

熱交換器의 海水冷却細管의 腐蝕과 防蝕(2)

—外部電流에 의한 熱交換器의 海水冷却細管内面の 直接的電氣防蝕—

田 大 熙

On the Corrosion and its Prevention of Sea Water Cooling Tubes of Heat Exchangers

—On the Direct Protection by the External Current for the Inner Surface of Sea Water Cooling Tubes of Heat Exchangers.—

Dae Hie, Jeon

Abstract

The heat exchangers cooled by sea water are protected against corrosion by the current from the sacrificial anodes or the auxiliary anodes fixed to the inner surface of the water chests. But all areas of the inner surface of their cooling tubes can not be protected by the current. Therefore, metal tubes which are more anti-corrosive are to be used for those heat exchangers, or the inner surface of their cooling tubes are to be covered with the protective film made by ferrous ions (Fe^{2+}) which are produced by an electrolytic method or by adding some compounds. But the former is to reduce the heat conductivity, the latter is insufficient to the protection.

In this paper, a heat exchanger is made of the tubes whose metal are more heat-conductive but less anti-corrosive; the twisted tapes, heat transfer promoters, to both faces of which the insoluble linear auxiliary anodes made of the Pb-Ag alloy are fixed, are inserted into the cooling tubes; and the reference electrodes, small-unbroken natural sea water type AgCl electrodes, whose potentials are stabilized in sea water for a long period are fixed on the cooling tubes to enable to measure the potentials of the inner surface of the tubes, for the protective current density is controlled by its potential. An attempt is made to protect the inner surface of the sea water cooling tubes against corrosion directly by the external direct current. And an anti-biofouling device for the sea water pipe lines and the heat exchanger is made and is equipped on the sea water suction pipe line, and its characteristics are checked.

The results of the tests are as follows:

1. The inner surface of sea water cooling tubes can be protected satisfactorily against corrosion by the external current.
2. The distribution and the change of potentials on the inner surface of cooling tubes can be measured by the small-natural sea water type AgCl electrodes.
3. The initial protective current density of any heat exchanger can be estimated by the results of the test.
4. The anti-biofouling device which has about 70% generating efficiency of the effective chlorine at $200mA/cm^2$, can be made in simple structure.