

Aluminum versus Zinc Anodes – aka Cathodic Protection

I picked up this article by Steve D'Antonio out of the Professional Boatbuilder April/May 2012 issue – “Performance Metals’ Navalloy and Intelligent Anode System”

“Knowing when to change the pencil anodes on engine and generator heat exchanges can present a challenge for boat owners and operators. Often, they have no clue when to do this and wait too long. Adding to the confusion, the consumption rate can be affected by engine run time, water temperature and salinity, as well as other issues such as stray-current corrosion. If not changed in a timely manner, the anodes break off and fall to the bottom of the heat exchanger, at which point they stop protecting the system, and instead create a new problem by impeding water flow.

Last November, I attended the Marine Equipment Trade Show (METS) in Amsterdam. While walking the aisles I spoke with representatives of the Intelligent Anode System from Performance Metals (Bechtelsville, Pennsylvania). Its products offer several advantages. First, its aluminum alloy anodes are essentially an anodic “free lunch” because aluminum works better and lasts longer than zinc. They also have a steel core that prevents the anode from breaking off and blocking water flow. And Performance Metals has a monitoring system that alerts the user when the anode needs to be replaced.

Performance Metals’ line of mil spec aluminum anodes is called Navalloy (an alloy primarily of aluminum, with 5% zinc and a trace of indium).

You haven’t heard of using aluminum anodes for everyday applications? The primary advantages of aluminum over traditional zinc anodes are: aluminum is well suited for use in fresh, brackish and seawater, making it appropriate for virtually any vessel and especially for those that move between these environments; and aluminum anodes pack a greater electrical punch than their equivalent weight in zinc, which in turn means they last longer. Although the price fluctuates with the market for metals, they are typically no more costly than zinc anodes, and aluminum anodes are lighter than zinc by a factor of two and a half.

There are still more advantages to aluminum anodes. Typically, when exposed to fresh water for a month or two, zinc anodes develop an aluminum-hydroxide coating that inhibits the activity once the boat returns to seawater. A similar phenomenon occurs with zinc anodes in vessels that are hauled out and the anodes form a non-

porous layer. Unless vigorously removed, that layer acts as an insulator, preventing proper protection thereafter. Aluminum anodes are immune to this phenomenon.

Outboard manufacturers whose products are destined for fresh water typically specify aluminum anodes (or magnesium, although this alloy should be used *only* in fresh water). Among corrosion experts, the advantages of aluminum have been known for years, but obtaining aluminum anodes in a variety of configurations has often been a challenge.”

So it sounds like aluminum is the metal of choice when buying anodes. But you want to be careful – if the price of the aluminum anode is too low, you may be buying re-melted scrap that hasn't been tested and may contain steel and other debris, which defeats the purpose!