



Critical Steam Turbine-Generator Components

REMAINING LIFE ASSESSMENT



Ideal for All Cycled or Base Loaded Units (TOSHIBA & OTHER MANUFACTURERS)

- › Solid/Bored Rotor Forgings
- › Turbine Inner & Outer Casings, Valve Casings, & Steam Chests
- › Inlet Sleeves & Nozzle Box
- › LP Shrunken-On-Disks & Blade Attachments
- › Generator Retaining Rings, Dovetails, Pole Connectors, Tooth Tops
- › ... and more

Turn to **Toshiba**

Life Extension & Safe Operation

Engineering evaluations based on unit operational, NDE, and metallurgical data. Toshiba provides comprehensive remaining life assessments and recommendations for safe and reliable operation of your plant's critical components. Evaluations are backed by experts who have conducted over 1,500 Remaining Life Assessments.

Benefits

- › Increase Equipment Availability
- › Extend Design Life
- › Assess Failure Risk
- › Avoid Unplanned Outages
- › Improve Upgrade/Repair Planning
- › Enhance Inspection Intervals
- › Improve Outage Schedule

toshiba.com/taes

REMAINING LIFE ASSESSMENT

Turn to Toshiba Expertise & Experience

Experts with over 1,500 RLA's performed to date.

- › Quick Turnaround During Outage
- › EPRI Probabilistic Approach & Standard Codes
- › Paper Study Option (No NDE Requirement)
- › Relationship with Major NDE Companies
- › RCA/Failure Analysis Support
- › Design Modification Support
- › Repair Implementation
- › Dedicated Shop & FT Staff
- › Mechanical Testing Lab
- › Large Materials Database
- › Service Bulletins

Delivering Value with a Global Service Area for All Manufacturers


CASE STUDY
01
AUSTRALIA

30-Year-Old 660 MW Toshiba Unit | HP/IP Rotor, HP/IP & Valve Casings


With a major steam path upgrade planned, the long-term structural integrity of the critical components was a concern.

- › NDE Data Study (Boresonic/UT, MT, ET & PT)
- › Creep-Fatigue Crack Initiation Analysis
- › Thermal Stress FEA's for Transient & Steady State Conditions
- › Non-Destructive Material Testing at Critical Locations
- › Probabilistic Creep-Fatigue Crack Propagation Analysis
- › Remaining Life & Inspection Interval Recommendation

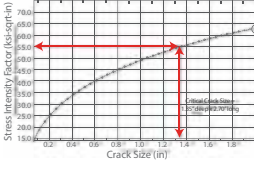
All other component RLA's resulted in long remaining life for steam path upgrade except the IP rotor. Due to significant creep deformation issues, the IP rotor was considered for limited service and a replacement was recommended.



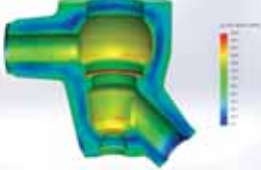
IP Upper & Lower Outer Casing



HP Inner Casing Thermal Analysis



Rotor Bore Critical Crack Size Plot



Main Stop Valve Casing Stress Analysis


CASE STUDY
02
U.S.

50-Year-Old 360 MW Cross-Compound GE Unit | LP Shrunk-on-Disk Analysis

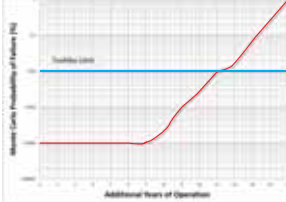
To address concerns about the structural integrity of 10 LP disks

- › Material Testing & NDE Data Study
- › Plant Water Chemistry Study
- › EPRI SAFER Disk Bore & Keyway Stress Analysis
- › Probabilistic Stress Corrosion Growth Analysis
- › Current & Future Failure Probability of All Disks
- › Remaining Life & Inspection Interval Recommendation

The 10-year operating risk was found to be low (<1 failure in 10,000 disks) for all disks after the recommended improved start-up.



EPRI SAFER LP Disk Stress Analysis

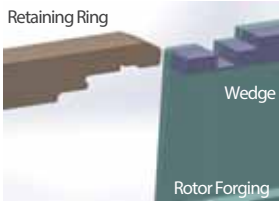


Critical Disk Failure Probability Plot

CASE STUDY
03
GERMANY

Design Modification of Siemens Generator Rotor Tooth Tops

Original tooth tops of generator rotor had low fatigue life due to heavy retaining ring shrink fit and coil loading at running speed. During the outage, significant deformation and cracking was found at tooth top radii. A long ring modification was implemented which increased remaining life from approximately 500 starts to more than 10,000.



Generator Rotor FEA Model

