

HeatX Product Information

Oceanit's HeatX is an advanced low-surface energy, polymeric coating designed to impart chemical resistance and water and oil repellency to a wide variety of metals and coated surfaces. Unlike many other protection solutions, HeatX can be applied extremely thinly and homogeneously, allowing for fouling and drag reduction while not affecting heat transfer efficiency.

Heat exchangers in power generation plants often times use ground or sea water to cool down hot water or other operational fluids exiting the power generating turbines. The use of unprocessed water in heat exchanger and chillers creates significant problems such as fouling and corrosion of the metal components. Alternatively, acidic or caustic impurities contained within processed hydrocarbon gas streams can crystallize and deposit on tube interiors, forming scale that can impact optimal flow across the exchanger.

How it Works?

HeatX is a water based, specially functionalized urethane coating with high water and oil repellency that can be applied to a variety of form factors including the interior of tubes in both straight and U-tube shell-and-tube configurations, as well as plate-and-frame exchangers. The unique surface nature of HeatX offers extremely low adhesion to both water and oil based materials resulting in drag reduction and improved fluid flow. HeatX can be applied to in service exchanger tubes as a part of a refurbishment operation that can remove existing scale and corrosion, and prevent any further damage. HeatX can significantly reduce the need and frequency of regular maintenance operations, and can extend the “useful life” of assets.

Benefits

- Long lasting chemical resistance and compatibility with water and hydrocarbon-based fluids.
- Can be applied in-field, in-place, with a minimum of required equipment downtime, and does not require a pristine/new surface for application.
- Imparts wear and erosion resistance in fluids with particulate contamination.
- Functional up to 400°F, and stable under thermal cycling

HeatX Material Characteristics

HeatX has been qualified to show corrosion resistance, abrasion resistance, and chemical compatibility with both water, hydrocarbon, and mixed phase conditions. HeatX has excellent flow properties, allowing for complete coverage of straight and U-tube configurations to 100% NACE standards. A selection of performance data is included below. Additional data relevant to specific applications is available on request.

| Oceanit's HeatX Coating | |
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| Appearance of Coating Film | Clear |
| Specific Gravity | 1.1 g/cm ³ |
| Application Method | Spray, Dip or Flood and Drain |
| Coating Thickness | 1-4mil |
| Applicable Surfaces | Carbon Steel, Copper-Nickel, Aluminum, Titanium Alloys |
| Maximum Usable Temperature | 400°F |
| Wear Resistance (ASTM D4060) | 8-11 mg (1 kg load, per 1000 cycles) |
| Particle Erosion Resistance (ASTM G76) | <1% Mass Loss |
| Corrosion Resistance in Accelerated Seawater Conditions (ASTM B117) | 1000 hr |
| Chemical Compatibility | |
| Acidic Conditions (pH <2) | Yes |
| Alkaline Conditions (pH >11) | Yes |
| Acid Gas (>1000 ppm CO ₂) | Yes |
| Sour Gas (>4 ppm H ₂ S) | Yes |

Case Study: Biofouling and Corrosion Resistance for an Energy Generation Plant

In collaboration with Hawaiian Electrical Company (HECO), a major utility company in the state of Hawai'i, Oceanit is currently evaluating the use of HeatX to protect shell-and-tube heat exchangers from biofouling and corrosion. HECO uses seawater as a secondary source of coolant in their shell and tube chillers for removing heat from hot liquids exiting the power generation turbine.

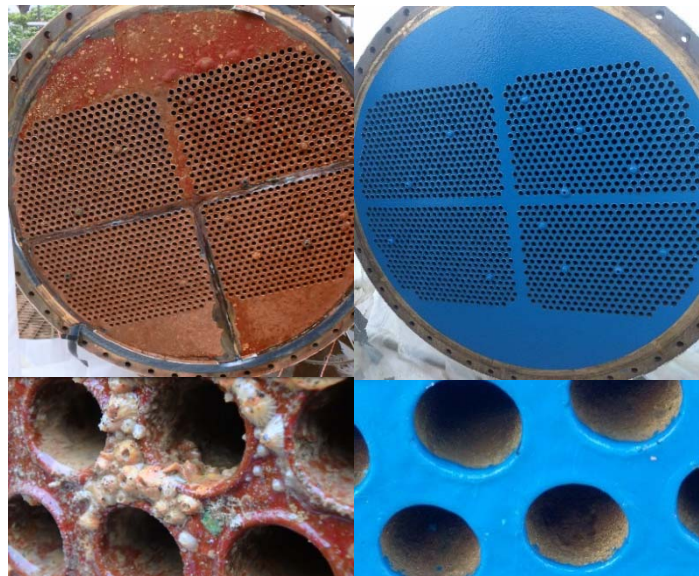


Kahe Power Plant (HECO)

Utilization of seawater for cooling introduces the major challenge of barnacle growth and fouling that can plug the inner tubes of the heat exchangers and results in significant reduction in the heat transfer efficiency. In addition, most of the metallic components which are exposed to seawater are susceptible to high levels of corrosion and needs to be addressed regularly. HECO estimates that on an average every 6 months most of the exchangers used in the plant undergo thorough cleaning, and biofouling can occur in as little as 30 days.

HECO Exchanger:

In this effort, Oceanit collaborated with HECO to apply HeatX on-site to refurbish an exchanger containing approximately 1500 $\frac{3}{4}$ " diameter, copper-nickel tubes of 20' length. Coating, cleaning, inspection and qualification were completed with only requiring 2 weeks of non-operation. Due to the extreme low surface energy of the HeatX coating, barnacle adhesion will be minimized within the tubes, while the carbon steel tube sheets can be protected against corrosion due to immersion within the seawater environment.



Uncoated:
Extensive Biofilm Growth

Coated –
No Biofilm Growth

Current Results:

Inspection completed after 30 days of operation determined that there is no visible biological growth on the coated surface, suggesting that the coating is providing significant resistance to biofouling growth. Additionally, heat transfer efficiency has remained consistent since coating, indicating no degradation in performance. Additional evaluation and inspection will occur at 180 days.