ORANGE ULTRASONICS

Clean-in-Process Technology

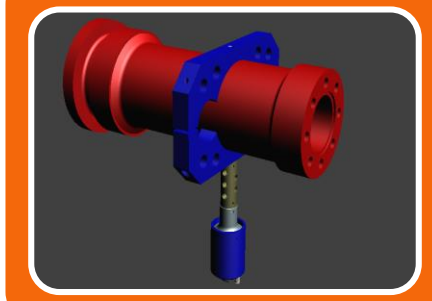
Continuous Fouling Mitigation in Heat Trains

Russell Philion
Chief Technology Officer
russ@orangeultrasonics.com

Our Key Technologies

Clean-in-Process Technology

- MORKO USP [Ultrasonic Scale Prevention]



Online Pipe Descaling and Debottlenecking

- M^3 Technology (clamp on) apparatus with pre-select ultrasonic power output, to match with specified outcomes

Ultrasonic Immersion Cleaning Baths

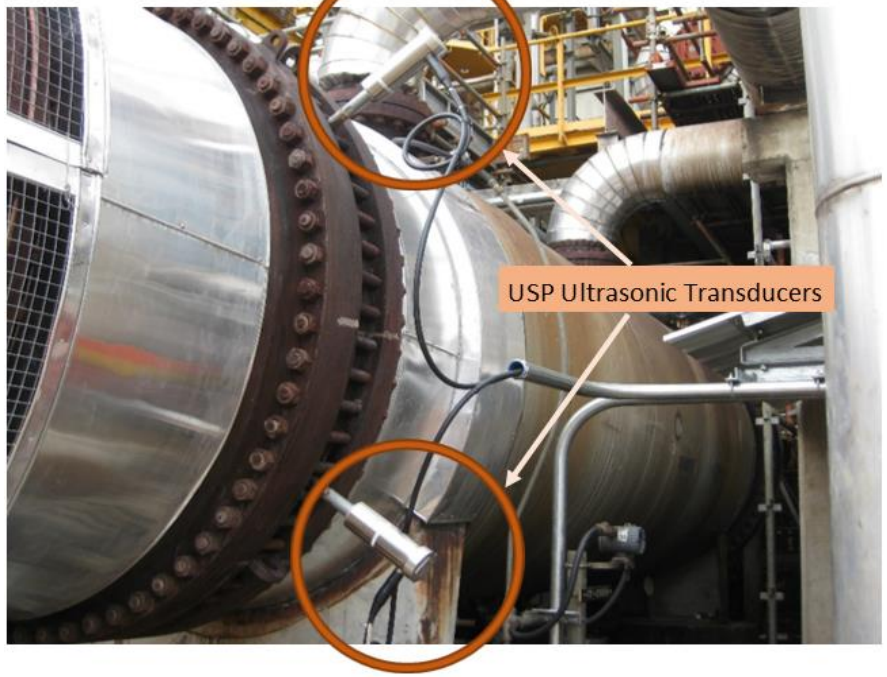
- Multiple sizes & configurations
- Variable powered units for purpose-built cleaning applications

Clean-in-Process Technology

The Technology: Where it Began

Immersion Bath Technology

Clean-in-Process Technology




The very first heat exchanger cleaned by ultrasonic bath in November 2009, Fort McMurray, Canada
SUNCOR
orangeultrasonics.com

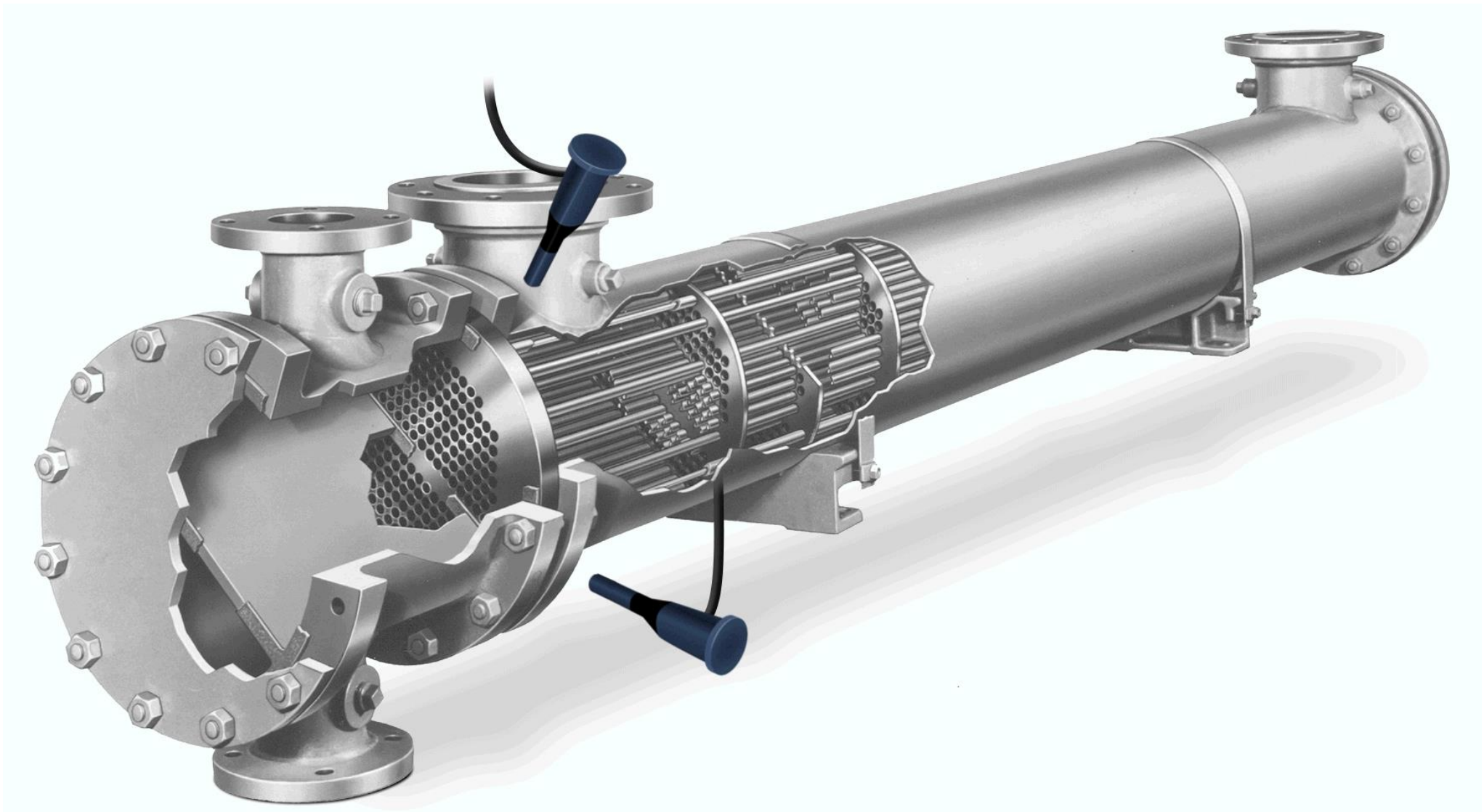
“The technology has proved to be a game-changer: providing energy savings, reduced environmental impact, improved heat transfer and measureable cost avoidance”.

Shell Chemical- Moerdijk,NL


What if the heat exchanger is too big for the bath or simply cannot be removed from the operating unit?
Can we use ultrasound to clean this in place?

ORANGE ULTRASONICS

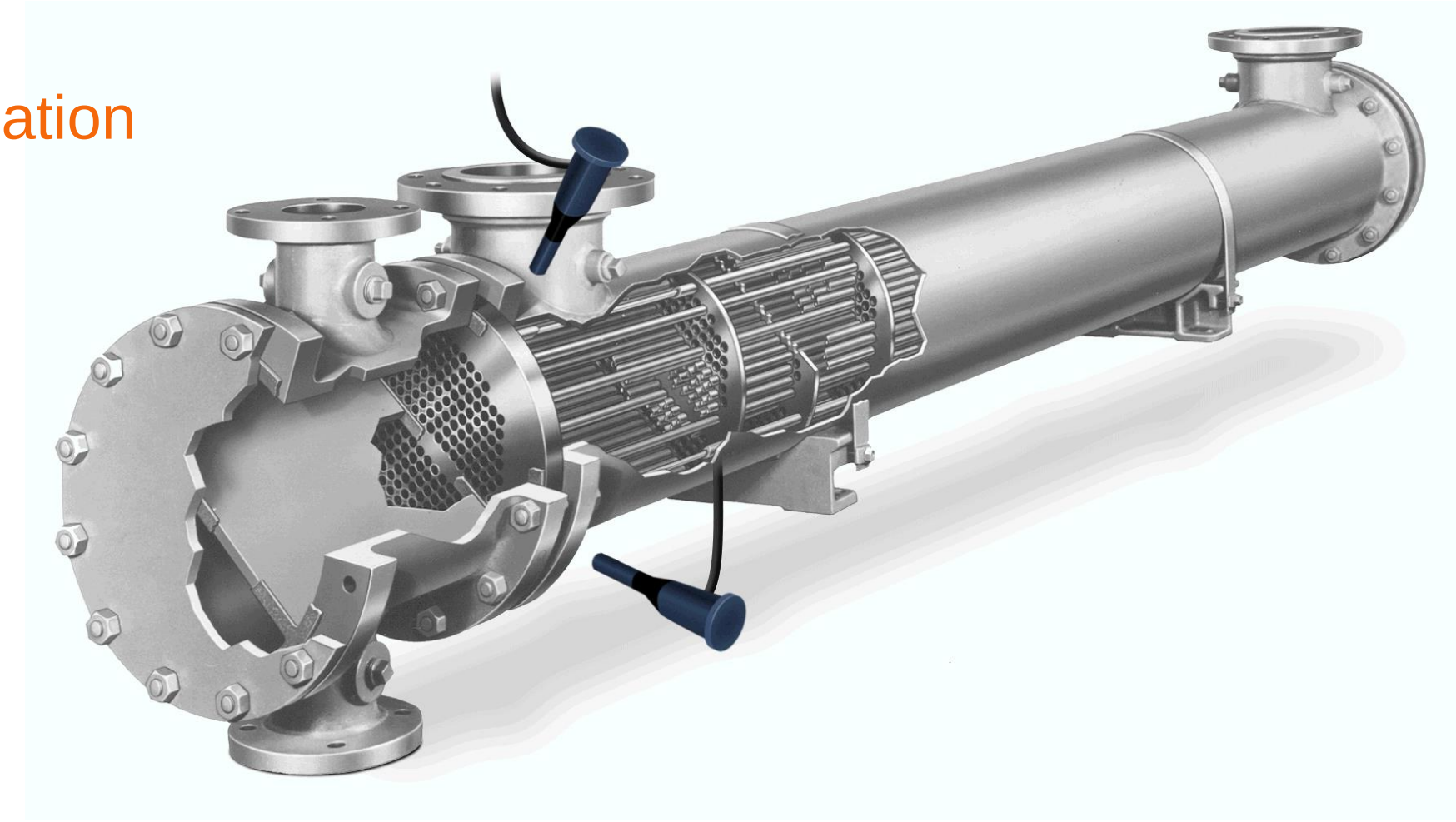
Ultrasonic Scale Prevention (USP)



Ultrasonic Scale Prevention (USP)

Online Fouling Mitigation
Clean-in-Process

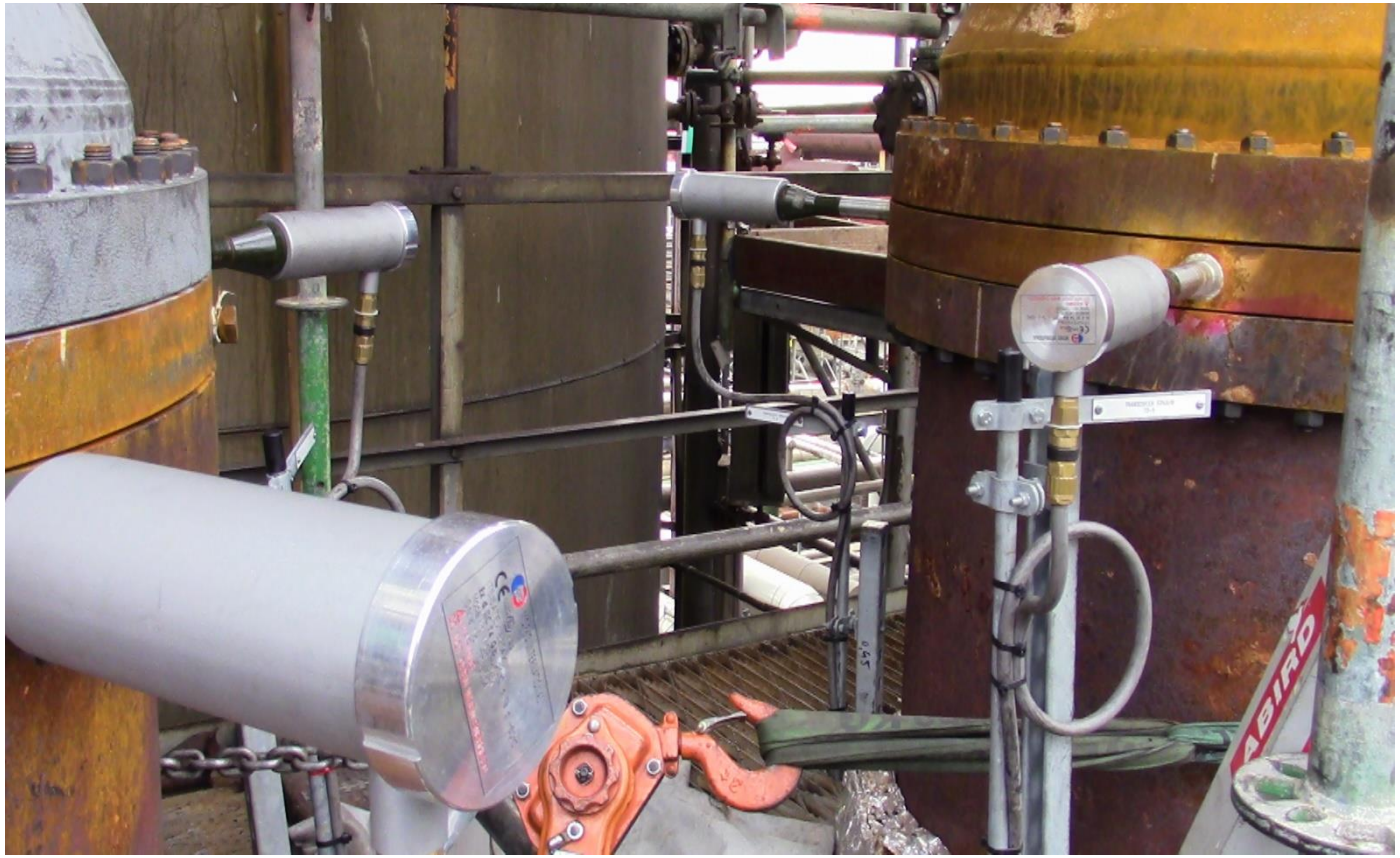
- Ultrasonic transducers mounted to tube sheet externally
- Low-powered transducers use specialized pulse-ultrasonic generators to drive the system



Ultrasonic Scale Prevention (USP)

Online Fouling Mitigation
Clean-in-Process

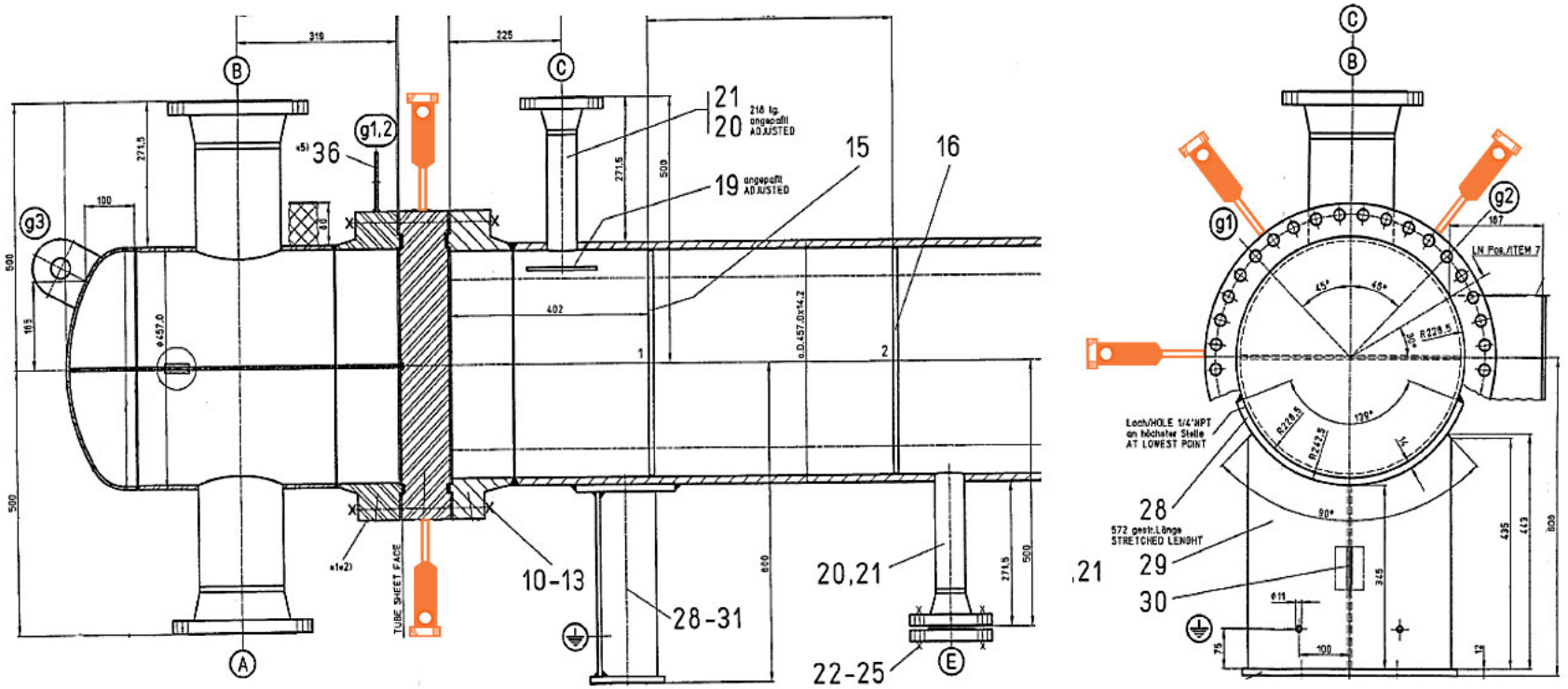
- Works on-line, 24hrs/7days/week
- Converts electrical into mechanical energy



Ultrasonic Scale Prevention (USP)

Online Fouling Mitigation
Clean-in-Process

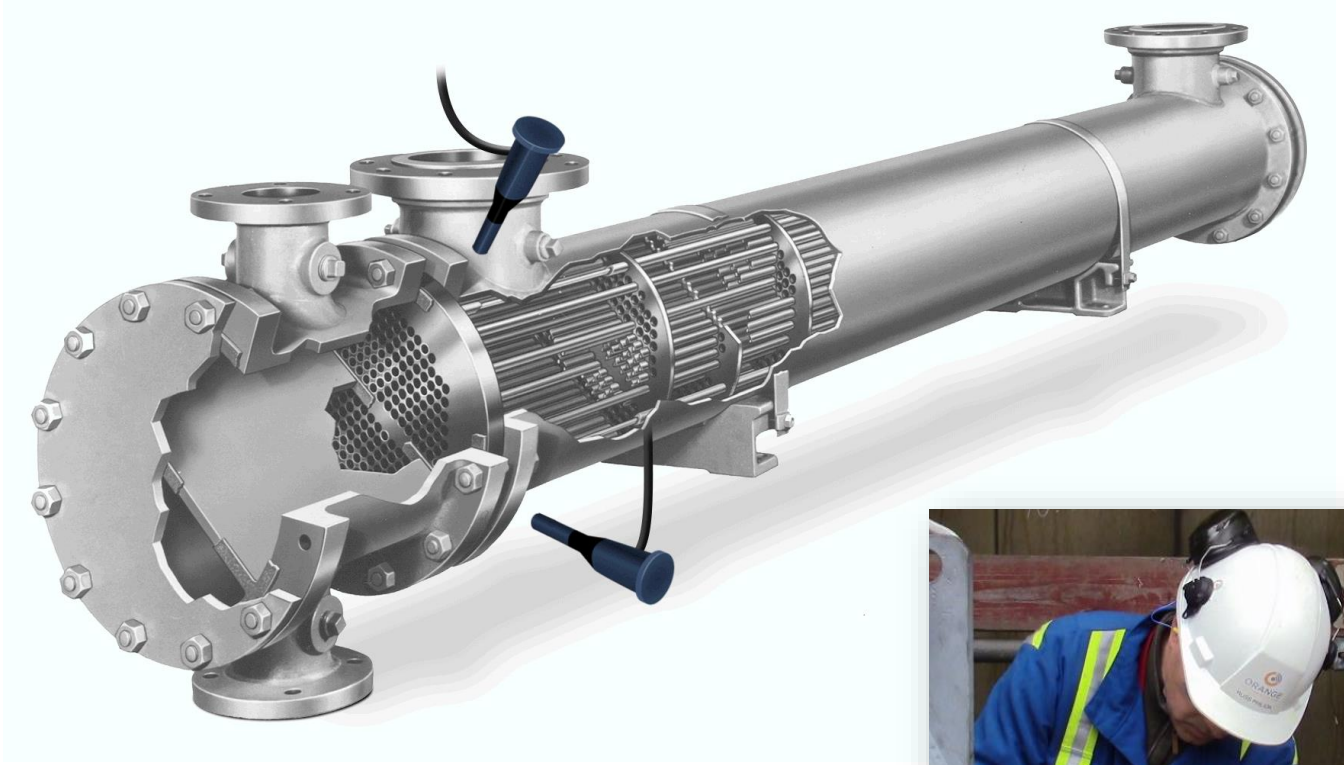
- Strategically positioned for optimal cleaning

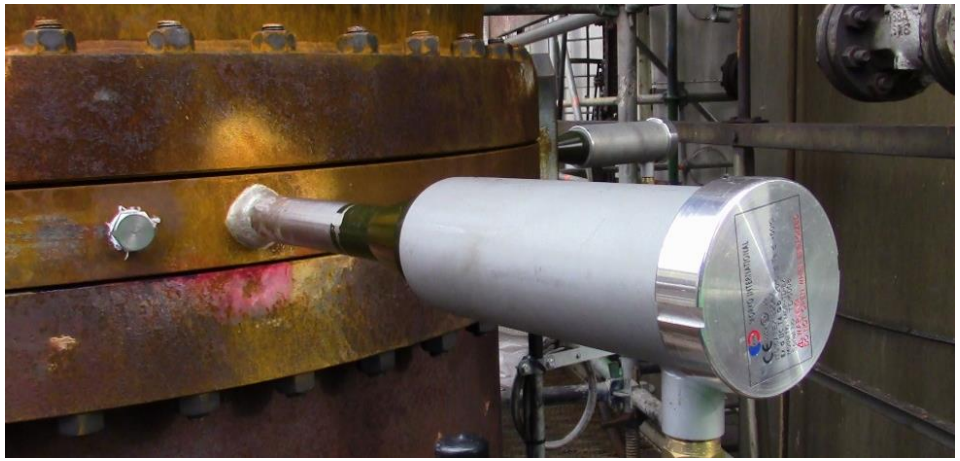


USP Transducers

Ultrasonic transducers propagate micro-pulses along the tubes.

Sends less than 5µm of mechanical energy into the tube sheet…



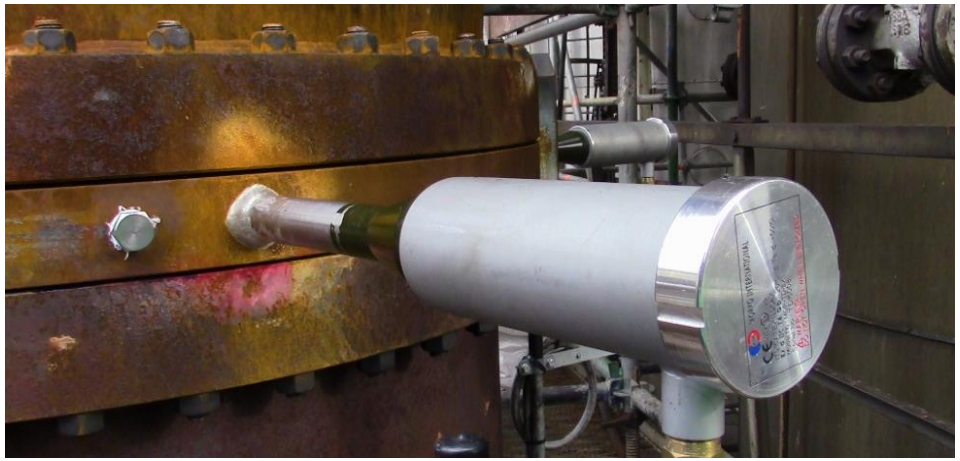


Less than 5µm.

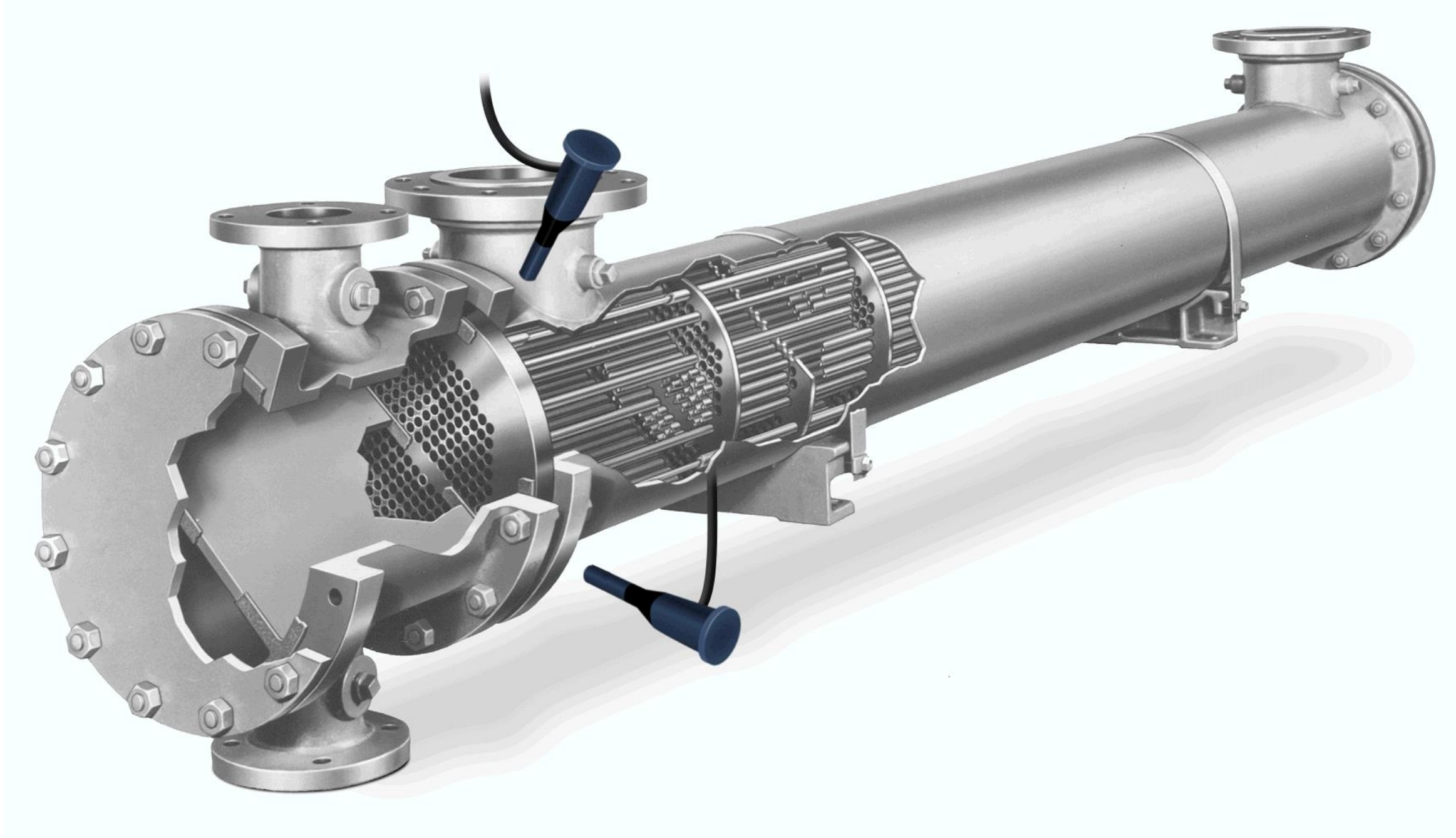
Why is this important?

USP Transducers

SAFE for all parts of the heat exchanger and surrounding equipment

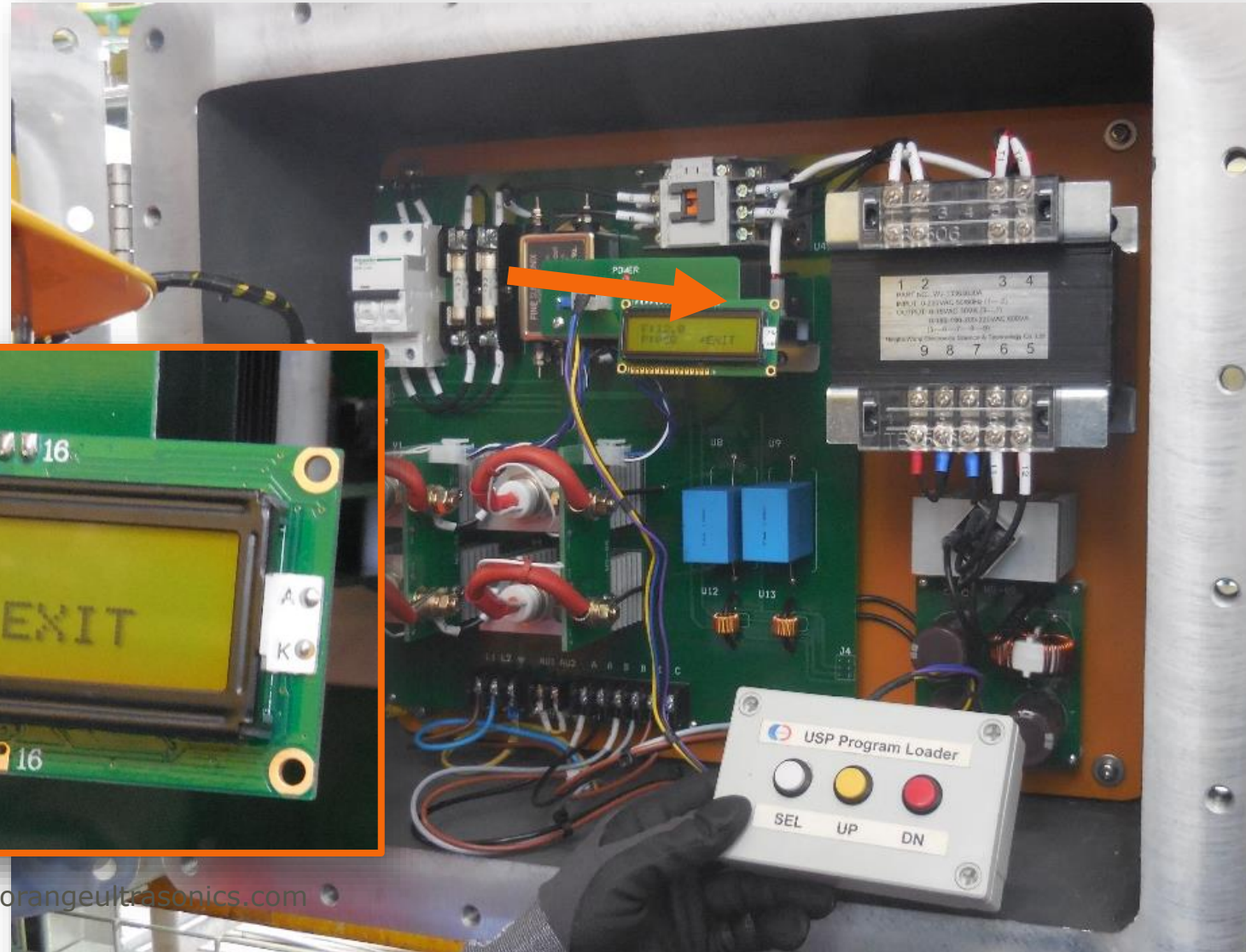


10m Ultrasonic Bath: 2019



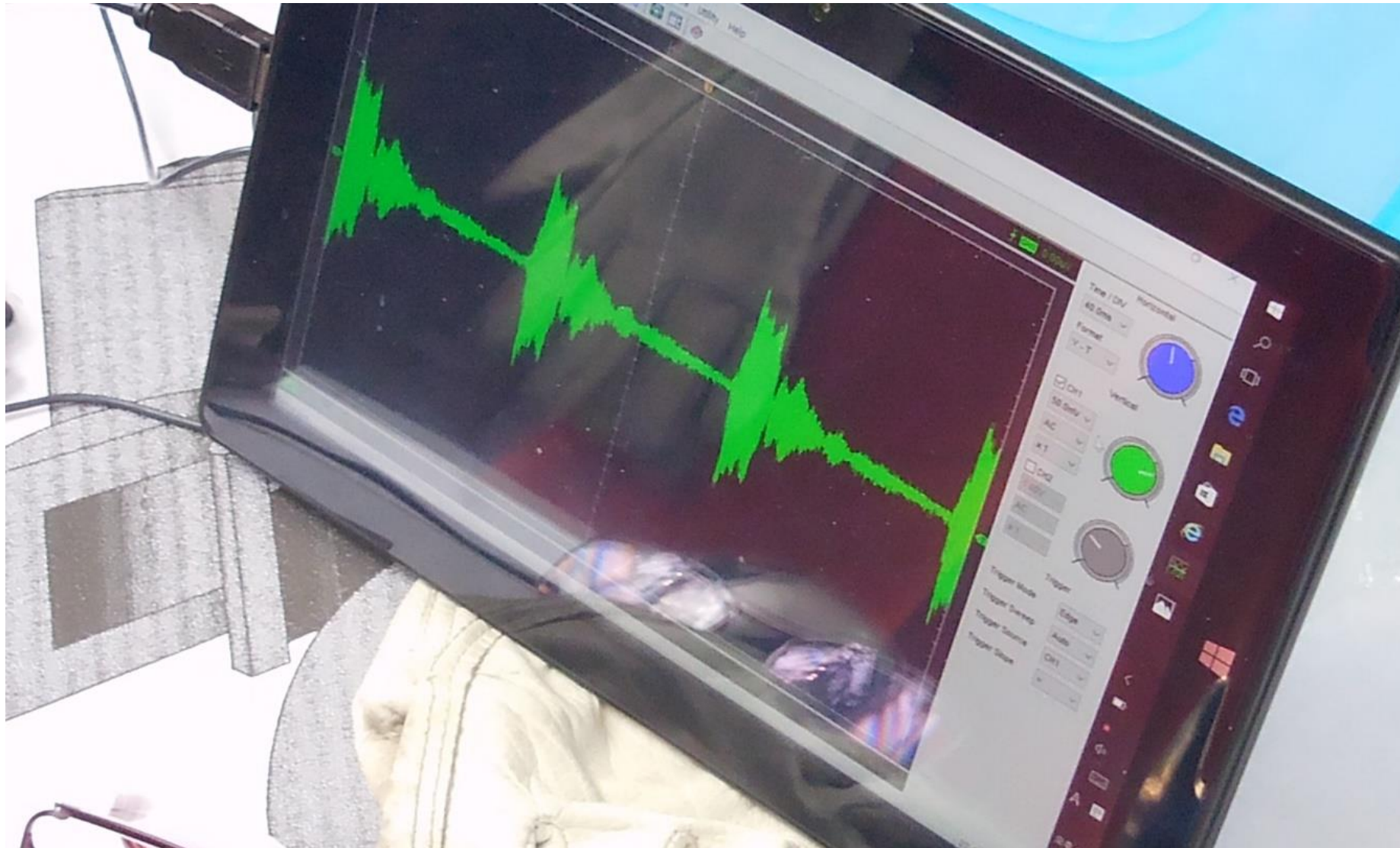
Calibrating the USP System

Ultrasonic frequency
is calibrated to the
heat exchanger.



Calibrating the USP System

We're looking for the exchanger's **natural acoustic resonance**.



Calibrating the USP System

Calibration settings range from:
30-100 micro-pulses per second.

Based on certain characteristics of the flowing media:

- Process Type
- Viscosity
- Temperature
- Precipitant fouling material

ORANGE ULTRASONICS

AFTER 1 Year in operation (Power Generation Plant)

WITHOUT USP

WITH USP

ORANGE ULTRASONICS

Our Customers

GS Caltex

DOW

S-OIL

SK energy

KUMHO PETROCHEMICAL

SAMSUNG SAMSUNG FINE CHEMICALS

ptt GLOBAL CHEMICAL

Riaupulp
a member of the APRIL Group
UNEP Champions of the Earth 2006 Corporate Partner

Thaioil

BAYER

IRPC
Integrated Refinery & Petrochemical Complex Public Co., Ltd.

ExxonMobil

PETRON

SRC

Hyundai Oilbank

Benefits of The USP System

- Increase Productivity
- Enhance Energy Recovery
- Shutdown Cost Avoidance
- Extend Asset Life

Benefits of The USP System

RUN-LENGTH

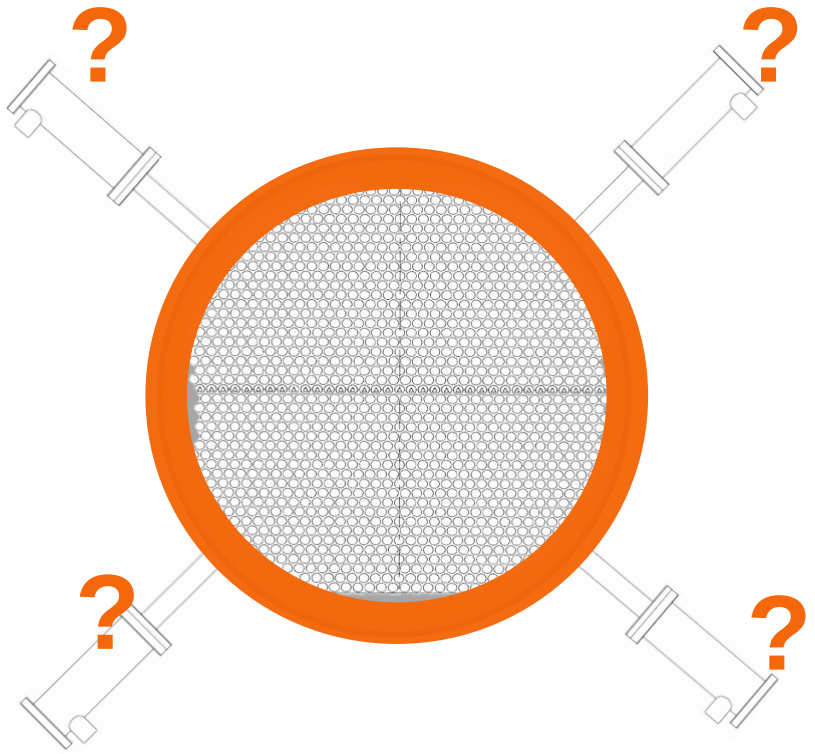
The key benefit. The USP system allows your processing units to continue in full operation as cleaning takes place.

Cost Estimates for USP

Cost is based on:

- **How many sets** *(two Transducers and one Generator = 1 set)* are required for proper fouling mitigation?

- What are the KPI's for the target candidates USP?



Cost Estimates for USP

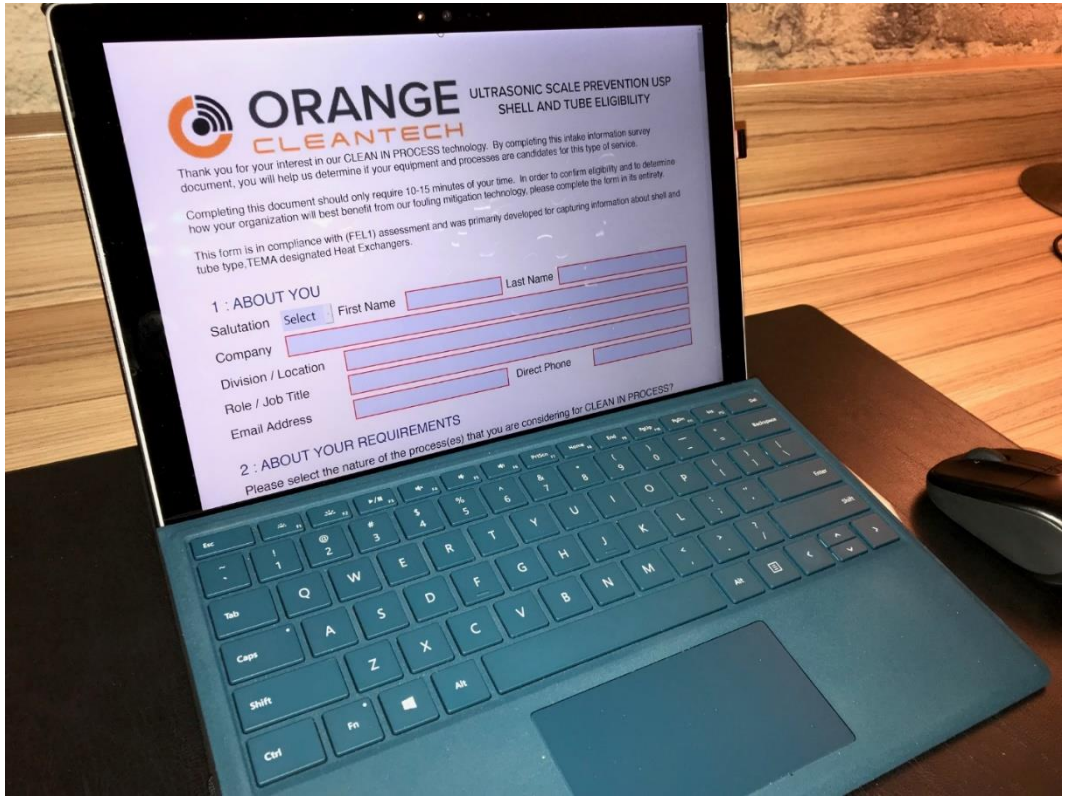
Factors affecting number of sets:

- Dimensions (Height, Diameter)
- Vertical/Horizontal Orientation
- Shell/Tube side: Fouling Media
- Media Temperatures
- TEMA characteristics
- Flow Rates
- Viscosity

Is Your Process a Candidate?

Start with the Heat Exchanger Candidate Form

- Find out if your process qualifies
- Helps us give you a cost estimate




What if you could skip a cleaning interval?
What if you could skip more than one?

The Return on Investment For Implementation of USP

Increase product throughput, overall heat transfer, and reduced operating fuel costs.

Avoid bundle pulling, crane(s), scaffolding, cleaning contractor, water for cleaning, reclamation of the waste water, and more.

What is your opportunity gain by not having to shut the unit down?

ORANGE ULTRASONICS

Clean-in-Process Technology

Continuous Fouling Mitigation in Heat Trains

Russell Philion
Chief Technology Officer
russ@orangeultrasonics.com

orangeultrasonics.com