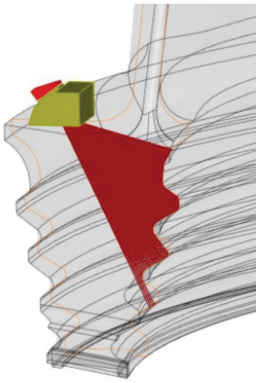
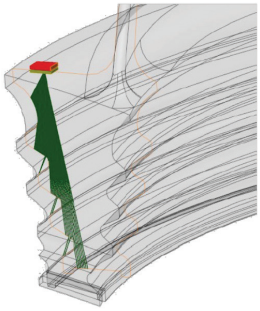
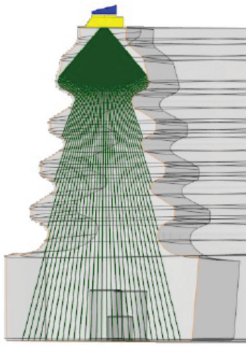
Structural Integrity Associates, Inc.®

STEAM TURBINE
ALSTOM RETROFIT ND48 & ND56 LP
L-0 Blade Root/Steeple Phased Array UT Examinations







Structural Integrity Associates (SIA) provides Comprehensive NDE and Engineering Assessments for Alstom retrofit ND48 & ND56 LP rotors.

SIA provides comprehensive, fully integrated solutions for life assessment, inspection, failure analysis, and online monitoring of steam turbine rotors. SIA has decades of experience and a deep understanding of design, operation, maintenance, and industry issues facing owners of popular designs, including Alstom retrofit ND48 & ND56 LP rotors.

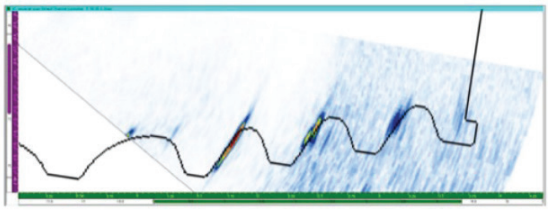
Due to the large blade size and rotation speeds, the L-0 curved, axially mounted blade roots on ND48 & ND56 rotors are subjected to high centrifugal forces. These forces often leave the blade root susceptible to low cycle fatigue (LCF), high cycle fatigue (HCF), stress corrosion cracking (SCC) and result in blade root cracking. SIA performs a proven manual phased array examination of each blade root and steeple to detect and size cracking.

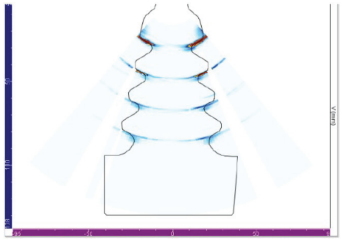
COVERAGE

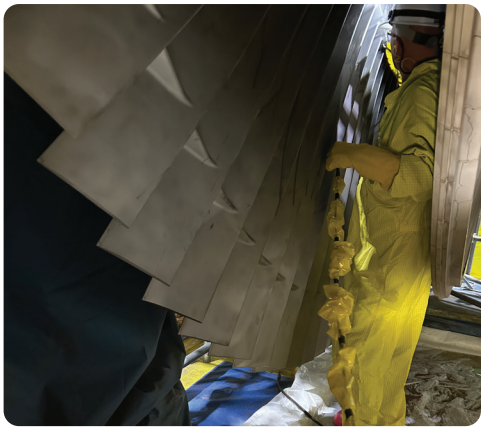
A Finite Element Analysis (FEA) of the blade roots/steeples is performed to screen for SCC and HCF risk zones and to support PAUT/NDE development. The locations of interest are subject to fatigue initiation and stress corrosion cracking (SCC) mechanisms. Using 3D modeling and ultrasonic simulation software, 100% coverage is achieved for areas subject to fatigue initiation and stress corrosion cracking (SCC) mechanisms.

VALIDATION

FEA stress plots of the 3D models were used to develop inspection protocols, ultrasonic simulation software simulated the expected results, and calibration blocks were fabricated to validate the results, for both the blade roots and steeples.







KEY TAKEAWAYS

- Multiple ND48 & ND56 LP turbines inspected to date
- PAUT Inspections completed within 12-hours (per rotor)
- Significant cost savings vs. de-blading, reduced critical path schedule, lower dose accumulation
- SIA's inspection technique is validated by EPRI and recognized by the Nuclear Energy Institute

Structural Integrity provides comprehensive, fully integrated solutions for life assessment, inspection, failure analysis, and online monitoring of gas turbines, steam turbines, generator equipment, and plant auxiliaries. SIA's multidisciplinary team has decades of experience, with deep understanding of turbine-generator design, operation, maintenance, and industry issues. Our holistic approach ranges from proactive management plans to emergent analysis and inspections and offers unprecedented value with an emphasis on maximizing the life of existing assets in a safe, risk-informed fashion.

LET US **DEMONSTRATE** THE VALUE OF AN **INTEGRATED TURBINE & GENERATOR ASSET MANAGEMENT PROGRAM**

RISK ASSESSMENT AND LIFE EXTENSION

- Industry leader in development of advanced analytical tools for rotor lifing
- Hundreds of rotors analyzed, covering every major manufacturer
- Proven capabilities to balance life versus risk to optimize capital planning

ADVANCED NDE

- Decades of expertise with technology development and application
- Faster, less invasive, and lower cost alternative to OEM inspections
- Complete open/clean/close services in combination with trusted partners

METALLURGICAL EVALUATION AND ROOT CAUSE ANALYSIS

- Full-service metallurgical lab for sample characterization and failure evaluation
- Demonstrated expertise in causal evaluation and mitigative actions
- Compressor inlet hygiene assessments

ONLINE MONITORING AND DIAGNOSTICS

- State-of-the-art platform for fleet asset management (PlantTrack™)
- SIIQ™ platform provides advanced hardware and proprietary algorithms for real-time tracking and recommendations
- Data-driven insights to optimize performance and/or avoid damage-likely conditions

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