Structural Integrity Associates, Inc.®

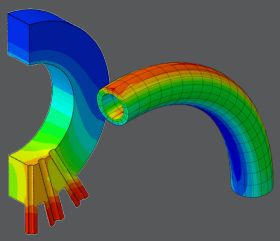
HEAT RECOVERY STEAM GENERATORS

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 heat into steam. Located 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 experiences a large 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 greater than 1100°F and utilize a number of modern alloys, which bring their own set of challenges. Fortunately, Structural Integrity has solutions to manage the life cycle of your HRSG.

Our staff have the design, assessment and operations experience that can tackle the full range of challenges from poorly designed drains on 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 worth considering.

CYCLE CHEMISTRY AND FAC AUDIT

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

INSPECTION PLANNING

Optimize your inspection strategy by reducing the inspection frequency on lower risk components and focusing needed inspections to maximize asset life.

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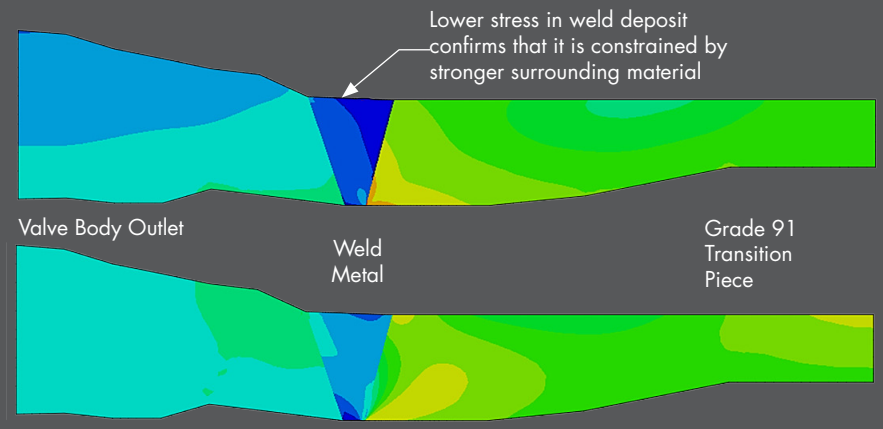
HRSG INSPECTION

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

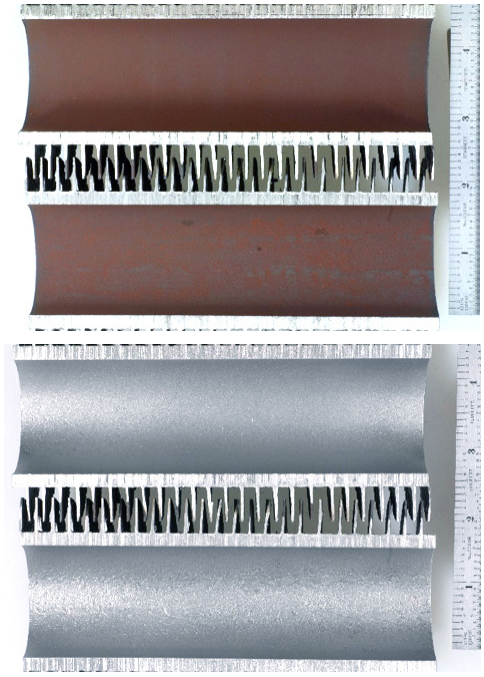
Structural Integrity is an industry leader in Creep Strength Enhanced Ferritic (CSEF) steel such as Grades 91 and 92, and we have specific expertise related to the issues that these materials present. Our services address all aspects of CSEF design, procurement, fabrication, installation, operation,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



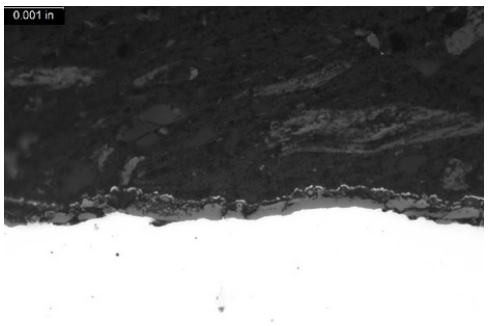
FEA output showing spatial distributions of creep-redistributed von Mises equivalent stress TOP and maximum principal stress BOTTOM in the modeled weldment.

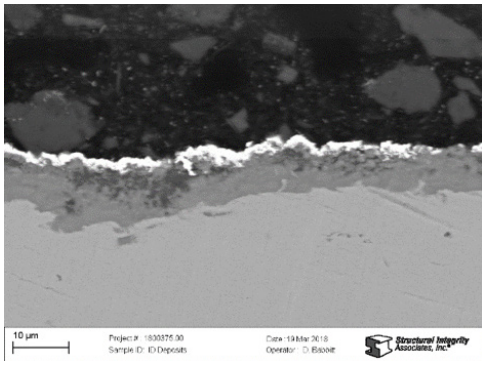
ATTEMPERATORS

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.



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.