

Retaining Ring and Rotor End Stress Analysis

The Retaining Ring on an electrical generator is the highest stress component on the rotor. A number of different configurations exist, which results in different critical characteristics and areas of concern. The concerns can be related to Top Tooth Cracking, Spring Key geometry and Retaining Ring Interference/Clearance.

Structural Stress Analysis of the Rotor is a core capability of EME and a number of proprietary programs have been developed to perform the analysis. Customer supplied inputs to the analysis include:

- Number of Poles
- Material of Construction
 - Retaining Ring
 - Spring Key
 - Rotor Body
- Dimensional Data
 - Retaining Ring
 - ID
 - OD
 - Thickness
 - Rotor Body (Retaining Ring Fit)
 - Centering Ring
 - Spring Key
 - Spring Key Slot
 - Wedge Slot
 - Coil Cross Section
 - Coil Overhang Dimensions

Based on the rotor geometry, materials of construction and rotational speed a stress analysis will be performed through solid modeling or a Finite Element Analysis (FEA). The process for conduct of the analysis typically involves:

- Construction of a three dimensional model of the rotor body, retaining ring, and centering ring in their original configurations.
- Apply known loads and boundary conditions such as retaining ring/rotor body interference fits and centrifugal loads. The centrifugal loads will include all the modeled components and calculated loads from the coils.
- Run the model and document the nominal stresses including stationary and operating speed stresses for comparison.
- Modify the model to reflect any changes in interference fits or other dimensional changes
- Re-run the model using initial loading and boundary conditions
- Compare stresses between modified rotor and original configuration
- Perform fracture mechanics calculations to determine the projected life span of the machine. The fracture mechanics calculations will be done by treating the ground-out section as a thumbnail crack.
- Issue a report detailing the results and recommendations.