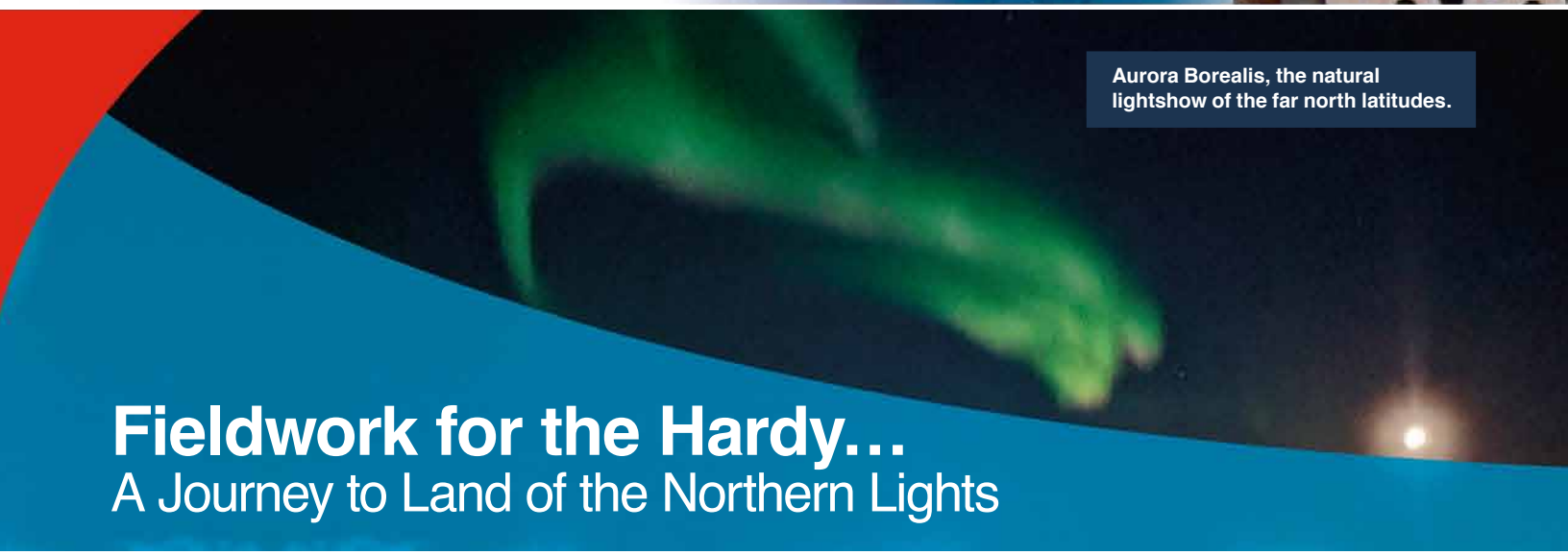
Curran international
Tubular Heat Transfer Services.

March, 2020



Aurora Borealis, the natural lightshow of the far north latitudes.

# Fieldwork for the Hardy…
## A Journey to Land of the Northern Lights

### 300 Miles North of the Arctic Circle

A mid-winter project in the Arctic offered Curran technicians a rare opportunity to experience a natural phenomenon, and days of long nighttime conditions. A Prudhoe Bay pipeline operator approved installation of an anti-foul exchanger coating during a routine maintenance event; and, in January "invited" a Curran crew north to Deadhorse, Alaska, elevation 15 feet, population 25.

The warmest recorded temperature in Deadhorse, in July 2016, was 85 degrees. The length of daylight that far north varies nearly 24-hours over the course of a year.

Fortunately for the Curran Houston-based crew, CCI Industrial Services, a Deadhorse services company, provided a weather-hardened, temperate, maintenance shop where all work was performed. This work included, surface prep and exchanger coating.

### 23-Plus Hours of Nighttime Darkness

Despite the 40-below F. temperatures, the long, nighttime conditions provided the Texas-based crews with a rare opportunity to experience the Aurora Borealis, "Northern Lights." The Northern Lights are the result of collisions between gaseous particles in the Earth's atmosphere with charged particles released from the sun's atmosphere.

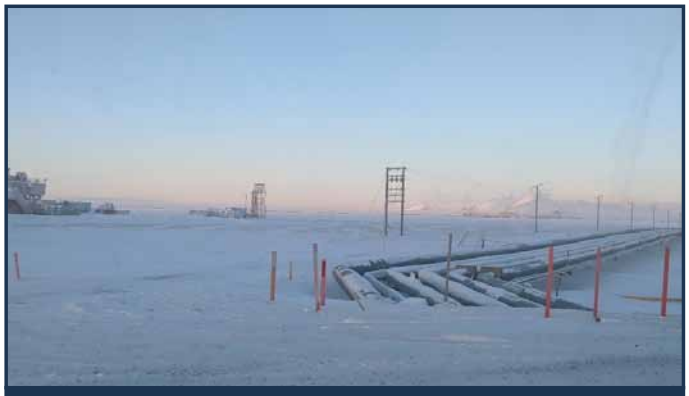
The exchanger operates in produced-water service through tube IDs. The pipe line operator has contended with fouling by following an annual pull-and-clean routine maintenance schedule. The exchanger is in 190F-produced-water service. As one would expect, the by-products of oil and gas wells can have high chlorides, particulates, entrained precipitates and organic compounds, all of which contribute to fouling and corrosion. Of course, exchanger efficiency and reliability are negatively impacted by deposit fouling and corrosion.

### Minimal Thickness Coating Produces Maximum Results

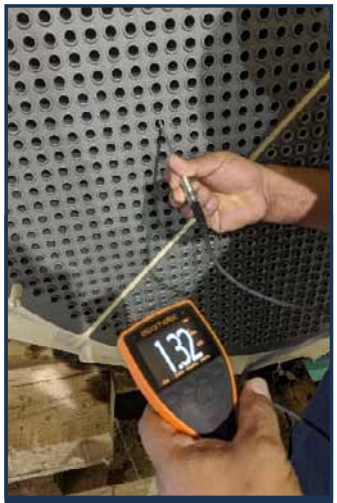
The operating company specified the application of a low-surface energy, omniphobic Curran-applied coating to the full-length tube IDs. The coating improved anti-foul performance of the exchanger. The coating reduced surface tension and foul attachment, and at less than 2 mils, the coating had a minimal impact to heat-transfer performance.

### Put Curran's Portfolio of Coating to Work for You

Call on Curran's application expertise to provide anti-fouling solutions for many services. Contact Ed Curran ecurran@curranintl.com or 281.339.9993 for a review of your operating conditions and fouling coatings.



About 50 days from the Vernal Equinox the Sun stays lows to horizon, daylight conditions are on the increase.




Gauge shows coating thickness, .00132" down tube.


Curran Project Manager at the end of the road in Deadhorse.

# Tools and Tech…
# in Trinidad and Tobago

### 760 Miles North of the Equator. 5,456 Miles Southeast from Deadhorse, Alaska.

A pre-Christmas telephone call from the southern Caribbean led to a January field consultation project for Mike Ferry, Curran International's Houston based senior re-tube and liner specialist.

The Republic of Trinidad, well known for its African and East Indian/South Asians cultures, and as the birthplace of steelpan, the limbo and music styles such as calypso, is the southernmost island in the Caribbean. Elevation sea level to 3,084 feet. Population 1,370,000.

The coldest recorded temperature there was 61.9 degrees. The length of daylight there varies only about one hour over the year.

### An Immediate Response from Curran

The end-client was an offshore production company, operating a platform near Trinidad and Tobago. The operator had an immediate need to refurb several air-cooled exchangers.

### Teamwork Wins

An island engineering and industrial services company subcontracted Curran for technical support. All mechanical and labor support was provided by the local contractor.

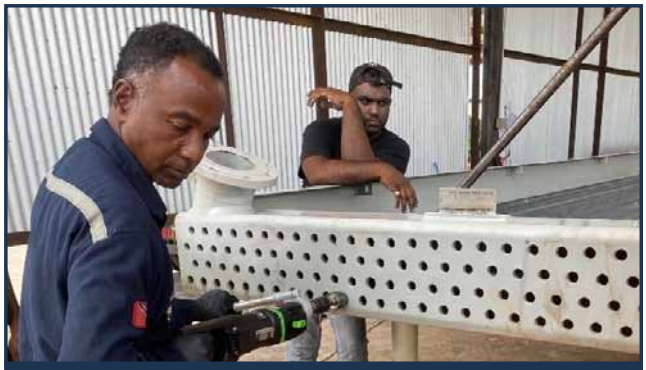
Ten tube bundles were retubed, 688 tubes replaced, and several exchangers required replacement of steel structural supports as part of the 17-day schedule. A hydro-test was performed to meet code requirements for the retube.

### Deadline Met!

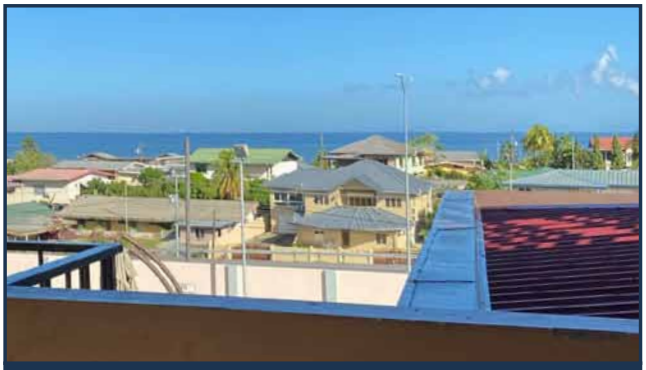
Despite the tight Holiday Season schedule, Curran worked with the prime contractor to source finned tubing within the short lead-time. Just as important, the end client project budget target was met. The exchangers were delivered to the platform for a timely commission startup in February.

The warm weather destination was a trip well-earned!

**To Learn More about Curran Rapid Response,** contact Alex Barre, abarre@curranintl.com, or 281.339.9993



**Local manpower performed all work, Curran provided technical retube support.**



**View from the balcony, balmy weather, warm breezes.**

# Curran Forms Alliance with
# Developer of Anti-Fouling Coatings

## Curran International and coatings developer and formulator Danish Technological Institute (DTI), are collaborating to service clients anywhere in the world.

This collaboration means plant operators save time, money, and increase the efficiency of their heat exchangers.

## Applying a low-surface energy coating to plate heat exchangers, significantly mitigates crude oil fouling.

Crude oil extraction and processing is a demanding process involving numerous complicated steps. Among these steps is the heating and cooling of crude oil, which stabilizes it. The performance of plate heat exchangers, used during this tempering, is endlessly challenged by fouling from crude oil derived-materials, which settle on the heat-exchanger surfaces during these operations.

Fouling reduces the efficiency of the heat exchangers, eventually causing production stoppages for cleaning. These all-too-frequent cleaning cycles entail comprehensive and expensive service processes. In many cases, the largest expense is operational downtime.

The application of a low surface-energy coating to the surface of plate heat exchangers most always reduces crude oil derived-fouling dramatically.

DTI develops custom-made anti-fouling coatings. When used on heat exchangers, these coatings have demonstrated success in extending operating service. Often these service-extensions can be six-times longer before heat exchangers require maintenance service.

## Applications proven on plate and tubular exchangers.

For several years the Danish company, which specializes in thin film heat exchanger coatings, has collaborated with Curran International- a US-based coatings applicator. DTI produces and ships the coatings. Curran International provides application services at one of its global facilities; or at an OEM exchanger-service depot.

The combined resources of formulator and applicator have resulted in several highly successful coating projects for client plate and tubular heat exchangers in-service on global offshore platforms and refineries.

## Successful job at OEM service shop demonstrates joint collaboration.

Recently, DTI and Curran combined resources to support a job for a large energy corporation with an offshore operating platform in Southeast Asia. As part of the plate and frame exchanger routine maintenance plan, the client specified DTI's specialized crude oil repellent coating as well as Curran International's application knowhow.

The collaborative effort was executed at an exchanger OEM service depot proximate to the offshore asset. The service depot provided plant services that supported DTI/Curran collaboration, including low-temperature, forced-cure of the coated plates.

While this was the most recent collaborative project, over the years, DTI and Curran have combined resources to successfully complete a number of significant projects. As this relationship evolved, the two companies have strategically aligned to provide a global one-stop-shop for client-owners.

## Commitment from Corporate Leadership

Claus Bischoff, Director at DTI noted, "we are thrilled to join in this partnership with Curran International. Curran and DTI have worked together on several projects in the past, all of which have been fruitful. DTI had always heard positive things about Curran from other collaboration partners. Since our collaboration had worked so well for several years, the natural next step was to form a joint global collaboration."

Edward L. Curran, CEO of Curran International, credits DTI for its significant formulating and testing expertise to qualify its coating materials for exchangers operating in demanding services.

"Client-owners also realize the benefits of the coating applied at a very thin layer, less than 20 microns. This thinness minimizes any impact to heat-transfer," Mr. Curran said.

Mr. Curran continued: "the commercialization of our joint work provides operators with solutions that increase production, lower energy-consumption, reduce or eliminate cleaning events, and also reduce associated health, safety and environmental risks- offshore."

## Unique and Effective Coatings

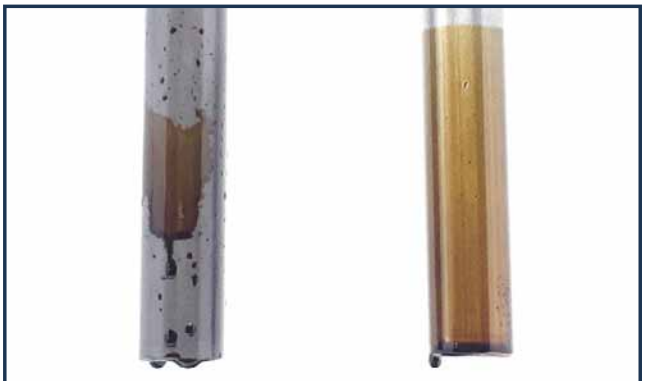
For this most recent application, DTI produced the crude oil repellent coating CORE (Crude Oil REpellent) Coat 030, as well as a primer. The primer was used in combination with CORE Coat 030 to ensure improved adhesion of the coating, when the coating is exposed to media with a high-saltwater content.

CORE Coat 030 is a Sol-Gel based organic-inorganic hybrid coating that can be supplied in a high-solid version for use on shell and tube exchangers; and a low-solid version for plate heat exchangers. CORE Coat 030 provides fouling/scaling reduction. For example, against crude-oil derived fouling, CORE is typically applied in a 5-10 $\mu$m layer.

## Worldwide Reach. Worldwide Service.

Curran International has a long history of providing innovative application methods and materials to heat-transfer equipment. Curran operates globally, executing projects on-site, offshore, and at its facilities in Houston, Rotterdam, Singapore, Edmonton, and India.

**For more information about the DTI and Curran International collaboration**, contact Alex Barre, General Manager, Curran International. abarre@curranintl.com; 281.339.9993.



**Demonstration of the oil repellency of CORE Coat 030 (left) and uncoated tube (right); the low surface-energy coating developed by DTI and applied by Curran International.**

Curran and DuraPol Limited Bring

# Highly-Crosslinked Coatings to the Refinery and Petrochemical Industries

Curran and DuraPol Limited announce an exclusive, worldwide distribution agreement for DuraPol UHT.

DuraPol UHT, 100-percent solids, highly-crosslinked coating can be spray applied in a single coat of 32-40 mils dry film thickness, (DFT). The cured coating has excellent sliding abrasion resistance coupled with a very smooth finish that enhances fluid-flow and prevents sludge build-up.

### At a Fraction of the Cost…

Carbon steel equipment coated with an appropriate DuraPol coating can achieve a level of corrosion resistance on a par with special alloys, cladding and thermal spray; but at a fraction of the cost.

DuraPol Ltd. hybridized novolac epoxy has earned worldwide recognition from the refinery and petrochemical industries as a protective coating with a broad range of chemical resistance- at temperatures as high as 374 degrees F.

DuraPol's formulation has been used for pressure vessels, chemical tanks, scrubbers, sulfur recovery and sour gas treating units. DuraPol UHT has been used to protect steel in a wide range of aggressive process services. These services include, sulfuric acid, hydrochloric acid, amines (DEA, MDEA, MEA), acidic vapor, MEK, toluene, and sodium hydroxide.

### A Special Application of a Special Formulation

As a result of the joint working relationship, and in collaborative development with Curran International, DuraPol formulated UHT Tube Coat™ for exchanger downtube coating.

Curran developed a novel application of this coating for use on heat exchangers. Curran's special application coupled with the DuraPol formulation of a highly-crosslinked hybrid epoxy offers excellent performance at just 12-mils total DFT.

Working in cooperation with DuraPol to support client applications and specifications,

Curran has exclusive worldwide rights to apply and sell UHT Tube Coat™

**Contact Curran International** Ed Curran for DuraPol data sheets and product information, ecurran@curranintl.com or 281.339.9993. www.curranintl.com

DuraPol + Curran international
Tubular Heat Transfer Services.

# Catch Curran

Learn more about Curran's unique, proven coatings, application techniques and worldwide service

### NACE Corrosion Conference and Expo, Exhibit Booth 611

**June 14 – 18**

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### American Fuel & Petrochemical Manufacturers - 2020 AFPM Summit

**August 25 – 27**

Grand Hyatt, San Antonio, TX

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