Heat-exchanger tube relining gains industry acceptance

Leaking heat-exchanger tubes that have been plugged can be restored to service if they are relined with thin-wall metal. The relining process, which has been used in various industries for the past 10 years or so, can help older powerplants maintain their competitiveness by restoring thermal efficiency and avoiding costly tube-bundle replacement (Fig 4). Another advantage of relining vs tube replacement: Liners are flexible enough to be coiled into a confined space prior to installation, making them well-suited to plants with limited access around the tubesheet.

A thin-walled, 0.020- to 0.028-in. liner is inserted into the leaking heat-exchanger tube, either through the entire or partial length depending on the location and severity of damage. The liner is then expanded for a metal-to-metal fit using hydraulic action. Once in place, the end of the liner is trimmed flush with the tubesheet and roller-expanded to conform to the existing tube flare.

Partial-length liners recently were applied at the Tennessee Valley Authority's Sequoyah nuclear power station in an auxiliary cooler. Eddy-current testing had revealed extensive stress-corrosion cracking of the 60-ft long cooler tubes. By inserting 25-ft liners, operators of the 15-yr-old station avoided the expense and downtime associated with heat-exchanger replacement.

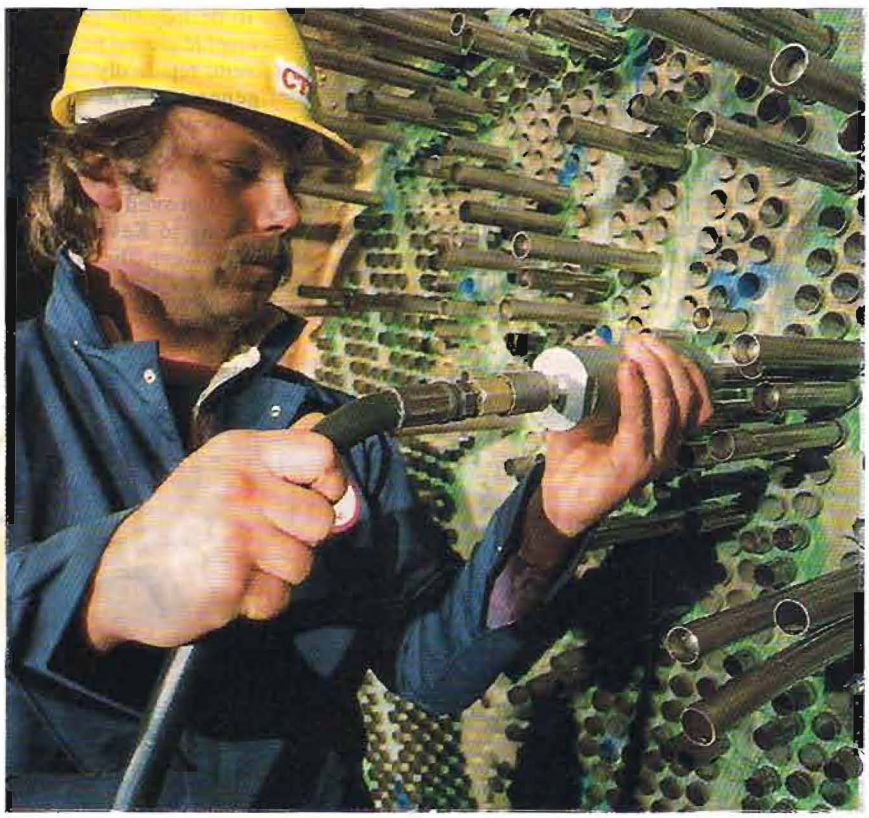
Last month, full-length liners, supplied by CTI Industries, Stratford, Conn, were installed in the Unit 6 main condenser of Commonwealth Edison Co's (Com Ed) Joliet station. Full-length liners typically are applied to main condensers that have 10% of their tubes plugged. At that point, plugging additional tubes incurs a significant heat-transfer penalty. Joliet, a 1680-MW coal-fired facility, had a total of 3830 tubes relined in a 2-wk period. Utility engineers report that the installation went smoothly, and was straightforward enough to be performed by local boilermakers with CTI providing only technical guidance. The relining project is just one aspect of a 20-wk life-extension project currently under way at the 37-yr-old station.

Initial job scope was limited to the condenser's 1500-tube air-removal section. According to Com Ed engineers, the choice between relining and retubing was clear: Retubing the air-removal section would have required removal and destruction of undamaged tubes in other sections of the condenser that were physically in the way.

As planning for the relining project continued, eddy-current testing revealed 2400 tubes outside the air-removal section that had at least 60% wall loss. The utility decided to add these tubes to the relining project, calculating that the entire job could be done for roughly one-third the cost of retubing. Not all of the condenser tubes could be relined, though. Some had to be plugged because the walls were too thin or had actually been severed by ammonia-grooving.

Relining tubes obviously incurs a heat-transfer penalty, compared to new and clean tube surfaces. According to the manufacturer, the penalty is approximately 10%. But as CTI's Terry Quinn points out, the actual heat transfer often is improved, because the tubes being relined were formerly plugged.

Com Ed engineers considered the fuel cost of heat-transfer loss from Joliet's relining project compared to the higher project cost of retubing. They estimated that it would take at least 10 years for the higher fuel cost to exceed the proposed retubing cost.



4. Tube relining may help older powerplants stay competitive by maintaining heat-transfer efficiencies and avoiding costly component replacement

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