

Application of Cathodic Protection to the Salt Manufacture Plant Made of Stainless Steels

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Summary

To ensure the long-term reliability of the salt manufacture plant, a calculation program to obtain the potential distribution in the solution inside the evaporator was developed and the possibility of cathodic protection of evaporator made of stainless steels was investigated. The program was made in consideration of Laplace equation and polarization curves. The evaporator was considered with two parts, which were the cylindrical part with the diameter of 3m and the height of 8m and the cone part with the diameter of 3m and the height of 3m. Based on the results of calculations, it was found that the electrode potential in the cone part was more less noble than that in the cylindrical part. This indicates that only the potential distribution in the cylindrical part must be considered in the design of cathodic protection. And it was also found that the electrode potential became more less noble with increasing conductivity and with decreasing oxygen pressure - under deairation condition-. These indicate that only the potential distribution in shutdown period, not working time, must be considered in the design of cathodic protection. For a evaporator made of type 316 steel with 10cm wide band-shape anodes at center, top and bottom of the cylinder, it was found that the electrode potential of this evaporator was estimated to be less than -0.4V vs.SCE, which was less noble enough than repassivation potential of the steel, when the potential of the solution close to the anode was kept at 0.5V vs.SCE. Under this condition, the potential difference between the evaporator, stainless steel, and the anode and current flowed from the anode were estimated to be 1.65V and about 10A.