Magnetec Monthly Chronicle

Issue No.4 **" FROM THE FIELD "** **April 2005**

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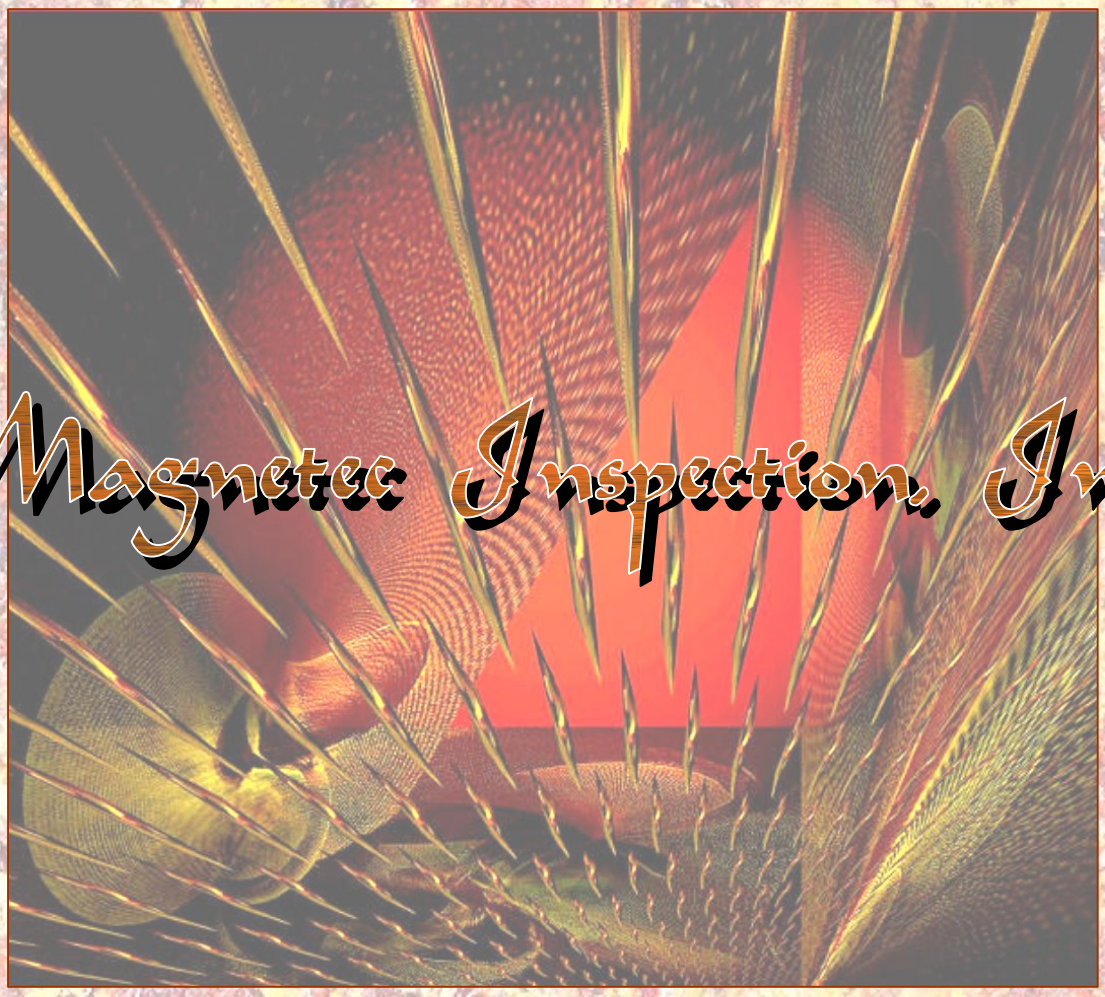

Excellence in Eddy Current Inspection Technology & Failure Analysis

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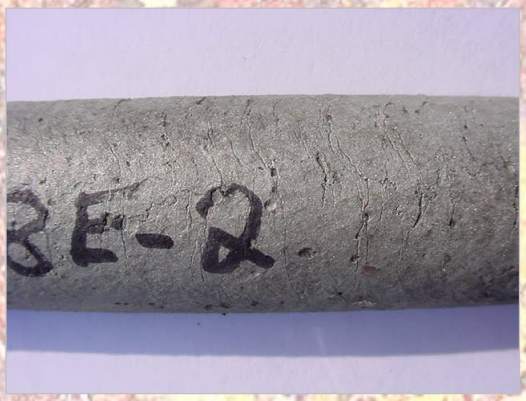
What's This?
Surface Cracking in 2205 Duplex Stainless Steel Tubing?

On a recent inspection trip to a Midwest Oil Refinery, Eddy Current Inspection techniques were applied to a Heat Exchanger bundle from the #1 SAT GAS Unit.

The Exchanger was in service as a Deethanizer Steam Reboiler with a shell side MAWP of 225 psi. at a max. temp. of 250º. ¾" 2205 Duplex Stainless Steel was the material which had replaced the previous SA-789-S31803 tubing reportedly less than 18 months prior. This can be a most common adjustment nowadays if it is felt that the change is necessary and affordable.



2205 is the most widely used duplex (ferritic/austenitic) Stainless Steel grade. It finds applications due to both excellent corrosion resistance and high strength.

The standard S31803 composition, has over the years, been refined by many steel suppliers, and the resulting restricted composition range was endorsed as UNS S32205 in 1996. S32205 gives better guaranteed corrosion resistance as it has good high temperature oxidation resistance.

2205 is not generally suitable for use at temperatures above 300ºC, as it suffers from precipitation of brittle micro-constituents (embrittlement), if it, like other duplex Stainless Steels, is held there for even a short time.

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What was found the time of the ECT inspection, was an apparent heat related stress corrosion cracking, which was to an isolated area at the bundle top front. This area had been darkened by a shell side process affect on that region of the bundle. The condition appeared as though it may have been caused due to localized overheating. Numerous small cracks and micro pitting could be seen on the surface of the tubes there. Some cracks appeared as pit initiated. Metallurgical analysis revealed some cracks to be at or above 50% through wall. This had been unexpected and due to the young age of the bundle, and the high corrosion rate, it was decided to Retube the bundle.

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