

## Protection of metals from corrosion

### Role of design and material selection in corrosion control

- **Materials selection**

Material should have good physical properties like magnetic and electrical properties. Corrosion can be prevented or minimized by minimizing the contacts between two different metals or non-metals.

- **Dissimilar metals**

Corrosion can be controlled by avoiding direct contact between two metals. This can be achieved by applying protective coating.

- **Design**

Rather than using bolted or riveted joints, welded joints are preferred to avoid corrosion. Also use of void sharp corner and edges is avoided.

### Corrosion Prevention

Corrosion in metal causes lot of loss in maintenance and structure also economic loss, therefore it is important to prevent metals or materials from corrosion. There are different methods of protection of metals from corrosion.

### Cathodic protection

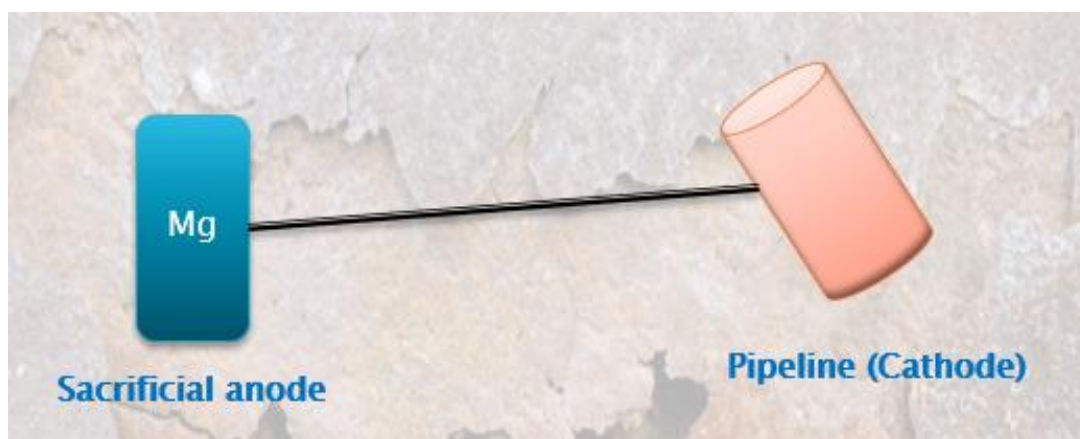
#### A. Sacrificial Anode

This is type of cathodic protection system is the sacrificial anode.

- The anode is made from a metal alloy which is more "active" (here Mg) than the metal of the structure that is protecting (that acts as cathode (here Fe)).
- The difference in potential between the two metals means the sacrificial anode material corrodes in preference to the structure.
- The oxidation that is corrosion takes place on Mg to give  $\text{Mg}^{2+}$  ions.
- This effectively stops the oxidation reactions on the metal of the structure being protection.

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### B. Impressed Current cathodic protection

- In this system a source of DC electric current is used to help drive the protective electrochemical reaction.
- For larger structures complete protection cannot be observed.
- In this method, an impressed current is applied in opposite direction to nullify the corrosion current and convert the corroding metal from anode to cathode.
- Cathodes and anodes connected to a DC source.
- This current is given to insoluble anode like graphite, stainless steel or scrap iron buried in soil.
- The negative terminal of DC is connected to pipeline to be protected. The anode is kept in back fill to increase the electrical contact with the surrounding soil

