SPC3. High Temperature Corrosion Behavior Of Nickel Based Weld Overlays

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Introduction

Staged combustion practices in the power generation industry have led to accelerated corrosion of waterwall tubes in fossil fuel fired boilers equipped with low NOx burners. The preferred solution to this problem is to weld overlay a more corrosion resistant alloy on the surface of the tubes. Commercially available nickel based superalloys, such as alloys 622 and 625, have been used for the overlay material. Three candidate weld overlay alloys have been developed by ThyssenKrupp VDM for use in low NOx boiler weld overlay applications

Technical Approach & Results

All weld metal coupons were removed from GTA welds and subjected to isothermal and cyclic corrosion testing using simulated low NOx combustion gases. The nature of the test gases ranged from highly sulfidizing to oxidizing, and both wet and dry gases were used. Short term isothermal, cyclic temperature and cyclic gas exposures were conducted in a thermogravimetric analyzer, to obtain kinetic weight gain data. Long term (up to 2,000hr) test were performed in a horizontal tube furnace. The corrosion scale that formed on the alloys was examined with both light optical microscopy, scanning electron microscopy and electron microprobe analysis.

Conclusions

It was found the alloy that contained the most chromium out-performed the other alloys in all corrosion tests. This alloy also contained the lowest concentration of molybdenum, an alloying element known to promote segregation in weld overlays. It was proposed that the combination of high chromium and low molybdenum are responsible for this alloys excellent corrosion resistance. To fully determine its corrosion resistance, field exposures of tubes overlayed with this alloy are currently being pursued.