

Vector® Vectrode® Current Limiter

Description

The Vectrode Current Limiter is designed to avoid excessive current outputs by anodes. The Vectrode Current Limiter is available in two standard sizes; custom capacities are available up to 5 amps. Use in discrete or distributed anode systems to provide more uniform current distribution.

One of the most challenging problems cathodic protection engineers encounter are problems created by considerable variations of current and potential over the structure. These variations are difficult to avoid and can be caused by:

- Anode resistance variations - this is a common problem when multiple parallel anode systems or parallel anode groundbeds are used.
- Differences in the resistance of the anode feeder cable - this can be a significant factor in multiple or distributed anode systems due to current and voltage attenuation along the feeder cable.

These potential variations can cause :

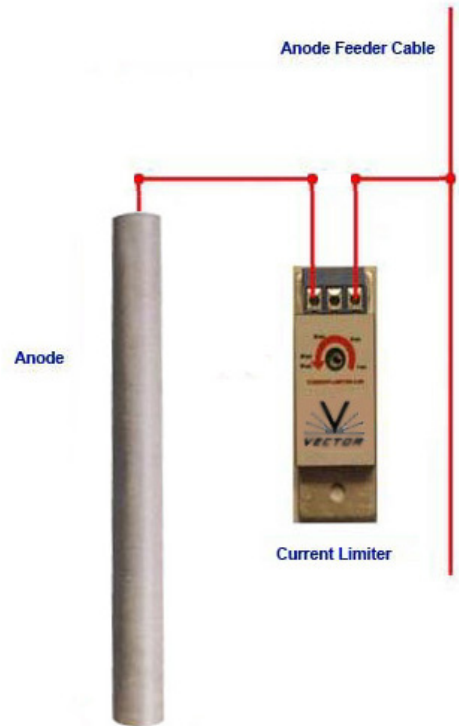
- insufficient current or polarization in portions of the structure unless other portions of the structure are over protected.
- localized excessive negative potentials can cause hydrogen evolution at the cathode surface which may result in hydrogen embrittlement and subsequent loss of strength of high-strength steel. On some high strength steels, this may lead to catastrophic failures. It may also cause disbondment of coatings; the coating would then act as an insulating shield to the cathodic protection current.
- localized excessive negative potentials which cause accelerated corrosion of lead and aluminium structures due to the alkaline environment created at the cathode. Alkaline conditions may also be detrimental to certain coating systems, and may cause loss of adhesion of the coating.

Advantages

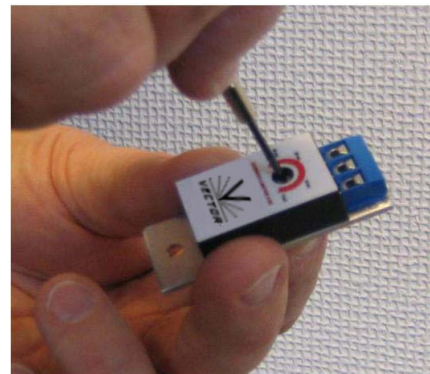
The advantages of the Vectrode Current Limiter are :

- better current distribution for multiple or distributed anode systems
- avoid high anode consumption rates, increase anode longevity
- make CP installation much easier and simpler by using simple AC/DC transformers without the need for current/voltage controllable power supplies
- small, economical design and easy to install
- requires no external power source, as it is powered by the anode feeder cable

The Vectrode Current Limiter System should be installed between the anode input cable and the anode feeder cable.



The Vectrode Current Limiter output should be adjusted to a preset value. Generally the Current Limiter output is set at the anode's "current rating" as specified by the anode manufacturer.



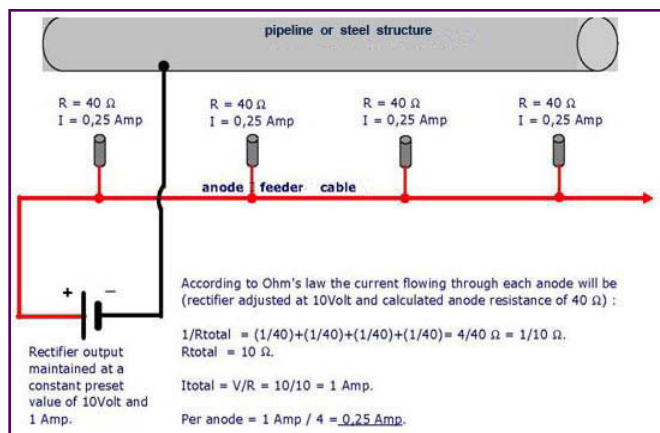
Independent of the anode to structure resistance and the voltage at the anode (max. 35 Volt), the current flow through the current limiter will not exceed the preset value.

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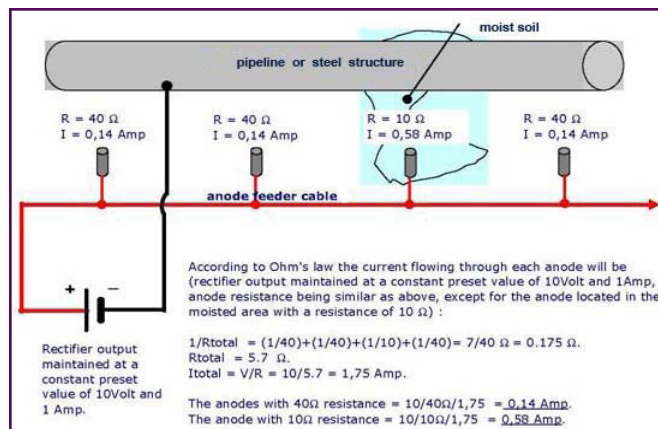
One of the most important parameters in the design of cathodic protection systems is the electrical resistivity of the electrolyte (environment). Resistivities encountered may vary from 1,000 ohm-cm for brackish river water to greater than 500,000 ohm-cm in non-porous granite. Measurement of the resistivity of the environment and calculation of the electrical resistance between the anodes and the structure due to the electrolyte must be made at an early stage in the design process to ensure adequate current will be provided by the anodes over the whole structure for the design-life of the installation. Exact calculation of the electrical resistance between anodes and structure due to variable resistivity of the electrolyte is rarely possible.

When current flows from a distributed or multiple anode system to a large metal structure, the current output of each anode may vary depending on differences in the electrolyte resistivity and geometry from one location to the other. Variations in anode resistance are caused by :

- humidity variation within the soil or concrete
- variation of ionic concentration within the electrolyte
- variation in soil composition
- variation in distance between anodes and structure



Anode Current Assuming Homogeneous Resistivity



Effect of Localized Variation in Resistivity on Current

It can be clearly seen that any localized change in resistivity will have a direct effect on the current distribution and the current output of each anode in a multiple or distributed anode system. This situation can cause localized over-protection of the steel structure and increase the consumption rate of the anode. This will decrease the service life of the anode. This situation can also result in underprotection of portions of the structure. The Vectrode Current Limiter has been developed to overcome these specific problems.

Current Limiter Sizes

Type	Capacity	Length	Width	Thickness
Small	0 - 50 mA	55 mm	20 mm	15 mm
Large	0 - 500 mA	95 mm	75 mm	25 mm
Custom*	0 - 5A	Design Dependent		

* requires AC power source

Each device can be provided with a sealed container as required for underground installation.

About Vector

Vector Corrosion Technologies is a member of the Vector Construction Group, a privately owned corporation with 11 offices throughout Canada and the United States. Vector takes pride in offering technically advanced yet cost effective solutions for concrete structures subject to corrosion damage and has earned numerous awards and patents for product innovation. As evidenced by the Corporate Safety and Environmental Policies, Vector is committed to a safe, healthy and sustainable environment.

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