Magnetec Monthly Chronicle

Issue No.6 **" FROM THE FIELD "** **June 2005**

www.magnetec-inspection.com

Magnetec Inspection, Inc.

Excellence in Eddy Current Inspection Technology & Failure Analysis

Phone# 815-929-1565 Cell# 847-542-2810 ew@magnetec-inspection.com

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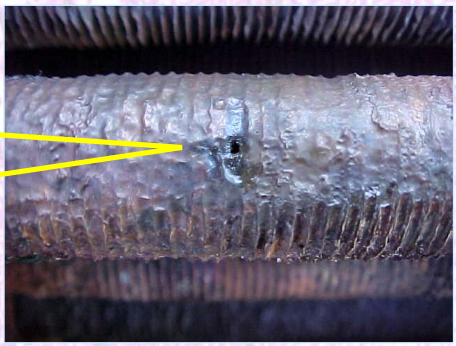
Acid attack/corrosion in Sulfuric Alky unit

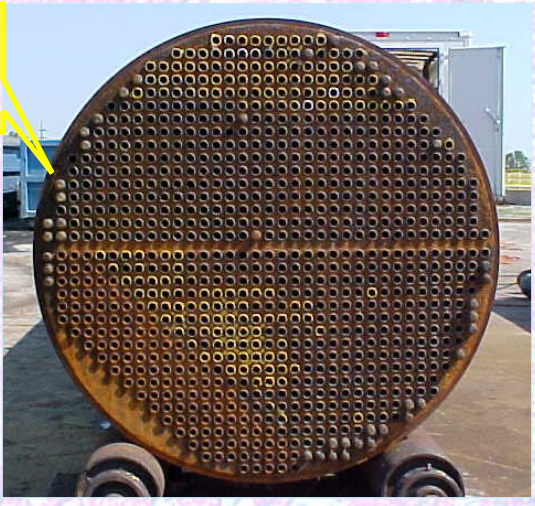
The exchanger is found in a medium sized Mid-East refinery. The bundle was inspected to determine active corrosion mechanism and to aid in life expectancy and service reliability for an expected 3 year operating time frame.

The exchanger operates as a Refrigerant Condenser with 3 other sister/parallel units in a Sulfuric Alky unit. The tubing consists of 884 straight tubes – .750" X .105 min wall X (Partial Carbon Steel remaining from previous retube) SB-111 -443 low fin admiralty brass X 20 Foot long tubing. The exchanger was reported with numerous previous failures and possible active failures prior to shut-down.

There was no previous Eddy current inspection history and the last (2001) external visual inspections found no adverse conditions. Based on service the bundle was not expected to have a severe active corrosion mechanism, however the past plug history alludes to a very active corrosion environment.



Active failure found during inspection process



Previous failures (44)

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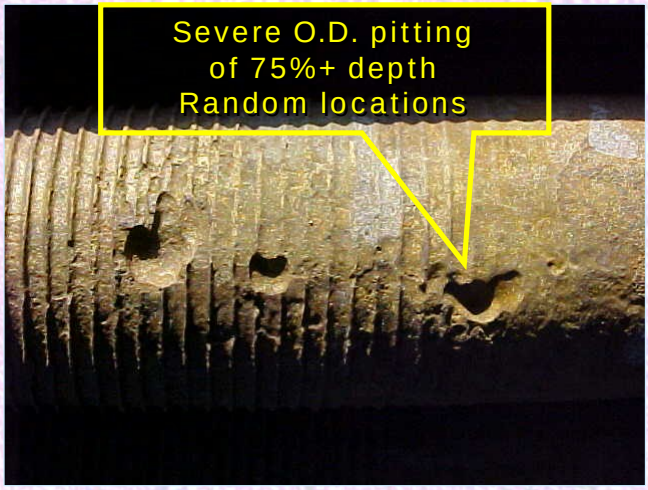
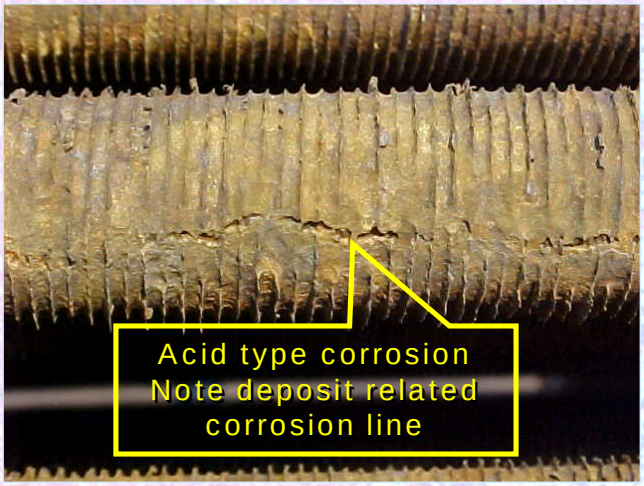
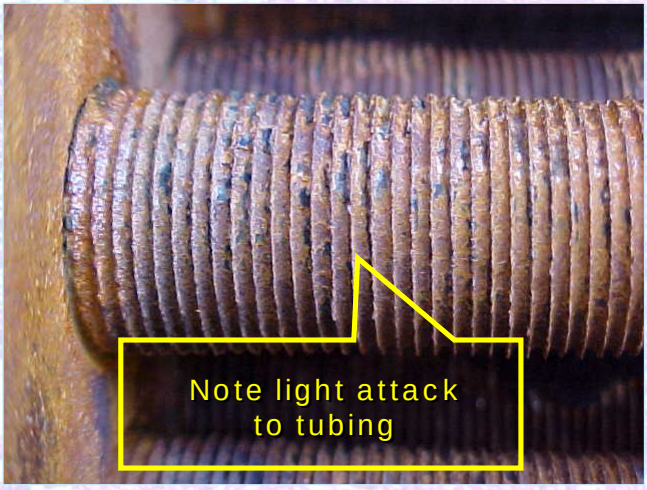
The inspection scheme was performed on 100% of the tubing across the entire bundle matrix with the bundle being previously hydro-blasted and located on the bundle pad. The brass tubing was found to contain O.D. wall loss in the form of severe wastage and isolated pitting across the bundle matrix.

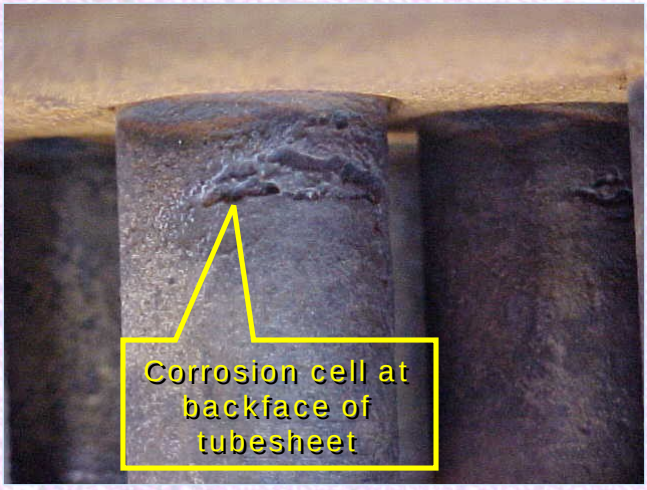




Many detected failures were found across the bundle matrix in random locations along the tube length. The corrosion wastage and pitting is found in heavy concentrations at the approximate center of the tube length which corresponds to the shell side inlet. The bundle was noted with 44 previous plugs and 183 tubes with wall loss/defects of depths 75%+ and 25 active failures. The I.D. surface of the brass tubing was found with no active corrosion or wall loss greater than 10%. The carbon steel tubing could not be inspected due to heavy build-up of calcium type deposits however past history and visual I.D. pits tend to show an active under deposit cooling water type corrosion pattern. The dual metallurgy found in this exchanger

and detected corrosion types tend to show that carbon steel is a good selection for control of shell side acid environment but poor choice for the cooling water service and the brass for poor acid service but good cooling water service. Based on the condition of the tubing and poor resistance of either metallurgies to service conditions the bundle should be replaced with a material upgrade prior to continued service.





Severe attack/wastage Note: Almost no attack to carbon steel components