

CTI Industries, Inc.

Life Extension for Heat Exchanger Equipment



**Southern Energy
Contra Costa G.S.
Antioch, California
October, 1999**

**Unit 6, H.P. Feedwater Heater
A Success Story**

CASE HISTORY
NO. U-2615
OCTOBER, 1999

CLIENT: Southern Energy - California
Contra Costa Power Plant
Antioch, CA

UNIT: Unit No. 6, HP Feedwater Heater No. 3
1,167 U-tubes, 304 Stainless Steel
5/8" O.D. x 20 BWG

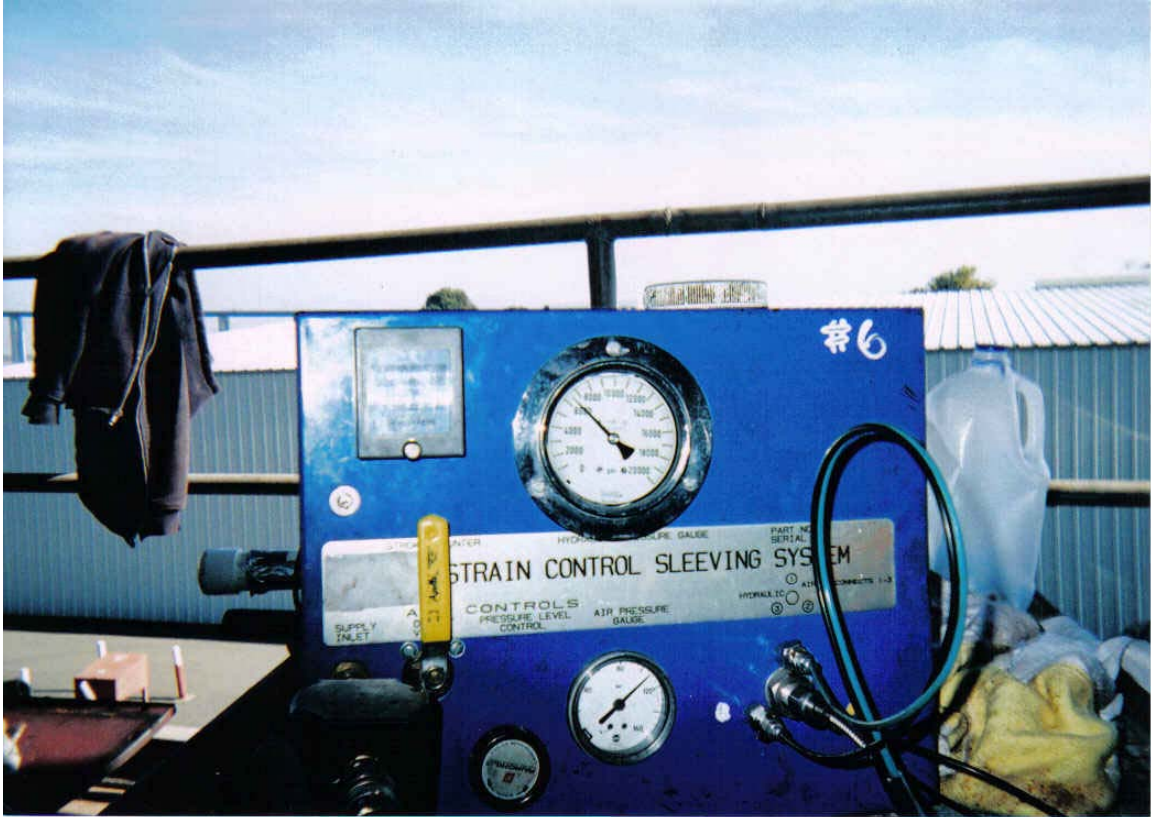
	Tube Side	Shell Side
Design Temperature	540° F	600° F
Design Pressure	3100 psi	675 psi

PROBLEM: Eddy Current testing revealed tube failures in the desuperheating section, approximately 96 inches from the tube ends.

SOLUTION: Installation of 927 CTI Shield/Seals, 110 inches long x 0.020" wall thickness manufactured from Type 316L stainless steel. Shields were hydraulically expanded their entire length and then roller expanded both at the flared end and the exit end. All previously plugged tubes were returned to active circulation.



The No. 6 High Pressure Feedwater Heater at Southern Energy's Contra Costa Generating Station. CTI was contracted to install 927CTI Shield/Seals, 110" long, constructed from 316L Stainless Steel.

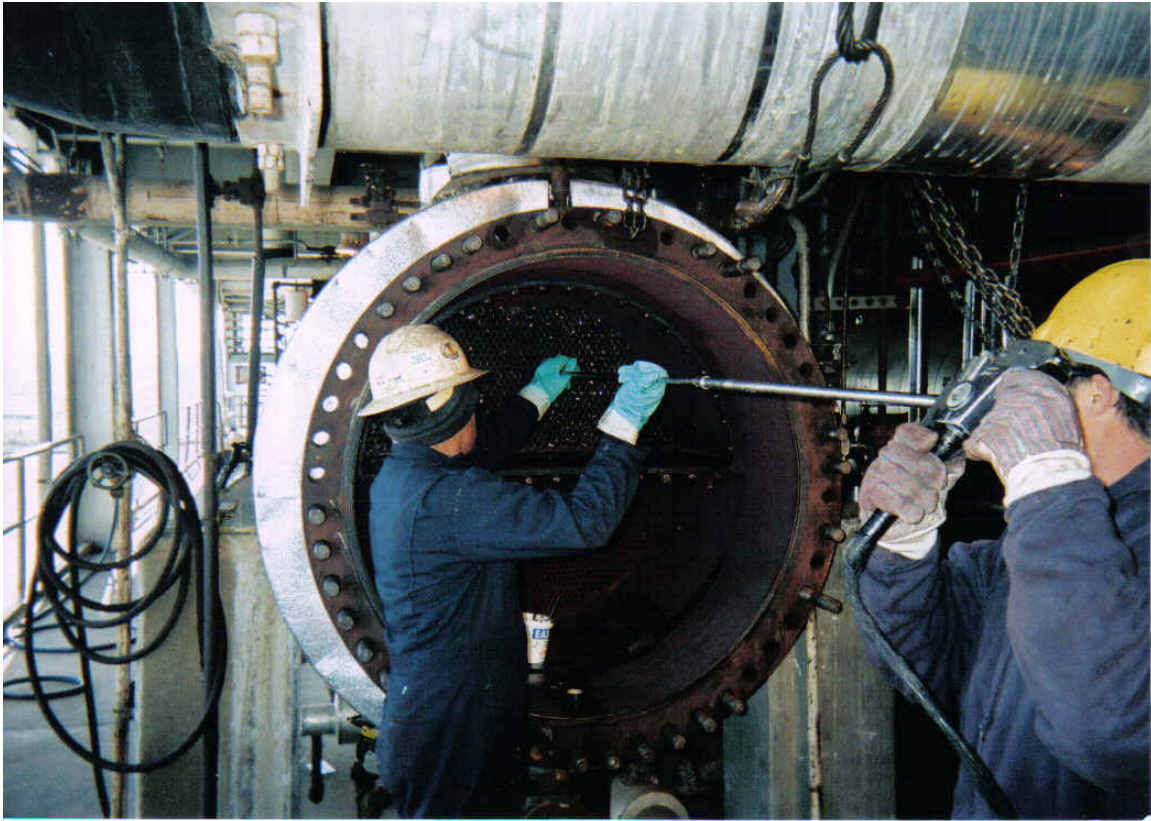


CTI's custom made hydraulic pumps are used to expand the Shield/Seals full length. The pump/mandrel combination is the most effective way to expand the thin-walled inserts into the parent tubes.

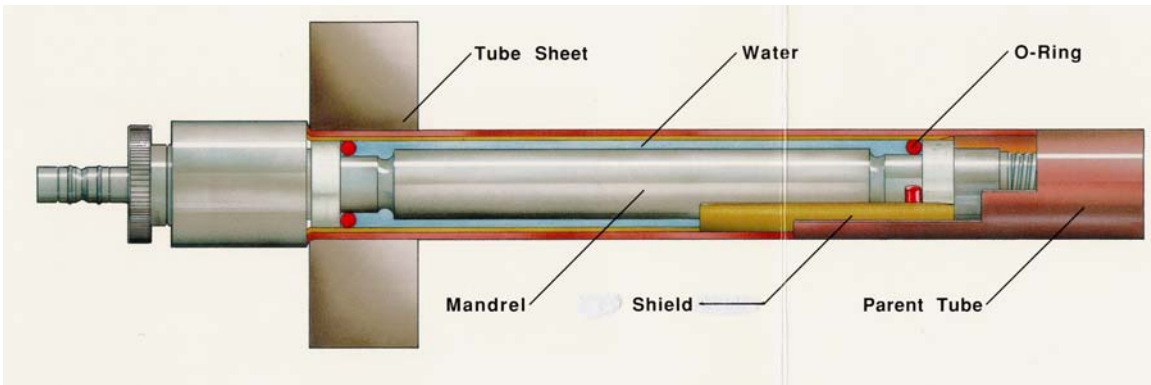
Pressure and volume controlled expansion of the inserts, usually with an .020" wall thickness, means we create a metal-to-metal seat without the risk of over expanding the parent tube. No explosives, no welding, no risk.



The 110" CTI Shield/Seals being installed, and they said it couldn't be done.



The hydroswage mandrel is completely adaptable. With the bleed port located just beyond the tubesheet o-ring seal, it makes no difference whether the insert is 8 inches long or 8 feet long. We can use sectional extensions to accomplish our metal-to-metal seat.

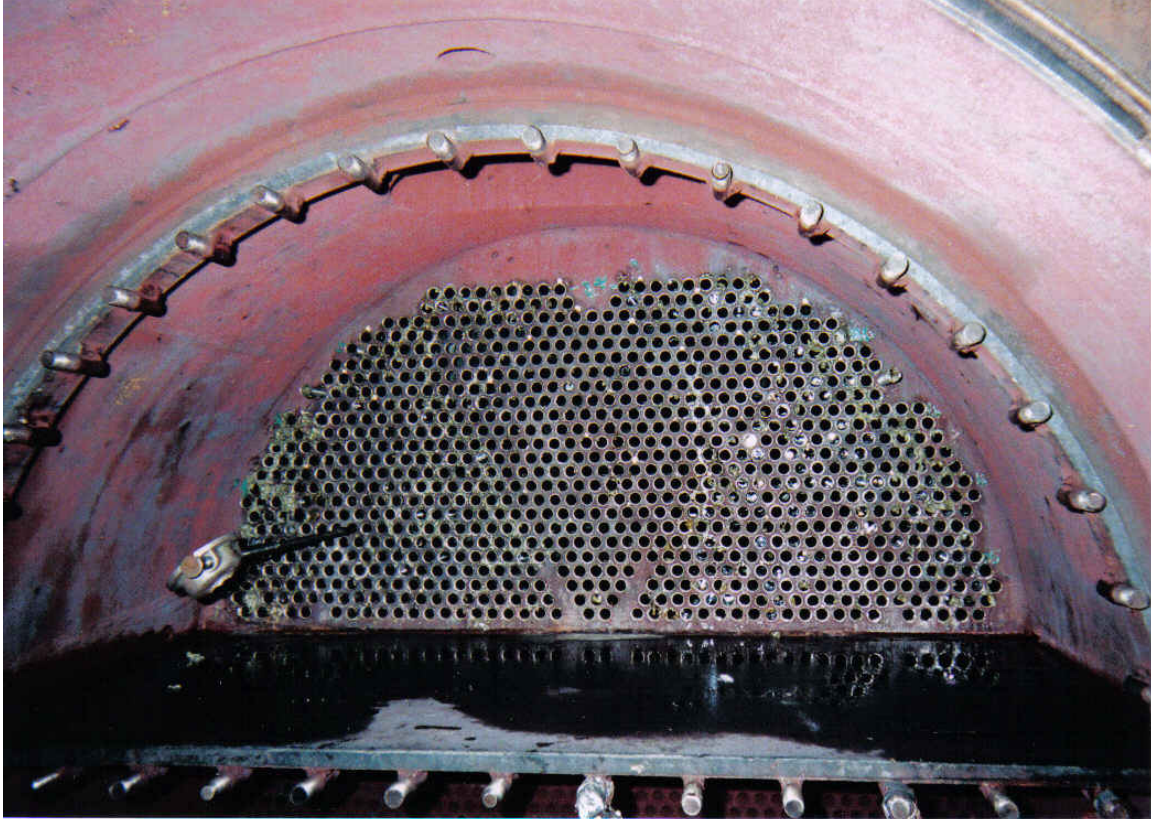




After the Shield is expanded hydraulically, the next step is to mechanically expand the insert at the tubesheet. Roller expansion at the tubesheet results in a leak-free bond while also reinforcing the original tube-to-tubesheet integrity.



The final expansion process is to mechanically expand the insert at the final inch, the discharge end. Deep-end expansion is vital to the success of the process, not only does the deep roll eliminate a transition-step, it also provides a seal. The deep end expansion, in conjunction with the roll at the tubesheet totally isolates any problem area<leaks>, and also protects against any further damage.



When the inserts have been expanded both hydraulically and mechanically, CTI then flares the tube ends to fit the original tubesheet profile. We'll then have the unit pressure tested, cleaned and returned to service. In this application, all leaking/plugged tubes in the desuperheating section of the heater were returned to active circulation.

This repair took place in October of 1999. As of November 30, 2005 it is still in reliable service. CTI has also been contracted to repair other feedwater heaters in the Mirant system.