



Condenser and Heat Exchanger
Restoration Systems

Oil Refinery Crisis Averted Thanks To Tube Restoration

Just this past February, a major South Texas oil refinery discovered severe damage (ID pitting) to their Air Cooler tubes while under inspection during a scheduled turnaround. In their present condition, the units were not suitable to be returned to service, putting the refinery – and the post T/A start-up – in jeopardy. Unfortunately, time was limited – and so were their options – since the situation was now “holding up the entire T/A”.

A replacement or retube of these bundles was out of the question due to the time constraints. Enter CTI Industries, who have been successfully repairing heat exchanger tubes – both new and old – since 1976. Plant engineers contacted CTI about their Full Length Tube Liners™, a tube restoration method which had been previously used at numerous refineries worldwide, for oil companies such as Aramco, BP, Chevron, ExxonMobil, Phillips 66, Total, etc.

Material selection for CTI Liners is extremely important, but in this time-critical situation plant engineers knew that they may have to select an alloy based on delivery rather than performance and reliability. However, CTI was able to have the material of choice – C276 – manufactured and delivered on-site within 8 days. This was welcome news for a project that typically takes 8 weeks to procure.

The 3 bundles in question (First Effluent Condensers) consisted of 242 tubes each, Carbon Steel SA-179 (1" OD x 10 BWG x 30' long) with aluminum fins. Due to the high pressure and temperatures (2330 psig/650°F), tubes were seal welded to the tubesheets. The 4-pass coolers were fabricated with header boxes on each end. Header plugs were removed to gain access to the tube ends.

Once the material order was placed, the plant decided to speed up the installation by removing the bundles from their 40' elevation and thoroughly clean the tube I.D.'s. Tube cleanliness is a strict requirement prior to the installation of CTI Liners. In this case, the methods used were HP water lancing followed by an ID abrasive blast. Once cleaned, the bundles were sent to a local fabrication shop where the CTI Liners were to be installed.

After CTI crews mobilized to Texas, the Liner installation commenced – 9 days ARO. With support from the workshop, CTI personnel worked on an around-the-clock basis.

Tube ID's were measured using 3-ball micrometers to determine Liner expansion requirements. The C276 Liner material supplied by CTI also has to meet specific mechanical properties to achieve the required expansion.

The installation process began by inserting Liners into all tubes, with their ends protruding from the header box plug holes (see photo). An expansion chuck - connected to CTI's custom air powered hydraulic Liner pump - is attached at one end of the Liner while a bleed chuck is affixed to the opposite end. The Liner is filled with water and the air is released. The pump pressurizes the water until the Liner is expanded full length to a contact fit with the existing tube I.D.'s. When the expansion process is completed, Liner ends are cut and trimmed flush to the tube ends, then roller-expanded at each tubesheet.



After each unit was complete, it was immediately shipped back to the refinery. All 3 units were successfully "Lined" in 4 days, enabling the refinery to start-up as scheduled and CTI to walk away with the award for, in the words of the Project Manager, "Outstanding performance!"