CCGS CONSTABLE CARRIÈRE

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SCHEME OF CATHODIC PROTECTION

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1 CATHODIC PROTECTION

1.1 General

Hulls of ships are very much prone to corrosion of an aggressive nature in the form of pitting corrosion unless they are protected with cathodic protection.

Protection with the very best and the most expensive coatings alone is not enough as the applied coating is vulnerable to mechanical damage at sea or in port and to imperfections at the time of application.

For maritime ships have two main types of sacrificial anodes: high purity Zinc and Aluminum which are alloyed with other metals to give performance enhancement.

Zinc was the first ever material to be used and is therefore considered the traditional anode material.

However, Aluminum has several outstanding values and has fast become the first anode of choice.

Both Zinc and Aluminum anodes have a normal design life of one, two or three years to suit the owner' requirements.

Hull anodes are usually welded direct to the ship structure, but can be bolted if required.

1.2 Number and type of anodes for hull protection

To obtain the approximate wetted hull area, the formula below may be used:

(1.8 x LBP x D) + (BC x LBP x B)

where

LBP = Length between perpendiculars = 39.7 m
D = Draft = 2.218 m
B = Breadth = 7.0 m
BC = Block coefficient = 0.409

(1.8 x 39.7 x 2.218) + (0.409 x 39.7 x 7) = 158 + 114 = 272 m^2

The total current requirement is calculated as:

$$\text{Current (Amps)} = \frac{\text{area (m}^2\text{) x current density (mA/m}^2\text{)}}{1000}$$

$$\text{Current (Amps)} = \frac{272\ \text{m}^2\ \text{x}\ 30\ \ \text{mA/m}^2}{1000} = 8.16 Amps$$

The total weight of anodes material is calculated as:

$$\text{Weight (kg)} = \frac{\text{current (Amps) x design life (years) x 8760}}{\text{capacity of material (Amps. hrs/kg)}}$$

8760 = number of hours in one years

$$\text{Weight (kg)} = \frac{8.16\text{Amps x 2 years x 8760}}{2700\ \text{Amps. hrs/kg}} = 53kg$$

The number and type of anodes selected must satisfy both total weight requirements as follows:

$$\text{Number of anode} = \frac{\text{weight required (total)}}{\text{individual anode net weight}}$$

$$\text{Number of anode} = \frac{53\ \text{kg}}{2.8\ \text{kg}} = 19\,pcs$$

1.3 Anode location

For hull protection

Anodes should be located equidistantly as possible around the hull between 4-6 meters apart. As a guide, 60% of the calculated anodes should be mounted in the after half of the vessel; with further consideration that 25 % of the calculated anodes should be placed around the stern only protection described below. Anodes situated in the forward part of the vessel should be located to prevent damage or removal by anchor chains.

Stern protection

Anodes should be positioned on the stern area and rudder adjacent to the propeller; care being taken to minimalize disturbance of the water flow propeller. Anodes should not be fitted within 300 mm of the line of the propeller tips and should be parallel to the flow lines of the hull. Twenty five percent of the anodes required for the hull protection are required for stern only protection.

1.4 Conclusion

In conclusion we advice 20 aluminum anodes with individual weight 2.8 kg.