

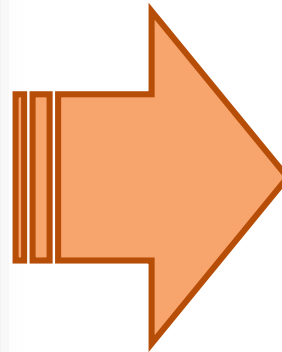
We Welcome:



SLIDE DECK:

1. Quick history of immersion based ultrasonic tank cleaning and how USP came to be...
2. What is USP: Equipment- where & how installed. Types, ul, atex ce
3. How USP works
4. Key drivers for using the tech.
5. Who's using USP: Clients/ Industries
6. TECHNICAL Parameters: Installation/ operation/ maintenance
7. Evaluating performance: equipment/ monthly calls
8. Process Candidates for USP: Determining fit
9. Budgets & logistics
10. FAQ' s
11. Intake HX sheet link:

The evolution from Ultrasonic Immersion-Bath technology to a *Clean-in-Process* tech, using similar ultrasonic principles:



The very first heat exchanger
cleaned by ultrasonic bath in
November 2009, Fort McMurray,
Alberta, Canada
SUNCOR Energy





"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

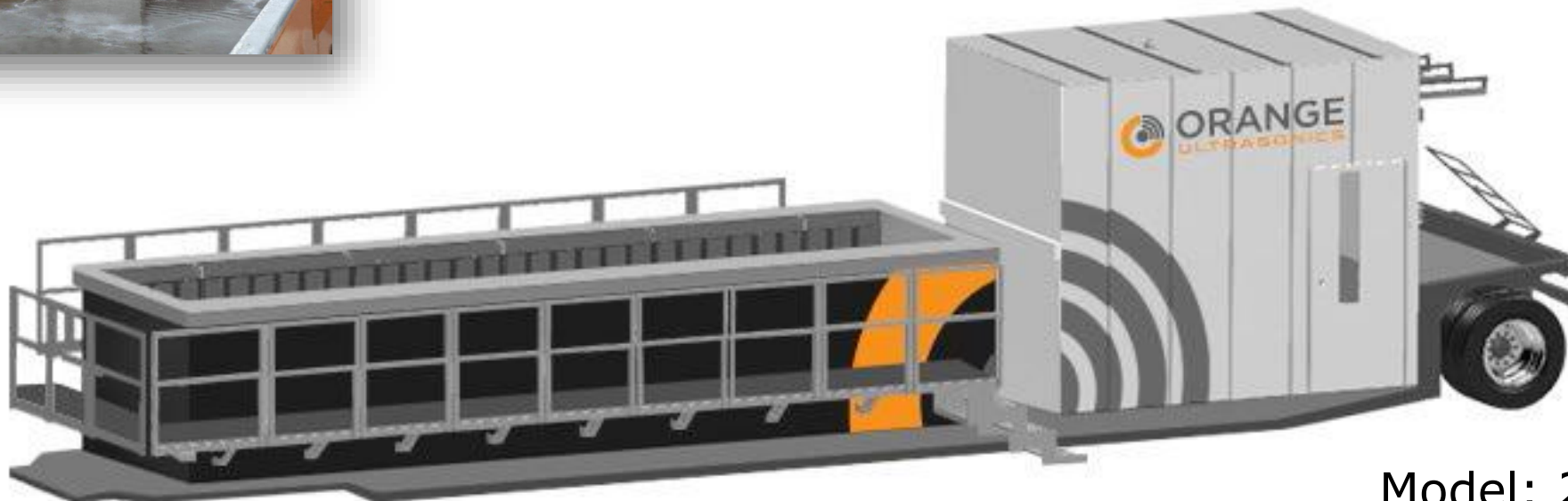


By 2012, the first European vessels had found a home with Mourik Services in Rotterdam, for specific contract work with Shell Moerdijk and Shell Pernis refineries


10m Ultrasonic Bath: 2016



- Will accommodate Hx units up to 8m in length
- Axle allows for easy transport and set-up without needing a crane.
- Essential Wave Technology (EWT). Purpose built ultrasonic generators and transducers to work in extreme conditions and temperatures.



Model: 2764AXL

A large industrial heat exchanger is shown in a factory setting. The heat exchanger is a long, cylindrical vessel with a circular end view that reveals a dense array of tubes. The tubes are arranged in a grid pattern, and the end view shows a thick, circular flange with many bolts. The heat exchanger is supported by a metal frame. In the background, there are other industrial structures and equipment. The text is overlaid on the right side of the image.

What if the heat exchanger is too big for the bath or simply cannot be removed from the operating unit?

Can we clean this in place?





What if we could skip a regular cleaning interval on this entire heat-train?

How much water can we save?

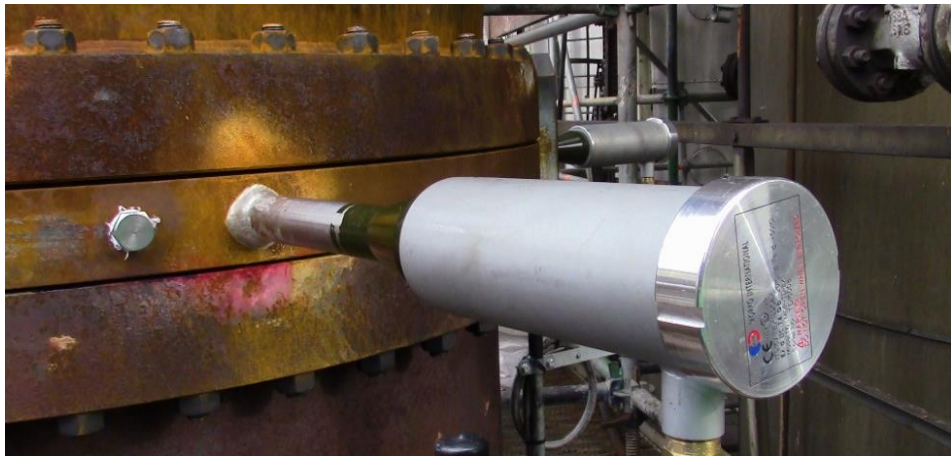
How would this impact our overall profitability?

A proprietary Clean tech that:

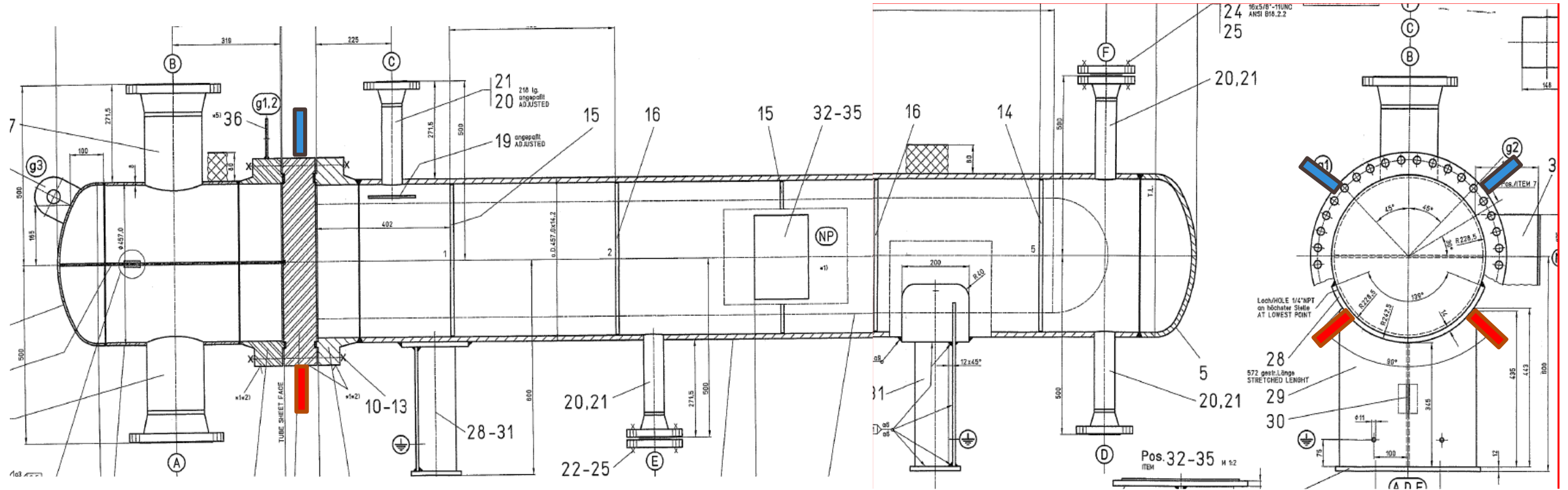
- Works in-line, 24hrs/7days/wk
- Strategically positioned ultrasonic transducers are affixed directly to the tubesheet
- Converts electrical into mechanical energy which mitigates fouling on the heat transfer surfaces.



Weld-on, pulse-actuated transducers are affixed directly to the tube sheet.



Transducer location is determined through an analysis of historical fouling issues, Hx dimensions and parameters specific to the process candidate



Specialized Ultrasonic generators provide pulsed-power from 30-100 micro-pulses p/s.

The setting is based on certain characteristics of the flowing media: type, viscosity, temperature, flow-rate.

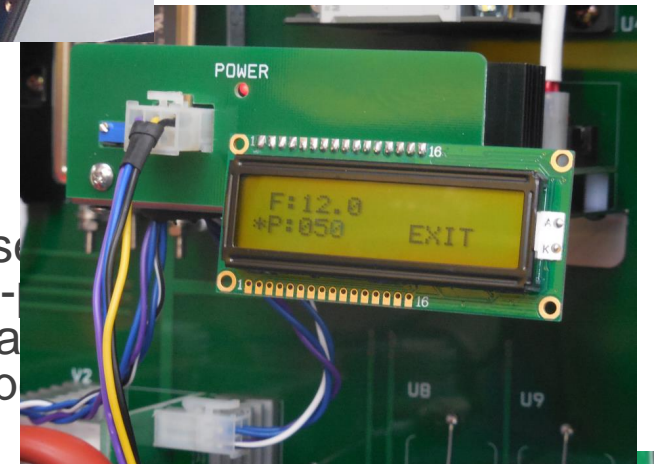
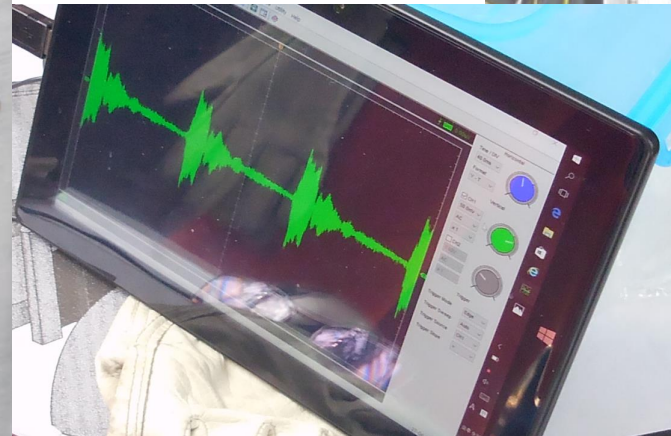
The systems are configured under: UL,CE and ATEX certifications.

Division Classification 1

220Vac 60 Hz

230/240Vac 50 Hz





Generators provide pulses
30-100 ultrasonic micro-
setting is based on certain
of the flowing media: typ
temperature, flow-rate.



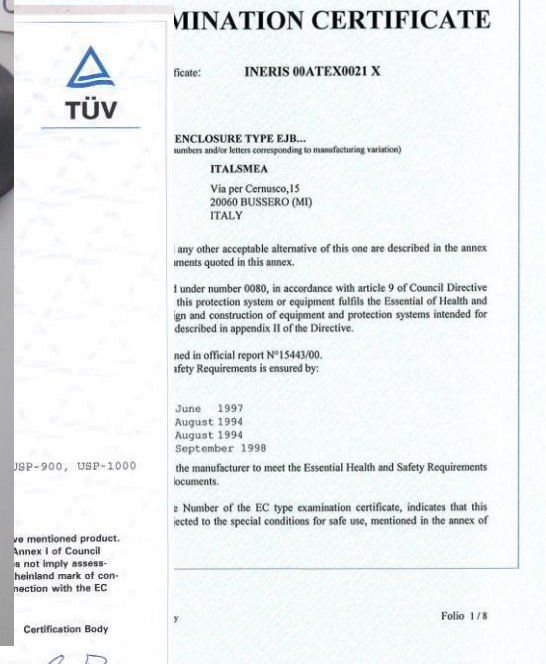
The system
UL, CE and

Division Cla

220Vac 60
230/240Vac



Equipment and protection systems intended for use in potentially explosive atmospheres
Directive 94/9/CE



Am Grauen Stein - D-51105 Köln

Compliant with the relevant and effective EC Directives are complied with. CE

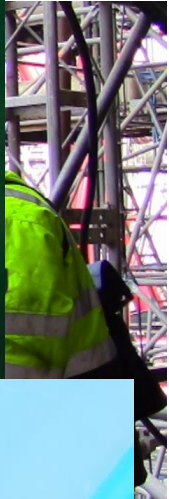
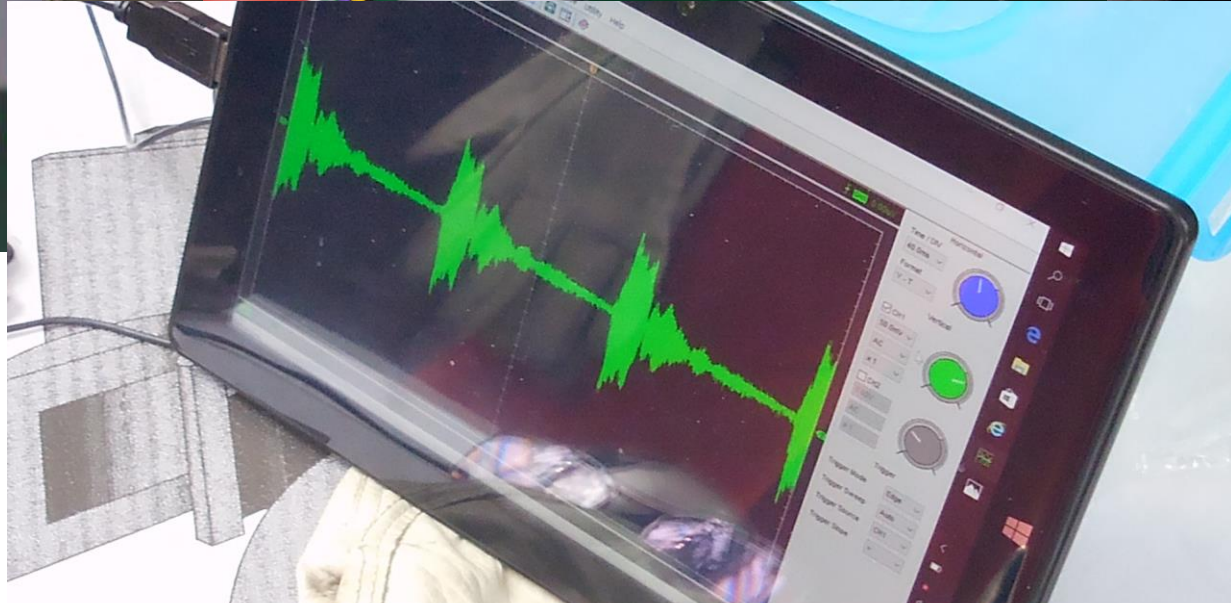
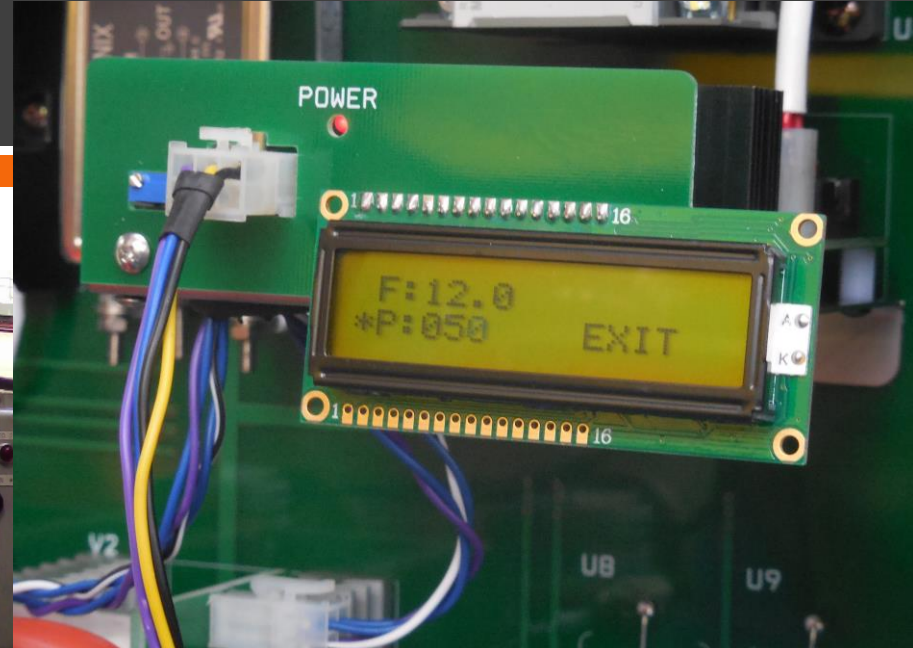


Generators provide pulsed-power from 30-100 ultrasonic micro-pulses p/s. The setting is based on certain characteristics of the flowing material, such as temperature, flow rate, and viscosity.

The systems are available in UL, CE and ATX configurations.

Division Class

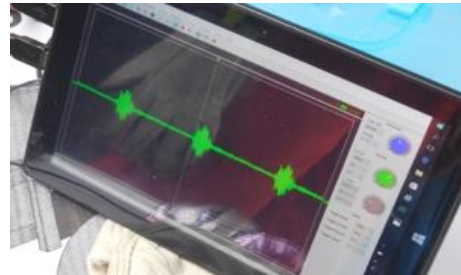
220Vac 60 Hz
230/240Vac 50 Hz



- System Commissioning and transducer calibration for optimizing US cavitation and vibration
- Testing



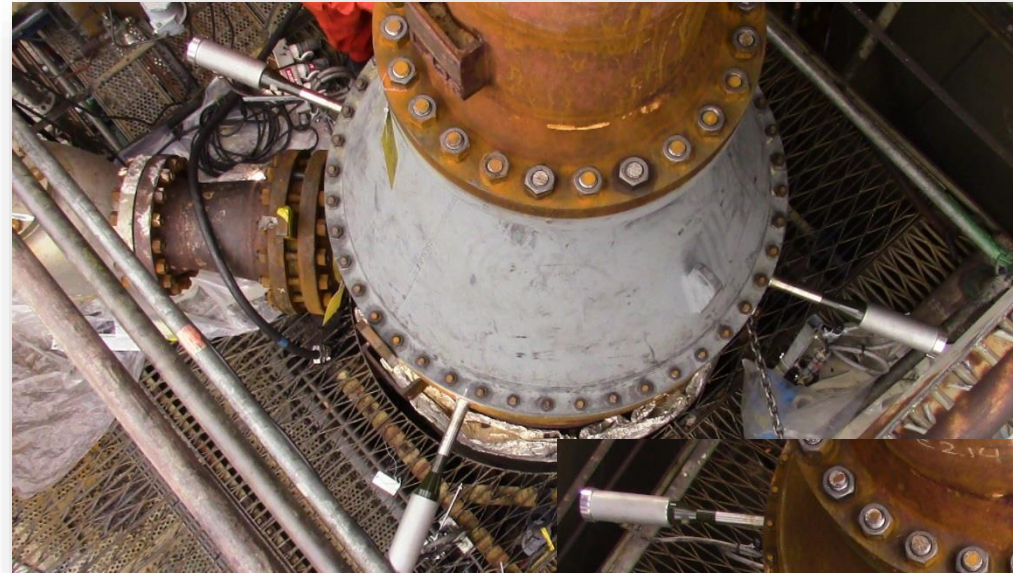
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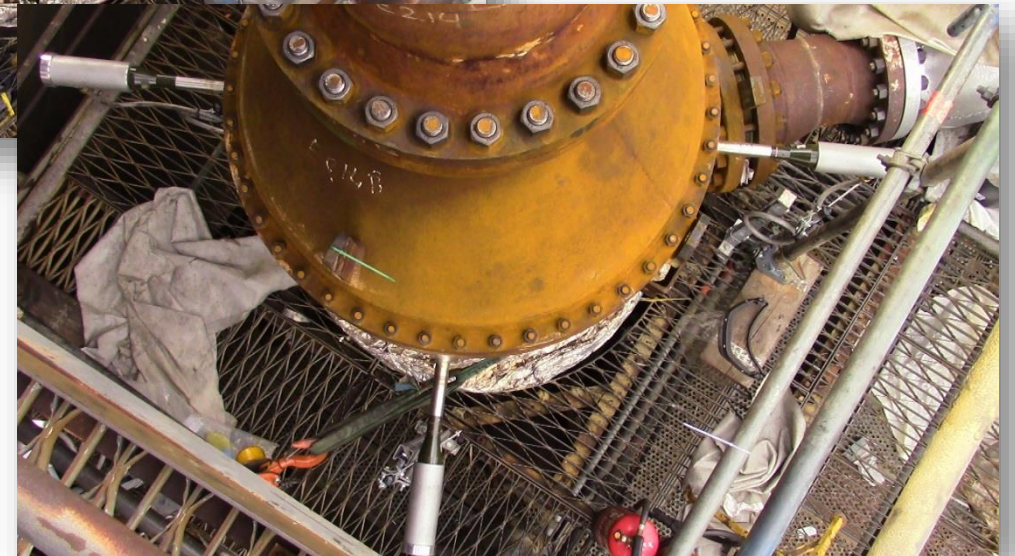
Royal Dutch Shell, Pernis, NL

CD-6: 214 A/B

- 4 USP Transducers per heat exchanger.
- Data from this first USP installation was captured utilizing the *Smart Perform*™ monitoring application. The application identified the initial USP successes and followed the performance for the year and beyond.

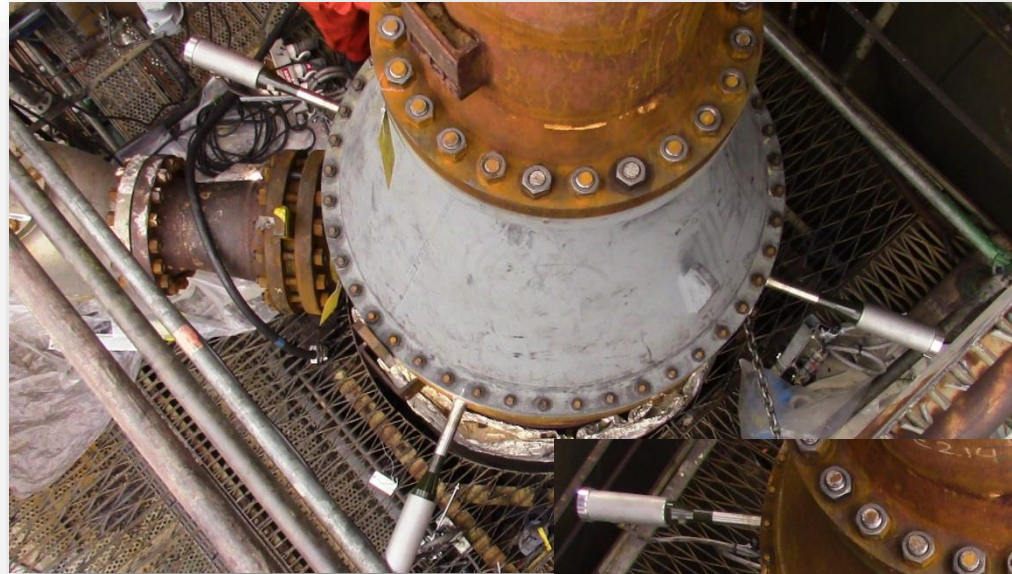


214A



214B

USE: S-OIL, SK, GS Caltex, PTT,
DOW Tern, Deer Park, USA

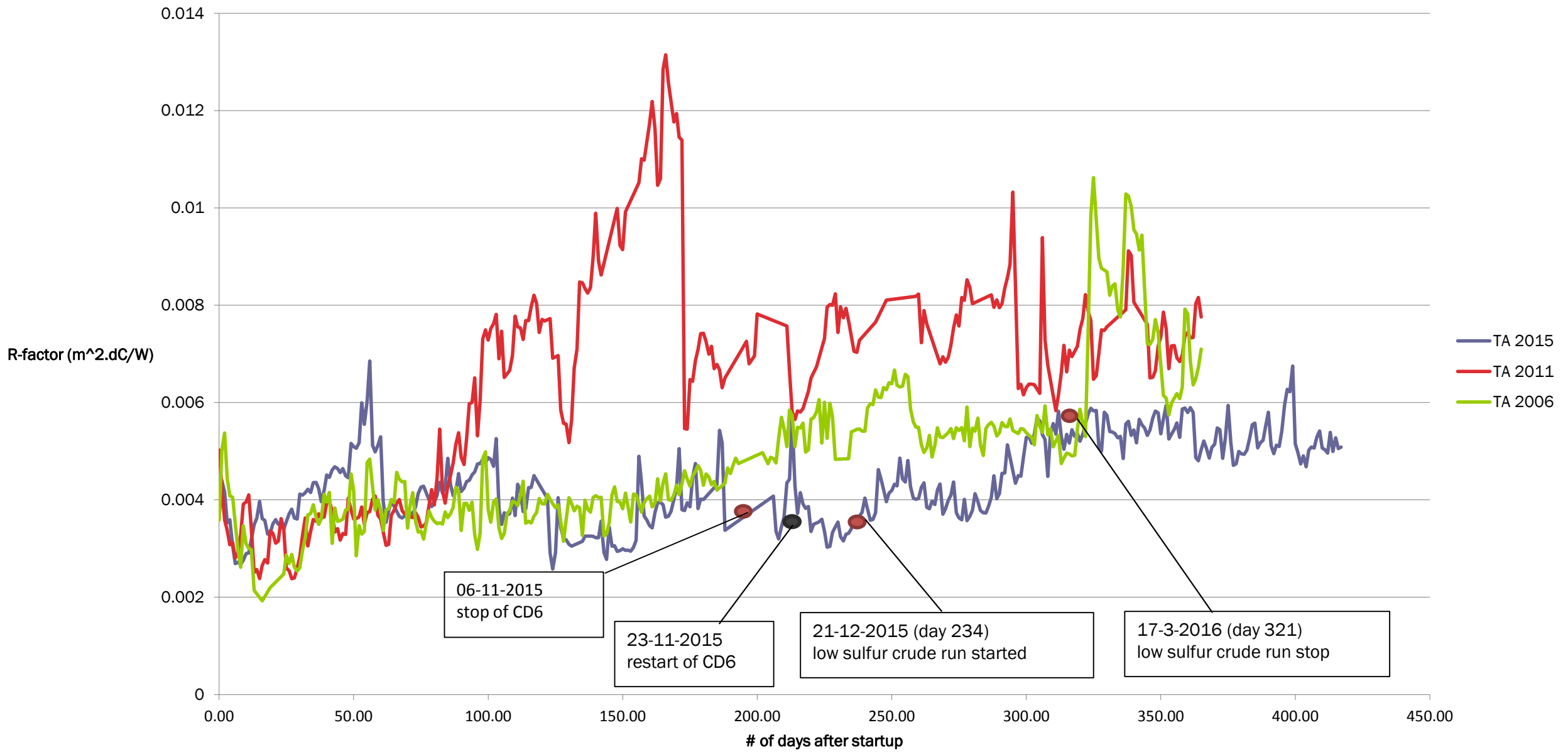


214A

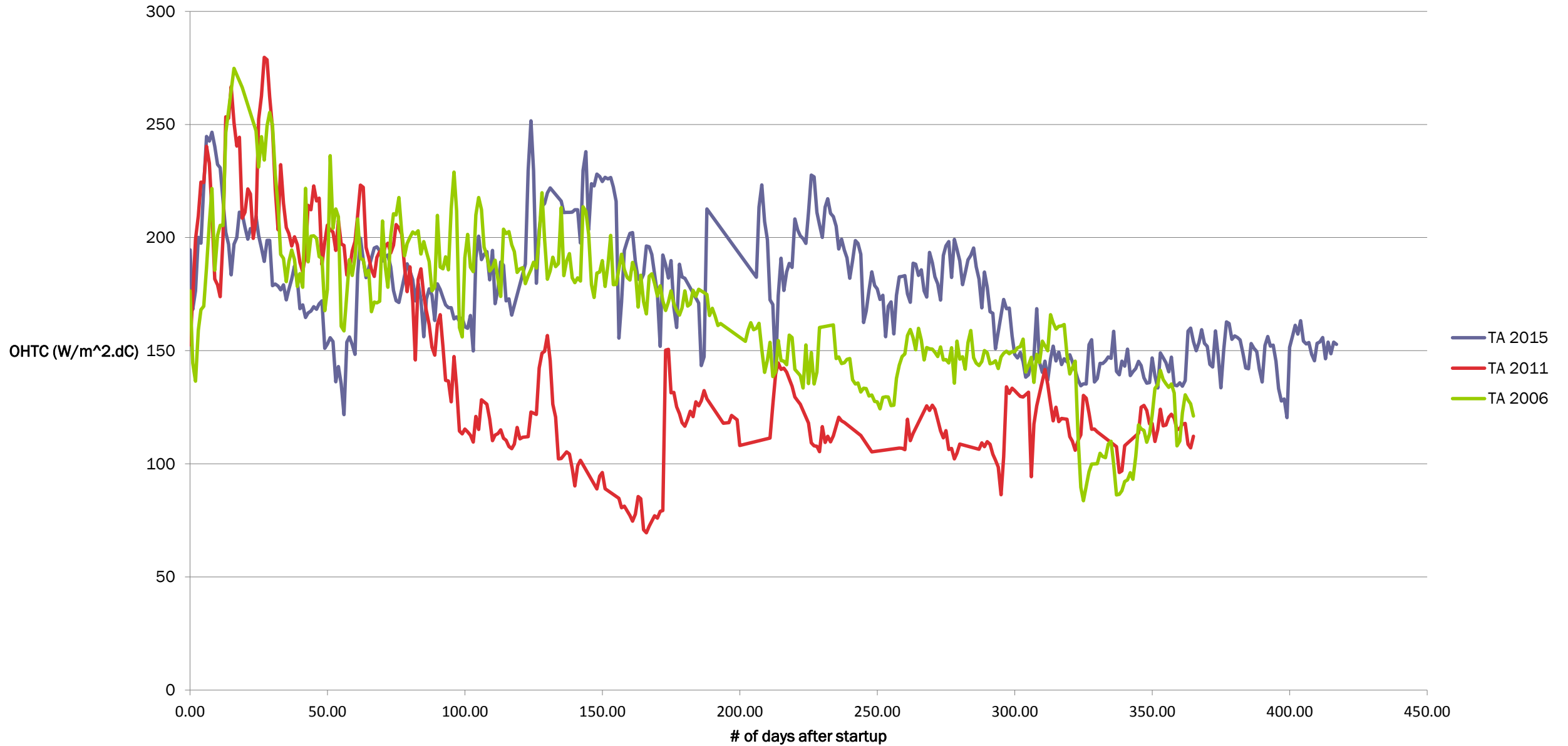


214B

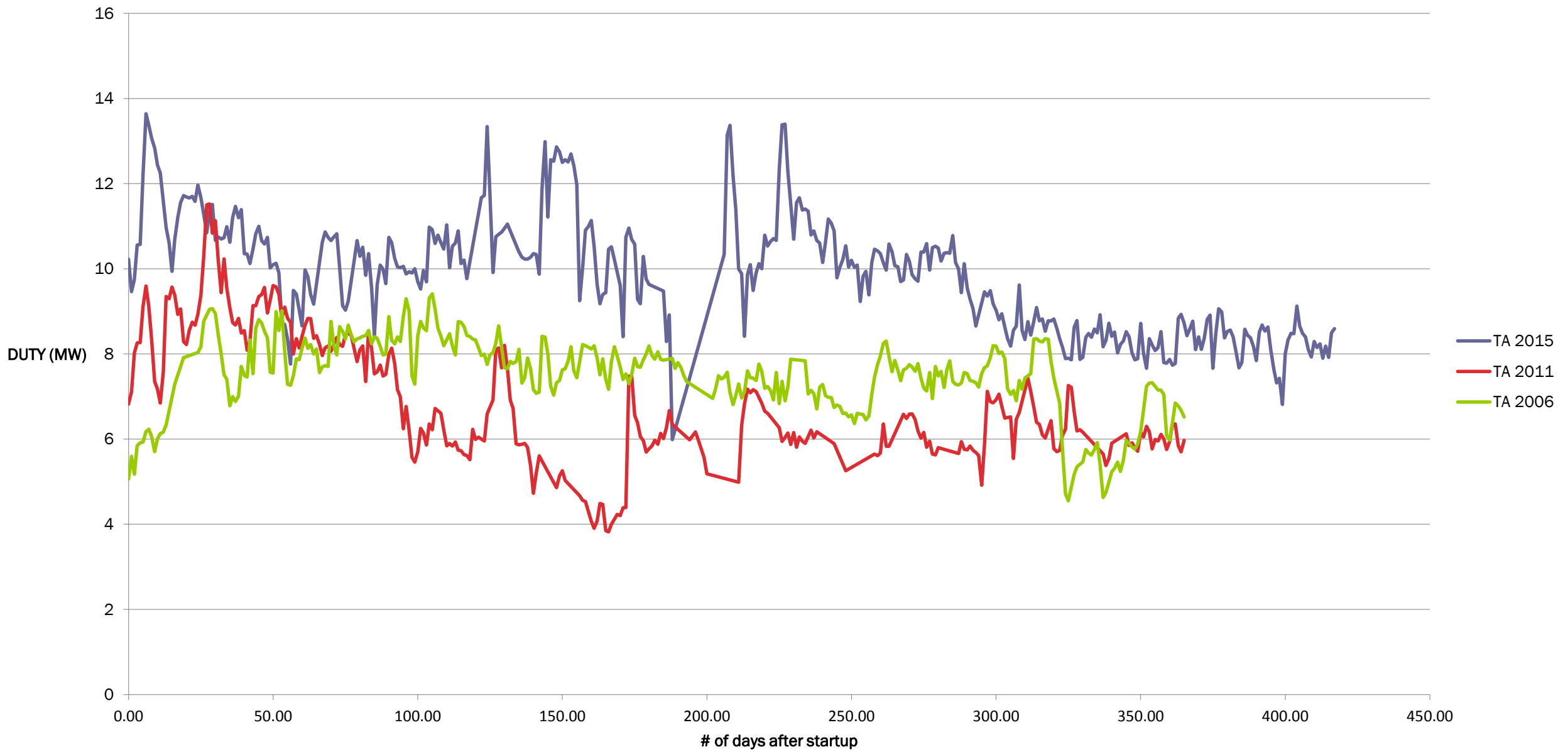
CD6 USP E214AB Performance comparison: overall fouling factor



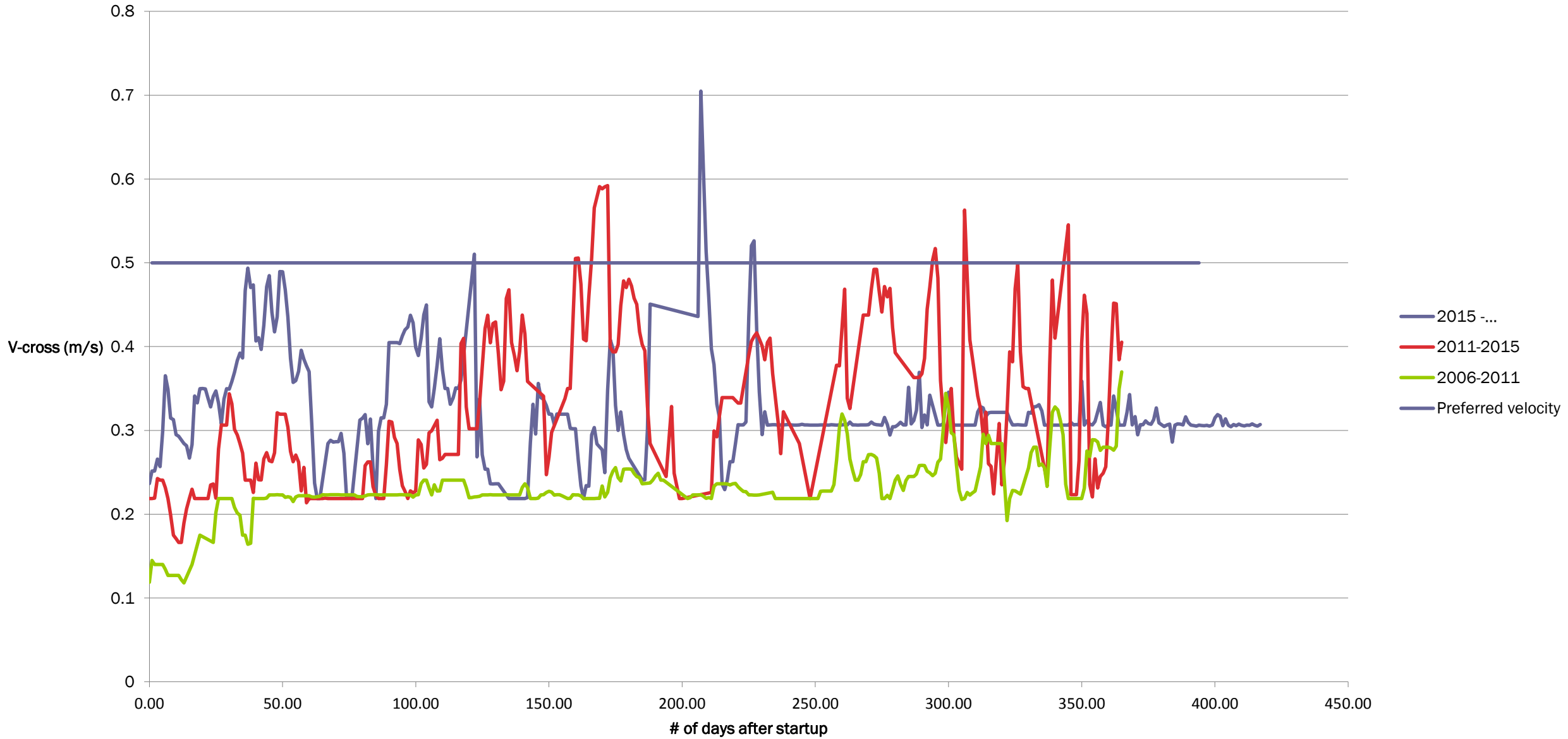
CD6 USP E214AB Performance comparison: OHTC



CD6 USP E214AB Performance comparison: DUTY



CD6 USP E214AB Performance comparison: Velocity (residue side)

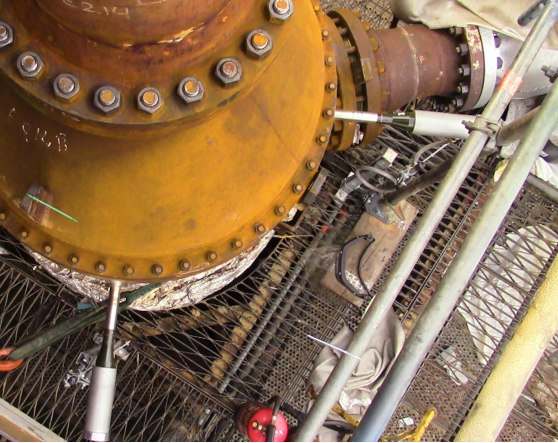


Here is what this really means....

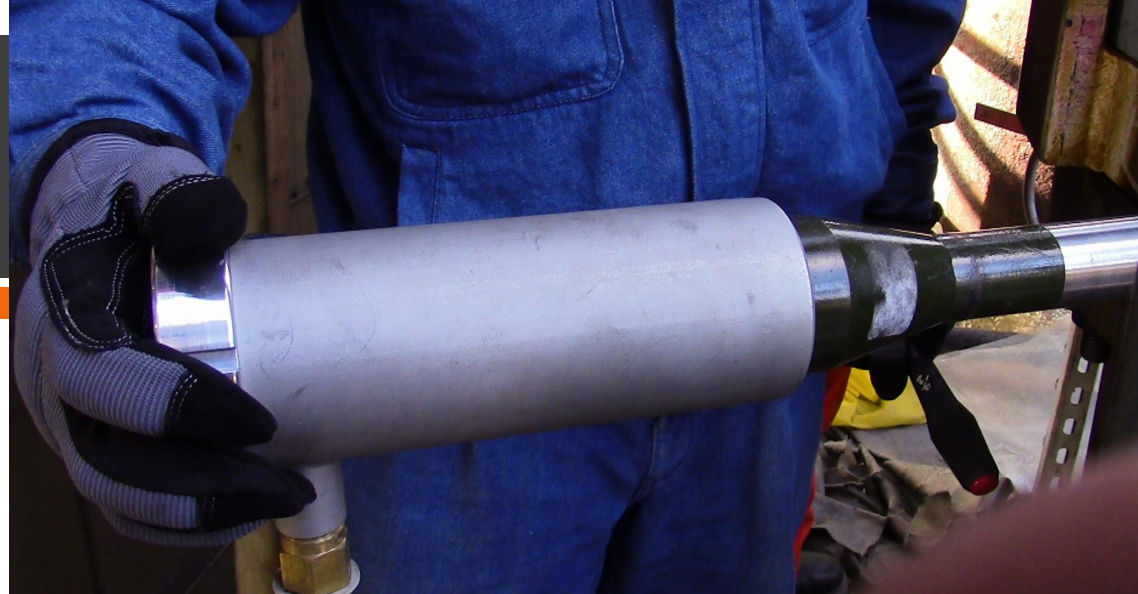
- An investment of \$280k by Shell for this solution, provided them with an energy savings of 1.4M in year one.
- **Cost avoidance-** not having to stop and clean: equipment, manpower, fuel, water and waste remediation resources.
- **Process Opportunity Gain:** What's the additional operational revenue gain for not shutting down for a maintenance interval??





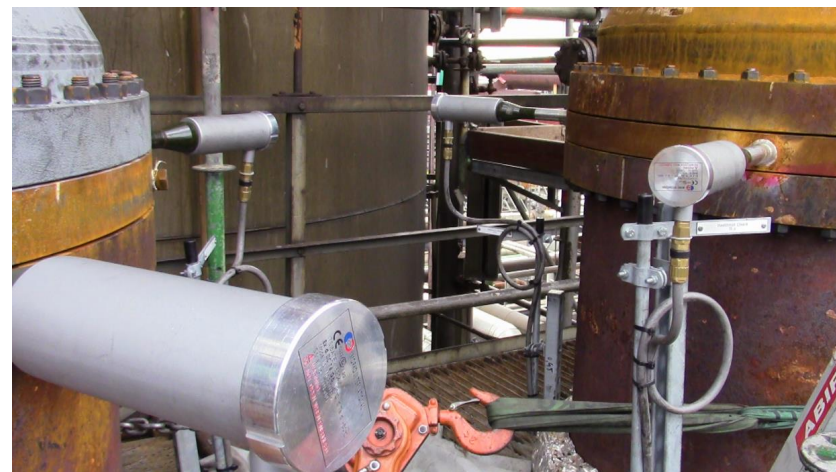


CHANGE
ASONICS



UPTIME— is the key benefit of this technology. The USP system allows your processing units to continue in full operation as cleaning takes place.

The result is greater heat transfer efficiency and significantly lower operational-energy costs.



CD-6: Hx Units: 214 A/B

- Installed April 2015
Ready to go!
- April 2016 –No cleaning required
- April 2017 –No cleaning required





IRVING **LORD**  TechnipFMC



Lubrizol



TESORO



INSTALLATION:

Event outage or T/A



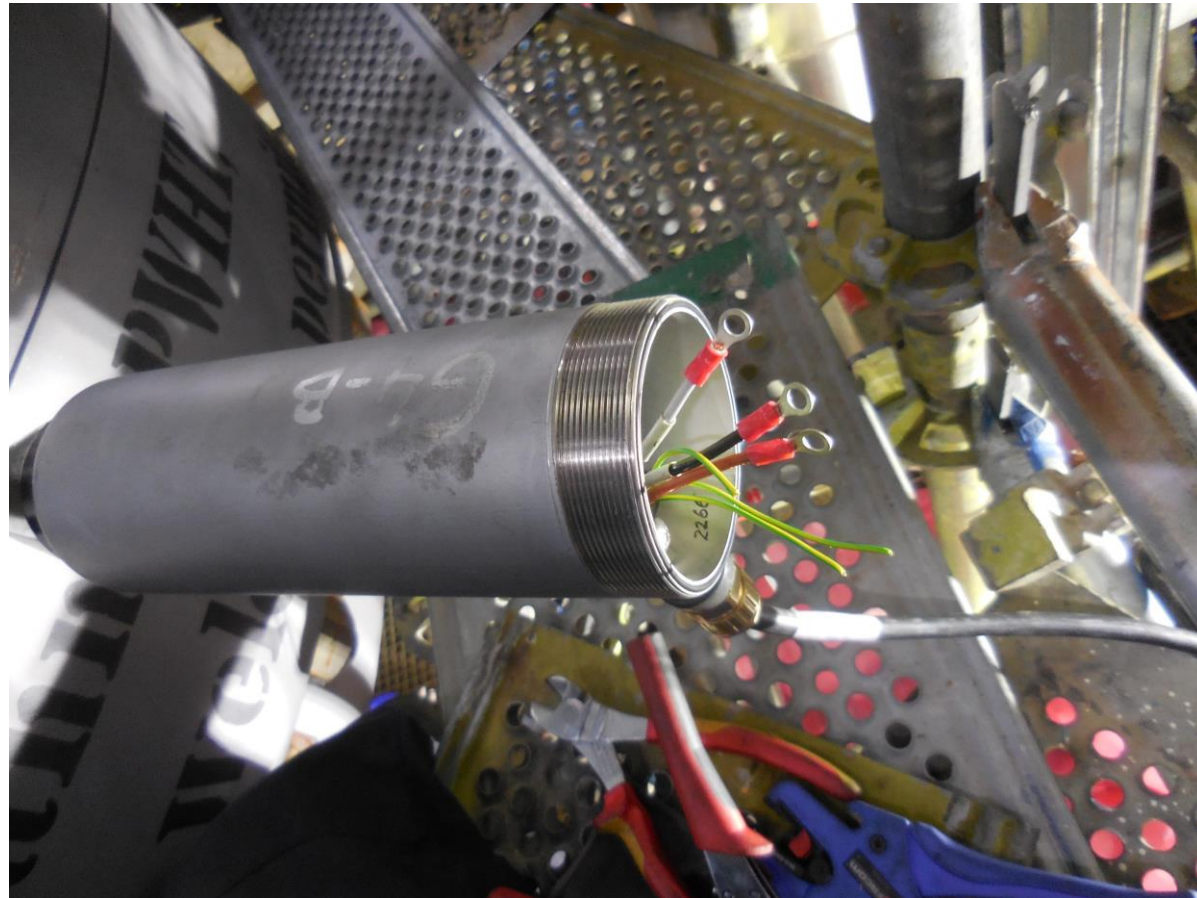
OPERATION:

Turn it on, leave it on.



MAINTENANCE:

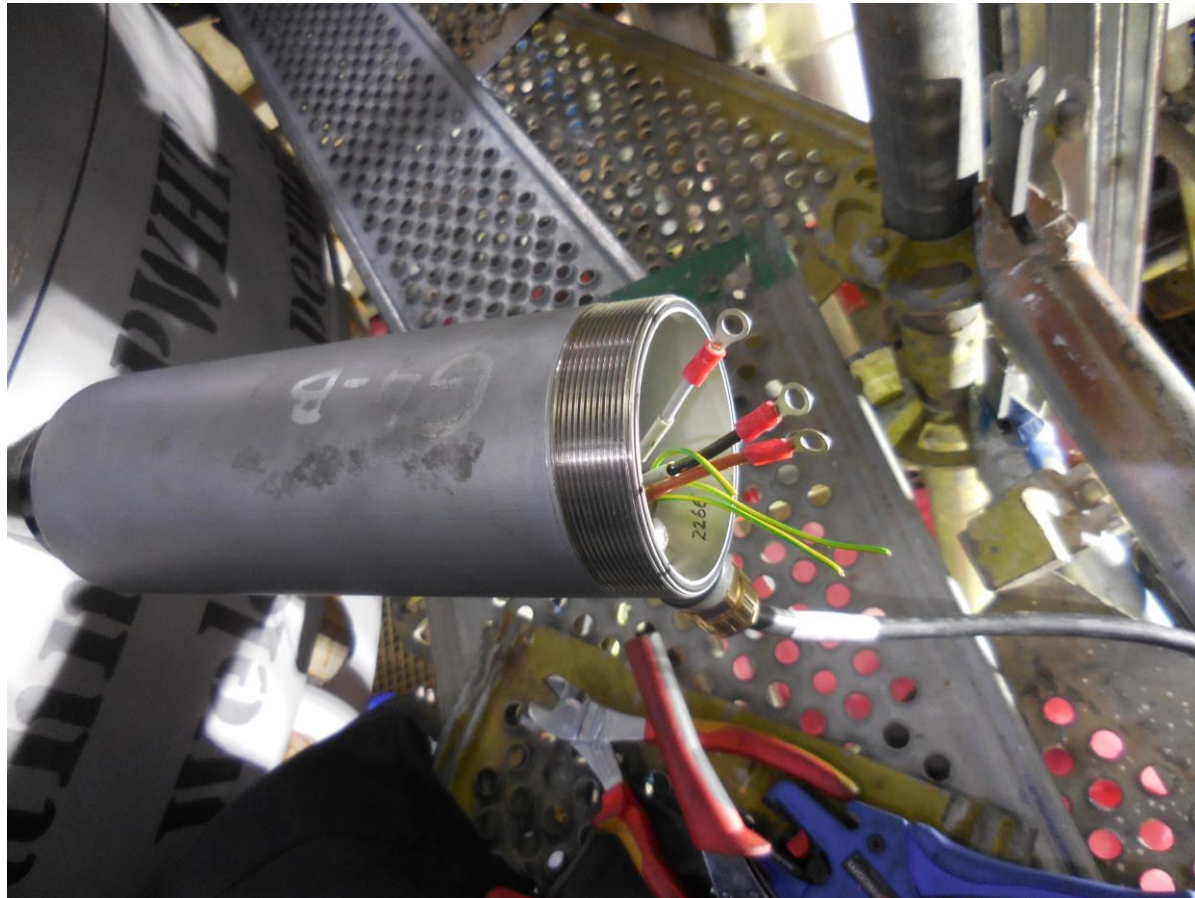
- 2 year inspection and part replacement
- 4 year inspection and parts replacement



FAQ's

- Sound emitted
- Vibration, concerns,
- Installation Window
- Operational know how
- Lifespan/Maintenance

- Others covered in USP/FAQ Link.



Cost Estimates for USP



Cost Estimates for USP



Factors affecting the budget for a USP system-solution:

- Physical dimensions: (Length, Diameter) and
- TEMA characteristics of the heat exchanger,
- Orientation: Vertical/Horizontal,
- Shell/Tubeside: Fouling Media

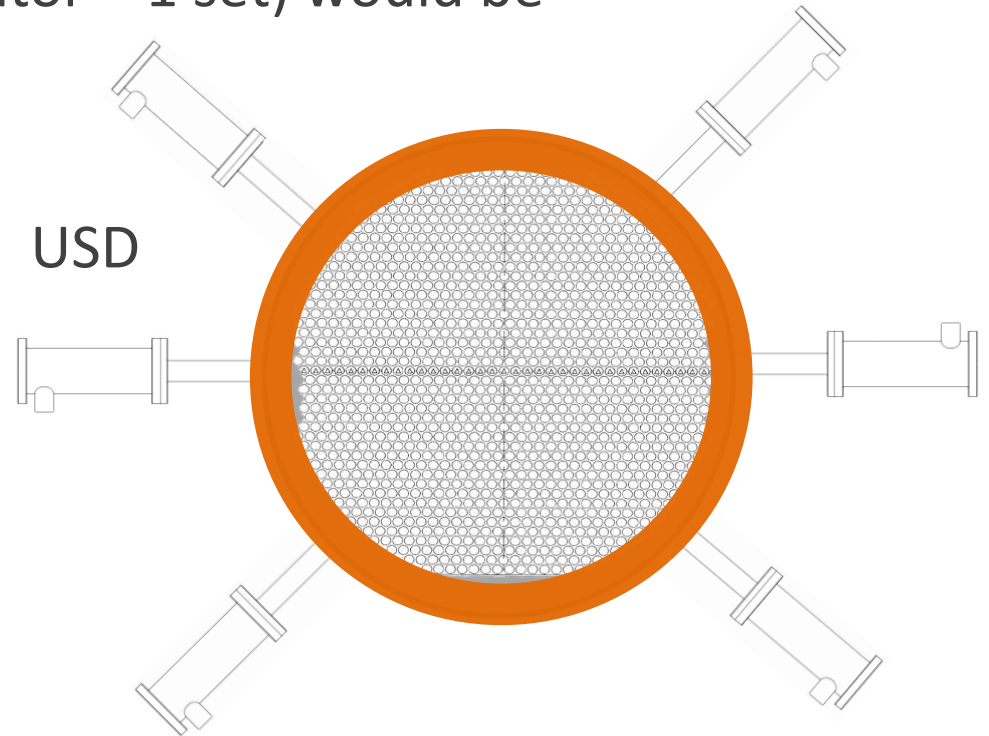


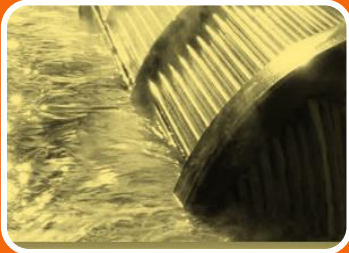
Cost Estimates for USP



Factors affecting the budget for a USP system-solution:

- How many sets (2 Transducers/1 Generator = 1 set) would be required for proper fouling mitigation?
- Each set requires an investment of \$85K USD





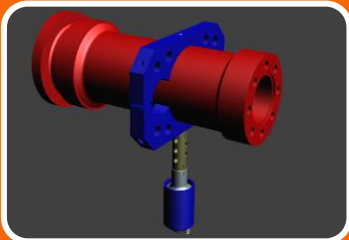
Ultrasonic Cleaning Baths

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



Clean-in-Process Technologies

- USP [Ultrasonic Scale Prevention]
- M³ Technology



Fouling Mitigation & Process Improvement

- M³ Technology (clamp on) apparatus with pre-selected ultrasonic power output, to match with specified outcomes

Presentation By:

Russell Pillion

CTO,

For additional information on this or other cases,
contact us at the information below:

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Direct: 1-416.779.8262



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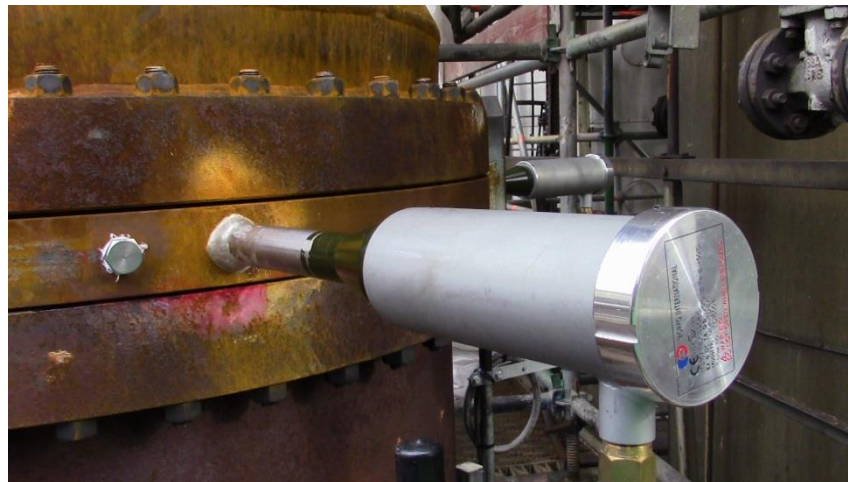
KUMHO
PETROCHEMICAL



russ@orangeultrasonics.com

CD-6 Shell Pernis, (Rotterdam) April 2015

- Heat exchangers 214 A/B have severe fouling issues.
- A dedicated USP system consisting of mount on transducers and ultrasonic generators provide pulsed-power to remove existing fouling and inhibit new fouling from forming on the heat transfer surfaces.
- The systems is: CE,UL and/or ATEX certified







Heat Exchanger

The market size of heat exchanger manufacturing is estimated to grow from USD 12.94 Billion in 2016 to USD 19.14 Billion by 2021, at a CAGR of 8.2%. Market Watch







10m Ultrasonic Bath
2016

Average USP Technology (Clean-in-Process) Sale Price: \$180k to \$280k USD

Customer ROI: Annual Energy Savings

Shell Oil- [Philippines]	\$1.2M
Shell Oil- [Rotterdam]	\$1.4M MVP
Shell Oil- [Houston]	\$680k MVP

ORANGE:

We manage a 40% mark-up and a 31% gross margin on these type of project opportunities



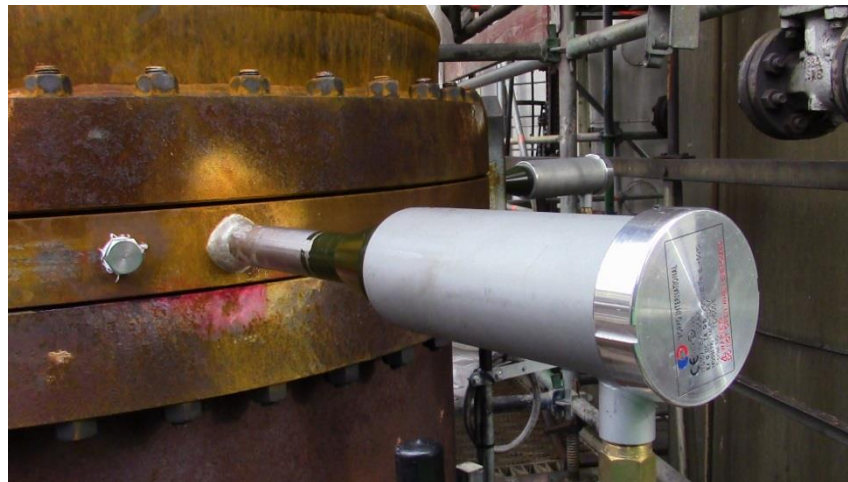
Ultrasonic Bath Sale Price:
\$885k USD

ORANGE:

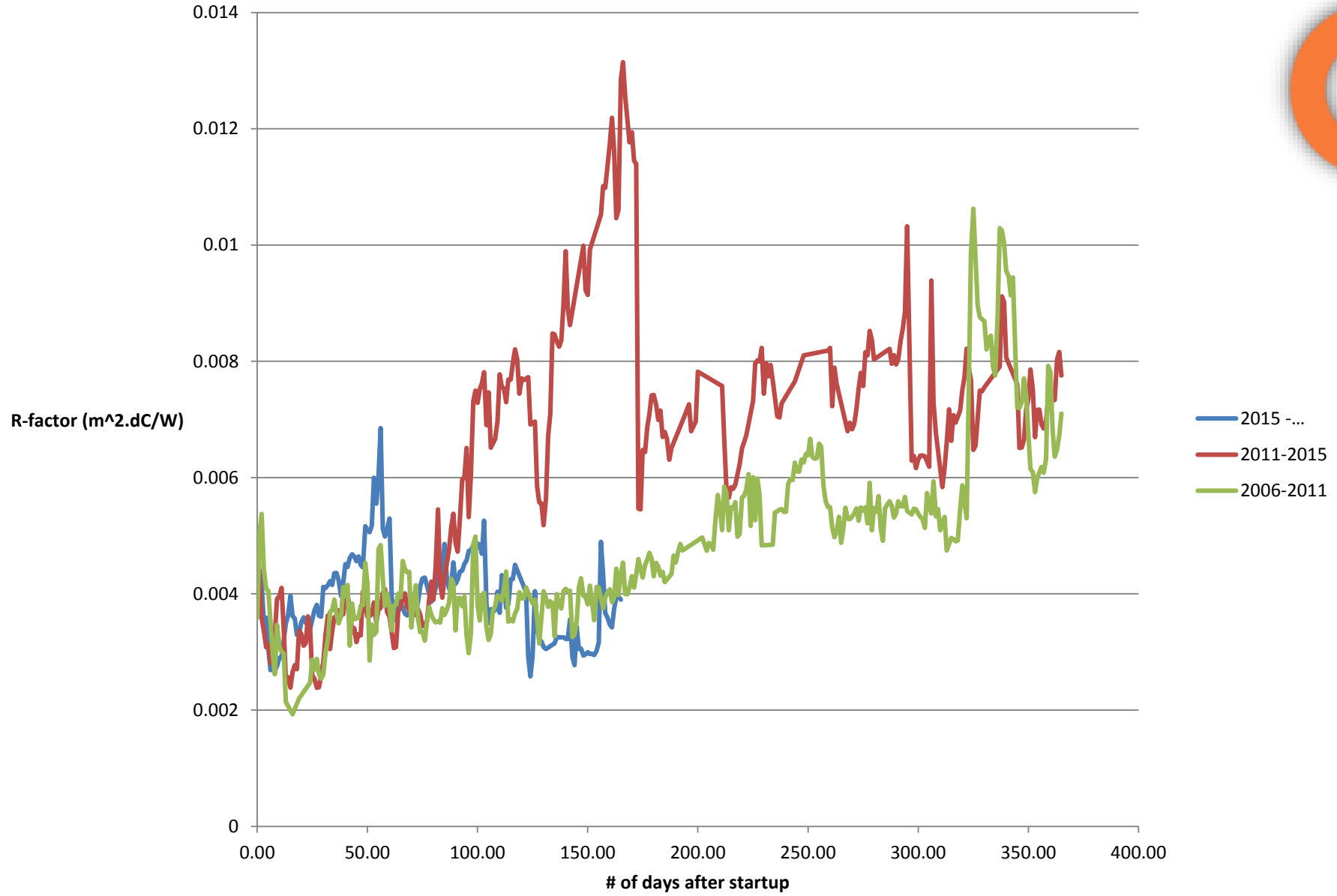
Cost of manufacturing the average unit is \$550K

CD-6 Shell Pernis, (Rotterdam) April 2015

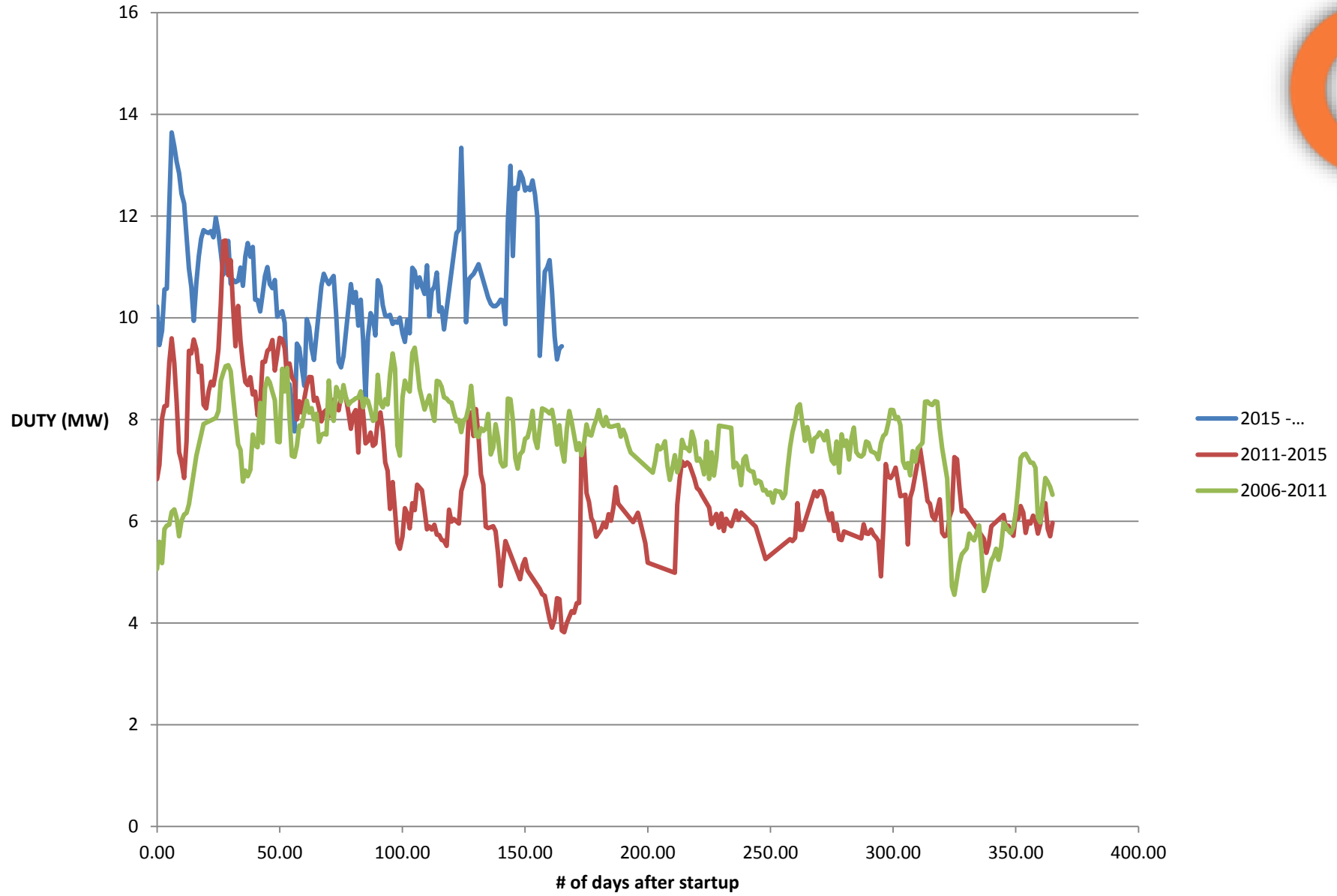
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CD6 USP E214AB Performance comparison: overall fouling factor

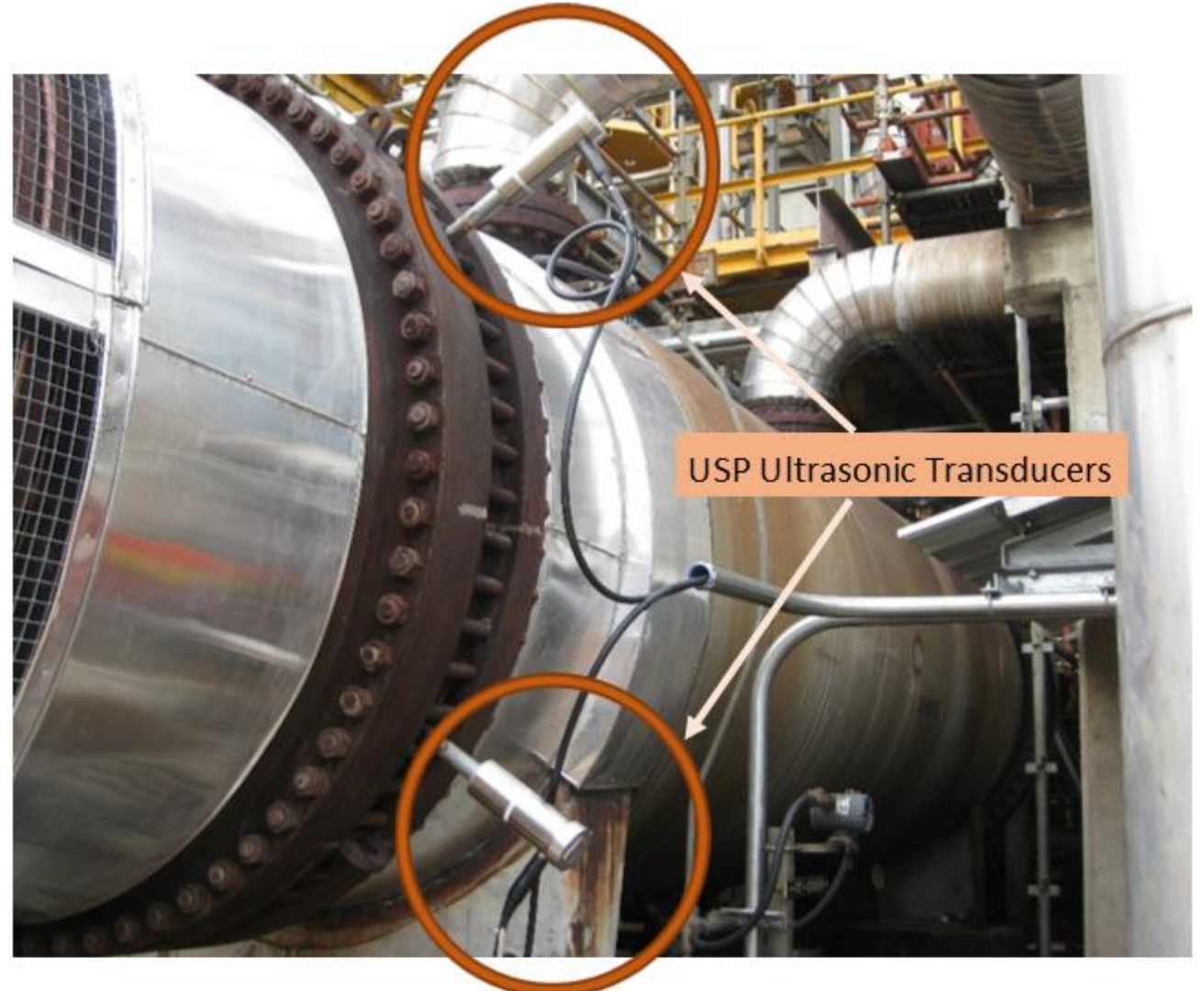


CD6 USP E214AB Performance comparison: DUTY

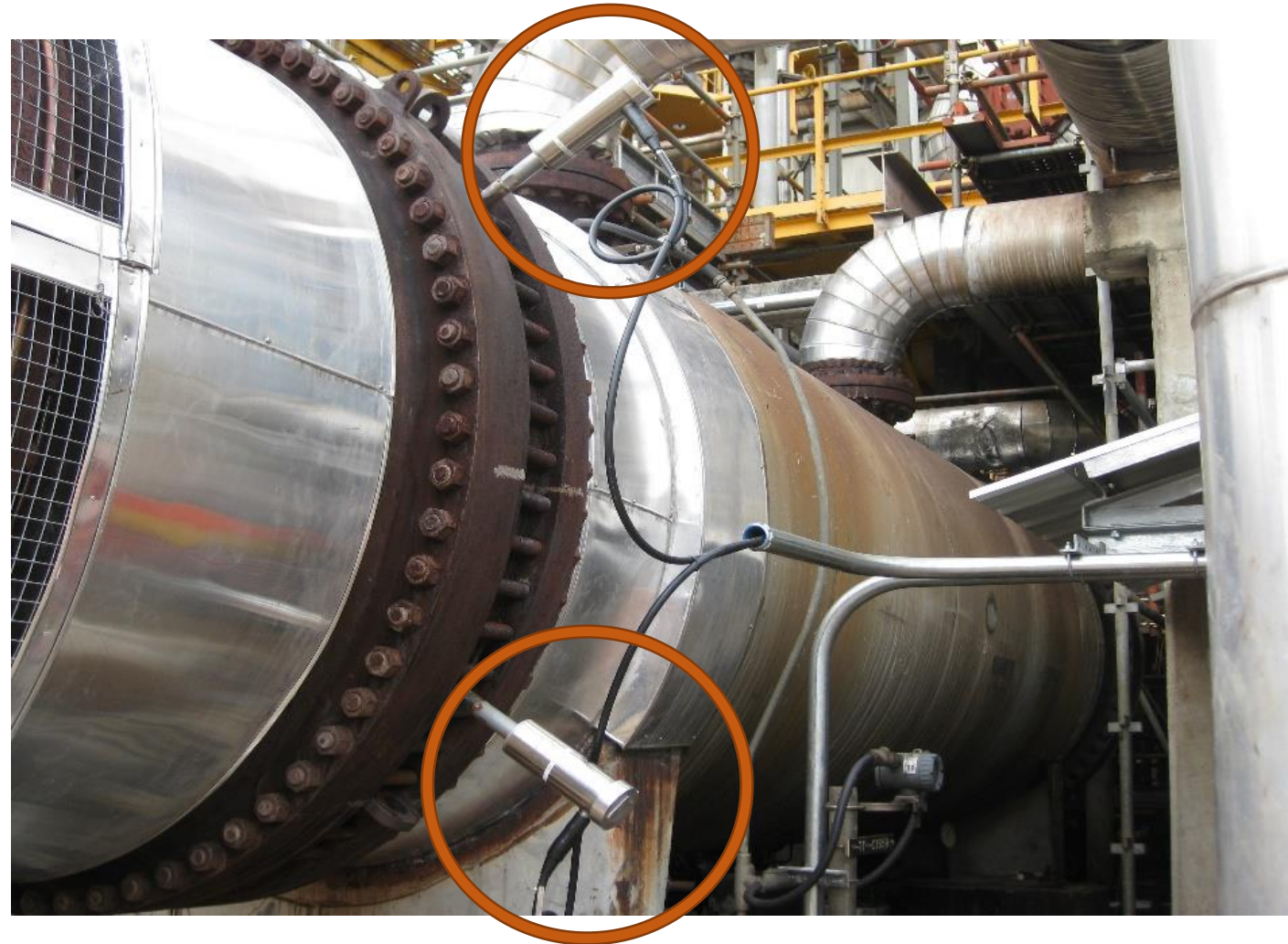


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Go-to-Market Approach

- Cooperative agreements with 3rd party organizations that have relationships with our key audiences.
 - HTRI [Houston/Europe]
 - USA Oil-special interest groups
- Shell Global Solutions International
- US Department of Energy: Shared sustainability initiatives
- Key Notes: Heat Exchanger Fouling and Cleaning Conference-Madrid, June 2017

Sales Channels

- [Bath tech] Industrial Services Companies
- [USP] Processing Plants: Oil & Gas, Chemical & Petro Chemical
- Processing Optimization Consultants: KPMG/Accenture/Solomon/KBR/McKinsey/WorleyParsons
- Pharmaceutical - 2018
- Water treatment & Power Generation plants, Food processors- 2018

Our Partnering Team:

- Strategic Partners: R&D Ultrasonic technology & prototyping- Le Locle, Switzerland
- Morko Technologies: South Korea
- Ultrasonic Transducer technology: Karlsruhe, Germany
- Engineering, simulation and 3d Modeling, Portugal
- Industrial Services Partner: Mourik Services:
Rotterdam, Netherlands
- Pasadena, Tx

How can MaRS help build our business?

- Lean Start-up OVER 2.0 Blank/Ries/Osterwalder
- Foundation Reconstruction
- Business Model Construction
- Introductions to potential financial/strategic partners
- Team build and onboarding
- _____?

Russell Pillion

President and Chief Technical Officer

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Direct: 416.779.8262



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Processing Refinery



Industrial Services Groups



Stand Alone Cleaning Facility

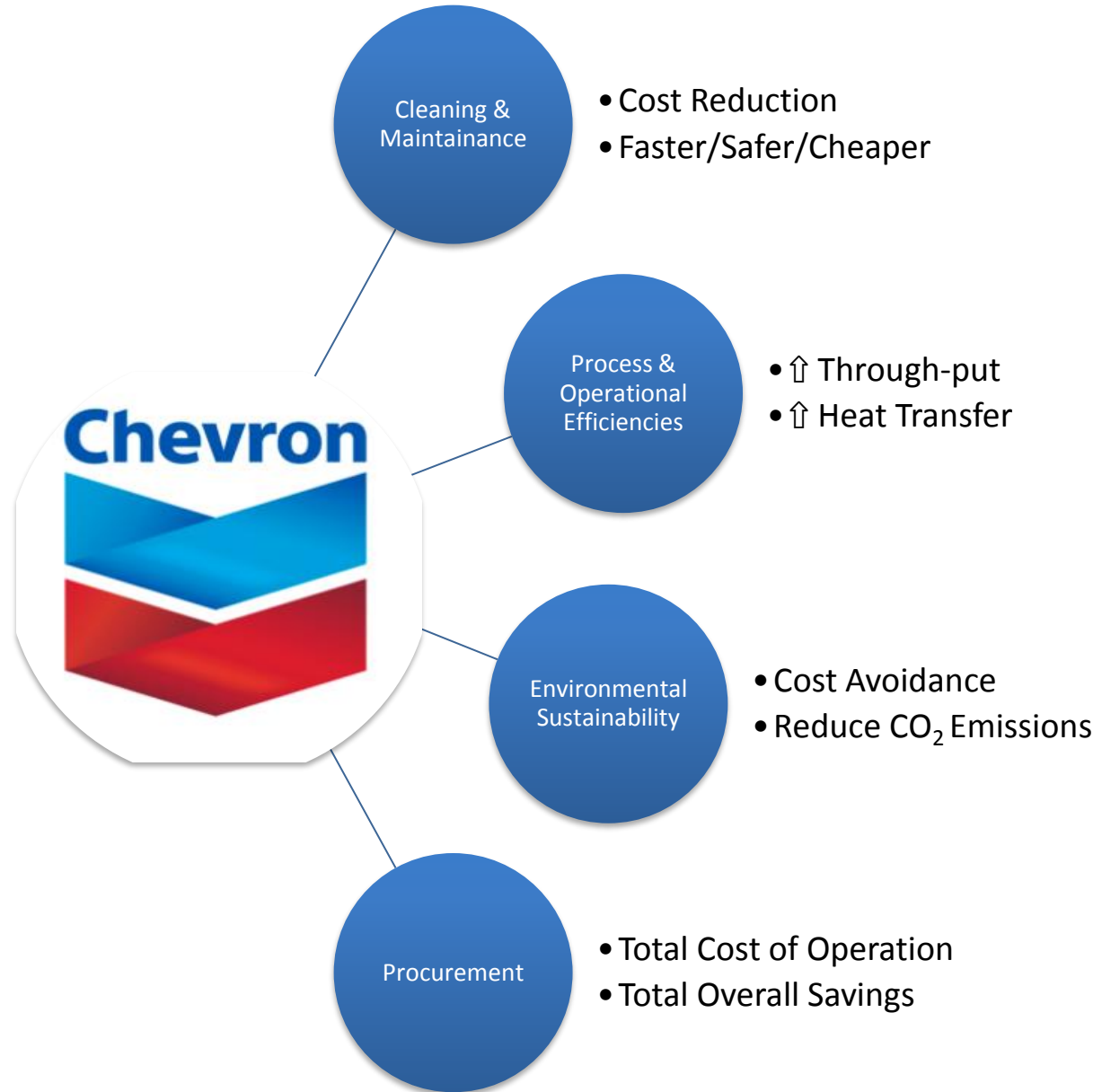


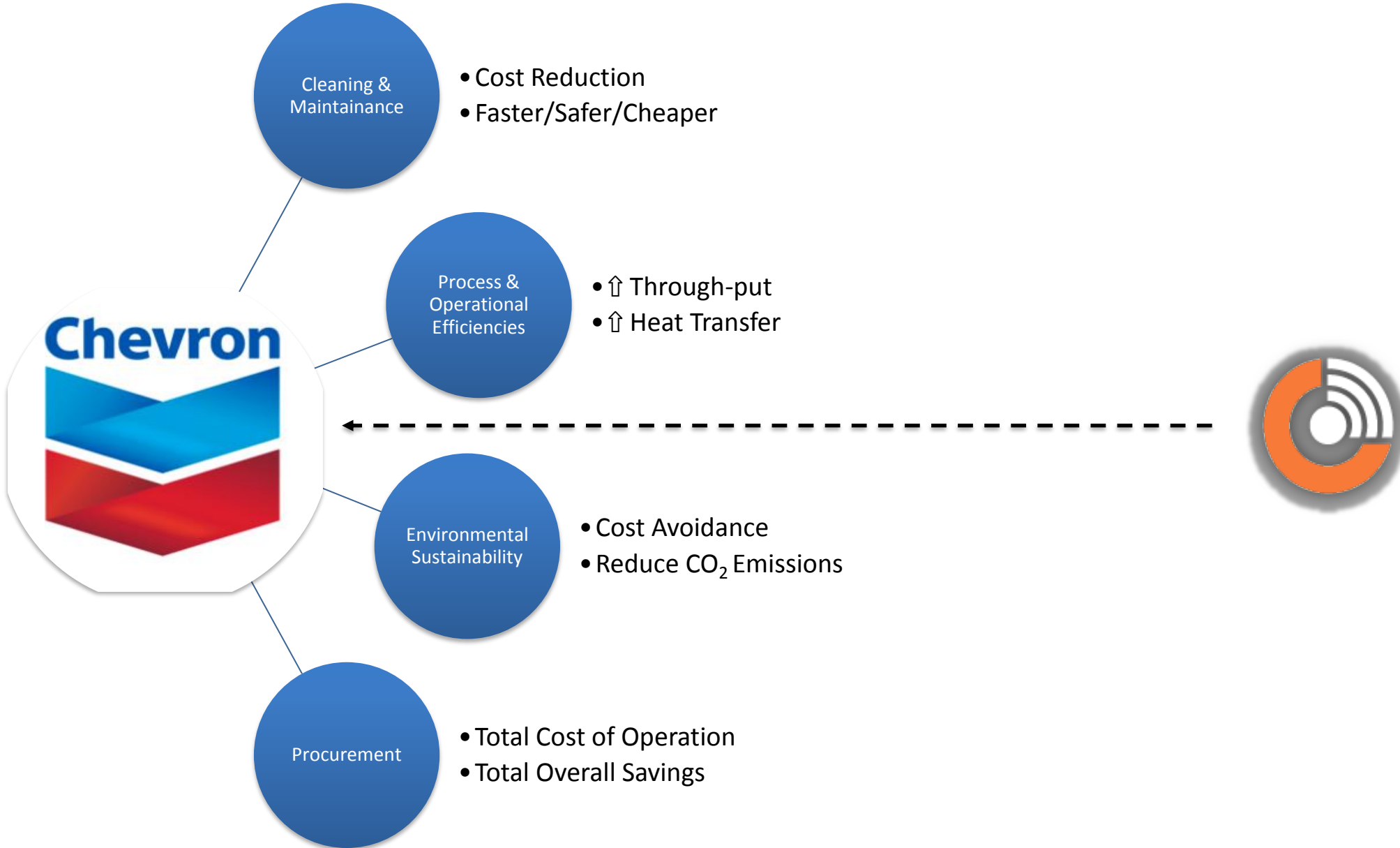
Heat Transfer & Research Institute

Special Interest lobbying groups

3rd Party Influencers









Cleaning & Maintenance



Process & Operational Efficiencies



Environmental Sustainability



Procurement



Industrial Services Groups



Stand Alone Cleaning Facility

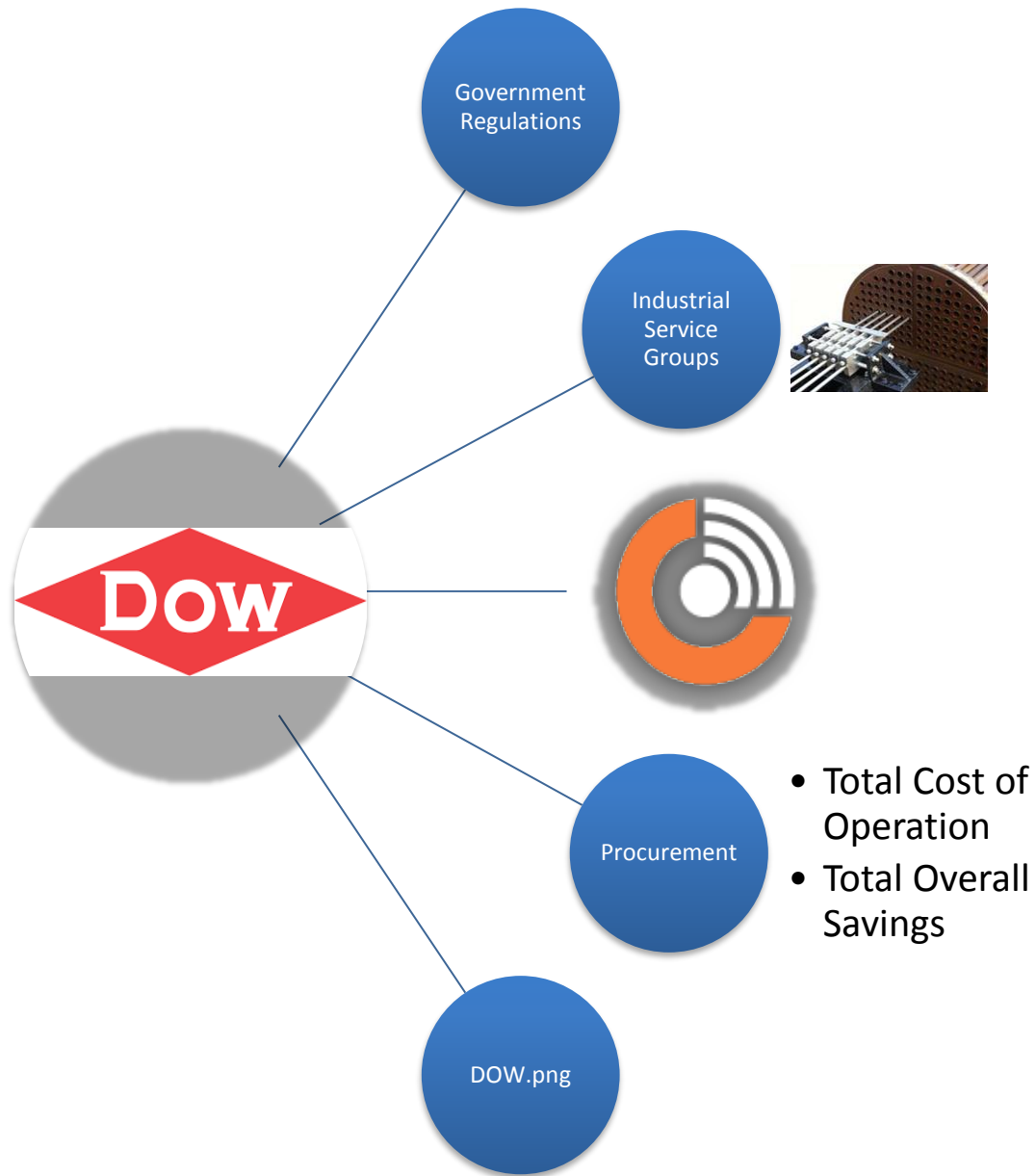


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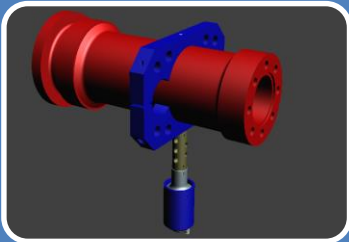
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Clean-in-Process Technologies

- USP [Ultrasonic Scale Prevention]
- **M³** Technology



Fouling Mitigation & Process Improvement

- **M³** Technology (clamp on) apparatus with pre-selected ultrasonic power output, to match with specified outcomes
- Ultrasonic Pigging Train







Sintered Metal filters
cleaned in batches

Previous cleaning with
high pressure water or
aggressive chemicals
were damaging these
filters.

RDS019

2297163



04/02/2013 13:42



Rotor: SHELL,
Rheinland,
Raffinerie



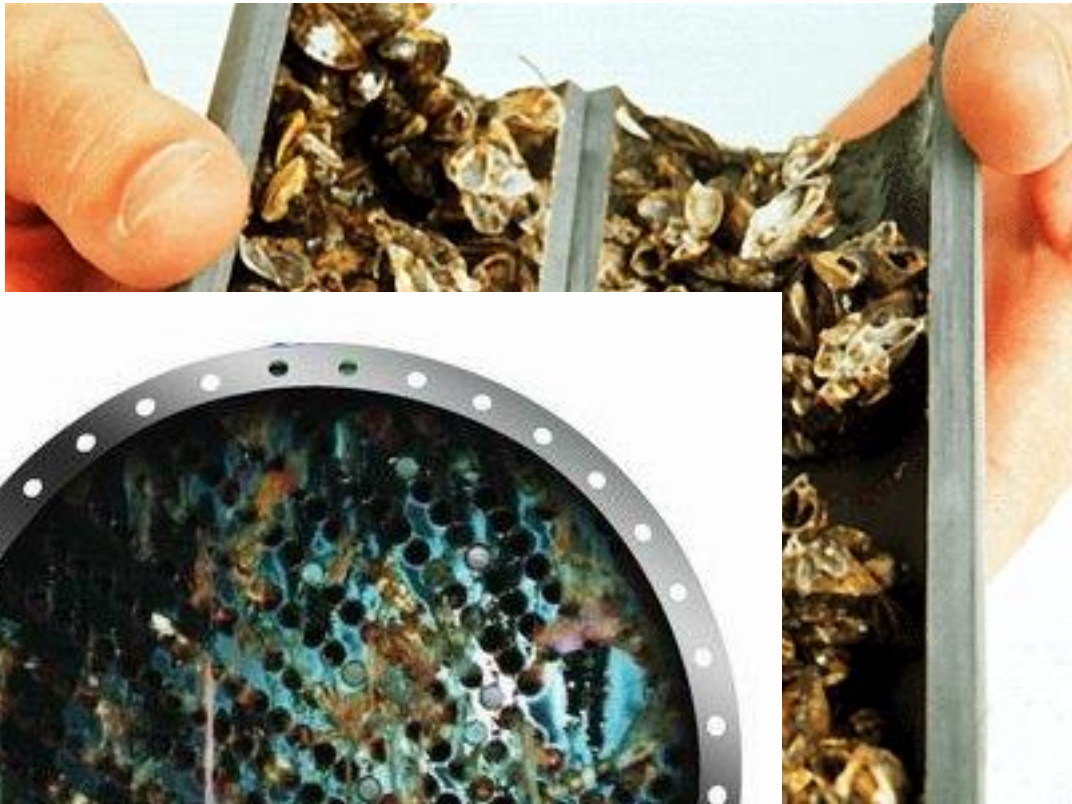
Rotor: SHELL,
Rheinland
Raffinerie

Note the cleaning
time!

04/02/2013 14:59

The very nature of this submersion technology allows the sound wave cleaning to reach and remove contamination from those hidden areas that other methods simply cannot.







ULTRASONICS

