

## Frequently Asked Questions

### 1. What is corrosion?

Corrosion is a normal occurrence common to all metals not in their natural state. The process often results in the deterioration of the metal. In many cases the metal deterioration can be severe enough to warrant replacement or repair. A simple scientific explanation for corrosion is that it's an electrochemical process and very similar to a battery where electrons flow between anodic (negative) and cathodic (positive) contacts. For corrosion to occur four elements are required:

- Anode: The area of deterioration or site from which corrosion occurs and current flows
- Cathode: The area of protection or site from which no corrosion occurs and current flows
- Electrolyte: A medium capable of conducting electric current (i.e. soil, water or concrete)
- Metallic Path: Connection between the anode and cathode

### 2. What is cathodic protection?

Cathodic Protection (CP) is a technology used to protect buried or immersed metals from corrosion. It is defined as the reduction or elimination of the corrosion process by either making the corroding metal a cathode via an impressed direct current (DC) or by connecting it to a sacrificial or galvanic anode.

**Impressed current cathodic protection:** This type of cathodic protection system requires an external power source (AC, solar) and is typically applied to metal structures with large surface areas such as transmission pipelines or above grade storage tanks.

**Galvanic cathodic protection:** This type of cathodic protection system is self-powered and is the simplest application of cathodic protection. Typically it is applied to metal structures in a soils environment where there is limited exposed surface area (i.e. well-coated short distance pipelines). Alternately, can also be used for large uncoated structures in sea water application.

### 3. How do we know cathodic protection works?

CP has been in use for decades to protect underground pipelines, ship hulls, offshore oil and gas production platforms, underground steel storage tanks, interior submerged portions of tanks and many other structures that are exposed to marine or corrosive environments.

### 4. Describe the installation of the impressed current system?

These systems require the installation of a power unit, distribution wiring, and earthing electrodes for the structure requiring corrosion protection. The right components are sized and selected through the pre-installation design. Often the applications are unique enough that each project requires individualized design to optimize system cost and effectiveness of corrosion protection. Once the system has been designed the install team and Corpro project manager work with the customer to safely and efficiently install the system. For soil applications, often excavation is required to expose the pipe, drill anode electrode holes, trench in cables and mount power and test equipment. After installation, the systems are commissioned by trained, certified technicians under the direction of an experienced cathodic protection engineer.

### 5. The entire rehabilitation project is supposed to take one year. Will the CP system installation impede the completion date for the project?

The CP system is typically installed simultaneously with other repair work. In general, there should be no increase in completion time for the restoration project if CP is included in the project scope.

### 6. Is there any maintenance to the CP system?

Once the CP system is installed, it is necessary to provide routine operation and maintenance. For impressed current systems, this involves visual inspection of the system and periodic checks. New advancements in technology, such as remote monitoring systems which are available from Corpro, have provided a convenient way of maintaining CP systems.

### 7. What is the cost associated with corrosion?

Corrosion will cost the US economy over \$1 trillion annually. The total cost in the U.S. is expected to increase annually, illustrating the broad and expensive challenge that corrosion presents to equipment and materials. At 6.2% of GDP, corrosion is one of the largest single expenses in the U.S. economy yet it rarely receives the attention it requires. Corrosion costs money and lives, resulting in dangerous failures and increased charges for everything from utilities to transportation and more.

## **8. Can project costs be minimized if owners purchase and install their own materials?**

This process could prove to be risky unless the owner has staff that are properly trained and certified in the application, installation and maintenance of cathodic protection systems.

## **9. Is the electricity controlled centrally and continuously? How much electricity will the CP system use?**

Yes, the rectifier and remote monitoring system are connected through one circuit breaker. The system is in continuous operation (24 hours per day). Surprisingly, very little energy is used. The electric power required to power most systems is between 100 and 1,000 watts.

## **10. If a pipeline gets struck by lightning, will the system be damaged?**

The rectifier can be equipped with upgraded lightning protection, which helps protect against lightning strikes.