

Grade 91 in HRSG's

As many of you are aware, deficiencies in the processing of Grade 91 and other Creep Strength-Enhanced Ferritic (CSEF) steels have been implicated directly in several well-publicized failures, forced outages, construction extensions, and premature component replacements. Recent inspections at several U.S. electric generating facilities detected an alarming number of improperly processed welds and components, and called into question the future reliability of similar critical components throughout industry. The impact of deficient material can be severe, as failures can be catastrophic, replacement material is difficult to procure and refurbishment of major components requires serious disruption of plant operation. Continued operation with components in degraded conditions is only advisable after specific materials testing and analysis that conservatively predicts its behavior using actual plant operating data.

Consistent with our proven leadership on such industry issues, Structural Integrity has formed and partnership with EPRI to provide a focused resource for technical expertise in CSEF metallurgy, assessment methodology, materials characterization and applicable predictive technology. As explained more fully below, the group's mission is to advance the understanding of CSEF issues while making available to industry Structural Integrity's collective expertise to effectively resolve existing problems and prevent similar difficulties in future projects.

Why has our industry performed so poorly in adopting these materials for use? Many of the difficulties are the direct result of a failure to modify entrenched design, manufacturing, and construction practices developed for the successful control of the "traditional" power station materials, such as Grades 11 and 22. Compared to those "traditional" materials, the metallurgical character of the CSEF steels is more complex. The formation of one specific condition of microstructure is essential in realizing the material's enhanced creep strength, and any disruption of that microstructure will substantially compromise the alloy's elevated temperature performance. It is essential, therefore, that at every stage of processing, from original material production to final installation of the component, rigorous control of the material condition is maintained.

Talk of process control is easy, but the effective implementation of such controls for these materials is far more difficult. This is particularly true in a commercial environment where for the past 20 years there has been a relentless drive to reduce front-end costs, resulting in the reduction or complete elimination of quality assurance efforts essential to the successful processing of these steels. The problem has only been

compounded by the loss of technical talent that has been felt in all parts of the industry.

As a service to the industry, Structural Integrity has developed a comprehensive "Life Cycle" asset management program specifically for these materials. The purpose of the program is to provide guidance at every step of implementation, from design, through procurement, to installation and operation. The types of assistance that Structural Integrity offers include:

- Review of component and system design to insure that the unique behavior of the CSEF materials are properly accounted for in design (e.g., the impact of the "Type IV" region on long-term weldment performance).
- Development or review of purchasing/processing specifications, welding programs, and QC programs.
- Vendor evaluation and on-site monitoring
- All aspects of advanced component inspection and testing.
- Life assessment and life optimization through operations review.

If you are considering the use of these materials in an up-coming project, or if these materials already are installed at one of your facilities, then Structural Integrity can help ensure that problems in implementation are minimized and the service life of the components is optimized

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