



Dear Reader:

Thinking back to conversations during the AFPM Reliability and Maintenance Conference, in San Antonio, and the insights offered by refinery and petrochemical professionals, the common theme was finding solutions for high-temperature fouling and coking.



We are listening.

Curran International is globally recognized for its tube ID protective coating applications. This unique expertise has given Curran an opportunity to work with scientists at the forefront of product development. Together with these scientists, Curran is developing tube coating applications using specially-engineered materials.

It's my goal to develop increasingly reliable, proven applications for specially-engineered materials that take foul-release coatings well beyond their current limitations.

At this time, Curran International is evaluating several new materials for use on heat exchangers and boiler tubes. Lab test results are promising. Field trial use and observation will further refine these promising materials. We will stay the course and continue to work on innovative applications solutions, as well.

As you have read over the last several issues, tube ID coating is only a part of the Curran International story. In this edition, you will read about the breath of exchanger restoration and repair solutions we bring to critical equipment.

## Contents

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### Letter From Ed Curran

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### Protect Your Investment

---

### Heather Hummer is a Big Reason Curran International Has Global Reach

---

### Producing a Quality Coating on a Short Schedule Saves Refineries Millions of Dollars

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## Catch Curran

Meet the Professionals from Curran:

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### ASME Power and Energy Conference

June 26-30, at the Charlotte Convention Center, Charlotte, NC



Also featured is a Curran Team Member, Ms. Heather Hummer, whose work enables Curran's very fast pace. Heather keeps our Field Operations Team ahead of the game.

Curran International is committed to full service and forward thinking.

I look forward to hearing from you.

Sincerely,

*Ed Curran*

Ed Curran



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Curran International  
(281) 339-9993  
[www.curranintl.com](http://www.curranintl.com)

## Protect Your Investment

### Hydraulic Tube Liners and Thin Film Tube ID Coatings Proven Technologies for Prolonged Heat Exchanger Tube Longevity

**Applying a Curran thin-film coating to the ID of your heat exchanger tubes will provide you with more reliable heat exchangers that will provide additional years of active service.**

#### Tube Failure Starts on Day One

From the time a heat exchanger is placed into active service, external factors such as erosion, corrosion and mechanical issues immediately begin to directly affect the longevity of the heat exchanger components, especially the tubes.

As issues manifest themselves and tubes begin to fail, the standard maintenance practice is to simply plug the failing tubes. As the tubes continue to deteriorate and fail, tube after tube is plugged until the percentage of plugged tubes necessitates either a retubing or complete replacement of the heat exchanger.

#### One Can Only Plug So Many Tubes

Although plugging failed tubes would appear to be the easiest and most cost effective approach, when dealing with damaged or defective tubes, plugging of tubes also creates other detrimental issues within the heat exchanger. These issues include poor performance and decreased longevity. For instance, as the plugged-percentage increases the heat exchanger thermal performance suffers proportionally. Additionally, as the plugged-percentage increases tube inlet velocities also increase. This increase in inlet velocities can lead to premature tube failures due to inlet erosion issues.

## Curran Has Two Effective Alternatives

As a full-service, forward-thinking company, Curran International offers services designed to help enhance the longevity of your heat exchanger tubes. Curran's services are specifically designed to maximize the value of your heat exchangers by providing increased reliability while maintaining thermal performance.

The first of these services is thin-film tube ID coating. Curran's coating process involves applying a very thin layer of epoxy coating to the ID of the tubes within your heat exchanger. As part of this procedure, the tubes are prepared using Curran's Proprietary Tube ID Grit Blasting Process.

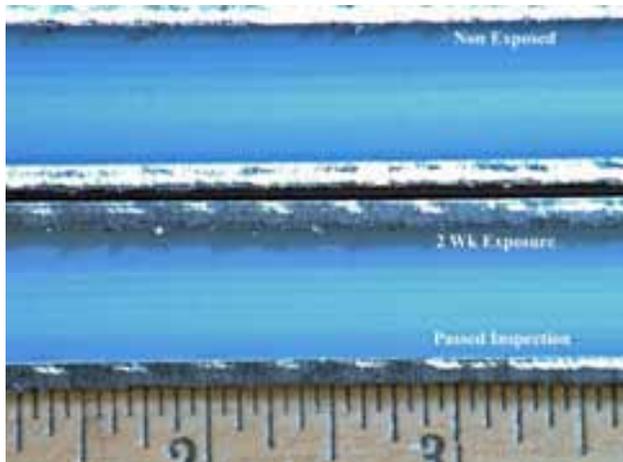
### Curran's Proprietary Tube ID Grit Blasting Process

Curran's tube cleaning method removes all contaminants and active corrosion cells that might be present within the tube ID. The process also provides a good anchor profile for the coating being applied.

### A Superior Coating and Application Method

Once the tubes are cleaned, the coating process involves propelling a coating applicator down the tube ID using compressed air. Curran's coatings have very good capillary action, also known as wicking action. The applicator is designed to promote pushing or forcing the coating into any cracks, pits or through wall holes (depending on size of the holes). This forceful application of the coating fills cracks and pits, seals holes and provides a protective barrier. The coating also has very good boundary release properties, which prevent the coated tubes from fouling as quickly as uncoated tubes. The coated tubes typically run cleaner between planned outages or TAs.

Additionally, the coating provides for more efficient cleaning when the heat exchangers are opened for routine maintenance. Applying a Curran thin film coating to the ID of your heat exchanger tubes will provide you with more reliable heat exchangers ones that will provide additional years of active service. The coating can also be re-applied years later, as needed.



**Split tube with thin film coating applied**



**Stainless steel liner within a carbon steel parent tube**

## **A Second Excellent Alternative to Plugging**

The second of these services is installing either full or partial length alloy tube ID sleeves or liners.

This process also involves preparing the tubes using Curran's Patented Tube ID Grit Blasting Process. As noted, preparing the tubes in this manner removes all contaminants present in the tubes; eliminates any active corrosion cells and returns the tubes' walls to bare metal. This thorough cleaning promotes better heat transfer by facilitating metal to metal contact between the sleeve OD and the parent tube ID.

### **Tubes Must Be Really Well-Cleaned**

Other companies providing this service, typically prepare the tube using high pressure water lancing. This process doesn't always remove all of the tube ID scale. Not removing all of the scale leads to lower thermal heat transfer by trapping the scale in the annulus between the parent tube ID and alloy sleeve OD. Incomplete tube cleaning can also lead to premature failure of the alloy sleeves by creating "hot spots" or from by trapping any remaining active corrosion cell(s) in the annulus between the parent tube ID and alloy sleeve OD.

### **Tubes Are Ready for the Liners**

After the tubes are prepared, they are inspected for cleanliness before the liners or sleeves are installed. Once the tubes pass all QA/QC inspections, the liners or sleeves are installed into the parent tube and expanded.

The liners or sleeves are expanded using the hydraulic expansion method. This method expands the liners or sleeves the full length of the parent tubes closing the air gap between the liners/sleeve OD and the parent tube ID. This eliminates any possibly insulator affect by facilitating 100% metal to metal contact. This process can repair tubes with excessive wall loss, tubes with cracking or pitting, as well as tubes with through-the-wall defects. Once the liners or sleeves have been installed, they are trimmed to the tube sheet face and flared as needed.

### **Professional Guidance and Follow-Through**

Curran's dedicated staff will assist you in selecting a sleeve or liner material that is best suited to the environment in which it will operate. For instance, a more erosion-resistant material such as stainless steel can be installed in tubes that are prone to erosion such as mild carbon steel or brass alloys. Further, Curran typically uses thin wall tubing (.028" or less) in order to minimize any issues with velocities or thermal heat transfer.

Do yourself a favor and contact a Curran professional before plugging your heat exchanger tubes. Your Curran professional will advise you whether or not one of these services might be a good fit for the tube performance / reliability issues you may be facing.

Please note, Curran's overall objective is to help clients maximize the performance and reliability of their tubular heat transfer equipment.

Curran's thin film tube ID coating and thin wall hydraulic liner services both go a long way towards helping achieve this objective.

For more information regarding thin film coating or hydraulic liner installation services, please contact Curran International 281.339.9993 or David Grimes [dgrimes@curranintl.com](mailto:dgrimes@curranintl.com).

[Return To Top](#)

## **Heather Hummer is a Big Reason Curran International Has Global Reach**

Getting a ticket and to the sold out 100th running of the Indianapolis 500, and making the journey from Houston on a long holiday weekend was the result of a well-executed plan.

Being track side for premier event of Indy racing was a "bucket list" event for Heather Hummer, Operations Coordinator, and a well-earned break from the hectic pace of day-to-day "race" she navigates to meet the just-in-time expectations of Curran's clients and the Curran Team.

Curran International's Operations Coordinator is a job that could be described as parts travel agent, equipment logistics and freight coordinator, human resources professional, employee trainer and customer service expeditor. Heather facilitates all the moving pieces that gets Curran's work crews and equipment mobilized and ready to get to work!

Heather, assigned as Operations Coordinator in 2011, has become the hub for all Curran field activity. During refinery and plant turnaround season, she is mobilizing as many as 40 Curran teammates to locations near and far.

In the first half of 2016, Curran work crews were at multiple plants on the Gulf Coast, in Montana, Utah, California, Ohio, Oklahoma, Tennessee, Florida, Hawaii, Santiago, Chile and Mumbai India. That's six time zones with a 15.5-hour difference between Mumbai and Honolulu. Later this summer, Curran manpower and equipment is traveling to Kazakhstan. It's a puzzle of manpower options, equipment logistics and plant schedules Heather puts together seamlessly.

Heather's work is big reason Curran International has global reach.

"Being flexible is a must as the operations assignments and priorities change on a daily, and sometimes, an hourly basis," Ms. Hummer comments.

Field “call outs” often come with less than a day’s notice and Heather’s success, she says, is her systematic approach that pulls together all the pieces. Commercial airline reservations, her experience with flight rescheduling and cancellation policies, local hotels and knowing which of those is preferred by particular work crews, local safety councils, grit suppliers and industrial supply resource suppliers are all components that require detailed coordination.

Heather has a system for keeping track of employee training. A massive field-operations white board denotes her work plan. The white board lists every field job and manpower assignment.

“My biggest job obstacle was taking over as Project Coordinator and not having any systems in place for keeping up with crew safety training. Now, I have a spreadsheet on which I easily track all employee safety training,” Heather noted.

Many think Heather’s success is a result of her tenacity to organize all the pieces, so that they’re moving in a planned, coordinated, harmonic manner.

“Customer needs for Curran manpower require a synchronization of talent, timing and tools. It’s a ‘Rubik’s cube’ of options; and Heather has a track record of lining everything up and getting Curran personnel and equipment to the contractor gate on time,” says Alex Barre, General Manager. “It’s demanding, but it’s what we do,” concluded Alex.

Heather also keeps her leisure schedule full with a wide range of hobbies and passions. Kayaking and camping provide solitude in the nearby sloughs, bayous and creeks of Clear Lake, Texas. An occasional run-in with local reptiles helps keep her balanced. “We’ve seen a lot of snakes and a six foot gator kept alongside my kayak,” Heather remembers.

It’s a good thing she handles pressure well.



**Keep calm, kayak on ... Heather enjoys the quiet, solitude and the occasional reptilian visitor along the bayous and sloughs in the great Texas outdoors!**

When not enjoying the great Texas outdoors, Heather, and her daughters Ashley and Kathy, attend a lot of live music events, from a downtown Houston Symphony Pops Series event to mixing in with crowds at rock and alternative concerts. Heather’s passion for musical performance fuels a commitment she makes to music education in schools.

Two grandkids, Kaitlyn and Dakota, get time from Heather too.

If she could she make the days and weeks last longer, Heather would still be a season ticket holder to the Houston Dynamo. “Unfortunately, our schedule is too full, so we decided to just go to games when we can go,” Heather said.

Watching open-wheeled Indy race cars lap the oval at 165 mph is a hobby for all the family. Attending the race at Texas Motor Speedway, in Fort Worth, has become the backdrop for an annual gathering. But her experience at the Indy 500 last month, with more than 250,000 other race fans, was a once in a life time event.



**Heather on the world famous Indianapolis racetrack, early on race day, with Indy “swag.”**



**Daughters Kathy (L), and Ashley (R), Heather in the middle**

[Return To Top](#)

## **Producing a Quality Coating on a Short Schedule Saves Refineries Millions of Dollars**

A study conducted in 1999-2005 estimated the minimum and maximum annual loss of production due to outages in oil and gas refineries in the Gulf Coast Region. The study stated the lowest impact was at 8.2% and the highest was at 33%. Hypothetically, for a refinery producing 100,000 barrels per day, this loss of productivity means a minimum loss of 8,200 barrels per day and a daily loss as great as 33,000 barrels.

Operating time is a major factor in process units of refineries. Outages can cost companies millions of dollars per day. This fact highlights the need for good planning and effective implementation by everyone involved – including contractors like Curran.

At Curran International we rise to the challenge. Curran understands the need for fast, quality production and products. Unlike other coating companies, Curran fills the need. With a focus on specialized applications and products to impact the major needs of our customers.

During a recent routine plant maintenance outage, plant engineers found aggressive corrosion of exchanger components in cooling water service. Attack on mild steel, likely as a result of a galvanic coupling, was discovered. The severity of this corrosive attack required immediate mitigation.

Based on visual inspection, the plant determined that four brass tube heat exchangers and a total of 17 exchanger head components would be sent to Curran's shop for coating. This "repair" work was unplanned. To meet plant's outage schedule, the key requirement was to have all the equipment coated, cured and ready-for-reinstallation within five days!

As the trucks bearing the exchangers and components rolled into the Curran's shop, shop manager Richard Rodriguez and his crew visually evaluated the substrates for abnormalities that may have required supplemental coating repair.



**Cooling water exchanger bundles as received at Curran shop.**



**Close-up of exchanger tube sheet shows evidence of galvanic corrosion attack, coupling of alloy tube and carbon steel tube sheet.**

Upon inspection, crevice corrosion of the carbon steel tube sheets was found at the joints of the brass tubes. Similarly, Richard and his crew found corrosion-pitting on the channels, primarily on the divider plates. Remnants of an earlier coating application was found on some of the components. These remains of this earlier coating also showed blistering, cracking and adhesion failure.

When Curran's team prepares any piece of equipment for grit blasting, the piece of equipment is rinsed with a surfactant. A post-grit blasting test of C-S-N (Chlorides – Sulfates – Nitrates) is conducted to determine presence of soluble salts on the surface.

It is very important to note, grit-blasting does not remove these contaminants, even where a “white metal” blast is achieved. Chloride salts on the surface of white metal can promote corrosion under the coating and eventually lead to failure. The extra surface prep steps provide best assurance the coating will perform as designed.

Grit-blast preparation achieves NACE 1 “white metal” cleanliness, and a surface profile. All surface preparation results are recorded in the Job Quality Control Log.

Gasket surface machined areas on flanges and tube sheets, as well as tube internals, are protected from the grit blast prep and coating processes. NACE guidance says, “white metal blast surface preparation will increase coating life.” Curran standard blast cleaning achieves SSPC-SP 5 / NACE 1 White Metal Standard, ensuring excellent adhesion and coating life.



**All surfaces were cleaned to “white metal” cleanliness, and surfaces evaluated for soluble contaminants.**



**Coating in progress, epoxy coating encapsulates surface in a protective film; tube end plugs protect from over coating down tube.**

Now, with the preparation complete, before coating, the coolers and additional pieces are taped again and the tubes plugged with sponge balls. This work ensures only the desired areas are coated. Curran 500™ is generously applied to create a high-build in areas on the tube sheet witnessing a lot of corrosion. The same procedure is done to the covers and channels.

To push the coating deep into crevices and pits, the coat is applied with a spatula and smoothed out with 3” brushes. After the high-build dries, it is lightly sanded to create a smoother, more geometric shape. A very light coat of Curran 500™ is applied to give the units a smooth, high-gloss finish. The smooth finish is integral to reduce drag and foul build-up. Even at high temperatures, the smooth finish will maintain its high-gloss.

To cure the coating properly, Curran employs its large, natural gas fired oven. All components are loaded in the oven and force-cured at exactly the correct, low temperature. The coated equipment is wrapped with protective plastic and cardboard to eliminate damage from road debris.

When the coated equipment reaches the refinery, the equipment is ready for an immediate return to service.

From start to finish, the job is handled with care, proper tactics are used and the right product applied. The project, planned for four days, was finished with time to spare.

Curran International's economic solution extends the life of assets, like heat exchangers and steam condenser tubes and Curran's methods are proven to reduce normal maintenance and advance operational efficiency to peak business performance.

To learn more about our protective coating applications and materials recommendations, please contact Curran International 281.339.9993 or David Lopez [dlopez@curranintl.com](mailto:dlopez@curranintl.com).

**[Return To Top](#)**