



NATIONAL PETROCHEMICAL COMPANY
STANDARDS

ENGINEERING STANDARD
FOR
CATHODIC PROTECTION

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1 SCOPE

- 1.1 This standard covers the requirement for the design, fabrication, installation and inspection of a complete cathodic protection system for all underground pipelines and structures including structures affected by stray currents.

1.2 DEFINITIONSAnode

The positive terminal of an electrolytic cell; the electrode at which oxidation takes place.

Cathode

The electrode at which reduction takes place. It is also known as negative electrode.

Anodic Protection

Reduction of the corrosion rate in an anode by polarizing it into a potential region where the dissolution rates low.

Cathodic Protection

Protecting a metal from electrochemical corrosion by using it as the cathode of a cell with a sacrificial anode. Also known as electrolytic protection.

Protection Potential

A term used in cathodic protection to define the minimum potential required to suppress corrosion. Protective potential depends on the structure of metal and the environment.

stray current,

A portion of a current that flows over a path other than the intended path, and may cause electrochemical corrosion of metals in contact with electrolytes.

Protection Current

The current made to flow into a metallic structure from its electrolytic environment in order to effect cathodic protection of the structure.



Impressed Current

Direct current supplied by a power source external to the anode system. Typical power sources are rectifiers solar modules and engine-generators.

Rectifier

A nonlinear circuit component that allows more current to flow in one direction than the other; ideally it allows current to flow in one direction unimpeded but allows no current to flow in the other direction.

Electrical Resistivity

The electrical resistance offered by a material to the flow of current times the cross-sectional area of current flow per unit length of current path; the reciprocal of the conductivity.

Test Station

Permanent wires attached to the structure and led to a convenient location for electrical measurements, used at points where the structure or soil is otherwise inaccessible for electrical testing (underground or underwater).

Ground Bed

Commonly a group of manufactured electrodes or scrap steel which serves as the anode for the cathodic protection of pipelines, tanks or other buried metallic structures. Types of ground beds are surface and deep anode configurations.

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STANDARDS AND CODES

- All the design and installation shall be in accordance with the latest editions of NACE Standards.
- For materials and equipment the relevant IEC or NEC Code or other international accepted standards shall be followed.
- Coating procedure and its materials shall be in accordance with the Latest ASTM Standards.

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TYPES OF CATHODIC PROTECTION SYSTEMS

3.1

IMPRESSED CURRENT SYSTEM

In this type of system, an external source of DC power, usually an AC/DC transformer-rectifier, is used to provide the driving voltage between the anode and the structure to be protected. The negative terminal of DC source is connected to the structure or pipe by a suitable cable and the positive terminal similarly connected to the anode. The DC power source shall be adjustable so that variations in cathodic protection current and voltage are available. Rectifiers are specially applicable where electric power is available and current requirements are large or soil resistivity is too high for sacrificial anodes. They are very flexible source since practically any combination of current and voltage ratings is available and the voltage of a rectifier is normally adjustable over a wide range.

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GALVANIC ANODE SYSTEMS

In a galvanic anode system, the driving voltage between the structure to be protected and anodes is provided directly by the potential difference between the materials involved. If the galvanic anode is subject to possible wetting by oil, Aluminium alloy or Magnesium anodes shall be used. Galvanic anodes, either singly or in groups or ribbon, are connected directly to the structure to be protected and are consumed at a rate proportional to the current output. Because of the limited driving voltage their use is generally in soil or water conditions of electrical resistivity less than 5000 ohm/cm.