



## Evaluation & Condition Monitoring of CP System For Onshore & Offshore Steel Structures

Cathodic Protection is used to control the corrosion of a wide variety of buried and submerged metallic structures. It is a cost-effective way to extend the life of a structure and to ensure integrity throughout its operating life.

*Cathodic Protection can be defined as...“the control of electrolytic corrosion...by the application of direct current in such a way the structure to be protected is made to act as the cathode of an electrolytic cell”.*

A protocol to delineate area on buried metallic structure where external corrosion has occurred, is occurring or likely to occur.

### WHY Cathodic Protection

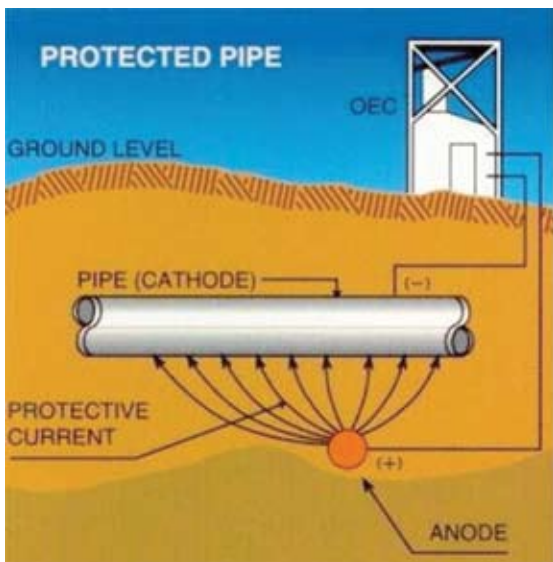
Cathodic protection provides effective corrosion control on steel structures and pipelines by creating a potential (voltage) gradient opposing the flow of ions away from the surface, thus preventing the anodic corrosion reaction. Cathodic protection may be used alone or in combination with an insulating coating. In such systems, the coating forms the first line of defense and where it is adherent and undamaged, the corrosive environment is kept away from the structure: where the coating is damaged, however, corrosion can occur and cathodic protection provides protection. It is worth nothing that cathodic protection can only be applied in the presence of an electrolyte – it is not an antidote for atmospheric corrosion.

### Methods of applying Cathodic Protection

- Sacrificial Anode System
- Impressed Current System

### Choosing a Cathodic Protection System

To achieve no corrosion at the cathode surface, it is important to ensure that protective current is passing onto all parts of the cathode surface. The current for full protection can vary considerably with environmental conditions - from 200mA/sqm in turbulent aerated seawater, to 1mA/sq-m for some onshore pipelines. Deciding which type of protective system to adopt therefore, depends on many factors - size and complexity of structure, nature of the electrolyte, availability of power supply, proximity of ‘foreign’ structures which may affect, or be affected by, the flow of current, etc. A detailed economic appraisal based on technical surveys is required.



VELOSI has predominant expertise of such surveys and analyses to assist clients in selecting the most effective solution to a particular problem.

## VELOSI Methodology

The Job protocol is broadly classified into two parts:

- Data review & engineering works
- Field works – surveys, inspections and investigations

VELOSI has identified seven (7) key steps to carry out evaluation & condition monitoring of CP system:

- Pre-Assessment Study
- Preparation of Methodology and Procedures
- Technical Audit of Existing CP System Installation of Main Pipelines & Performance Assessment of Tank Form Area, Pump Stations Facilities and associated piping network
- On/Off Potential Survey, CIP Survey and Line Current Survey
- Visual Inspection of Heat Shrinkable Sleeves
- Review & Evaluation of Remote Monitoring and Control System
- Post Assessment of the Project – Final Reports & Deliverables

## Applications of Cathodic Protection

Structures that are commonly protected by cathodic protection are:

- Underground Pipelines
- Well Head Casings
- Ships' hulls
- Storage tank bases
- Jetties and harbor structures
- Steel sheet, tubular and foundation pilings
- Offshore platform, floating and sub sea structures
- Storage Tanks (oil and water)
- Water-circulating systems
- Steel embedded in reinforced concrete structures (bridges, buildings etc.)

## VELOSI Experience

VELOSI's involvement with more than 30 studies worldwide of different Cathodic Protection Systems in onshore/offshore Pipelines, tank bottom and allied on-plot metallic facilities/topsides, subsea pipelines reveals that Evaluation & Condition Monitoring of CP system, impressed current or Sacrificial helps to:

- Ensure reliability and longevity
- Assess efficacy & effectiveness of the CP system
- Evaluate the remnant life of the CP System
- Recommend upgradation and improvements

The industry recommended practice for corrosion protection package is the application of 'Protective coating in conjunction with effective cathodic protection system'; where the CP system provides a 2nd line of defense to retard external corrosion threats.

