



TITANIUM TUBE LIQUID CHILLING EVAPORATORS AND CONDENSERS FOR HIGH RELIABILITY AND EFFICIENCY. HANWEST “CTIE-MR” AND “CTIC-MR” SERIES REFRIGERANT TO FLUID HEAT EXCHANGERS WITH TITANIUM “FINE FIN” & “MICRO RIB” INTERNAL SPIRAL FIN FLUID TUBE.

RESISTANCE TO WATERS.

• **Fresh Water.**

Titanium resists all forms of corrosive attack by fresh water and steam to temperatures in excess of 315°C. Some natural river waters contain manganese which deposits as manganese dioxide on heat exchanger surfaces. Titanium is immune to this form of corrosion and is an ideal material for handling all natural waters.

• **Sea Water, General Corrosion.**

Titanium resists corrosion by sea water to temperatures as high as 260°C. Titanium tubing, exposed for 16 years to polluted sea water in a surface condenser, was slightly discoloured but showed no evidence of corrosion. Titanium has provided nearly twenty years of trouble-free sea water service for the chemical, oil refining and desalination industries. Pitting and crevice corrosion are totally absent, even if marine deposits form. The presence of sulfides in seawater does not affect the resistance of titanium to corrosion. Sulfides are quite common in coastal locations that use sea water for cooling.

• **Erosion.**

Titanium has the ability to resist erosion by high velocity sea water. Velocities as high as 36m/sec. cause only a minimal rise in erosion rate. The presence of abrasive particles, such as sand, has only a small effect on the corrosion resistance of titanium under conditions that are extremely detrimental to copper and aluminium base alloys. Titanium is considered one of the best cavitation-resistant materials available for sea water service.

• **Stress Corrosion Cracking.**

Titanium is essentially immune to stress corrosion cracking (SCC) in sea water.

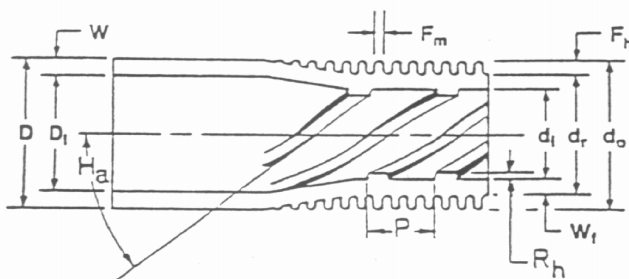
• **Corrosion Fatigue.**

Titanium, unlike many other materials, does not suffer a significant loss of fatigue properties in sea water.

• **Bio-fouling.**

Titanium does not display any toxicity toward marine organisms. The integrity of the corrosion resistant oxide film, however, is fully maintained under marine deposits and no pitting or crevice corrosion has been observed. It has been pointed out that marine fouling of titanium heat exchanger surfaces can be minimised by maintaining water velocities in excess of 1.2 m/sec.

TITANIUM FINE FIN / MICRO RIB TUBE SECTION.



D — Outside Diameter of Plain End
 D₁ — Inside Diameter of Plain End
 d_r — Root Diameter
 d_o — Diameter Over Fins
 d₁ — Inside Diameter of Fin Section
 W — Wall Thickness of Plain End
 W_f — Wall Thickness Under Fin
 F_h — Height of Fin
 F_m — Mean Fin Thickness
 P — Mean Rib Pitch
 R_h — Height of Rib
 H_a — Rib Helix Angle

Hanwest will manufacture titanium heat exchangers for evaporator or condenser applications in tube in tube or shell and tube configurations, in capacities from 2.5kW to 30kW capacities.