

May, 2017

## Tube-In Tube Liners

Return Corroded Tubes to Duty with Very Minimal Downtime!

Curran International's proven repair solution, using full length tube liners for a tube-in-tube repair, maintains tubes in-service – with very minimal downtime.

Curran has executed liner installation during critical turnaround schedules. Using pre-ordered material, this repair strategy has been executed within a matter of work shifts.

Exchanger tube ID corrosion, and tube damage may require that tubes are plugged and removed from continued service; or that repairs are made to maintain equipment integrity. When tube ID propagated corrosion has effected many tubes in a bundle, plugging tubes may not be an option.

**What makes Curran's repair strategy compelling is the liners can be installed and hydraulically expanded in-situ, and on a short schedule.**

The cost-benefit of this repair strategy is optimal when used on air coolers, shell and tube exchangers, surface condensers, because this strategy minimizes schedule impacts, and the costs associated with removing the equipment for repair.

In a traditional exchanger re-tube, existing tubes are pulled and new tubes threaded through existing baffles and tubesheets. With Curran's method, full-length liners are channeled down the existing tubes, making installation much faster.

### Here's How It Works

Curran International provides a turnkey solution for tube cleaning and tube liner installation.

It is recommended that tube inspection, RFT or IRIS, is performed prior to determining the scope for the tube repairs. A predictive assessment of the inspection data will aide in the selection of a liner material.

The liners are installed after the existing tube is clear of debris, excess deposits and scale, and has no mechanical damage. To optimize installation, the existing tubes should

be "RFT" clean. Removing scale and surface deposits from the existing tube ID lowers the risk of deposit corrosion under the liner.

Curran is widely recognized for its dry grit tube cleaning method to render tubes "near white metal" clean.

When installed a length of repair tube extends from each tube end, and tools attached to ends deliver pressurized water to hydraulically expand full-length liner. Curran high-pressure pumps expand liners at 6000–7000 PSI, achieving a hydraulically-mated tube-in-tube. In a minute or less, depending on the size of the tube, the expansion achieves a set diameter.

To view an animation of tube cleaning and liner installation of air cooled exchanger, visit Curran's website [www.curranintl.com](http://www.curranintl.com)

### And, You Can Upgrade Your Alloy Too

When selecting liner material to mitigate future corrosion issues, clients commonly specify an "alloy upgrade." Thin gauge tubing is specified, common wall thickness range from 0.022" – 0.042". Existing corrosion/erosion conditions down-tube are important considerations. Use of a superior alloy means a thin gauge liner can be used as a protective "overlay" – with the existing tube serving as the pressure boundary.

Clients select the material best suited for operating conditions and apparent corrosion issues.

Many tube materials can be used for this repair strategy, common alloys are 300 series stainless steel, duplex stainless, Monel, and Hastelloy®. Steam condenser repairs have been with in-kind Admiralty Brass, or one on the Cu/Ni alloys.

While tube liners offer immediate benefits for exchanger tube repairs, liners add some additional resistance to heat transfer. However, this marginal added resistance is offset by keeping tubes in service.

For more information, please contact Curran International at 281.339.9993; or visit Curran's website [www.curranintl.com](http://www.curranintl.com).

# Keeping Benzene Where It Belongs

**In some instances, defective heat exchangers can have an adverse effect on the environment and/or the personnel working on or around the equipment.**

## As Case in Point

Curran International was recently contracted by a large refinery that was having issues with their Benzene condensers leaking.

Since the EPA has classified benzene as a Group A, known human carcinogen, the plant needed a proven solution to keep the benzene from venting into the atmosphere and creating excessive exposure to plant personnel.

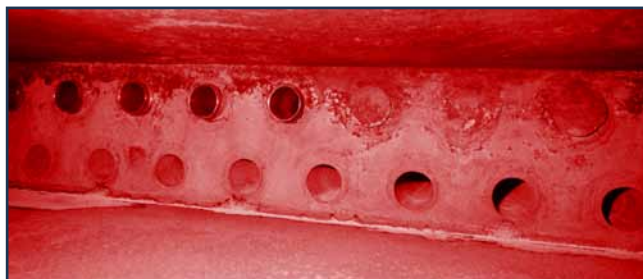
## Curran Arrives and inspects

Upon arrival at the plant, Curran technicians inspected the benzene condensers in question. Curran noted the flow of benzene through the condenser headers was eroding the tube-to-tubesheet welds, which lead to compromised tube joints. Once the tube joints were compromised, the benzene began passing through the tube-to-tubesheet annulus and venting out through the backside of the header tube plate.

After consultation with the plant personnel, Curran was informed that the plant was only experiencing issues with the west-end headers. Therefore, a decision was made to grit blast the west-end header tubesheets, wrappers and covers.

## Cleaning and Coating

Once the grit blast cleaning was completed, Curran applied a coating of Curran 1500 to these components. Curran 1500 is an advanced two-part (100% solids) epoxy coating designed specifically for high temperature immersion service in water and process streams (up to 365 F, 185 C).



Header Tube Plate as Found



Hole at the Tube to Tubesheet Interface

This coating is an organic/inorganic hybrid with state of the art coating technology. Additionally, since the condenser was also experiencing tube leaks, the decision was made to install full length AL-6XN liners.

## Liners are Added

The liners were installed using the hydraulic expansion method. This is done by expanding the liner the full length of the parent tube, using hydraulic pressure ensuring a positive, full length liner to parent tube mating.

## An Unexpected Surprise

Once the repair work was completed, the unit was pressure tested and, at this point, it was noted that the east-end header was failing the hydro test.

This was a surprise to the plant personnel because they had never identified any leaks on or within the east-end header box. Benzene had been venting from the east-end headers for a period of time without being detected by the plant personnel.

The combination of sealing the west-end headers and installing the liners made it possible to locate the defects on the east-end, so that those leaks could be addressed as well. After repairs were implemented by Curran, the plant was able to isolate and repair the leaks on the east-end preventing benzene from escaping into the atmosphere.

If you have any questions or concerns regarding the integrity of your heat exchangers, call the professionals at Curran.

Through inspection and testing services Curran's highly-skilled and experienced technicians provide customers with "peace of mind" that their heat transfer equipment is operating as designed and without issue.

For more information about this article or the services provided by Curran please contact David Grimes 513.222.1501; or [dgrimes@curranintl.com](mailto:dgrimes@curranintl.com); visit the Curran website [www.curranintl.com](http://www.curranintl.com); or call 281.339.9993.



Tube Plate After Coating

# Save on Energy Costs Due to Fouled Boiler Tubes

## Boiler tube cleaning can be a nightmare.

And, if there isn't a good procedure in-place, an expensive nightmare.

Plant maintenance managers take several different approaches as attempts to mitigate this costly maintenance; sometimes directing crews to constantly clean tubes the best way they can, even circling back to the same tube within two days.

Curran has been grit blasting and performing surface prep for more than 30 years. You could say the company grew-up with a blast nozzle. Over the years, by refining blasting methods to work across the range of tubular equipment, Curran has perfected its processes.

Curran's dry abrasive method provides the highest quality clean you can get inside of a tube, and that clean is predictable.

Dry grit blasting is an alternative to water blasting. Dry grit does not react with sulfur deposits that can create a sulfuric acid. Curran grit blasting can work around existing refractory as needed to preserve its installation. Dry abrasive blasting is ideal for these tough jobs.

Curran takes tubes with thick scales and blasts bulk debris from IDs in 30 seconds. What you would find is the more tenacious rock-hard deposits prove grit blasting to be highly effective. Cleaner tubes minimize under-deposit corrosion.

Curran has evolved its tube ID cleaning methods for large boiler and heater tubes that experience heavy buildup due waste gases condensing downtube. Grit flows at a high velocity downtube scouring the tube ID. This has proven to be a very effective method that renders tubes NDE clean, even cleaning pits downtube.

Grit blast tube cleaning allows for more accurate data collection, which, in turn, can lead to more informed inspection analysis.

Once tubes are cleaned, there is a new, innovative foul-release coating that minimizes deposits. By reducing tube-fouling, tube IDs remain clean and maintain operating efficiency.

For use in many non-aqueous services, Curran has developed Curramix, a thin film (less than 50 microns) anti-fouling, ambient-cured coating system. Curramix is thin enough not to affect heat transfer and strong enough to withstand up to 2000F service.

As a result of reduced fouling, under-deposit corrosion will be mitigated. Ideally Curramix should be applied on a newly-fabricated unit to truly enjoy the anti-fouling benefits Curramix provides. However, Curramix can be applied to units that have been in service after being cleaned.

Cleaning and coating services are provided by Curran and can be done in-situ at your next turnaround.

Contact David Lopez for more information about this article, [dlopez@curranintl.com](mailto:dlopez@curranintl.com), 213.268.7648; or contact Curran International at 281.339.9993, [www.curranintl.com](http://www.curranintl.com).



Image of fouled tube ID (L) in sulfur service: risk of under deposit corrosion and impact heat transfer; grit blasted tube (R) facilitates accurate NDE, and returns heat transfer duty. Dry grit does not react with sulfur waste debris, and is highly containable.



# Producing Solid Materials from Small Molecules – The Sol-Gel Process.

At NACE Corrosion 2017 Conference and Exhibition, a paper describing recent work to develop applications using sol-gel-derived coatings was presented.

Sol-Gel coatings, applied to exchangers in very low film thicknesses, improve the repellency of steel substrate in a broad range of fouling services.

Sol-Gel coatings have useful application for “process-critical exchangers” where fouling impacts heat-transfer duty.

Please find the paper presented at [NACE conference Thin Sol-Gel Coatings for Fouling Mitigation in Shell-and-Tube Heat Exchangers](#).

## Curran International is R Stamp Certified!

Recently, Curran International earned The National Board Inspection Code (NBIC) R Stamp Certification.

This valuable certification allows Curran to perform repairs and alterations on a variety of pressure vessels.

A pressure vessel is defined as any tank or vessel designed for operation above 15 psig.

**To obtain R Stamp Certification, Curran had to qualify in accordance with the NBIC Certification Process.**

The NBIC Certification Process required Curran to outline all repair procedures and demonstrate competence in performing such repairs.

Each repair or alteration performed under R Stamp Certification must be thoroughly documented. All related documents are submitted to the National Board and kept on file.

The National Board Inspection Code (NBIC) is a consensus document created by an evolving committee of pressure equipment professionals.

**Currently, Curran performs code pressure vessel repairs for the following industries:**

- Power
- Refining
- Incineration
- Cogeneration
- Petrochemical
- All industries that utilize ASME pressure vessels

## Catch Curran

### AFPM Reliability and Maintenance Conference

May 23 – 26

Ernest N. Morial Convention Center  
New Orleans, LA



**AFPM**

American  
Fuel & Petrochemical  
Manufacturers

### EPRI 2017 Condenser Technology Conference

May 25 – 27

Loews Minneapolis Hotel  
Minneapolis, MN



ELECTRIC POWER  
RESEARCH INSTITUTE

### 2017 Southern Company Generation Technical Conference

August 22 – 24

Birmingham Jefferson Convention Center  
Birmingham, AL

**Generation Technical Conference**  
*Sharing Innovative Solutions*

