NATIONAL ELECTRIC COIL®

Our Experience Generates Results!

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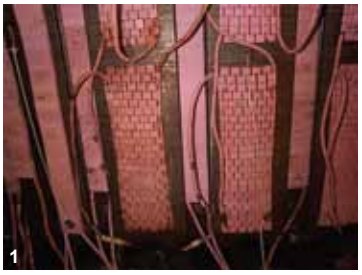
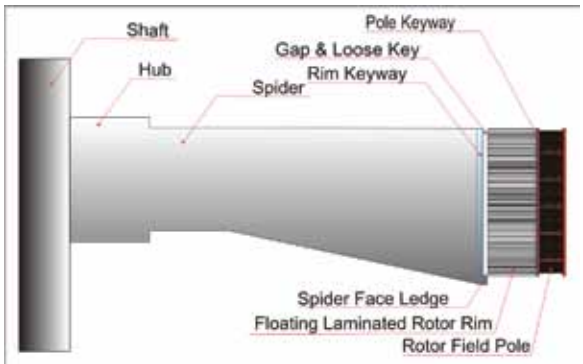
TMM 601: Hydrogenerator Rotor Rim Shrink

Age Causes Deviation from Original Circular Shape

As hydrogenerators age, their laminated rotor rims relax, deviating from their original circular shapes. The tight shrink fit loosens between the end of the cast or fabricated rotor spider arms and the rim. The rim takes on more of a polygonal configuration, and the keys that align the rotor spider end arm to the rotor rim become loose at operating speed. With repeated start–stops and thermal cycling, this condition worsens. It can lead to an irregular air-gap, accentuated magnetic forces between the rotor poles and the stator winding, fatigue, loss of rotor center, balance issues and further deterioration. The radial shrink between the spider and the rim also can loosen due to the centrifugal forces from the mass of the rim. This causes further loss of shrink fit between the rim and the spider keys causing the rim to float.



(1) Heaters applied to outer diameter (OD) of rotor rim. (2) Rim wrapped with blanket insulation. (3) Heating is carefully monitored and controlled. (4) Installing new keys in place. (At top right) Cross section of rotor shaft, hub, spider arm, rim and pole area, shown at running speed.



Rotor Spider & Rim Cross-Section Shown at Running Speed

NEC's Technical Maintenance Memo™ Recommendations

Although called a "rim shrink," the recommended repair does not actually "shrink" the rotor rim. The repair re-establishes the proper shrink fit between the laminated rim and the rotor spider. An overview of the general procedure is as follows:

- Clean the area between the rotor rim and the rotor spider arms to remove all accumulated dirt and trash.
- Take feeler gage readings between the rotor rim and the rotor spider arms and record the readings.
- Level the rotor on the pedestal.
- Perform a laser check of the rotor rim looking at roundness, verticality and diameter.
- Support the rotor rim on jacks for the reshrink.
- Heat the rim and remove the spider keys
- Clean the spider key areas
- Take feeler gage readings between the rotor rim and spider arms in the unshrunk condition.
- Analyze the readings and calculate the new spider key size. This may require another laser check.
- Install larger keys to re-establish the proper interference fit.

Heating of the rim requires careful planning and execution. Temperature spikes could warp the rim, affecting the rotor balance or changing the metallurgical properties of the material. Typically, the rim is heated uniformly by ceramic type resistive heaters applied to the rotor rim. Custom-made heating blankets are wrapped around the rim to retain and distribute the heat uniformly. Temperature recording charts are used to monitor the temperature of the rim at all times at uniform spaces around the circumference. All heating is controlled and monitored.

Experienced Committed Professionals

National Electric Coil specializes in the repair, rewind and retrofit of hydro and fossil generators of all makes and sizes. NEC has done 16 rotor rim shrinks to date for four different hydrogenerator fleet owners: four 36 MVA GE machines, eight 14 MVA GE machines, three 42.5 MVA Westinghouse generators, and one 80 MVA Allis Chalmers machine.

Call Us Today!

If you have additional technical questions, please call or email Bill Moore at (614) 488-1151 x125, bmoore@national-electric-coil.com or Steve Jeney at (614) 488-1151 x105, sjeney@national-electric-coil.com. NEC can help you with the initial inspection for these

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