

ALTERREX* Diode Rectifier Replacements by Nexus Controls

ALTERREX excitation systems were supplied with large steam-turbine generators that shipped between 1965 and 1992. The system consisted of a second AC generator, commonly referred to as the Alterrex alternator, attached to the main unit shaft via a rigid coupling. The output of the Alterrex was then rectified by a set of fixed diode-based rectifier bridges installed in the Alterrex alternator "doghouse." The system utilized a dedicated loop from the unit stator water-cooling system to cool the individual diode bridges. The bridges consisted of 12 or 24 press-pack diode modules delivering high performance and reliability in an efficient form factor made possible by the liquid cooling.

The Problem

Unfortunately, the non-conductive de-ionized water used by the stator is corrosive. The corrosive nature of the cooling water and years of continuous high velocity flow are the root-cause of most of today's maintenance problems. Specific maintenance issues associated with the system cooling components include: thin walling/erosion of the copper pipe used for supply lines and manifolds; fitting erosion; braze leaks; Teflon (black) tubing cracks; O-ring hardening; gate valve corrosion; and copper migration within Teflon® (white) tubes. Aging electrical components are also driving increased maintenance, as diode indicating lights used for diagnostics fail more often than the diodes, causing false failure indications and wasted maintenance time.



The Solution

After more than a 40-year average service life and advances in material technologies, the original diode bridges can be replaced with a modern power conversion system. Nexus Controls has designed a new rectifier bridge for a one-for-one replacement of the original rectifier and mounting in the original cubicle. The new diode bridge is available with a range of on and off-site services to ensure the right level of services to meet plant personnel, budget and outage limitations.



You retain your existing cubicle, overhead bus-work, and cabinet doors. We replace the diode rectifier, replace the on-line repair switch, replace the manifolds with stainless piping

and valves, and provide a new, more reliable diagnostic indicator panel. Nexus Controls is helping you reset the clock on the Alterrex diode rectifiers.

Electrical Scope	On-Site	Factory Installation	
	Field Service	Level 1	Level 2
Remove existing diode banks	X	X	X
Remove existing wiring	X	X	X
Remove existing annunciation devices	X	X	X
Clean/inspect 5-Pole switch	X		
Replace 5 Pole Switch	Option	X	X
Install new diode bridges	X	X	X
Install new bridge wiring harnesses	X	X	X
Install new interface module	X	X	X
Install new annunciator panel	X	X	X

Mechanical Scope	Field Service	Level 1	Level 2
Remove all existing copper tubing	X	X	X
Remove existing isolation valves	X	X	X
Install new stainless steel isolation valves	X	X	X
Install new stainless stator water connection manifold	X	X	X
Flow and pressure testing	X	X	X
Stator water flow calibration	X	X	X

Cabinet Scope	Field Service	Level 1	Level 2
Install new Lamicoid labels	X	X	X
Strip, prep and powder coat cabinets (interior and exterior)			X
Inspect/repair door gaskets			X
Inspect/repair door handles and locking mechanism			X
Replace door-mounted filter racks and filters			X

Features

- Minimum water carrying parts
 - One aluminum heat-sink (with a single continuous stainless-steel tube)
 - Two ball valves
 - Industry standard stainless steel interconnecting tubing
- High-reliability materials: Eliminates all copper, brass and Teflon components.
 - 100% stainless steel tubing for SWC
- High-quality valves and fittings: quick disconnect connections and no rust-prone gate valves
- Standard hydraulic fittings: off-the-shelf products, not high-cost long cycle components
- Easy to repair with all front accessible components

Benefits

The Nexus Controls Alterrex diode bridges can be installed with a new EX2100e Alterrex digital voltage regulator. Replacing the aging analog controls provide improved diagnostics and monitoring of the new diode bridges as well as a host of other performance, diagnostic and reliability features. For Alterrex systems retrofit with legacy digital automatic voltage regulators, Nexus Controls also offers a full line of control migration products (digital front ends) to address again first or second generation excitation systems supplied by GE or other controls OEMs.

Concern	Original AXTERREX Rectifier	New ALTERREX Diode Rectifier
Erosion of copper pipes	Significant problem. Voltages rapidly drive ions into the de-ionized cooling water, causing erosion.	Eliminated. All wetted surfaces are stainless. Heat-sink is grounded, eliminating "ion-driving."
Leaks or blockages at connection points	Significant problem. Depending on the specific model, there are between 20 to 30 hoses per cubicle. Some are small and easily blocked.	Greatly reduced. Only two connections per diode bridge.
Copper tracking along Teflon tubes	Significant problem. Voltages cause copper to track along the inside of the short Teflon tubes.	Eliminated entirely. No Teflon tubes or voltages present to drive tracking.
Bridge diagnostics	Unreliable. Neon lights used for failed-cell indication fail more often than the cells.	Increased reliability. New blown-fuse indicator and single-light with test button is reliable and less susceptible to false positives.
Bridge repair time	Long. The product is crowded and has many water hoses. Also, maintaining diode clamp alignment is tricky.	Short. Easy access to diodes and fuses, and no clamps. Easy access to water hoses.
Product cost	Fairly high. Many expensive and custom parts.	Low. Mostly industry standard parts except for the heat sink
Installation time	Medium. Time-consuming process to remove and replace old, eroded parts	Low. Fewer parts. New wiring harnesses.

We've Been Here All Along

For decades, Nexus Controls, a Baker Hughes business, (formerly known as GE Energy Control Solutions) has successfully delivered turbine and generator control system solutions for power generation customers around the globe. Our team of experienced domain experts leverage a comprehensive portfolio of reliable control platforms to tailor the outcomes to best meet your needs.

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