

Embedded Sacrificial Anodes

Embedded sacrificial anode can not only prevent the corrosion of reinforcement in concrete, but also repair the corroded reinforced concrete. The embedded sacrificial anode is composed of special grade zinc anode ($Zn \geq 99.995\%$), prefabricated high alkaline active mortar coating material, special pore agent and conductive steel wire. During the manufacturing process, the zinc anode is treated with special process to maintain the high working area and uniform corrosion consumption of the zinc anode. When in use, only the steel wires at both ends of the embedded sacrificial anode need to be connected with the reinforcement. After pouring the concrete, the mortar will immediately activate the zinc anode and continuously provide electronics for the reinforcement to prevent it from corrosion.

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BACKGROUND

Reinforced concrete has many advantages, such as simple structure, low price, excellent durability, convenient construction and so on, so it is widely used in national infrastructure construction, such as sea crossing bridge, platform foundation, PCCP water pipeline and so on.

Under normal circumstances, during the hardening process of concrete, hydration reaction will occur to produce calcium hydroxide, which will make the concrete environment alkaline. In this alkaline environment, a layer of dense passive film will be produced on the surface of the reinforcement inside the concrete to separate the reinforcement from the concrete medium, so as to prevent further corrosion of the reinforcement.

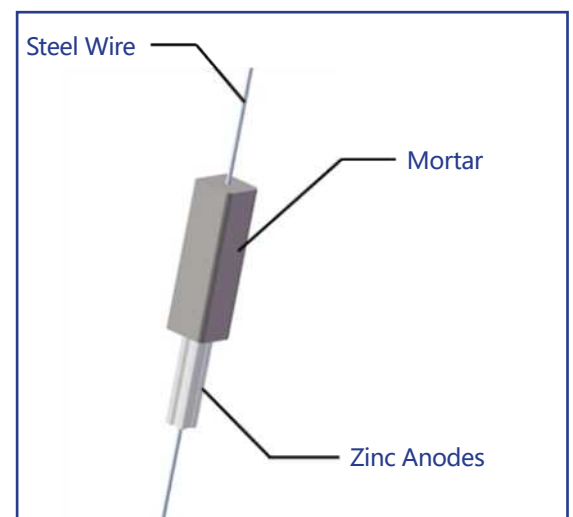
With the passage of time, some harmful substances (such as CO₂、SO₄²⁻、Cl⁻) will slowly invade the interior of the concrete and damage the alkaline environment of the concrete structure, while chloride ions will directly damage the passive film on the surface of the reinforcement and eventually lead to the corrosion of the reinforcement. After corrosion, the cross-sectional area of reinforcement becomes smaller and the strength decreases. The volume expansion of corrosion product (Fe₂O₃) will cause concrete expansion and cracking, and finally cause immeasurable economic losses and unpredictable consequences.

For the protection of concrete reinforcement, YUXI launched an embedded sacrificial anode product, which can protect the reinforcement well.

APPLICATION

Our anodes are used to extend the service life of reinforced concrete structures under wet, dry or alternate environment includes:

- ▶ Bridges
- ▶ Port terminals
- ▶ Base platform of wind power equipment
- ▶ Fences & concrete structures close to seashore
- ▶ Prepressed concrete structures
- ▶ Other concrete structures



FEATURES

- ▶ Open potential (-mV) greater than -1100 mV
- ▶ Alkaline mortar provides strong alkaline environment with $\text{pH} \geq 14$
- ▶ Low resistivity mortar (less than $100 \Omega/\text{m}$)
- ▶ Long service life span that could exceed 10 years
- ▶ Short activate time and consistency of activate state ensuring stable protection potential & current
- ▶ Anode corrosion products spread uniformly within the mortar, which makes sure that the anode won't deal expansion press to surrounded concrete structure
- ▶ Easy installation: simply twine the steel wire of anodes onto the protected rebars

RELIABILITY TEST

Reinforcement, concrete and embedded sacrificial anode are selected for self coupling test. The output current of sacrificial anode is monitored during the curing period within 30 days after concrete pouring and after continuous coupling operation for 6 months. The results show that:

- ▶ In the early stage of pouring, the output current of the embedded sacrificial anode reaches $5000\mu\text{A}$, and the steel bar is rapidly polarized; then the output current gradually decreases, and finally tends to be stable ($720\mu\text{A}$), and the steel bar potential is stable at about -420mV ;
- ▶ After 6 months of coupling, the output current of the sacrificial anode is stable at $60\text{-}120\mu\text{A}$ (fluctuates in a small range due to the influence of temperature and humidity), and the potential of the steel bar is stable at about $-400\text{mV} \sim -440\text{mV}$.

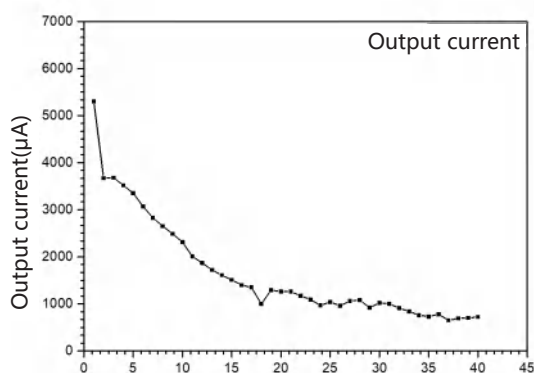


Figure 1 Maintenance period

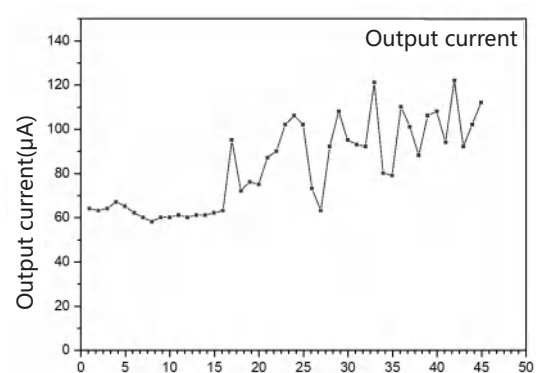
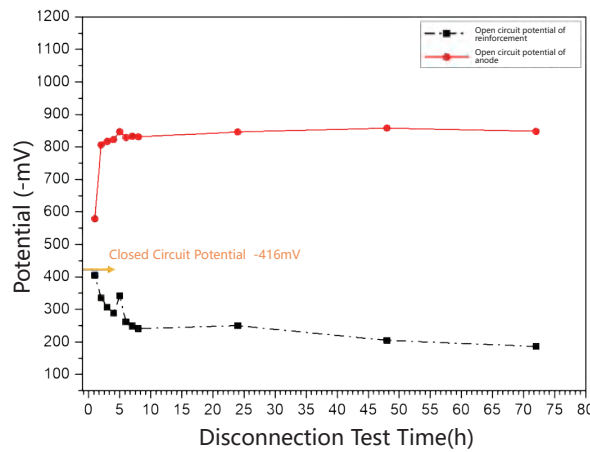


Figure 1 Maintenance period

PROTECTION POTENTIAL

According to the requirements of NACE SP0290 standard, the corrosion attenuation potential of steel bars should be greater than 200mV. According to this, the open-circuit potentials of steel bars and anodes were continuously measured for multiple time periods, and the results met the standard requirements; after recoupling, the closed-circuit potentials of steel bars recovered to -440mV.



SPECIFICATIONS

Model	Zinc Core Weight	Strip Type Anode Size	Round Type Anode Size
YX-CP-IN-01	42	25×30×70	φ40×50
YX-CP-IN-02	65	25×30×100	φ40×60
YX-CP-IN-03	90	35×40×100	φ50×70
YX-CP-IN-04	150	35×40×120	φ55×70

- ▶ YUXI provides regular size for customers and also accepts customization requirements.

LAYOUT SPACING

The installation spacing of embedded sacrificial anode is affected by reinforcement area, corrosive environment, temperature and other factors. Please consult YUXI for specific installation spacing. The following table shows the maximum distribution spacing of recommended anode.

Reinforcement density ratio (reinforcement surface area / concrete surface area)	Maximum anode spacing (mm)
<0.2	700
0.21-0.46	680
0.47-0.70	610
0.71-0.93	560
0.94-1.15	500
1.16-1.36	480
1.37-1.56	450
1.57-1.75	450
1.75-1.93	430
1.94-2.1	430

Reinforcement density ratio (reinforcement surface area / concrete surface area)	Maximum anode spacing (mm)
<0.2	750
0.21-0.46	700
0.47-0.70	650
0.71-0.93	600
0.94-1.15	550
1.16-1.36	500
1.37-1.56	480
1.57-1.75	480
1.75-1.93	450
1.94-2.1	430

ATTENTION

- ▶ Before using the product, wet the mortar outside the anode with clean water to help activate the product quickly;
- ▶ Handle the anode with care during use;
- ▶ The electrical continuity of the integral reinforcement shall be ensured;
- ▶ The exposed steel wire and reinforcement of the product shall be firmly connected to maintain good electrical connectivity.

INSTALLATION DIAGRAM

