

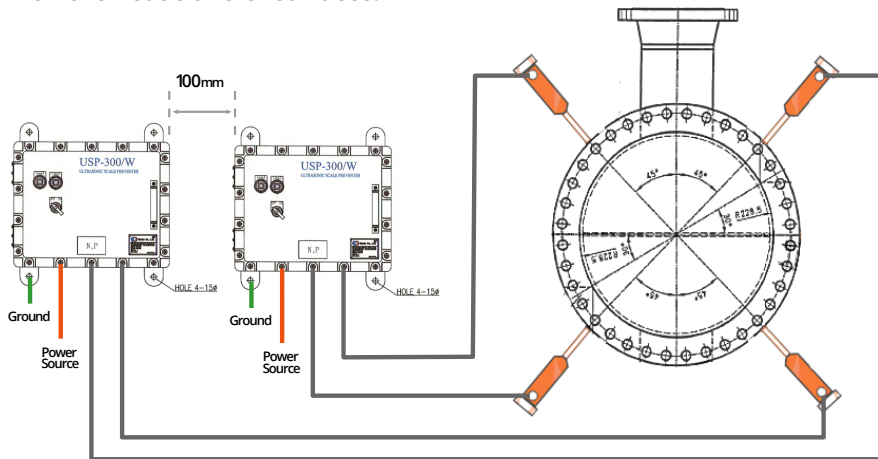
How USP Works

Ultrasonic Scale Prevention (USP) technology by MORKO® works online, 24/7, to remove fouling while your heat train is in full operation.

It uses high frequency, low displacement vibrations to remove existing fouling and inhibit new mineral scale and fouling build-up, from forming on the heat transfer surfaces.

Weld-on, pulse-actuated transducers are affixed directly to the tube sheet. Transducer location, is determined through analysis of historical fouling issues and the mechanical attributes of the exchanger.

The systems are configured to comply with: UL, cUL, CE, ATEX.



Ultrasonic Generators

Ultrasonic Transducers

Online Cleaning

+ Run-length

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

+ Cost Avoidance

Not shutting down at your regular cleaning interval saves environmental, mechanical and human resource costs associated with this down time.

+ Productivity

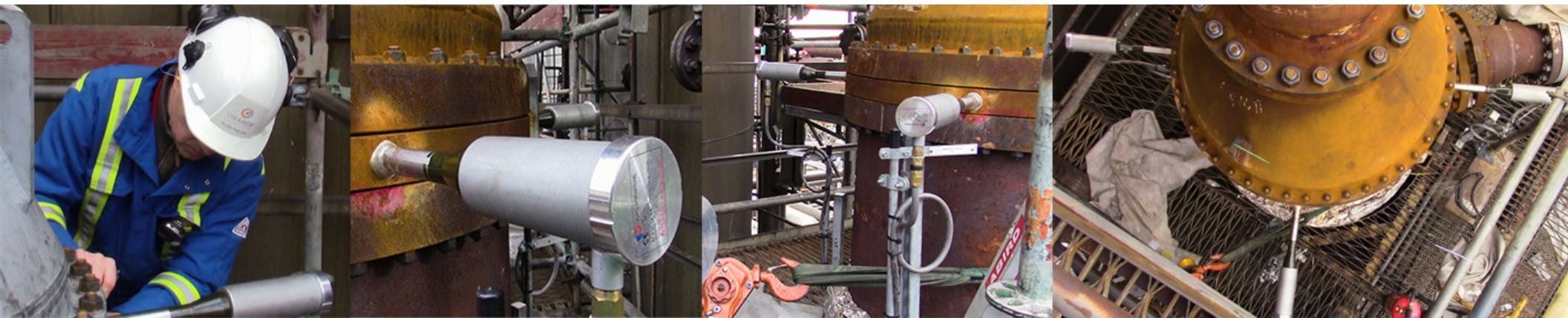
USP keeps heat transfer surfaces cleaner for longer, allowing for better heat transfer and greater process throughput.

+ Energy Recovery

A reduced fouling curve allows for more consistent temperatures. This can equate to significant operational fuel savings.



Engineering sound into superior cleaning technology™



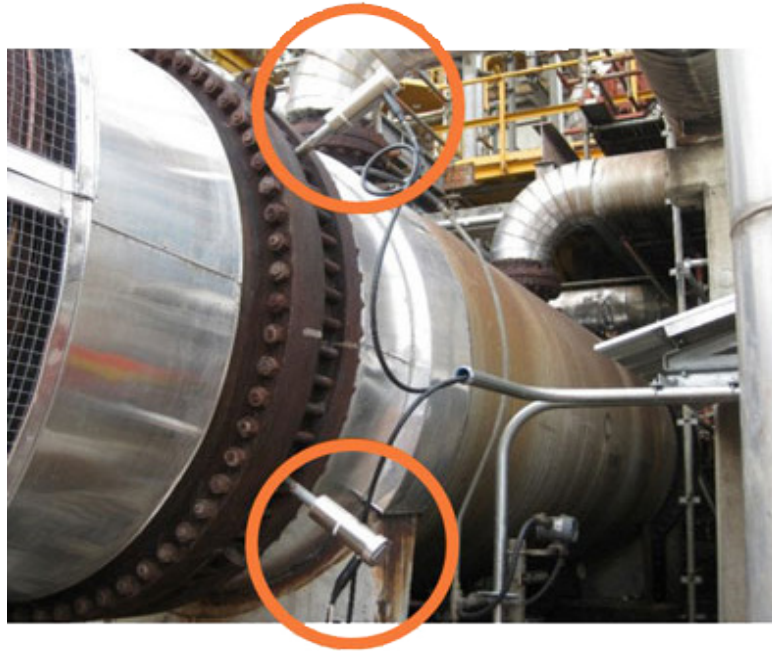
Operating Parameters

USP works best with:

Heat Exchanger Surface Temperature: $\leq 390^{\circ}\text{C}$

Max Bundle Length: 8m U-tube | 14m Straight-tube

Fluid Phase: Liquids of varying viscosities or two-phase vapor/liquid with $< 50\%$ by volume vapor



Equipment Parameters

CATEGORY	GOOD FIT FOR USP	NOT FIT FOR USP*
Equipment Type(s)	Pipe, Spool, Screw-Feeders, Conveyors, Hoppers	Brazed aluminum platefin-tube
Heat Exchangers / Piping Runs	Fired/Unfired Heater, Boiler, Reboiler, Air Cooler, Chiller, Condenser Design: Shell-and-Tube, Hairpin, U-Bend, Straight, Welded Plate and Frame, Spiral, Twist-tube (Koch)	Plate/frame with gasketed plates
Equipment Material of Construction	Carbon steel, 304 SS, 316 SS, most materials can be accommodated as well	Pure (not alloyed) aluminum
Equipment Orientation	Vertical or Horizontal	N/A
Shell and Tube: TEMA	Any design with exposed tube-sheet [or significant welded connection between tube-sheet and shell] TEMA "D" type heads may be an option	Breech-lock-type heat exchangers; Non-exposed tube-sheet (or with approval from ORANGE)
Shell and Tube: Tube to Tube-sheet Connection	Welded or rolled	N/A

**New applications are continuously discovered. Discuss your equipment parameters with ORANGE to review for potential fit.*

Specifications

Certifications

- cUL, UL
- CE
- ATEX
- Class 1, Division 2



Electrical

- Power Input: 220 - 240 volt AC
- Power Output: +/- 150 volts per transducer
- Operating Frequency: 10.1 - 14.1 kHz
- Generator Power Settings: 180, 190, 200, 220 volts

Mechanical

Transducers

- Dimensions: 463.2mm x 76.3mm
- Weight: 6kg

Generators (CE/ATEX)

- Dimensions: 600mm x 556mm x 300mm
- Weight: 66kg

Generators (cUL/UL)

- Dimensions: 540mm x 743mm x 300mm
- Weight: 80kg

Transducer Cabling

- 600V FR-CVV-SB, 3* 1.5SQmm armor shielded cable

Warranty

- First of 12 months period on installation or 18 months after delivery

Engineering Sound Into Superior Cleaning Technology

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