

Preventing corrosion with cathodic protection

At TransCanada, ensuring our pipelines and other facilities operate safely is the most important aspect of our business.



For protection of steel pipelines, cathodic protection has been used since the 1930s. Over time, it has proven so effective that it's now required as a standard pipeline protective safety measure.

Cathodic protection is a common method used in various industries that uses a low electrical current to prevent corrosion of metal structures such as pipelines, tanks, steel-pier piles and offshore oil platforms.

How electricity helps prevent corrosion

Cathodic protection is a technological application TransCanada uses to ensure the safety and integrity of its pipeline systems.

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In its simplest form, metal rods called anodes are connected and placed in close proximity to the pipeline. Using the system described on the next page, anodes become more susceptible to corrosion, bearing the burden of the corrosion

in order to protect the buried pipe. The system is isolated from above-ground pipeline facilities. It does not affect adjacent buildings, fences or other structures and is not hazardous to people or animals.

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Design considerations

A cathodic protection system is designed in accordance with regulatory requirements and pipeline industry codes and practices giving consideration to:

- Length of pipeline to be protected
- Thickness of the pipeline coating
- Soil characteristics including
 - Type of soil (i.e., sand, clay, loam)
 - Corrosive nature of soil
 - Soil resistance to passage of electrical current
- Water table characteristics
- Parallel routing to other buried pipelines and high-voltage electric transmission lines

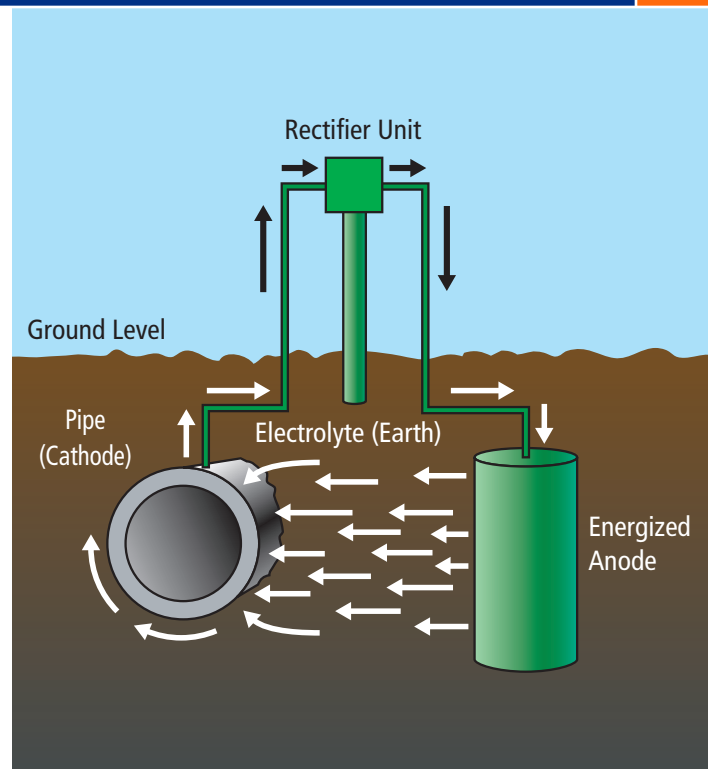
These factors help determine the amount of current that must flow through the system, and the voltage required to achieve the required current level. The system is then designed, built and maintained to achieve the required electrical current flow in order to protect the steel pipeline from corrosion.

Components of a cathodic protection system include:

- Rectifiers
- Anode ground beds
- Conductive material
- Test leads

Cathodic protection uses a rectifier to convert Alternating Current (AC) power to Direct Current (DC). AC power is generally used in households and carried through power lines throughout North America. DC power is generally found in batteries like those found in your car or used in a flashlight. On one side, the rectifier output is electrically connected to the pipe, and on the other side, it is connected to anodes (metal rods). The rectifier is usually sited adjacent to existing power lines in the area. Anodes are buried in groups (referred to as ground beds) along the pipeline and are backfilled with a carbon-based conductive material to improve their effectiveness. As long as the electric current flows from the pipeline through the rectifier to the anode bed, as shown in the diagram, exposed pipe metal is protected from corrosion.

Current requirements are based on different soil types. Efforts are made to co-locate the equipment at other facility sites such as pumping stations or valve sites.



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The distance between rectifier units depends on the current requirements of the system. Current requirements are based on different soil types. Efforts are made to co-locate the equipment at other facility sites such as pumping stations or valve sites.

The effectiveness of the cathodic protection system is measured using test leads. Essentially, test leads are monitoring locations that check the cathodic protection voltage levels. They are attached to the pipeline approximately every two to three kilometres (one to two miles) and are typically installed at public road and railroad crossings, and at existing pipeline crossings.

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