

# COPPER NICKEL ALLOY BOXCOOLERS

Weka Presents Environmental-Friendly and Maintenance-Free CuNi Boxcoolers

Modern ships are complex constructions using a variety of materials. Combined, different materials may cause material corrosion. Bio-fouling causes ships to sail slower, cause water inlets to be clogged, and cause a range of further disadvantages. Anti-fouling paint actively releasing copper ions are prohibited for non-commercial ships in many countries. Environmental concerns are spreading. The prohibition of active paint releasing copper is just one example.

## Weka Technology

Weka has been manufacturing marine products since 1957. The core business is boxcoolers which are used for inland waterways and sea-going vessels. Weka offers a range of materials for different applications. This is for economical as well as for environmental reasons.

Boxcoolers are used for cooling of diesel engines between 3 and 30,000 kW. Boxcoolers have several advantages compared to conventional cooling methods: lower weight and price, easier maintenance, higher reliability - especially in dirty or contaminated water.

Weka has taken the boxcooler principle to new heights of performance. Recent application and technology development has resulted in a product which competes successfully with conventional cooling for diesel engines in almost any application.

Weka is the leading global boxcooler company.

*Complete boxcooler before assembly into the ship*



*Protection against bio-fouling is necessary, but copper-nickel alloys is naturally protected. The left part of the picture shows a traditional coated boxcooler, the right part with tubes of copper-nickel*

Based on extensive development, Weka has taken on a leading environmental role. The acceptance of boxcoolers is rapidly expanding. Reasons for this include low purchase and installation costs, and low maintenance costs. In

total, low life-time costs. Environmental aspects support copper-nickel boxcoolers with adequate corrosion protection.

## Copper-Nickel Alloy

Environmental concerns have also been raised about the release of copper from other sources, such as active impressed current anti-fouling systems. The advantage with protection systems actively releasing copper is that cheaper materials may be used; e.g., coated boxcoolers for ship engine cooling. Without the active release of copper ions around the coated boxcooler, bio-fouling would shortly render the coated boxcooler in-efficient. The disadvantages are paid for by nature.

One ship equipped with an impressed current anti-fouling system may release 700 kg copper ions per year. This is based on information from one supplier of aluminium-brass coated boxcoolers. The actual use is probably higher due to non-perfect conditions, unnecessarily high impressed current, etc.

Ship components made of copper-nickel do not need active systems for their protection. Copper-nickel alloys form a protective shield against bio-fouling and emit very low amounts of poisonous copper ions. Weka, one supplier of boxcoolers made from copper-nickel tubes, has developed a protection system which manages to fully protect the ship and boxcooler from cor-

rosion while at the same time eliminating the need for anode protection.

#### Environmental Criteria

Dutch company Weka, the leading boxcooler company, has completely abandoned aluminium-brass and active anti-fouling systems in their boxcoolers.

Weka's choice of copper-nickel alloys for the tubes in the boxcooler is based on economical and environmental reasons, says Cees de Kwant, head of Weka Boxcoolers. "Copper-Nickel is a perfect material for boxcoolers. It has good manufacturing properties and is naturally protective against the fouling by animal. Earlier difficulties to adequately protect CuNi boxcoolers from galvanic corrosion, especially during welding at construction, have been solved. We regard the minimal issue of copper ions as a very strong argument for CuNi tubes, and we see yards and shipowners increasingly prepared to accept the slightly higher initial cost. During the ship's operative life-time, the higher cost for CuNi tubes is paid back many times by lower maintenance costs."

Contemporary arguments around long-term environmental issues offer two major options: The wait-and-see-take-action-when-proven view and the view that the most dangerous case must be considered: what might happen if? The argument that the oceans are big, and some pollution is solved in a huge volume of water disregards both the local implications (what happens on the spot) and long-term implications (what happens when oceans, like many lakes already decades ago, are full with pollution).

#### Sound Alternative

The combination of Weka boxcoolers made of environmentally friendly copper-nickel alloys with an improved passive protection system meets the requirements of environmentalists as well as of ship-owners.

The protection of ships from fouling by barnacles and mussels is a traditional problem. Many protection systems based on the impressed current anti fouling principle release large amounts of copper ions into the water. Such



*Mats Hjortberg is the application expert who has proposed most innovative applications of boxcoolers*

protection is regularly applied around water inlets, boxcoolers, propulsion and rudders on the ship.

Release of potentially poisonous copper ions into water is an environmental issue. In line with its commitment to the environment, Weka has further developed boxcoolers and protection systems. Today's announcement of a fully passive system means a reduction of the release of some 700 kg of copper per ship per year. For comparison, the commonly referred to environmental problem of anti-fouling paint on ships, which has been banned for leisure boats in many countries, is estimated to correspond to 500 kg per year for all ships in one country researched.

#### Passive Protection

The Weka passive protection of components on the ship exposed to sea water is based on the use of copper-nickel alloys, and controlled bal-

ancing of the difference in potential between different materials. Copper-nickel alloys are naturally resistant to bio-fouling, by forming a protective surface shield. The release of copper ions into water is almost negligible. The corrosion protection is made possible by recent breakthrough in the understanding of galvanic corrosion related to potential difference between different materials.

Due to the natural anti-fouling properties and the efficient corrosion prevention, Weka boxcoolers made of copper-nickel tubes show much lower life-time costs than traditional cooling systems for ship engines, such as plate heat exchanger inside the ship or boxcoolers made from galvanized steel or aluminium-brass tubes.

#### Maintenance Free

While conventional cooling systems for ships require extensive maintenance, the new boxcooler series are virtually maintenance-free. This reduces direct investment cost, but also reduces the time a ship has to spend in dock for maintenance.

Cees de Kwant explains: "We know that boxcoolers have a much lower installation cost than plate heat exchangers. We now know that copper-nickel boxcoolers need much less maintenance than steel or aluminium-brass boxcoolers. This has a profound impact on the operating cost of a vessel over its life-time. Environmental issues are getting attention, and it is no longer seen as acceptable for environmental reasons to release free copper ions for protection of ships. Another environmental issue with materials such as aluminium-brass is that if the protection fails, e.g., when a copper anode falls off the ship, cleaning must be made using strong chemicals.

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*Boxcoolers can be efficiently used on large as well as on small ships, such as this trawler*

