THANK YOU! Breakfast Sponsor



Industrial Cleaning Sign-In Form



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INDUSTRIAL CLEANING COMMITTEE



CO-CHAIRPERSON: JOSE RAMOS, KURARAY

CO-CHAIRPERSON: BRADLEY COBLE, COVESTRO



VICE-CHAIRPERSON: FRANK G. ROMITO, STONEAGE

ANTI-TRUST GUIDELINES FOR CONDUCTING MEETINGS

IBR appreciates your willingness to be an important part of this organization and the services provided to our industry.

The following guidelines shall be followed in conducting meetings of IBR. This is not an exhaustive list of every possible subject to be avoided; in the event you have doubts about the propriety of any matter to be discussed in a meeting, our legal counsel is available for consultation. Generally, the anti-trust laws proscribe unlawful combinations or agreements. Sometimes "agreements" may be inferred from conduct. IBR wants to avoid even the appearance of impropriety, and this is the spirit of these guidelines.

- Do not discuss the prices of goods or services of any particular company(s).
- Do not disparage the goods or services of any particular company(s)
- Do not recommend the selection of any particular company as a supplier or customer
- Do not urge or counsel that participating companies engage in any concerted activity to accomplish any unlawful purpose, i.e., boycotting any company or coercing a company to take some desired action.
- Do not discuss matters which may be trade secrets or confidential to any company, i.e. don't engage in "off the record" comments or state matters "not to be repeated out of this room".
- Do not propose secret or "rump" sessions after the official meeting is adjourned to discuss matters which cannot lawfully be discussed at the official meeting.
- Do not recommend or sponsor the gathering of statistical data, the publishing of standards, or doing joint research without advance written approval of the Operating Committee of IBR.
- Industry Business Roundtable's purpose is to educate participating companies, so every company represented will be better informed and can make its own individual decisions. IBR members are not required to adopt the IBR recommendations or policies.

Thank you in advance for adhering to these guidelines.



Emergency Exits and Restrooms



Pledge of Allegiance

I pledge allegiance to the flag of the United States of America and to the Republic, for which it stands. One Nation, under God, Indivisible, With Liberty and justice for all.

\star

Texas Pledge

Honor the Texas Flag; I pledge allegiance to thee, Texas, one state under God, one and indivisible.

New Attendee Introductions











NDUSTRY

BUSINESS ROUNDTABL





SAFETY ESSENTIALS + ESPAÑOL

Thoughtfully developed to bridge key English industry terminology with expert Spanish translations and explanations for limited English proficient learners.

Course Code: SE-SAFES Time: 3.5 Hours

- Maintains all technical information in English
- Designed using adult ESL learning methods
- Visual Enhancements to improve comprehension
- Dual language definitions & extended glossary
- Additional knowledge verification focused on industry terms

LOCK = BLOQUEAR TAG = ETIQUETAR TRY = PROBAR









INDUSTRIAL SAFETY ENGLISH ASSESSMENT



TRAINING THE NON-NATIVE ENGLISH LEARNER



Welcome

INDUSTRIAL CLEANING COMMITTEE MEETING

SPEAKER: Pete Dunn, Jr.

COMPANY: Dunn Heat Exchangers, Inc.



PASADENA, TX, 77505



BUSINESS ROUNDTABL

HEAT EXHCANGER CLEANING AND MAINTAINENCE

Overview of different cleaning methods High-Pressure Water Media Blasting Chemical Cleaning Ultrasonic Vapor Phase Thermal Decomposition

Presented By: Peter Dunn



















HIGH PRESSURE WATER CLEANING

In a drive to improve safety and productivity, the company founder decided to begin cleaning bundles onsite in 1972. Initially, field equipment was adapted, before Dunn began to design and build its own waterblast cleaning equipment.





WATERBLASTING



Cleaning of the shell side (OD) using high-pressure water is accomplished by using a remotely indexed series of nozzles.



WATERBLAST LIMITATIONS



Square pitch bundles allow clear paths for the highpressure water to flow through the bundle.



Triangular pitch bundles can be more challenging, as after the first or second row of tubes the water stream will become partially obscured



As square pitch bundles increase in diameter the flow rate must be increased while maintaining pressure to adequately reach the center of the bundle.

WATER LANCING

Waterblast is a term that describes high-pressure water cleaning in an Industrial setting. For most of the Shell and Tube exchangers, off-line cleaning with high-pressure water remains the fastest and most cost-effective cleaning method.





Tube side cleaning is accomplished by high-pressure water exiting a small number of orifices at the end of a lance that is fed through the length of the inside diameter of the tube. Pressures can vary from 2,500 PSI (172 Bar) to 40,000 PSI (2757 Bar).

WATERLANCE LIMITATIONS



Pitting of carbon steel tubes is a known challenge when IRIS NDT is required.

Shown at left is a picture of the ID of a carbon steel tube after the cooling water scale was removed using high-pressure water.

MEDIA BLASTING



Post high-pressure lancing, residual material can quickly be removed with a quick media blast.

4 tubes

IRISNDT

Inspection Results

The inspection was performed from the color coded tube-end on 100% of the tubes as directed by the client. See drawing for orientation.

The results of the inspection are as follows: No wall loss was found in the 4 inspected tubes in either inspection before grit blast or after grit blast.



Color Coded End

SYMBOL	QTY	
0	8 (100%)	
0	8 (100%)	
\bigcirc	8 (100%)	
•	0 (0%)	
\bigcirc	0 (0%)	
	0 (0%)	
•	0 (0%)	
0	0 (0%)	
0	0 (0%)	
	0 (0%)	
	0 (0%)	
	SYMBOL O O O O O O O O O O O O O O O O O O	

CHEMICAL CLEANING



SHELL SIDE FOULANT

For cleaning the shell side of FTS exchangers, circulating a tailored cleaning solution at the proper temperature can be the best option.

For certain applications circulating a tailored chemical solution while the bundle soaks in a large vat can be extremely effective.



CLEANING – VAPOR PHASE



Vapor Phase cleaning at Dunn involves the introduction of a biodegradable solvent in a vapor state heated by steam. Temperatures stay well below 300*F, and the steam helps to carry the solvent deep inside the equipment quickly loosening sticky long-chain hydrocarbons.

ULTRASONIC

Is a type of chemical cleaning in which Ultrasonic generators are used to circulate the solvent. Can be very effective for sticky hydrocarbons that are easily dissolved with inexpensive detergents.





In place of other circulation means the cavitation and implosion effects of the ultrasonic generators regularly expose fresh solvent to the foulant.

ULTRASONIC

As the solvent surrounds the foulant, a layer of saturated solvent is quickly formed.

Just as when bundles are chemically cleaned without the addition of Ultrasonic generators large quantities of concentrated waste is created. Bundles must still be lanced to clean the ID of the tubes.



PYROLOSIS



Polymers and other Hydrocarbons that are unable to be successfully removed with Water-blasting or Chemically Cleaning can be thermally decomposed in a specialty type of furnace. By heating the piecence of process equipment to be cleaned in a controlled environment the foulant can be decomposed into a light ash.

MEDIA BLASTING





COMPARISON OF CLEANING METHODS

	Cost	Time	Shell Side Foulants	Tube Side Foulant s	Drawbacks
High Pressure water	\$	Mid	Most foulants excluding coke, hard polymers, very sticky or gummy materials, severe cooling water scale can also be difficult.	Most foulants excluding coke, and hard polymers. Carbon Steel tubes may need media blasting for accurate top tier NDT.	
Media Blasting	\$	Fast	Not effective	Most effective when performed after high pressure lancing has removed foulant.	Limited applicability
Chemical Cleaning	\$\$-\$\$\$\$ Solvent Dependent	Mid	Most foulants excluding coke, and hard polymers	Most foulants excluding coke, and hard polymers. *Tubes must have some flow to circulate the solvent.	Cost is dependent on type of solvent needed and quantity.
Ultrasonic Cleaning	\$\$\$-\$\$\$\$	For certain shell side foulants it is the fastest method	Most foulants excluding coke, hard polymers, very sticky or gummy materials. Heavily fouled units can quickly exhaust the solvent requiring multiple evolutions.	Not effective	Cost is significantly more than traditional chemical cleaning.
Vapor Phase	\$\$-\$\$\$\$	For certain foulants can be almost as fast as Ultrasonic	Sticky or gummy hydrocarbons	Not effective	Cost is significantly more than traditional chemical cleaning.
Thermal Decompositio n	\$\$\$-\$\$\$\$	Longest Duration	Any material that can be thermally decomposed below limit of exchanger MOC.	Any material that can be thermally decomposed below limit of exchanger MOC.	Typically, highest cost and longest duration.

TEXAS MID COAST NH3 CONDESOR



During a scheduled outage a Chemical plant found that one of their Ammonia condensers could not be removed from the shell.

They did not have records as to the date it was last pulled.

TEXAS MID COAST NH3 CONDESOR



The unit had cooling water on the shell side, at customer direction multiple chemical circulations were done to dissolve the solids that were preventing the bundle extraction. With each evolution, the solvent was circulating through the shell side, but the PH was found to be near 7 after a single pass.

TEXAS MID COAST NH3 CONDESOR



After 3 separate attempts to chemically dissolve the solids, alternative extraction methods eventually allowed the bundle to be pulled from the shell.





BUNDLE STUCK IN SHELL FROM EXCESSIVE FOULING



Large AEU that was clean service on the tube side with cooling water on the shell side.

The plant had no record that the unit had ever been pulled since originally put in service in 1988.



Inlet nozzle after failed initial extraction





Outlet nozzle after failed initial extraction













REPLACEMENT

The bundle was pulled during an unscheduled outage after multiple tube leaks had developed. Multiple passes were made with high-pressure water followed by multiple media blasting passes; heavy scale remained.

The scale could not be removed by chemically cleaning the unit as the tubes were carbon steel and the scale was found to be Iron that had fused to the ID of the tubes.



MECHANICAL REMOVAL

The FTS unit had a process failure upstream that led to a large volume of rubber gasket material being deposited on the OD of the unit. Shell was partially removed so that solids could be vacuumed from the OD of tubes.

THERMAL REMOVAL



A large styrene condenser was thought to have at least 2 nozzles plugged with solid styrene causing the plant to run at reduced capacity. A plan was made at the next scheduled outage to melt the styrene from the shell prior to extracting the bundle.











THERMAL REMOVAL

The existing bundle was fabricated in 2205, which placed significant restrictions on the maximum temperature allowed during the bake.

While maintaining strict temperature guidelines all of the styrene was successfully removed. After the unit cooled the bundle and shell were cleaned to bare metal.



THERMAL REMOVAL

Shell after removal of the bundle.



THERMAL CLEANING CAUTION

There have been several instances recently where either stressrelieving ovens, or portable stressrelieving blankets have been used in attempts to clean bundles with heat. Aside from the legal and environmental issues, functionally heating hydrocarbons without any way to control their environment is extremely dangerous.

INDUSTRY BUSINESS ROUNDTABLE



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SAVE THE DATE!

SAVE THE DATE HASC TAILGATE FEBRUARY 7, 2025



May 16, 2025

Next Meeting: August 22nd, 2024

BUSINESS ROUNDTABL

Innovation Through Collaboration!

No Meeting in <u>JULY</u>