



Structural Integrity
Associates, Inc.®

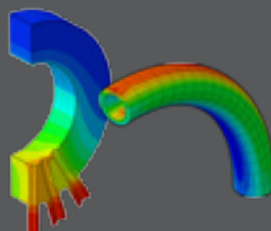
HEAT RECOVERY STEAM GENERATORS



The Heat Recovery Steam Generator (HRSG) is a vital part of a Combined Cycle (CC) plant, capturing the exhaust heat from the combustion turbine and converting that into steam. Being sandwiched between the combustion turbine and steam turbine puts the HRSG in a unique position having to accommodate requirements imposed by both those turbines. As a result, HRSGs experience significant thermal transients, operate under wide range of loads, and experience high steam temperatures and pressures. Consequently, the HRSG can experience a huge range of damage mechanisms. To compound this, many HRSGs were originally intended for base-load operation and are now required to cycle. Modern HRSGs, now feature steam temperatures in excess of 1100F and utilize a number of modern alloys, which bring their own set of challenges. Fortunately, we have solutions to help you with life management of your HRSG.

Our staff have design, assessment and operations experience that can tackle a range of challenges from poorly designed drains or attemperator systems, through cycle chemistry and flow-accelerated corrosion audits to creep-fatigue and oxidation of creep strength enhanced ferritic steels. If a component failure occurs, Structural Integrity has extensive experience with metallurgical testing and failure analysis to identify causative factors to prevent future or recurring failures.

SERVICES HEADER AND TUBING ASSESSMENTS



SI can provide audits of HRSG design and operation to evaluate which damage mechanisms may be active, assess likely lifetime and recommend inspection methods and inspection intervals, or suggest operational enhancement to mitigate damage, or design upgrades that may be worth considering.

CYCLE CHEMISTRY AND FAC AUDIT

Operational and design reviews are performed to provide insight into cycle chemistry and possible concerns with the HRSG and other components in the water-steam system (e.g. steam turbine or condenser).



INSPECTION PLANNING

Working with Structural Integrity's experienced resources allows for fine-tuning of inspection activities without wasting effort on lower-risk components.

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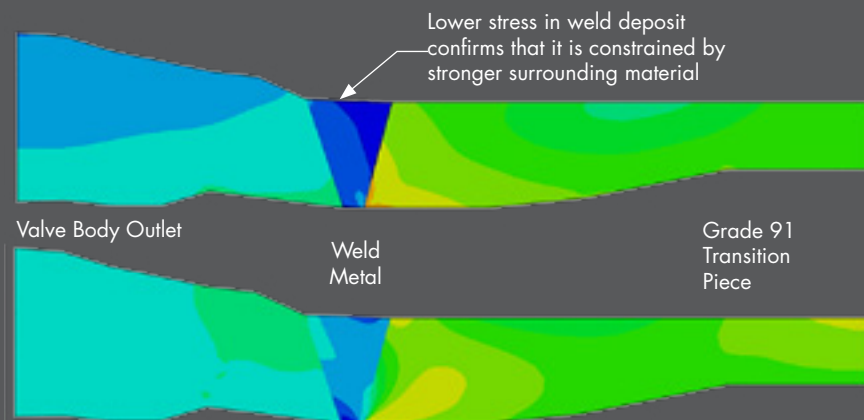
HRSG INSPECTION

With the latest in tools and technologies, Structural Integrity's trained and experienced NDE professionals perform inspections for HRSG tubing, piping, and headers. Our methods and procedures address a wide-range of needs from oxide scale and component thickness measurements to tube and pipe weld examinations using linear phased array and TOFD technologies to specialized inspections for hydrogen damage and corrosion fatigue.



CSEF (GRADE 91) EXPERTISE

Structural Integrity is an industry leader in Creep Strength Enhanced Ferritic (CSEF) steel such as Grades 91 and 92, and we have specific expertise related to the issues that these materials present. Our services address all aspects of CSEF design, procurement, fabrication, installation, operation, analysis, and inspection



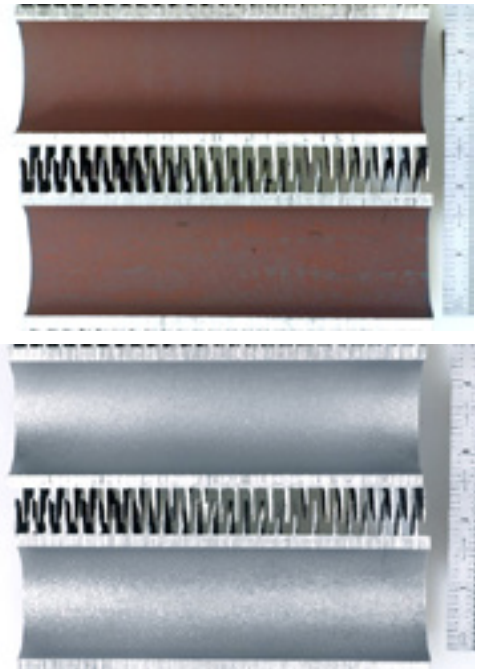
FEA output showing spatial distributions of creep-redistributed von Mises equivalent stress TOP and maximum principal stress BOTTOM in the modeled weldment.

ATTEMPERATORS

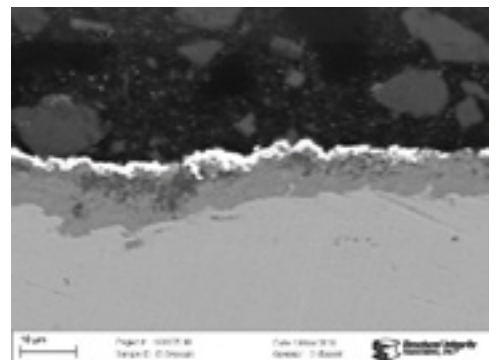
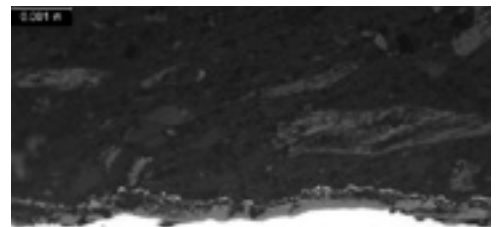
We can review attemperator design, operation, maintenance, and control logic to identify deficiencies, assess the impact and provide advice on mitigations from modified control logic to design upgrades. We also offer online attemperator monitoring software as part of our **PlantTrack** software.



PlantTrackTM
Engineering Insight Through Data



Deposit loading coupons before and after cleaning from tube with light deposits.



Optical metallographic TOP and SEM BOTTOM images through the oxide/deposit layer on the hot side of the tube. The ID surface is facing up in these images. The bright layer along the top of the deposits is from gold coating, which is part of sample preparation.