

GENERAL

Cathodic protection (CP) is a proven method of controlling and reducing corrosion of pipelines, vessels, tanks and other structures, located both above and below ground. The added expense of installing CP systems is usually justified based on pipe or vessel repair/replacement costs.

Corroding structures have both anodic and cathodic areas. Electrons naturally flow from the anodic areas through an electrolyte (for example soil) to the cathodic areas and back to the pipe, thereby completing a circuit. Corrosion occurs where the current discharges from the metal into the electrolyte at anodic areas. By applying cathodic protection to a structure, the entire exposed surface can become cathodic to the environment, thereby mitigating the corrosion.

Cathodic protection has also been shown to be effective in reducing corrosion underneath biomass (SRB) colonies, by impeding their attachment to the steel surface.

ANODES

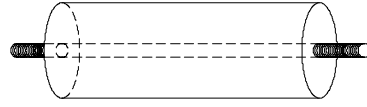
Anodes are a metal that have a different EMF/potential compared to a corroding structure. When attached to the structure, they provide protection by corroding preferentially. Two types of anodes are available: sacrificial and impressed current type.

Sacrificial Anodes

The three most common types of sacrificial anodes are: activated aluminum, zinc and magnesium. Aluminum is the most widely-used material for anodes, as it has a higher current capacity in comparison to the other metals. Magnesium should be considered when the chloride content is less than 10,000 ppm. Sacrificial anodes do not require any external power source in order to operate.

SACRIFICIAL ANODES (P/N)	
Aluminum Treater (3" x 22" / 76 x 560 mm)	84023
17 lb Packaged Magnesium	84057

(other types available upon request)



Sacrificial Anode

Impressed Current Anodes

This type of anode can be classified as either decaying or non-decaying (stable). Impressed current systems require the anode to be energized in order to function. Current requirements increase with temperature, H₂S and SRB's.

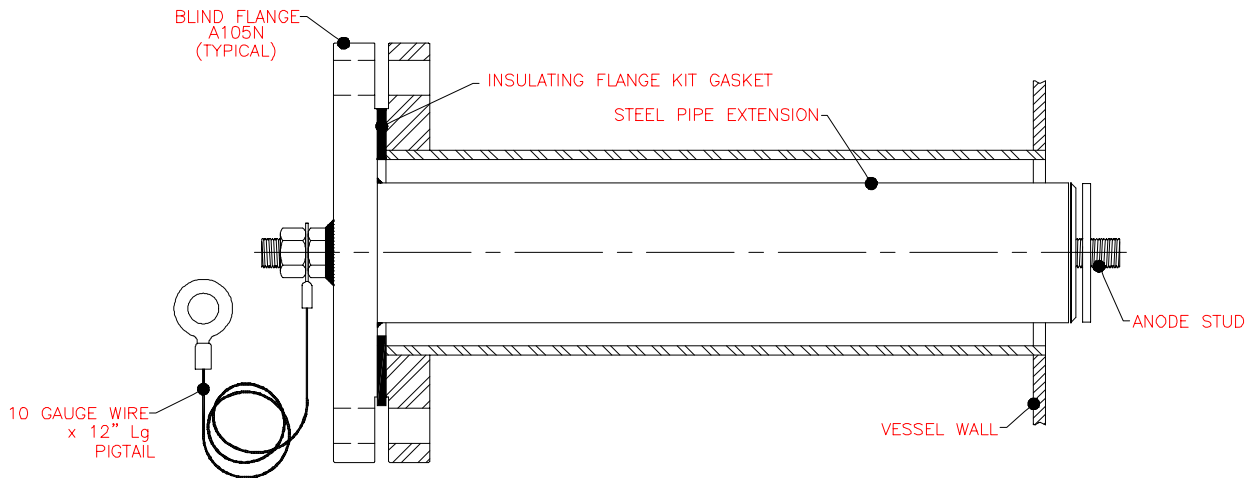
TYPE OF SYSTEM	ADVANTAGES	DISADVANTAGES
Sacrificial	<ul style="list-style-type: none"> • simple & reliable • low maintenance • unaffected by lightning strikes or power failures • typically less expensive 	<ul style="list-style-type: none"> • less flexibility to change once in service • additional anodes must be installed to increase current output
Impressed Current	<ul style="list-style-type: none"> • flexible to operate • voltage & current adjust manually or automatically • anodes typically supply higher ampere-hours of current 	<ul style="list-style-type: none"> • require a power source • need closer monitoring & maintenance • significantly higher cost

Sacrificial anodes can be insulated from the vessel for measuring current output through a short length of exposed wire and a shunt. Anodes can be suspended from tank decks, allowing easy replacement without taking the vessel out of service.

Flange mounting provides the most secure method of placing an anode through a pressure vessel wall. The use of an anode adaptor allows trouble-free installation of sacrificial vessel anodes (see diagram on following page).

Caproco supplies an array of anode adaptors. The standard adaptor is suitable for aluminum or zinc anodes 22" (560mm) long x 3" (76mm) diameter.

FLANGED ANODE ADAPTOR (A105)	
4" 150#	84052
4" 300#	84057
4" 600#	84059



REFERENCE CELLS

Reference cells are a dependable method of taking a potential measurement in order to verify the correct functioning of a cathodic protection system. The three most common types of cells used are: copper/copper sulphate, silver/silver-chloride and zinc. Portable reference cells can be used to measure potentials on above and below-ground structures, and are refillable.

Kirk electrolytic grounding cells act as an electrochemical switch, redirecting any hazardous voltage surge to ground. Grounding cells are designed to not interfere with the lower current flow of the cathodic protection system.

INSULATION KITS

Caproco offers an array of insulation kits for pipeline connections, including flange gaskets, protectors, sleeves and washers.

Flanged connections must be properly sealed to prevent leakage, and should be cathodically insulated to prevent any stray currents from causing corrosion. Insulating gaskets are available in three basic designs, depending on the fitting option desired:

Type D - fits the ring groove of ring-type-joint flanges

Type E - full-faced with precision cut bolt holes

Type F - fits the raised face portion of the flange

All gaskets are available in phenolic, and are sized to ANSI specifications.

Insulating sleeves and washers are available in high density polyethylene, NEMA grade LE phenolic and mylar, and also come as integrated one-piece units.

Flange protectors and corrosion inhibitor grease help to eliminate the possibility of any matter penetrating between the flange faces, preventing corrosion bridging which could lead to a short.

All insulating parts are available in higher pressure & temperature ratings and material options upon request.

THERMOWELD EQUIPMENT

Thermoweld equipment is especially designed to bond cables onto piping, and is a common method for attaching CP cables to pipes or other structures.

Handy caps are designed to fit over the welded cable connection and are installed simply by pressing firmly into place. Typically, new cadweld installations are given a coating of mastic and then taped to prevent accelerated corrosion at the connection point.

MISCELLANEOUS SUPPLIES

Caproco can provide various pipeline supplies upon request, such as: hand roll tape, colored dye (for leak detection) and wire/cable. Talk to your nearest Caproco representative for all your cathodic protection needs.