Cathodic Protection Products

SVM METALS

Corrosion of Metals and the Principle of Cathodic Protection

• Corrosion is an electrochemical reaction between a material and its environment which results in the deterioration or destruction of the material. It requires an anode, a cathode, a common electrolyte, and an electrical connection between the two zones. The corrosion process results in the flow of a small electric current from the anode to the cathode through the electrolyte. The magnitude of the current, which is due to a number of factors, is directly proportional to the metal lost due to corrosion.

• Cathodic protection is a technique used to reduce the rate of corrosion of a metallic surface by making the metal the cathode and the other entity which is used to suppraess the rate of corrosion is known as Anode .

• It is important to remember that the aim of cathodic protection is to shift the natural voltage of a metal in a negative direction to a point at which corrosion is significantly reduced..

• There are two main ways of achieving cathodic protection. These are the Sacrificial Anodes Cathodic Protection (SACP) system and the Impressed Current Cathodic Protection (ICCP) System.

Sacrificial Anode Cathodic Protection System

• Sacrificial Anode Cathodic Protection (SACP) is a type of cathodic protection where a less noble material that acts as a sacrificial anode is connected by metallic conductors to the structure to be protected. The materials used for this purpose are Aluminium, Zinc and Magnesium. They provide electrons to the structure to be protected and are consumed.

• Sacrificial anodes are one of the most effective methods of protecting metallic structures or vessels against corrosion. Sacrificial anodes, as distinct from impressed current anodes, do not require an external power source. They are cost effective and simple method of protecting against corrosion.

• Sacrificial anodes have a definite life after which they have to be replaced with fresh set of Anodes. Anodes are cast from high purity primary magnesium, aluminium and zinc ingot, with additional "activating" elements added to the melt to ensure that the anode offers the most effective protection. The addition of the activating elements is strictly controlled according to national and international standards and verified by spectrographic and Electrochemical analysis.

• Aluminium and Zinc Sacrificial anodes are used for the protection of steel structures operating in marine environment and Magnesium for fresh water and soil environment to protect buried pipelines.

Impressed Current Cathodic Protection System

• It offers permanent and automatic protection that aids in preventing galvanic corrosion and electrolysis from attacking the undersides of various mobile or fixed offshore structures as well as sea vessels. The initial installation costs are higher and it also requires regular and routine monitoring and functioning.

Chemical Composition of Sacrificial Anodes

• The below mentioned chemical composition and electro chemical properties have been chosen with great care to ensure an even corrosion pattern, reliable electro chemical capacity and a long working life. These alloys are used for standard sacrificial anodes. Upon request, SVM can cast anodes with different alloy specifications as the case may be as per customer specific requirements.

Element Range (%)

Aluminium Anodes		Zinc Anodes	
Zinc (Zn)	2.50 - 5.00	Aluminium (Al)	0.10-0.50
Silicon (Si) max	0.13	Cadmium (Cd)	0.025-0.15
Indium (In)	0.02 - 0.05	Copper (Cu)max	0.005
Copper (Cu)	0.03 max	Iron (Fe) max	0.005
Iron (Fe)	0.13 max	Silicon (Si) max	0.125
Others each 0.10 max	Others each 0.10 max	Others each 0.10 max	Others each 0.10 max
Aluminium	Balance	Zinc	Balance

	Aluminium	Zinc
Nominal Electrical Capacity :	*2500-2700 AmpHr/Kg*	*780 AmpHr/Kg*
Nominal Open Circuit Potential :	*-1.05-1.08 V (Ag/AgCl)*	*-1.00 V (Ag/AgCl)*

Note : The copper, iron and lead contents of our normal zinc alloys are usually less than 0.003%

Magnesium Anode Properties

Electro Chemical :

Performance Data:	Standard Grade Cast	High Grade Cast
Efficiency (%)	>50	>50
Closed-circuit potential (V)	-1.52 to -1.57	-1.64 to -1.69
Open-circuit potential (V)	-1.57 to -1.62	-1.77 to -1.82

Chemical Composition (% By Weight)

Chemical composition for normal grade cast according to ASTM B 843 and customer specific requirements

Content %

Element	Normal Grade Cast	High Grade Cast
Aluminium (Al)	5.30-6.70	≤ 0.001
Manganese (Mn)	0.15-0.70	0.50-1.30
Zinc (Zn)	2.30-3.70	≤ 0.020
Nickel (Ni)	≤ 0.003	0.001
Copper (Cu)	≤ 0.050	≤ 0.015
Iron (Fe)	≤ 0.003	≤ 0.020
Silicon (Si)	≤ 0.100	≤ 0.040
Other	≤ 0.300	≤ 0.300

SVM Range of Sacrificial Anodes & Other Marine Cathodic Protection Products

• We offer a wide range of high Quality Aluminium ; Zinc and Magnesium Sacrificial Anodes made as per the internationally accepted standards.

• These Anodes are offered in a wide variety of sizes and weights with WELD ON, CLAMP ON ,BOLT MOUNTED types of Inserts to suit to the structure to be protected Viz. Hull and other appendages and Tanks of sea going vessels and other marine structures.

• Our range of OFF SHORE Anodes are made with ultra High Purity Aluminium with Inserts according to the structure – Pipe Core; Bigger size Flat bar core etc to protect Plat forms ; Jetties ; Piles etc .

• SVM can also supply Magnesium and Zinc Anodes for On shore Pipe line protection and Grounding application which includes pre packed Anodes with standard back fill material and associated cables as per customer specification

How SVM can assist in the Prevention of Fouling (Marine Growth) ?

Marine Growth Prevention System or Anti Corrosion & Antifouling Systems-MGPS or AFAC Systems :

• Antifouling and Anti Corrosion (AFAC) or Marine Growth Prevention Systems (MGPS) are used to prevent ship seawater pipes from bio fouling.

• The bio fouling that adheres to and develops inside sea water cooling circuits can seriously jeopardise operation of the ship and also damage the protected systems. Cooling circuit pipes and sea water intakes are subject to encrustation with marine macro and micro organisms.

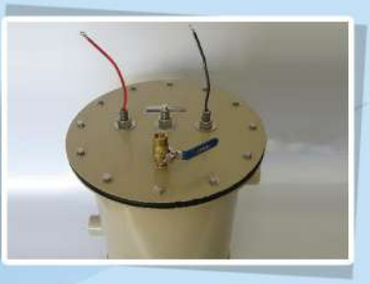
• These systems are relatively inaccessible and complex, so the best way to control growth of marine fouling in cooling circuits is to use specific Marine Growth Prevention Systems (MGPS) that inject efficient biocides into the pipes and the water intakes.

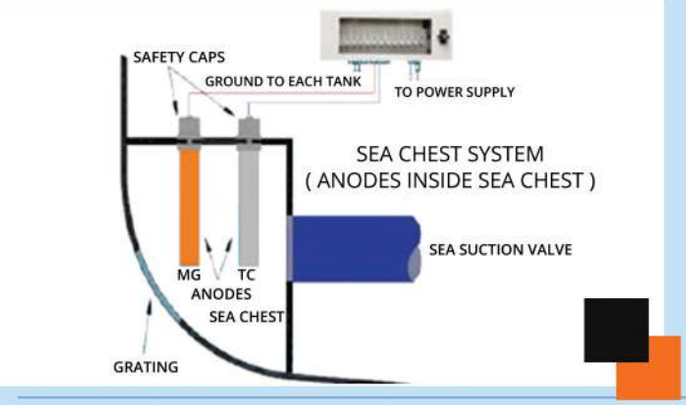
• As far as concerns operation of the ship, bio fouling not only risks blocking the cooling circuit pipes, reducing the flow of water necessary and essential to the auxiliary systems, but can also cause degradation of the structural integrity of the pipes and hydraulic equipment, as a result of induced corrosion (MIC microbiological induced corrosion).

• SVM can offer systems to prevent the growth and proliferation of the marine macro and micro organisms.

• Our system is usually formed of one or more copper anodes (for anti-fouling protection inside pipes), coupled with one or more Aluminium anodes (to control corrosion of the pipes) or Iron/stainless steel anodes (to control corrosion of the pipes and acting as cathodes), which are installed inside the sea water intakes or in the filters

• The anodes are connected to a direct current power supply that can be varied to allow controlled release of the copper ions (and aluminium or iron ones) and obtain the concentrations necessary for the biocidal action.



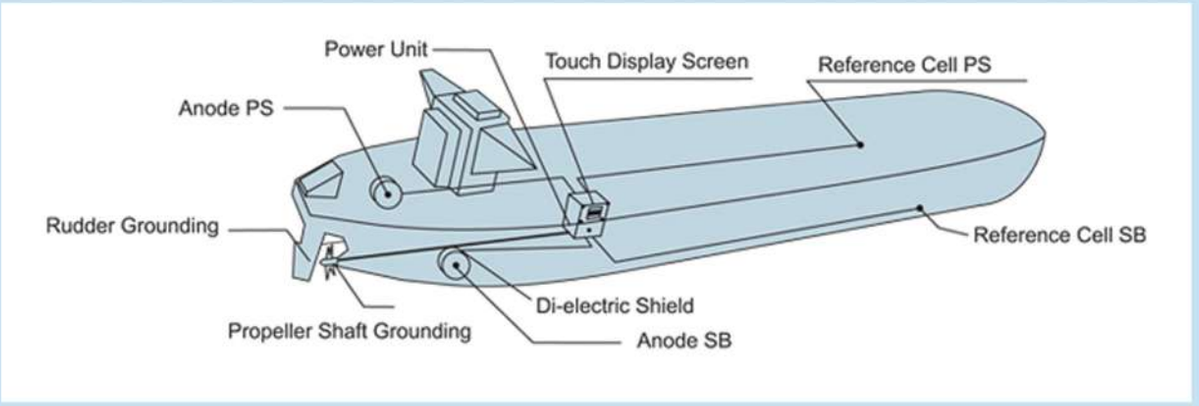


Impressed Current Cathodic Protection Systems

SVM can also support your requirements on IMPRESSED CURRENT CATHODIC PROTECTION(ICCP) Systems :

- The ICCP impressed current cathodic protection system protects metal structures against corrosion.
- The metal surface to be protected is cathodically polarized.
- The system is based on control of potential by means of "reference cells", which automatically govern the impressed current of the permanent anodes which are Platinized Titanium (Pt Ti)/ Mixed Metal Oxide (MMO-Ti). The reference cells are normally made of zinc (Zn) or silver/silver chloride (Ag/AgCl).
- An essential feature of Impressed Current Cathodic Protection (ICCP) systems is that they constantly monitor the electrical potential at the seawater-hull interface and carefully adjust the output to the anodes
- The anodes and the reference cells are electrically connected to a suitable electric power supply. Any change in potential measured by the reference cell immediately alters the intensity of the impressed current. The value of the potential is thus maintained around the metal structure's immunity value.
- By installing an ICCP system, operators can make significant cost savings in hull maintenance and achieve reductions in fuel costs by having a smooth hull surface. Furthermore, the system will safeguard the owner's investment and ensure greater safety through stronger hull integrity.
- With our expertise we can also support on very stringent ICCP requirements for naval ships.

SVM can supply shaft-grounding systems complete with slip rings, silver graphite brushes, brush rigging and as well as the control system which is an Electronic Unit called ACTIVE SHAFT GROUNDING SYSTEM.



Why Choose SVM Anodes ?

Alloy Composition

To provide optimum protection from corrosion, sacrificial anodes must meet the chemical specifications identified in International standards as well as customer requirements. If anodes do not meet these specifications, they may offer limited protection, no protection, or worse still, actually cause corrosion.

Right from selection of Raw material – High purity Aluminium; Zinc and Magnesium and other important ingredients like Indium; Cadmium etc and processing of the melt in a controlled furnace utmost attention is ensured.

In our laboratory we do carry out spectrographic test of Samples (minimum Two) from every batch of anode material against an approved master sample. Every sample from each batch is stored for the design life of the anode. This process ensures that every SVM anode functions at its optimum capacity, and therefore offers the most effective protection.

Quality Assurance

To ensure the production of uniformly high quality products, a SVM metal is in the process of being certified to the requirements of ISO9001-2015 and also Type approval programme. The manufacturing process also undergoes intensive independent audits of critical processes periodically so that Quality is guaranteed to the utmost satisfaction of the customers.

Additional Anode Testing

SVM conducts anode performance tests as per DNV RPB STANDARDS to ensure anodes function to their optimum as per the QUALITY MANAGMENT SYSTEM PROCEDURES.

In addition, specific tests are also conducted that are unique to particular customer specifications. The laboratory facilities are designed to be flexible enough to accommodate variations on standard testing Procedures.

SVM is always open to accept Third Party Inspection of any agencies and will be pleased to provide certificate as per customer requirements.

QUALITY CREDENTIALS

Certificate of Registration

This Certificate certifies that the Quality Management System of

SVM METALS

G-14D, SIDCO Industrial Estate, Kakkallur, Thiruvallur-602003, Tamilnadu, India.

has been audited by ICV and found to be
in compliance with the requirements of the standard

ISO 9001 : 2015

This certificate is valid for
the following scope

Manufacture and Supply of Aluminium Gravity Die Castings & Machined Components, Non Ferrous Metal Components, Sacrificial Aluminium, Zinc & Magnesium Anodes, MGPS and ICCP System Accessories.

Certificate No.	: IN/3571591/5147
Certificate Issue Date	: 22/10/2020
1st Surveillance Due	: 22/09/2021
2nd Surveillance Due	: 22/09/2022
Date of Expiry	: 21/10/2023

EGAC Accredited
QMS Certification
CAB # 119007

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- Validity of this Certificate is subject to completion of surveillance audit on or before of due date in case Surveillance audit not allowed to be conducted this Certificate shall be suspended / withdrawals.
- This Certificate is intellectual Property of ICV and Certificate should be returned to ICV in case of non compliance of certification procedure. Authenticity of this certificate can be verified at www.icvassessments.com

Indian Register of Shipping

CERTIFICATE NO: **2021TAC027**

TYPE APPROVAL CERTIFICATE

This is to certify *that the product is in accordance with the applicable rules/standards/codes as described below. The product is considered to be suitable for use in marine applications and is* ***included*** *in the list of approved products.*

MANUFACTURER	**SVM METALS**
MANUFACTURING WORKS	G-14 D,SIDCO Industrial Estate,Kakkalur,Thiruvallur- 602 003, Tamilnadu,India
REGISTERED OFFICE	19, Ganesh Nagar, Kosavan Palayam Village, Thirunindravur, Chennai- 602 024
PRODUCT NAME	**SACRIFICIAL ANODE**
MODEL NO. / TRADE NAME	WELDED, BOLTED, CLAMPED FOR HULL,TANK & OFFSHORE
PRODUCT DESCRIPTION	Annexure I
APPLICABLE RULES/STANDARDS/CODES	1) Rules and Regulations for the Construction and Classification of Steel Ships 2) IS 2062 : 2011 3) AS2239 : 1979, Galvanic (Sacrificial) Anodes for Cathodic Protection 4) MIL –A-18001 K –Anodes Sacrificial Zinc Alloy
CONDITIONS OF APPROVAL	Annexure II
VALIDITY	The Certificate is valid until 09/04/2026

ISSUE DATE: **09/04/2021**
PLACE: **MUMBAI**

Premjit Panigrahi
Sr. Principal Surveyor

Our Background

SVM is the Cathodic Protection division of SIVAGAMI METAL INDUSTRIES Who are one of the leading manufacturer of Aluminium alloy Ingots managed by technically qualified and businessmen as promoters with more than Two decades of experience in this industry of Aluminium alloy and Gravity castings. This company is ably supported by a team of highly qualified and experienced personnel who provides the technical expertise and skill to support the manufacturing activities, covering sacrificial Anodes and other products in the cathodic protection product portfolio.

SIVAGAMI METAL INDUSTRIES

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