

C276 LINERS FOR CARBON STEEL AIR COOLER TUBES

In July 2011, CTI Industries, Inc., Orange, CT USA, installed its Full Length Tube Liners™ into new heat exchangers for a major international oil company.

CTI was contracted by Spiro-Gills Thermal Products Ltd., Stafford, U.K., who have been designing and manufacturing heat exchangers since 1946. Spiro-Gills built the three (3) banks of Air Coolers consisting of 736 tubes. The tubes were A179 carbon steel, 1" OD x 12 BWG x 30 ft. long, with imbedded Aluminum fins. The fixed header boxes designed for the units required all "Liner" work to be performed thru the header box plug holes, utilizing long-reach specialty tools – I.D. cutters, milling tools, expanders, tube gauges, etc.

Press Release, Spiro-Gills, 18 July 2011 - **MANUFACTURER PLAYS IT COOL WITH INNOVATIVE SOLUTION**

A company specializing in manufacturing bespoke heat exchange systems for the oil and gas sector is pioneering an innovative technology that offers outstanding protection against corrosion at a fraction of the cost of similar industry solutions.

Stafford-based Spiro-Gills Thermal Products Ltd, which produces a diverse range of heat exchangers, process cooling systems, and finned tubing for heavy industries including oil and gas, petrochemicals, and power generation, has partnered with globally-renowned heat exchanger restoration specialists CTI Industries to develop an exciting new air cooler unit for a major UK oil refinery.

The unit, which will operate in the notoriously harsh temperatures associated with oil processing, has been produced from carbon steel, but the tubing inside will be protected by CTI Industries' patented Full Length Tube Liners™. The Liners, consisting in this case of a nickel-based C-276 Hastelloy, ensure the tubes maintain compressive strength and are protected against corrosion, pitting, and wall-thinning. It is anticipated the technique will extend the lifespan of the unit for anything up to 30 years, and will also dramatically reduce maintenance work, repair and replacement of tubes, and operational downtime.

"Producing an entire unit like this from C-276 Hastelloy isn't feasible, as the cost would run to millions of pounds," Steve Mottershead, of Spiro-Gills, revealed. "However, using a more cost-effective material initially – such as carbon steel in this example – and then employing Hastelloy as a protective lining ensures the unit is given a long-lasting protection against corrosion, at literally a fraction of the price.

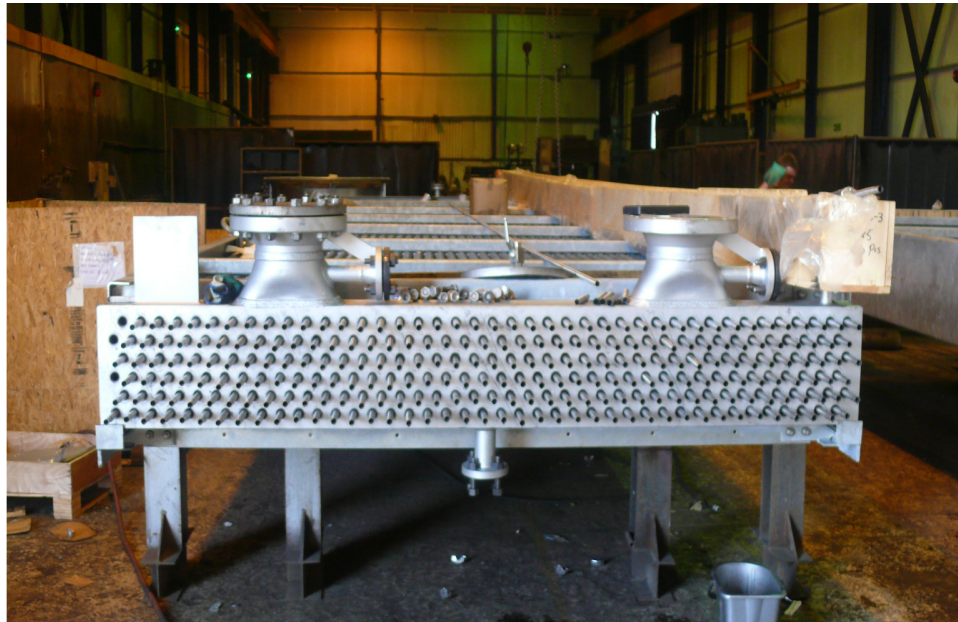
"Whilst the technology utilized in this project has focused on providing a very specific solution to a client's particular problem, there is undoubtedly huge potential for wider-spread use throughout the entire oil and gas sector, due to the winning combination of cost-effectiveness and long-lasting protection."

The CTI Full Length Tube Liners™ (.022" wall thickness) were constructed of C276 material, ASME B626, a Nickel alloy with outstanding erosion/corrosion characteristics in a wide range of severe environments. However, due to the strength of the material and its associated difficulty to expand, special care must be taken with regard to its physical properties such as yield, tensile, elongation, etc. If

the ductility is not properly controlled, the material could burst prematurely or not expand sufficiently to obtain the required metal-to-metal contact with the parent tube.

Once the Liners are installed and successfully hydro-expanded (approx. 6,500 psi), the ends are cut, trimmed flush, then roller-expanded at both the inlet and outlet tubesheets to obtain the required pressure seals.

The C276 Full Length Tube Liners™ also offer an added safety benefit over carbon steel tubes alone. In many refining processes, individual molecules and atoms can diffuse into the carbon steel tubes, forming accumulative deposits. This can create damage in the form of micro-fissures at grain boundaries which can lead to cracks in the tubes. The C276 material can provide resistance to this type of decarburization of carbon steel.



C276 Liners protruding from header box plug holes, prior to expansion.

This is the first installation of its kind in the U.K., however, oil refineries in the U.S.A., Asia and other parts of Europe have achieved similar success in adding C276 Full Length Tube Liners™ to newly built Fin-Fan Air Coolers. When compared to purchasing and installing Nickel alloy finned tubing, one Reliability Engineer from a west coast refinery in the U.S.A. stated “We expect better corrosion resistance with Hastelloy Liners than solid Alloy 825 tubes, and for much cheaper.”