

# Hydroelectric Generator Repair

If experience in hydroelectric is critical...you have come to the right place

You've got a hydroelectric generator that's gone down or needs repair, and you need to know what to expect before you start trying to find a shop that can handle it (and you've heard that just trying to find a repair shop can be a challenge). Here are the basics of what you need to know about hydroelectric generator repair as well as what to expect as you get your unit back online.

## Hydroelectric Generators

**Hydroelectric generators** are many times synchronous generators (very much like synchronous motors) and are used to convert the mechanical energy from a hydraulic turbine into electricity. While some hydroelectric generators are relatively small in size, the vast majority can be quite massive both in terms of size and weight. Note that the operation and repairs performed on these generators are not that much different from synchronous motors.

## Hydroelectric Generator Repair

The most common repairs necessary for a hydroelectric generator would be rewinding and correcting mechanical problems. However, there are a host of other (sometimes smaller) repairs that are not uncommon for generators. In addition, it sometimes becomes necessary to upgrade a generator to improve output or reliability, especially if it is an older model.

### Rewinding a Hydroelectric Generator

The **rewinding process** begins with a careful inspection that includes measurement of coil dimensions, bracing, and insulation details. These details are collected for the purposes of accurate duplication of the original generator setup or as a starting point for potential design improvements. Remember that these generators have windings on both the stator and rotor, so you must gather complete data on both.

Next, the generator windings are stripped and winding data is gathered and analyzed. After all of the insulation and winding data has been gathered, the

repair shop will have enough information on hand to recommend design improvements. Next comes the actual process of rewinding. Keep in mind there are electrical tests performed progressively through the winding process to ensure winding integrity.

## Repairing Imbalance and Alignment on Hydroelectric Generators

Both **imbalance and misalignment** can be major issues for both motors and generators. The process of rotor balancing (aka, dynamic balancing) begins with collecting vibration measurements from the motor while it is running.

One of the critical tests run during this process is a **spectrum analysis via a fast Fourier transform (FFT)**. This test provides data about the nature of the imbalance as well as whether the imbalance may be related to a structural issue. **Vibration analysis** and multimodal analysis are also important parts of detecting other issues including bearing issues, loose fasteners, broken welds, rotor/stator faults, and resonance conditions.

And keep in mind that just because a generator may be considered old and outdated, that doesn't mean that vibration analysis can't track down imbalance and alignment issues.

### Other Hydroelectric Generator Repairs

Other types of repairs that a hydroelectric generator may need could include the following:

- Machining brake rings and hydro shafts
- Recutting flange faces
- Repair or rewind exciters
- Bearing overhaul (including sleeve, tilt, and guide bearings as well as re-babbiting of existing bearings)
- Repair or replacement of slip rings
- Overhaul of brush rigging
- Dry ice cleaning of the stators and rotors

- Field pole overhaul and re-insulation of rotors

## Upgrades on Older Hydroelectric Generators

It is also common for upgrades to be performed on older model hydroelectric generators and can include several different types of repairs that have already been listed. An upgrade is typically done to increase output, reliability, durability, performance, and efficiency.

## Hydroelectric Generator: Repair in the Field or On-Site?

The major challenge when repairing a hydroelectric generator as opposed to a standard motor or generator lies in the sheer size and weight of the generator. In many instances, these generators are just too big to try to bring into a repair shop for a repair or rebuild. Many shops are limited when it comes to the size of generators they can bring into the shop and the voltage levels they can perform adequate testing on.

The good news is that many repairs can be done on-site -- even including complete rewinds -- while other times it's possible to perform a hybrid **onsite/offsite repair** where at least part of the rewind (or other repair process) is performed in the repair shop. In some cases, however, normal in-shop repairs and rewinds are feasible.

Before selecting a repair shop, you should verify that they can actually work with the size generator that needs repairing and can handle the logistics of moving at least the necessary generator components to their shop.

## HECO Knows Hydroelectric Generator Repair

At HECO, we don't just specialize in electric motors: we also have extensive experience in repairing hydroelectric generators. Over the years, our experienced staff has performed multiple on-site and in-shop tests, repairs, and even rewinds on many different brands and types of generators. In fact, HECO's facility is set up to handle repairs on large generators and motors and

we do generator stator and rotor rewinds, stator core iron replacements, rotor repairs, shaft repairs, and even complete exciter rebuilds.