



NATIONAL ELECTRIC COIL®

Our Experience Generates Results!

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SES 201: Rotor Dovetail Cracking

Application

Rotor dovetail cracks can be initiated by fretting at the interface between steel wedges in the rotor and the surface of the rotor's dovetail-shaped slots. Once initiated, a crack can be further propagated by high cycle fatigue resulting from the flexing of the rotor during rotation. Inspection of dovetail grooves should be done when the rotor is out of the stator.

NEC's Specialized Engineering Solution™

NEC's SES™ provides a sound technical solution to the problem of rotor dovetail cracking raised at quite a few users groups meetings and by recent EPRI projects and related workshops.

The greater the ratio between a rotor's length and diameter (L/D ratio), the more it bends and the higher the probability of fretting and fatigue cracks. Fretting most often occurs in the *Number 1* slots, which have harder steel wedges. Cracks due to this problem can initiate on the load-bearing surface of the tooth where two wedges butt against each other. Cracks occur in the *radial circumferential* plane, as shown in the diagram on the top left. Severe negative sequence current events, such as motoring, can overheat the localized material, significantly changing its properties and accelerating crack initiation.

NEC can evaluate your rotor in terms of its L/D ratio and estimate a probability of finding cracks based on these parameters.

Eddy Current Testing (ECT) of the dovetail grooves is the fastest and easiest means of inspecting for these cracks. ECT can be done with the windings in place, without the risk of contaminating the rotor winding insulation system. NEC utilizes a Teflon "wedge" that perfectly matches the slot and wedge groove

geometry to hold the ECT probe in position during testing. Probe sensitivity and ECT inspection parameters are verified with NEC's own calibration block, which duplicates the Electric Power Research Institute (EPRI) calibration standard.

NEC can also arrange to have a field Ultrasonic Test (UT) done, allowing inspection for crack indications with the wedges and retaining rings still in place.

If repairs are necessary, NEC utilizes a special tool to machine shallow scallops on the dovetail groove's load-bearing surface, removing the cracks in this area. "Preemptive" machining can be done on the load-bearing surface at the intersection with each slot wedge.

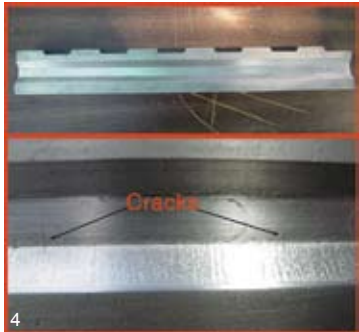
As an additional option, NEC can replace the steel slot wedges above the *Number 1* coils with high strength aluminum wedges. The softer aluminum minimizes the probability of new occurrences of fretting fatigue. A small chamfer is placed on the wedge dovetail to reduce the contact surface between two adjacent wedges that might rub against each other during the bending of the rotor in operation.

NEC Qualifications & Resources

National Electric Coil has specialized in the repair and retrofit of generators for the last 90 years, including the manufacture and re-insulation of rotor windings.

Call Us Today!

To schedule a field or service facility inspection of your rotor, please call or email Steve Jeney at (614) 488-1151 x105, sjeney@national-electric-coil.com. If you have additional technical questions, please call or email Bill Moore at (614) 488-1151 x125, bmoore@national-electric-coil.com.



(1) Diagram shows a typical crack location. (2) Wedge groove galling found on this rotor was not due to fretting fatigue. (3) A Teflon wedge holds the probe for Eddy Current testing steady as it is moved down the slot. (4) Probes are checked with a calibration block (top). Notches in EPRI Calibration Standard block simulate the type of cracks (bottom) to be located. (4) Ultrasonic testing can be done with the wedges and retaining rings still in place.

Specialized Engineering Solution™ 201-IE-1008