外部電源에 依한 水中鋼管의 陰極防蝕에 關한 硏究

(Ⅰ) 陽極外側의 鋼管兩端防蝕

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A Study on the Cathodic Protection of a Steel pipe in Water by Impressed Current Method (Ⅰ)

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Abstract

The polarization potential distribution and the electric power for corrosion prevention are more affected by the anode location in the impressed current method than by the galvanic anode method.

However, there seem to be few researches except basic research of simple underwater steel pipe on the effect which anode location exerts on polarization potential distribution under the impressed current method.

This paper deals with a basic research which premises economical corrosion prevention on the surface of huge steel pipe underwater or underground.

In case of installing two insoluble anodes, the authors interpreted in the theoretical and experimental respects the effects which anode location exerts on polarization potential distribution and electric power for corrosion prevention, and studied an economical condition of corrosion prevention according to the above interpretation.

But this research is so extensive that this paper deals with only the corrosion prevention on the surfaces of steel pipe of the two outer sides of anodes, leaving the case on the surface of pipe between the two anodes for later research.

The results of research are as follows:

1) The cathodic polarization potential on the steel pipe surfaces of the two outer sides of anodes can be caluclated by

$$E_x=E_0e^{-\alpha x}=E_0\exp[-2\sqrt{\rho_s D/\{D^2-(D-2t)^2\}}\cdot x/\sqrt{R}$$

$$E_0=\{1.7667/[\log(lh)]^{0.9582}\}i_0-146.4624/(lh)^{0.5683}$$

$$\sqrt{R}\times10^3=(0.3877lh+1.0664)x+25.6901lh-64.4196$$

2) Required voltage of power source for the cathodic protection can be determined by

$$V_0=I_0[0.0723+0..0144\log(lh)]\rho\times10^{-3}+1.85$$

$$I_0=4i_0\pi Dl\times10^{-4}$$

and the required electric power for only the corrosion prevention on the surfaces of steel pipe of the two outer sides of anodes becomes $P=\frac{1}{2}V_0I_0$.

3) The laryer specific resistance of water is, the geater is the effect of anode location on the required minimum power. But the h range which requires minimum power is 0.63~0.75 without any relation with the specific resistance of water.