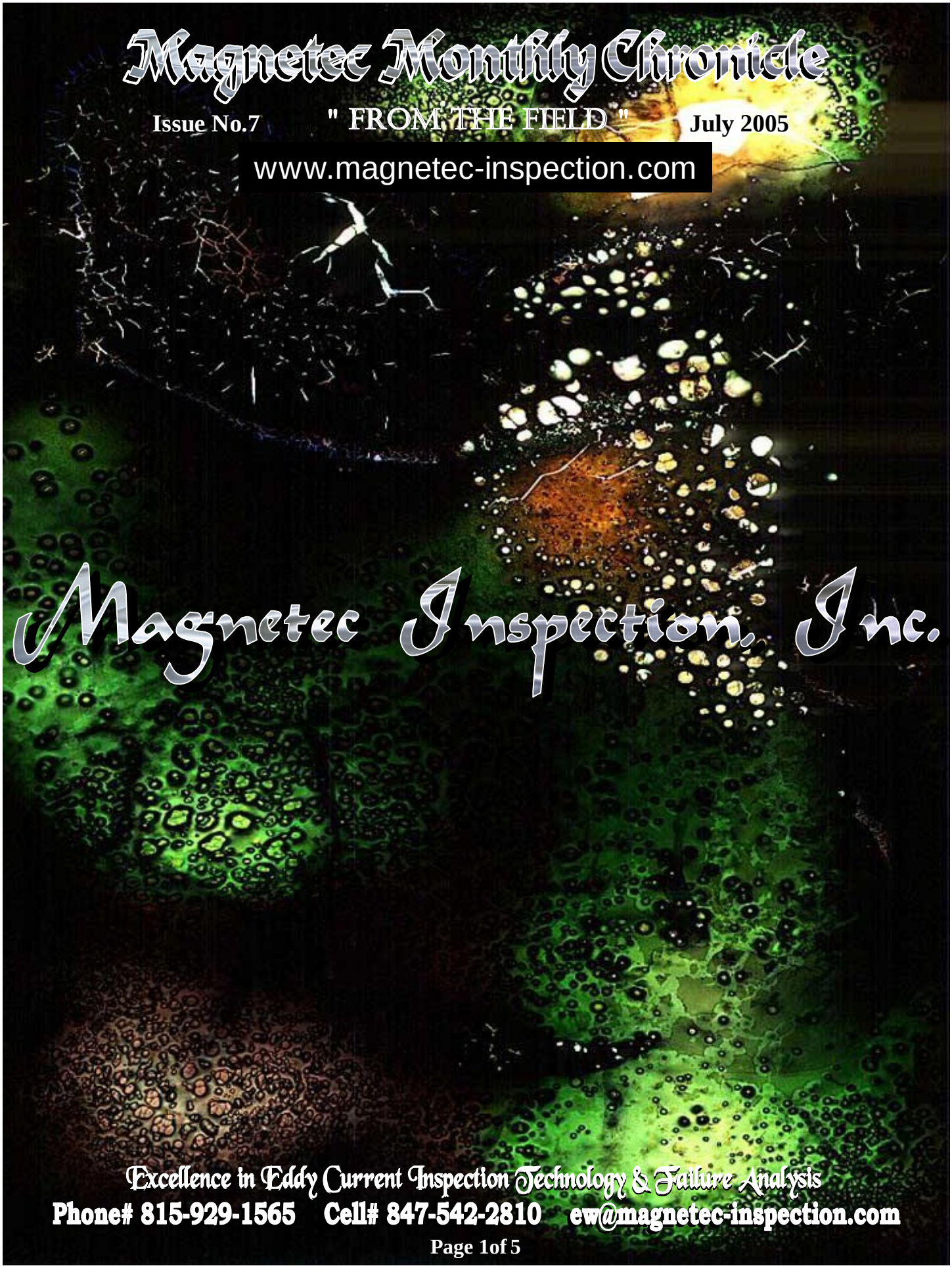
Magnetec Monthly Chronicle

Issue No.7 " FROM THE FIELD " July 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

Magnetec Monthly Chronicle

" FROM THE FIELD "

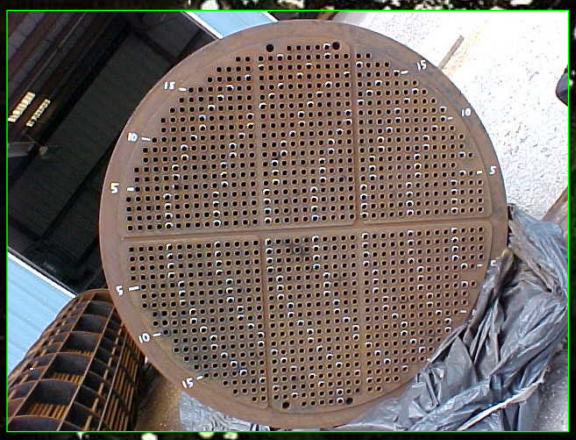
www.magnetec-inspection.com

Issue No.7
July 2005

WOW Only 4 Months of Service!

Subject: Organic acids/salts corrosion in Atmospheric Crude unit

The exchanger is found in a large Gulf coast refinery. The bundle was recently replaced and preliminary visual inspection noted the bundle in good condition and was held for a possible spare bundle.



The Eddy Current Test/RFET was performed to determine active corrosion mechanism and to aid in life expectancy and service reliability. The exchanger operates as a single Vacuum tower overhead condenser in a crude unit. The bundle consists of 555 u-bend tubes – .750" X .095 min wall X SA-214 X 20 Foot long tubing.

The previous bundle(s) history was reported with numerous previous failures and bundle 5 replacements during its 20 service. There was no previous eddy current inspection history for the current bundle and the last (2002') external visual found/reported no adverse conditions. The inspection scheme was performed on 25% of the

Magnetec Inspection, Inc.

Excellence in Eddy Current Inspection Technology & Failure Analysis

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

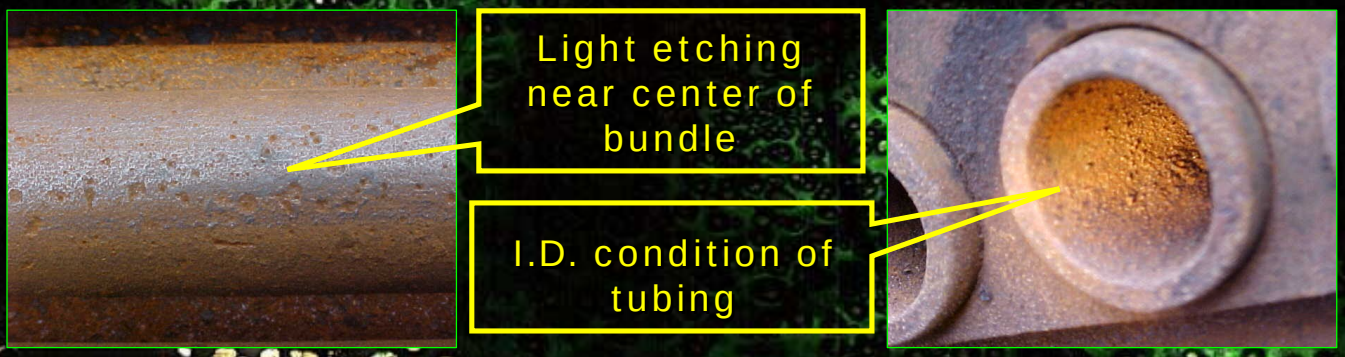
tubing across the entire bundle matrix with the bundle being previously hydro-blasted and located on the bundle pad. The Eddy Current Test detected severe corrosion wastage and pitting in heavy concentrations at the last 1/3 of the bundle length near the u-bends which corresponds to the shell side inlet. The I.D. surface of the tubing was found with no active corrosion or wall loss greater than 10%. The severe O.D. general corrosion extending from the 13th baffle to the u-bends where the most severe attack has occurred.

Top half of bundle adjacent to shell side inlet. Note general corrosion to u-bends

Severe corrosion with depths to 70%. Location is 2nd row into bundle matrix at u-bends

The active corrosion is a combined defect type of single and multiple pit sites within a general corrosion area. The pitting is found in heavy concentrations and inter-connected with adjacent pit sites with depths of 15%-45% in most cases. The general wall loss is noted with the most severe attack on the top half of the bundle near the u-bends with wall loss of 65% at the apex of the bends. The active corrosion mechanism is due to entrained organic acid/salts from the atmospheric OVHD feed laying out on the tube wall and establishing an aggressive corrosion environment. The shell side inlet is found at the top rear of the bundle where process gas enters the bundle matrix and courses through the single segmented baffles towards the

front of the bundle. It is the first 1/3 of the process gas path that the most lay-out of corrosion constituents occurs and the associated heavy corrosion is noted. The corrosion tends to taper and diminish in attack as the process gas works from the back of the bundle to the front outlet.



The past history for this exchanger service has many inservice failures and replacement bundles with service cycles as low as 4 months when 1st tube failure was noted. The history and past Eddy Current inspection has documented the active corrosion mechanism and location which could be controlled by a material upgrade resistant to the corrosion constituents within the process gas. Due to relative young age of the bundle and the severe O.D. corrosion detected the bundle is considered in poor service condition and was retubed with a material upgrade.

Magnetec Monthly Chronicle

Issue No.7 " FROM THE FIELD " July 2005

www.magnetec-inspection.com

Tube and support condition away from corrosion zone

Isolated deep pitting

Isolated and interconnected pit sites

Pitting at u-bends, 40% depth

View of top periphery u-bends adjacent to inlet piping

Excellence in Eddy Current Inspection Technology & Failure Analysis

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