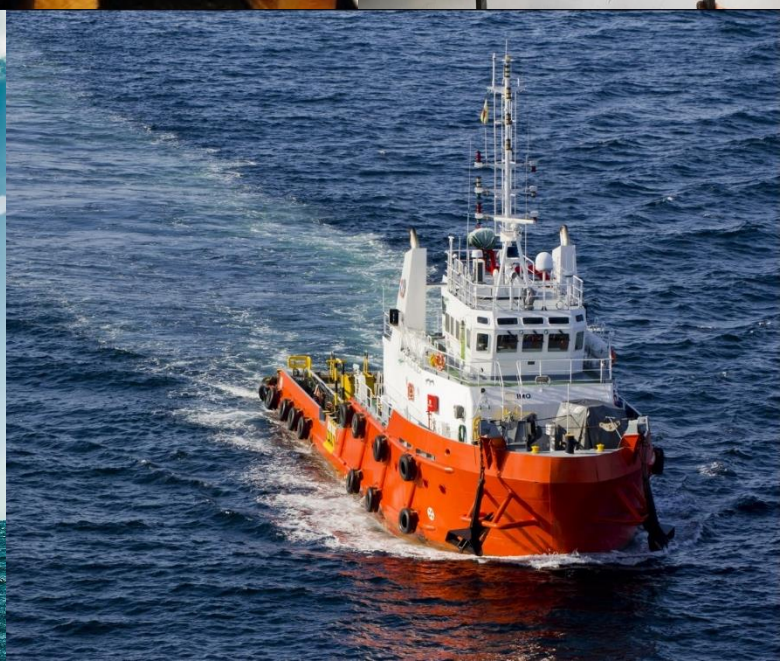
CATHODIC PROTECTION
AMPAK®
SINCE 1954

ANTI FOULING SYTEM



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1. INTRODUCTION

Automatic electrolytic fouling prevention

This is an automatic electrolytic process for the prevention of fouling by growth of wiry type algae, shell-fish, mussels, etc.
The system is based on the same principles as the use of marine anti-fouling paints where copper pigments are used for provision of a toxic medium. It is established that cuprous oxide leached from the paints has a strong toxic action on growth such as algae, shell-fish, barnacles and other growth.

Anti-fouling paints are active when leaching rates of copper oxide exceed 10 microgram/cm² per day, which means that a surface of 1 m² can be kept clear of biological growth by leaching of approx. 30 gr. of copper oxide/year.

Similar amounts of copper oxide are active in our system.
Whereas anti-fouling paints are only active during the period the leaching rate is over the given quantity, in our system cuprous oxides are formed continuously in controlled amounts and similarly the action against growth and development of algae and shell-fish is continuous and controlled.

It would appear that the use of copper as anodes only could have dangerous consequences. Corrosion cells can be established when dissolved copper is displaced from solution and redeposited on steel surfaces. However, this possibility does not and cannot occur in the conditions of use since in the first instance the quantities of copper going into solution are negligibly small and secondly this copper does not remain as dissolved copper, but is immediately oxidized to copper oxides which are insoluble.

Both cuprous and cupric oxides are insoluble so that the amount of copper ions in water is untraceable and far below so-called natural levels.

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1.1 Anti-Fouling by Impressed Current

Aluminium anodes are used in combination with copper anodes because direct current (D.C.) dissolution of aluminium alloys results in formation of "colloidal" solutions and hydrated aluminium oxides or "floc" which is gelatinous and encapsulates the precipitated copper oxides so that they are removed as a sludge. Similarly, "suspended" impurities in the water are removed so that a cleaner water is produced.

The quantities of copper forced into solution are relatively small for example a water inlet of 800 m^3/hr we dissolve 106 kg of copper per year (= less than 0,02 ppm) of which most of the copper is precipitated and 26 kg of aluminium. Design are based on type of water, flow rates, conditions and fouling character, but the amounts of copper and aluminium dissolved will be of this relative magnitude.

All immersed steelwork connected to the anodes will be fully cathodically protected and the corrosion rate of allied pipework downstream reduced by reduction of dissolved oxygen in solution and the formation of mixed Fe-Al-oxide crystals at the steel/pipe surface.

This Cu-Al system is used with steel pipelines and coolers mad of galvanised material. When using this system with CuNiAl cooler and pipeline material, iron anodes are used instead of aluminium anodes. The working of the system is equal to the system using aluminium anodes.

1.2 Advantages

The system can be regarded as a perfectly safe system. Not only on account of the corrosion dangers, but it will not create any danger for handling personnel, nor will it give any pollution effect in the effluent.

The system will need little care and maintenance and with the exception of replacement of worn anodes, will work fully automatically.

The system is cheap. Running costs are low, low consumption since the system works at low voltage.

Consequently, the major running costs are in the replacement of the copper and aluminium anode which costs are very low in comparison with systems which depend on addition of chloride or other chemicals.

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2. DESCRIPTION OF THE SYSTEM

2.1 Cooling water systems on board of vessels

In ships much seawater is used for cooling of engines, for condensors, for oil- and water coolers, etc.
Often these systems suffer from heavy growth of mussels and other shell-fish types in the water inlet boxes, in piping's and in the equipment when the water is used.
Especially in ships, usually active in harbour areas, such as dredgers, ferryboats, tug boats, etc. This situation occurs and sometimes the growth is at such a speed that cleaning of the equipment is necessary already after a few months of activity.

But also when the systems are not in use or in full use these troubles occur and are even more difficult to fight. Not however with our system.
The anodes can be installed inside the water inlet box (sea chests).

This box as well as the pipelines and equipment from thereon will be protected against biological fouling. Moreover, the sea chest is protected against corrosion by cathodic protection.

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3. INSTALLATION

Installation of equipment can be carried out through classified electricians. It is principle a simple procedure due to the compact design of the system and can be timed to coincide with regular dry docking schedules.

The copper- and aluminium anodes or copper- and iron anodes should be installed in the positions indicated on the installation drawing supplied.

If installation in the sea chest(s) is impossible by lack of space, installation is possible in special reaction tank(s) in the pipelines from the sea chests to the pump(s).