



MUI International

Atlas Tank Pack

Cathodic Protection (CP) System

Underground Storage Tanks

Coated steel underground storage tanks (UST) require cathodic protection (CP) to control corrosion. Generally, if the steel surface of the UST system is in direct contact with soil, gravel, sand, it must be protected by a CP system.

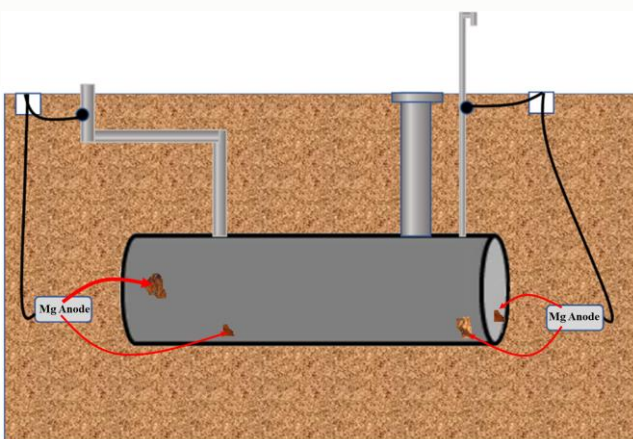
Sacrificial Anode CP System vs. Impressed Current CP System

Sacrificial (Galvanic) anode CP (SACP) system consists of magnesium or zinc anodes connected to the UST or piping. With this arrangement, the anodes will corrode over time instead of the tank or piping.

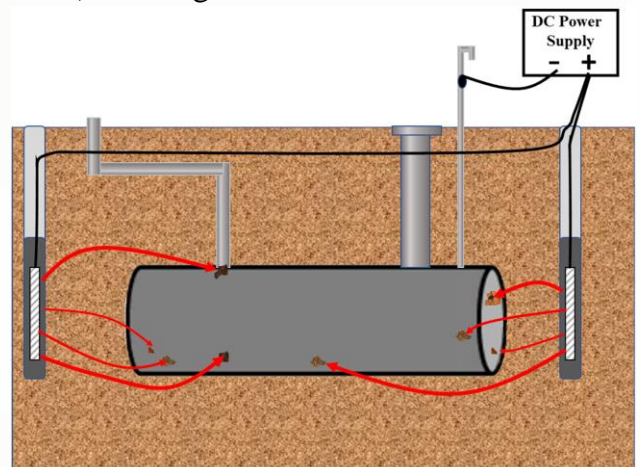
SACP system is generally used for a new tank to protect small coating defected areas. Because of the poor CP current distribution from the low voltage anode (about 1 volt), the CP current cannot distribute wide area once the coating starts deteriorating.

When tanks or piping contact with the reinforcing steel in concrete structures, the CP current is taken by them instead of the tanks and piping. In this case, sacrificial anode CP system cannot provide sufficient corrosion protection even though the insulation flanges are installed.

Impressed current CP (ICCP) system consists of a transformer rectifier (DC power supply) and impressed current anodes. When the coating deterioration occurs or is expected during the CP design life, ICCP system is only the choice because it is operated with the higher driving voltage (> 20 volts) and larger CP current.



Sacrificial Anode CP System

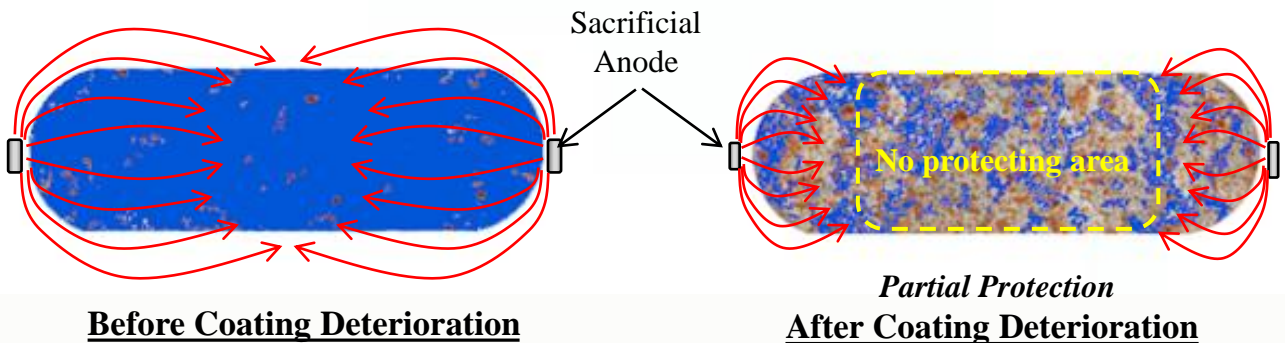


Impressed Current CP System

What are the Important Factors for CP System For Existing UST

Factor 1: CP Current distribution becomes poor due to the coating deterioration

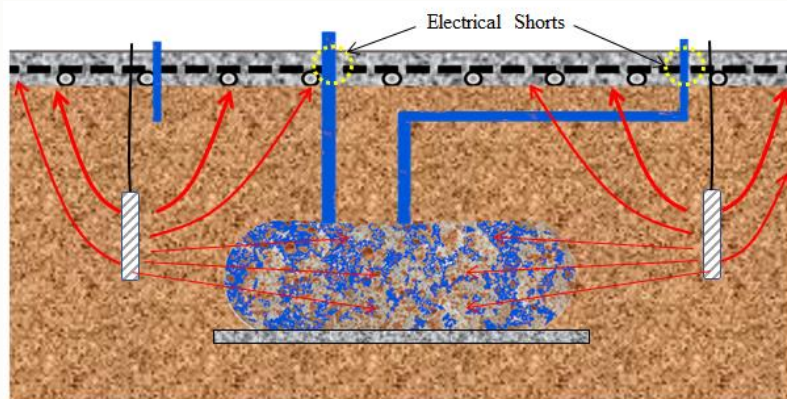
When the coating on the tanks has deteriorated, the CP current from a single anode cannot be distributed to the entire tank surface. Therefore, ICCP system must use to protect the entire UST and piping.



CP current distribution from sacrificial anodes related with coating deterioration

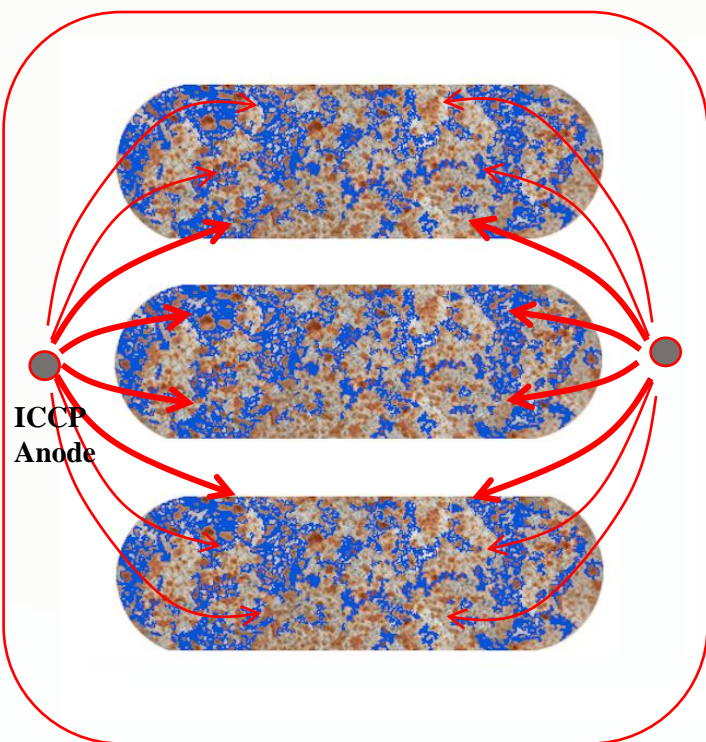
Factor 2: CP current distribution by electrical short circuit with rebar in various concrete structures in underground

Insulation joints are sometimes used to improve the CP current distribution by isolating the tanks and piping. However, in many cases, the piping from the tanks are electrically shorted to the reinforced concrete structures (e.g., building foundation, paving, etc.) As a results, the majority of the CP current is absorbed by the rebars due to the large bare steel, so that the tanks and piping cannot be protected by a single ICCP anode. In this case, the ICCP design must be considered the loss of CP current to the rebars and limited CP current distribution from a single anode.

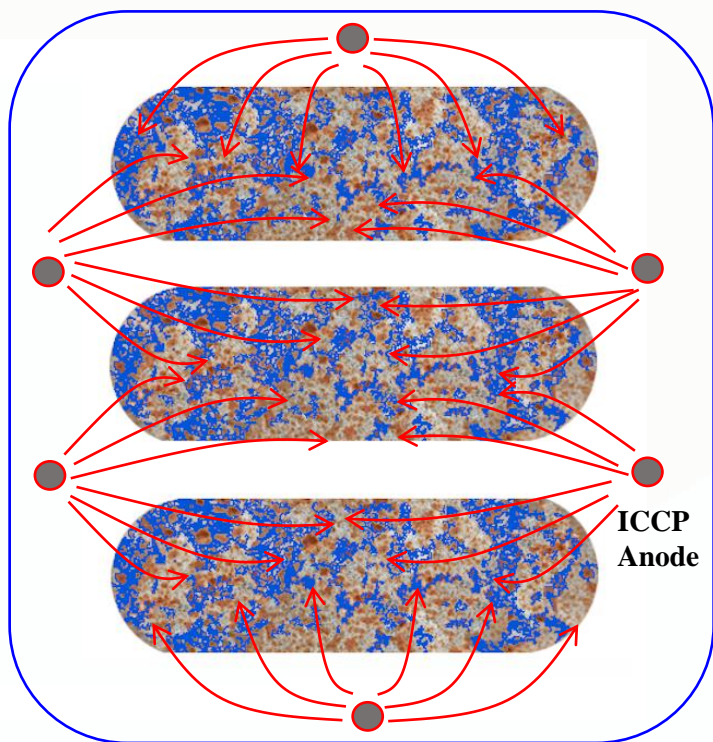


Factor 3: CP Current Distribution for Multiple USTs

The ICCP current distribution from a single anode is misled by many CP engineers based on the pipeline CP system background. Since USTs are closely embedded each other, the CP current from one anode cannot reach to the entire tank surfaces. Therefore, anodes must be distributed around the tank system to protect all tanks. In particular, when the tank system is electrically shorted to the reinforced concrete structures, the proper anode distribution is extremely important by considering that the majority of the CP current is taken by the rebars.



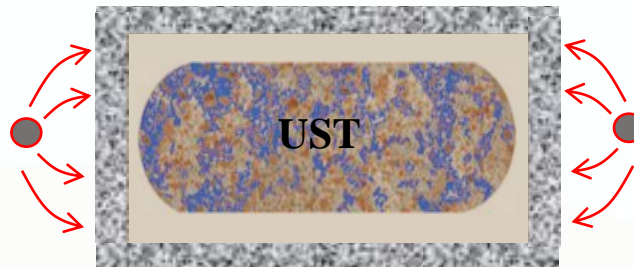
Partial Protection of UST System



Entire Protection of UST System

Factor 4: CP Current Distribution for the UST in Concrete Pits

When anodes are located outside of the concrete pit containing UST, the CP current is shielded by the concrete. If the anodes are not installed inside the concrete pit, cathodic protection is not feasible for the tank.



Factor 5: “ON” and “Instant-Off” Potentials

Both sacrificial anode and impressed current CP systems for UST are quite different from the pipeline cathodic protection because the CP current is more concentrated in a small area. As a result, a large IR-drop is generally included in the “ON” potentials. Therefore, to obtain the accurate polarization level of the UST, “Instant-off” potential must be obtained for both sacrificial anode and impressed current CP systems.

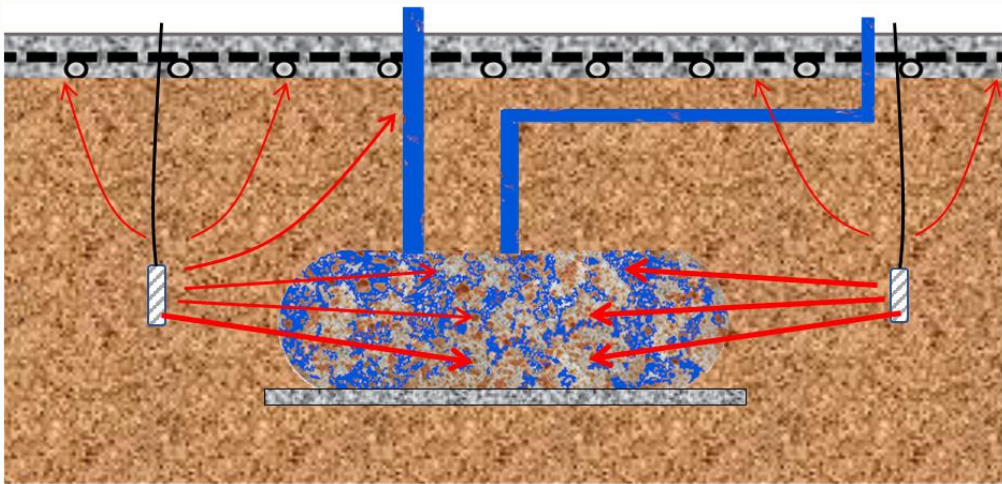


The “Instant-off” potential indicates that this CP system does not meet the CP criteria (-0.85 V) even though the “ON” potential indicates -1.2 V.

MUI Atlas Tank-Pack CP System

MUI Atlas Tank-Pack CP System is specially designed for underground storage tanks to minimize the cost of the installation.

Betelguard Impressed Current Anode: To minimize the CP current flows to the reinforced concrete paving or others, the canister anode length is shorted without losing the anode current capacity.



Canister Anode
(750mm L x 75 mm Dia.)

Transformer Rectifier (TR): Because the CP system for UST requires several anodes uniformly to distribute the CP current to the entire tank system, the individual CP current output needs to be monitored. In general, this uses a power distributor box. However, the TR cabinet in Atlas Tank-Pack combines the DC power source and distribution box (up to 10 shunts) together to eliminate the power distribution box.

The maintenance of the CP system is important for the effectiveness to control the corrosion. However, most UST owners do not have sufficient knowledge to maintain the CP system properly. Therefore, the DC current output and AC power are simply monitoring by the lumps installed on the TR cabinet door.



Heavy-duty lightning surge protection modules for AC& DC and AC&DC breakers



Multiple DC shunt resistor in cabinet
(Single shunt is also available.)



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