MESA

Quality Focused, *Service Driven.*

Malcolm Baldrige National Quality Award 2006 Award Recipient

Not All Magnesium Anodes Are Alike

There is a reason today to be concerned about the Quality of magnesium anode ingots. The reason is due primarily because all U.S. foundries producing high quality anodes were driven out of business by 2002, by low cost foreign foundries. This lead to a big problem – foreign producer's anode ingots had very poor performance qualities. We know this to be fact because in late 2002 MESA began 3rd party testing the anodes from the major foreign foundries and none of them met the minimum industry performance standards.

MESA spent the next 2 years working to identify foreign producers capable of producing good anode ingots. During this period, confirmed by the testing program, we rejected over 30,000 ingots in our quest to supply only quality anodes. Through this search MESA was able to identify 2 foundries that were committed to casting quality ingots. Today we are still working closely with them as our primary suppliers of magnesium ingots. They worked diligently to develop the processes necessary to always meet the cathodic protection industry performance standards. In fact MESA's anodes are now regularly exceeding the minimum acceptable Current Efficiency values by at much as 15%.

What Constitutes a Quality Anode

There are several factors that affect performance of a magnesium anode. They are chemical composition, open circuit voltage potential and current capacity also known as current efficiency.

Chemical Composition

Quality anodes must be cast to meet the chemistry identified by ASTM Standard B843-07 (Specification for Magnesium Alloy Anode for Cathodic Protection). This means they must be made to a specific chemistry recipe. It's important to know that simply meeting the recipe does not guarantee a good anode. The casting process definitely affects the critical operation of the anode.

Open Circuit Voltage Potential (OCVP)

The open circuit voltage potential is a measurement of the anodes ability to produce a voltage to overcome the native potentials of steel and to ultimately provide cathodic protection. It is key that the open circuit potential meets or exceeds the minimum standard -1.55/-1.75 volts H-1/HP with respect to a copper/copper sulfate electrode. Lower readings may require additional anode(s) to reach the necessary protected voltage.

Current Capacity / Efficiency (CE)

Current capacity or efficiency of an anode, very simply defined, is a measurement of the anodes ability to 'utilize itself'. Think of the anode as a flashlight battery using its voltage until depleted. A normal current capacity rating for magnesium is 500 Amp/hours/lb or 50% current efficiency. Higher current efficiency yields longer anode life and more cost-effective anodes. Lesser efficiencies result in both extra anode and installation costs because early replacement is required.

If any of these three factors is insufficient then the anode is subject to poor operating performance and/or premature failure during its service life.

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Analysis of Alternate Suppliers Quality

In August 2003 MESA acquired 5 magnesium anodes from 5 prominent U.S. anode manufacturing companies. [Note: Manufacturers perform final assembly of the ingots, adding copper lead wires, mag backfill, and outer packaging for shipping.] All 5 anodes failed to meet the minimum current efficiency and only one met the minimum open circuit voltage potential. The results were not surprising since MESA had been testing major foreign foundry ingots having similar results.

To get a more current status of anode quality MESA commissioned in October 2007 an outside company to buy and test anodes from the 6 major U.S. manufacturers. The report was completed in March 2008 and showed 4 anodes failed the current efficiency minimum and 3 anodes failed to meet the minimum open circuit voltage potential. This proves that many of the anodes marketed today still DO NOT MEET industry minimum quality requirements.

The Testing of Magnesium Anodes

The only way to know if you have an anode that meets the above mentioned minimum standards for OCVP and CE is to run the ASTM G97 test (Laboratory Evaluation of Magnesium Sacrificial Anode Test Specimens for Underground Applications). This is a precise 14-day test that only a few testing facilities in the US are capable of performing correctly. Costs associated with each test can run between $600 - $1100 per anode. As mentioned earlier, MESA has pre-qualified select foundries that have casting processes in place to produce quality anode ingots. These foundries perform their own internal chemical composition and G-97 testing and provide these results to us. To verify our supplier's results, MESA always tests one ingot, via a qualified 3rd party laboratory, out of each truckload/container we order. Failure results in a rejection of the entire shipment.

Summary – Lowest Cost vs. Real Cost

We know, because of the aforementioned test results, that there are anodes being sold by others that DO NOT meet the minimum standards for magnesium anodes. The MESA VALUE PROMISE states that we will lead the CP industry in service and quality. That is why we spend so much time, money, and energy developing foundry relationships that 'we know' and 'we confirm'(3rd party lab) are turning out a high quality raw ingot to industry specifications. This coupled with MESA's own high standards for final anode fabrication allows us to confidently assure our customers that every anode supplied by MESA will perform to industry expected standards. Does this cost more? You bet it does! But if compared to a competitor's anode that doesn't perform to minimum standards, our extra initial cost is canceled out min. 4 fold over the 30 year life of the MESA anode. Buying from MESA helps your company "maintain your industry leading position" with quality and service second to none.

[Hypothetical Cost example at 2%/yr inflation and NO raw material increase: MESA good anode $90 + $250 to install = $340/per tank total to last 30 years. BAD anode $75 + $250 to install but only lasts 10 years -- so install new anode now $90 + $300 to install but only lasts 10 more years – so install new anode now $110 + $360 to install = total cost for 30 years of protection $1185/per tank.]