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Prevention of the Crevice Corrosion for the Large Flange of the Salt Manufacturing Plant by Inserting an Insoluble Anode

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Summary

Stainless steels are commonly used in salt manufacturing plants. However, in the concentrated salt solution environment, the stainless steels inside the large flanges tend to suffer the crevice corrosion. The purpose of this study is to develop the technique to prevent the crevice corrosion completely by inserting a insoluble anode into the flange.

The crevice repassivation potentials, $E_{R,CREV}$, for the Type 304 stee / Asbestos - crevice were measured to be the values within -350±20 mV vs. SCE in 25%NaCl solutions at temperatures from 20 to 100 C. The electrode potential for the Type 304 flange surface should be kept below the $E_{R,CREV}$ to avoid the crevice corrosion.

A flange cell was assembled and filled with 25% NaCl solution. The flange was JIS10K-300 made of Type 304 stainless steel, and asbestos gasket was sandwiched between it. With no applied external current, the electrode potentials for the Type 304 stainless steel measured with respect to the reference electrode inserted between the flange surface and the gasket were the values from -300 to -200 mV which were more noble than the $E_{R,CREV}$. By inserting a Pt electrode into the gasket and applying cathodic current on the flange surface, the electrode potential was fond to decrease. However, when the current was applied from one long Pt wire electrode connected to one power supply, the electrode potential varies widely from position to position on the large flange surface. This fact suggested that, the Pt electrode and the power supply should be divided. When four Pt electrodes which were connected to four separated power supplies respectively were used, the potential variation range became small. With the average cathodic current density of 30 μA/cm^2, the electrode potentials for all over the flange surface decreased below the $E_{R,CREV}$.