

CORROSION

Definition

Corrosion is a process which involves the conversion of metal into an undesirable compound (usually oxide) on exposure to atmospheric conditions i.e. moisture and oxygen.

Types of Corrosion

- Atmospheric Corrosion
- Waterline corrosion

Atmospheric Corrosion

Example:

Tarnishing of silver, development of a green coating on Copper and Bronze and rusting of Iron are some examples of corrosion.

Rust is a case of corrosion of iron. It is hydrated Ferric Oxide $\text{Fe}_2\text{O}_3 \cdot n\text{H}_2\text{O}$. It is non-sticking in nature and peels off exposing more of iron surface for further rusting.

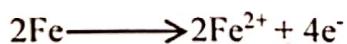
Mechanism:

Atmospheric rusting can be explained by electro-chemical theory.

Commercial form of iron behaves like small electric cells in presence of water containing dissolved O_2 , CO_2 , or SO_2 .

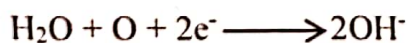
At anode

Oxidation reaction occurs as



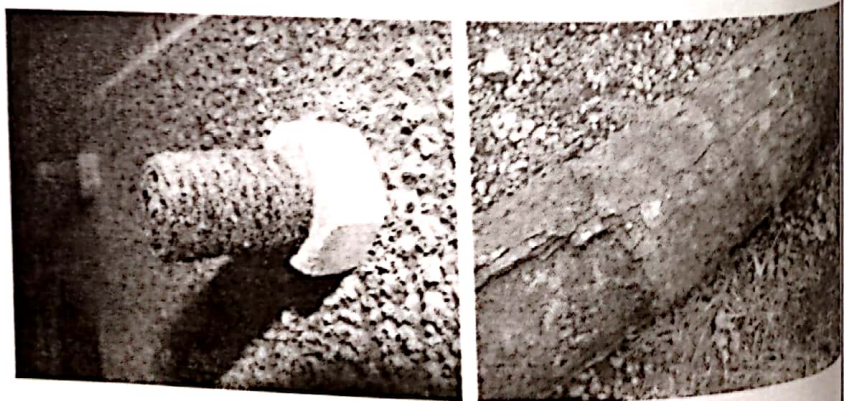
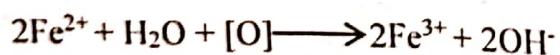
At cathode :

These electrons form hydroxyl ions



- Fe^{2+} ions and OH^- ions then diffuse under the influence of dissolved oxygen and Fe^{2+} ions are oxidised to Fe^{3+} ions.

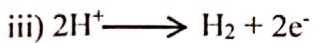
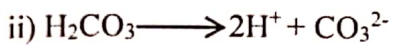
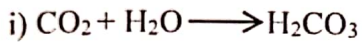
- These Fe^{3+} ions, then combine with OH^- ion to form hydrated ferric oxide i.e. rust.



B) In presence of CO₂

The rusting of iron also increases in water containing dissolved CO₂.

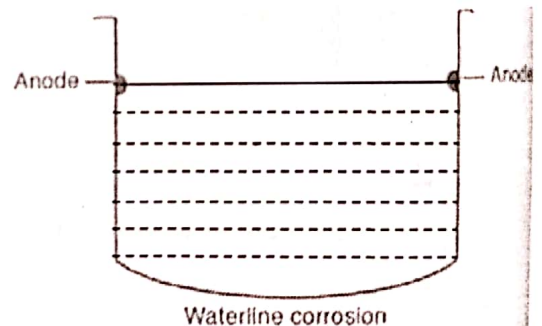
Mechanism:



Waterline Corrosion

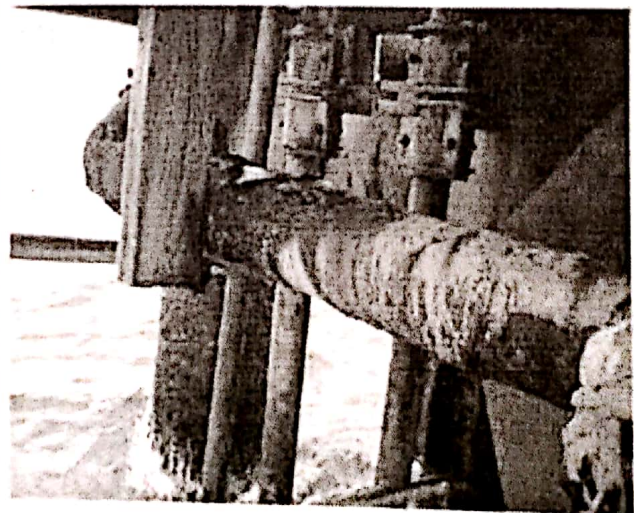
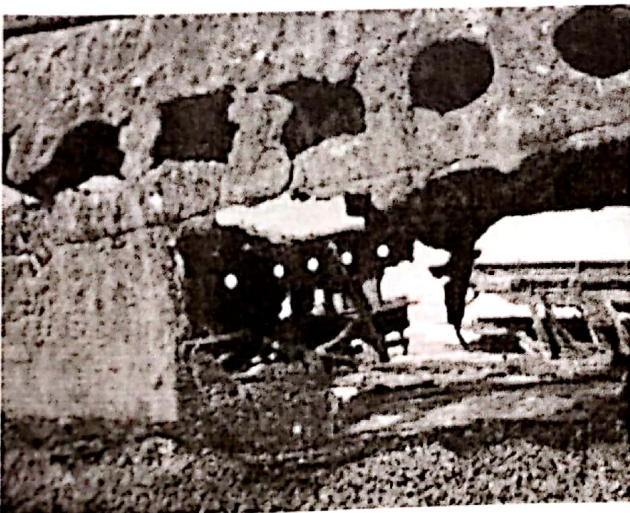
Reason of waterline corrosion

- Waterline corrosion occurs due to differential oxygen concentration
- When water is stored in steel tank, considerable corrosion takes place along a line just below the level of water meniscus.
- The area above the water line is cathode as oxygen concentration is more in this area.
- The area just below the water line is anode, because here oxygen concentration is less.

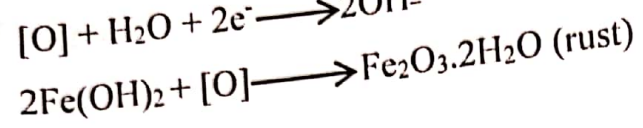
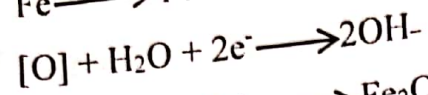
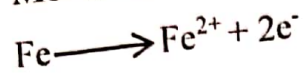


Occurrence:

This type of corrosion occurs in ships, water tanks, pipe lines etc.



Mechanism:



Protection of corrosion:

There are many methods to protect the metal from corrosion.

But as per the syllabus, we will discuss the following methods.

a) Alloying:

By alloying of metals, we can protect those from corrosion. Alloys resist corrosion in two ways.

- i) Homogeneity
- ii) Oxide film

b) Galvanisation:

• Zinc is used to protect iron from rusting, because reduction potential of zinc is less than that of iron.

Zinc is more electropositive and protects iron from rusting.

• **The process of covering iron with zinc is called galvanisation.**

• Zinc loses electrons in preference to iron and is consumed in due course of time. As zinc sacrifices itself and protect iron, it is known as sacrificing metal.

- (A) The presence of even traces of impurities like that Cu or Zn in iron promotes rusting.
- (V) The presence of metals like chromium & nickel slows down the rusting.
- (VI) The presence of alkalis also retards rusting.

15 WATER LINE CORROSION - Water line corrosion is a type of differential oxygen concentration corrosion. Water stored in a tank shows maximum amount of corrosion along the line just beneath the level of the water meniscus.

Water Alloying - Iron can be protected from corrosion by alloying iron with Chromium and nickel (Iron 7%, Chromium 18%, and Ni 8%) it becomes corrosion resistant and used for making cutlery knives and domestic utensils.

Water Galvanization - It is the process of depositing a thin layer of zinc on iron. The iron coated with a thin layer of zinc is called galvanized iron.

Galvanization can be done

- (i) By spraying molten zinc on iron surface.
- (ii) By dipping the iron sheet into molten zinc.