectric dam with three main spillways. Water is cascading down the spillways, creating white foam at the base. The sky is blue with scattered white clouds. The dam structure is made of grey concrete with some weathering.

# Hydroelectric Generators:

A Preventative Maintenance Guide

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Hydroelectric power is a renewable and environmentally friendly source of energy that currently accounts for roughly

**19%** of global energy production.

On a smaller scale, hydroelectric power generates between 6-10% of all energy in the United States and approximately 61% of all energy in Canada. However, the increasing reliance on hydroelectric generators in recent years has placed additional stress on electromechanical systems due to thermal cycling and the other effects generated by this hydroelectric equipment. Due to these stresses, it is important to regularly perform preventative maintenance on hydroelectric generators to keep them and their associated systems functioning properly.



# Importance of Preventative Maintenance for Hydroelectric Generators

Placing more demands on hydroelectric generators means that more preventative maintenance protocols are required to keep them operating reliably. These preventative maintenance protocols should be regularly scheduled, and all collected data must be recorded for trending analysis. Routine preventative maintenance for hydroelectric generators should include lubrication, generator inspection, and bearing inspection. It is also important to perform a variety of visual inspections, condition monitoring and electrical tests.

## The visual inspections should include:

- Infrared thermal sensing during operation

- Shifts in stator laminations

- High-resistance heating in rotor pole amortisseur winding

- Inspection of rotor bolts

- Loose pole collars

- Delamination of rotor pole winding

- Signs of electrical and mechanical heating

- High-resistance connections in electric buss

- Loose wedges

- Winding lead degradation

- Winding blocking, bracing, and ties

- Signs of Corona degradation due to Partial Discharge

## The electrical testing should include:

- Polarization Index (PI) testing

- Partial Discharge (PD) testing

- Electromagnetic Core Imperfection Detection (EL CID) testing

- Surge testing and Rotor voltage drop testing

- Doble Testing



Some of the analytical methods most commonly used in the maintenance of hydroelectric generators include:



### VIBRATION ANALYSIS

This technique is commonly used to monitor the internal conditions of a given hydroelectric generator. When performing vibration analysis, technicians are able to diagnose, quantify, and work to eliminate or prevent unwanted vibrations, which can cause excessive damage to equipment that is expensive to repair.



### WINDING ANALYSIS

Winding analysis is ideal for identifying winding issues as well as condition-based monitoring of the winding insulation's dielectric strength. Because winding analysis can be used to help estimate the remaining lifespan of a given piece of equipment's insulation system, it is an important component of preventative maintenance.



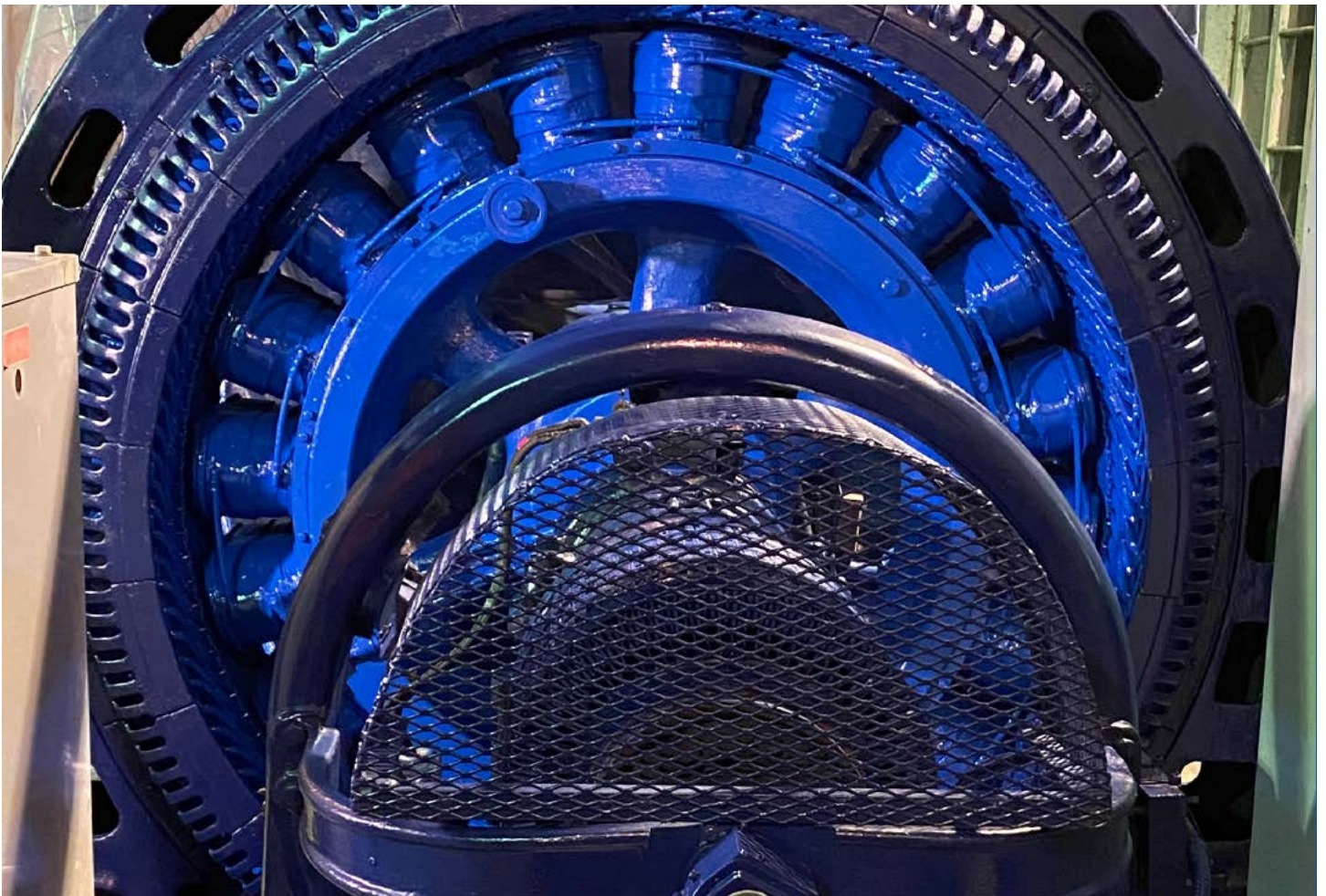
## DYNAMIC BALANCING

Dynamic balancing is a technique that is often used to correct the random imperfections in a rotor's rotational axis that create unbalance. This technique must be used to test and measure any equipment with rotating parts to ensure its accuracy.



## OIL ANALYSIS

While a generator's parts must be routinely inspected, its oil also must be analyzed. Analyzing oil can reveal information about the conditions of rotating machines by uncovering the presence of any impurities, indicating the rate of wear, and quantifying the level of contamination that is present in a given system.



## Common Repairs for Hydroelectric Generators



Common repairs for hydroelectric generators fall into the three following categories:

### PREVENTATIVE REPAIRS

Performing preventative repairs is critical for keeping hydroelectric generators running reliably. For instance, replacing the stator winding wedges in a generator is periodically necessary to assure stator windings remain tight, and it is also necessary to improve the tying, bracing, and blocking of the winding. The insulation should be repaired if it has sustained any damage, such as impact damage or abrasion. Finally, partial discharge monitoring should be performed to assess the severity of insulation degradation caused by partial discharge and avoid an unplanned winding failure.



## REWINDING

Updating the winding of an older generator can offer the opportunity to increase its efficiency and output. Because the rewinding process requires abundant engineering, updating the winding design can either be done in advance or reverse engineering after the stator windings have been removed. Different generators generally utilize different coils; for example, large high-voltage

(HV) generators typically use a resin-rich B-stage coil whose stator slot features semi-conductive material and a gradient located at the transition where the coil leaves the stator. In contrast, large medium-voltage (MV) generators often use a sealed system coil (or occasionally a resin-rich B-stage coil), and small medium-voltage generators can use a vacuum pressure impregnation (VPI) stator coil if they are small enough to be removed from their foundation and sent to a rewind facility.

## ADDITIONAL REPAIRS

In addition to those listed above, some hydroelectric generators may require a wide variety of other repairs, such as:

- Bearing overhaul & re-babbitting

- Brush rigging overhaul

- Rotor re-insulation

- Slip ring repair or replacement

- Exciter repair or rewinding

- Dry ice cleaning of rotors and stators

- Flange face recutting

- Machining hydro shafts and brake rings

## Hydroelectric Generator Preventative Maintenance and Repair Services from Renown Electric

At Renown Electric, we understand that preventative maintenance is deeply important for the success of your business. Our Total Care Support Cost plan allows you to take control of your maintenance by outsourcing your support and preventative maintenance services to us at a fixed and affordable price. Our preventative maintenance capabilities for the hydroelectric sector include inspections, testing, vibration analysis, dynamic testing, winding analysis, and more.

The skilled technicians at Renown Electric work hard to keep electric hydro generators running reliably. We can perform a wide variety of maintenance and repair services, including repairing and rebuilding gearboxes and generators and completing on-site repairs, to help keep your equipment performing its best.



## Contact Renown Electric Today



Keeping a hydroelectric generator functioning at a high level of reliability requires scheduling plenty of coordinated preventative maintenance cycles and timely repairs. Numerous inspections and analyses should be performed to ensure that all generator equipment is meeting industry standards, and any necessary repairs (whether preventative or not) should be performed as quickly as possible to extend the reliability and lifetime of your equipment.

If you need expert preventative maintenance or repairs for your hydroelectric generator, the technicians at Renown Electric can help. With over 35 years of experience, our employees have the certifications and expertise needed to spot problems and devise innovative solutions for a wide variety of hydroelectric generators. If you're interested in learning more about how Renown Electric can help prolong the lifespan of your equipment, [contact us](#) today.



## About Us Page

Founded in 1984 and centrally located in Concord, Ontario, Renown Electric operates from a 25,000 square foot state-of-the-art main repair facility, a 34,000 square foot large motor repair facility with 50 ton cranes throughout, and a 12,000 square foot warehouse dedicated to motor management and inventory of new products. Our team includes over 40 employees who excel in all aspects of electric and mechanical motor repair, remanufacture, overhaul, field service, and engineering support.

We are proud to serve a diverse customer base from a wide range of industries from across the globe. No matter the size of the company, from a small start-up to a massive multinational concern, Renown offers unmatched customer service to support your every step of the way.

Renown is an authorized dealer and service representative for most major manufacturers, so our customers are assured the highest-quality products and repairs. Our engineering expertise and production capability allows us to remanufacture all major AC & DC motors up to 5000 hp.

Our company has CSA Certification for the repair and service of motors and generators in hazardous locations, as well as ISO 9001:2015 certification; we utilize the latest computerized testing techniques to ensure our repairs meet or exceed OEM specifications.

Renown has a large fleet of service and delivery vehicles—including a selection with cranes for simple and prompt job-site pick-up and returns.

Renown's commitment to service extends beyond the reaches of our shop by offering predictive maintenance programs designed to meet the customers' requirements. Programs include on-site laser alignment, balancing, vibration analysis, infrared thermography, oil analysis, non-destructive testing, onsite repairs and rewind services.

To learn more about Renown Electric and the services we provide, [contact us today](#).

Learn more about  
**CoolBLUE**  
**Inductive Absorbers**



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