

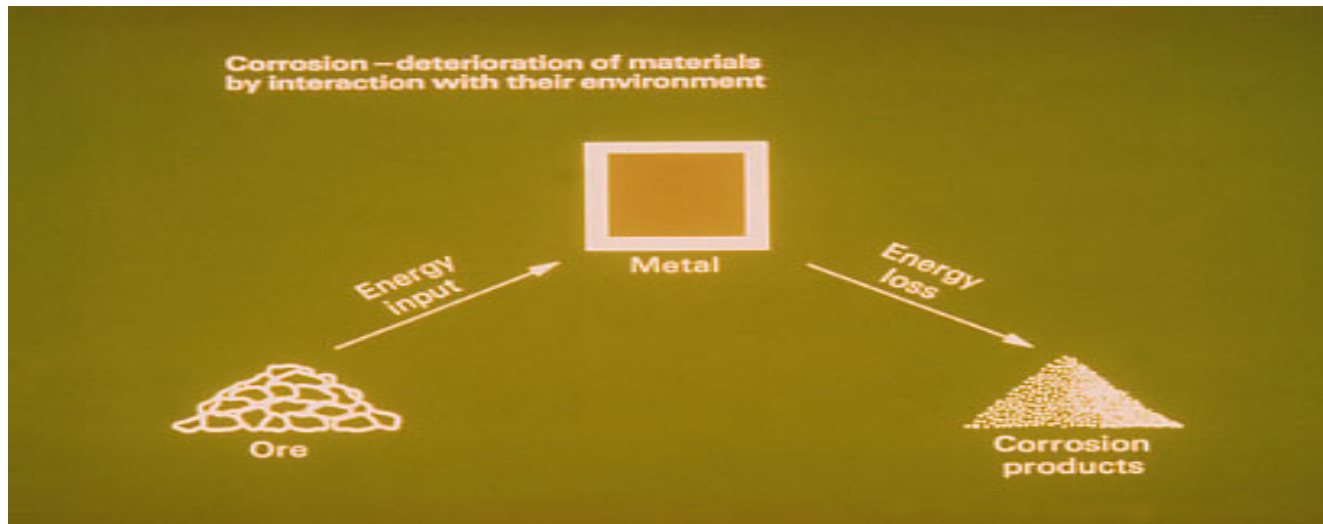
CORROSION

Dr. C. Mary Anbarasi

Associate Professor in Chemistry

J A College , Periyakulam

Definition of Corrosion



Corrosion is the deterioration of materials by chemical interaction with their environment. The term corrosion is sometimes also applied to the degradation of plastics, concrete and wood, but generally refers to metals.

Anodic & Cathodic Reactions

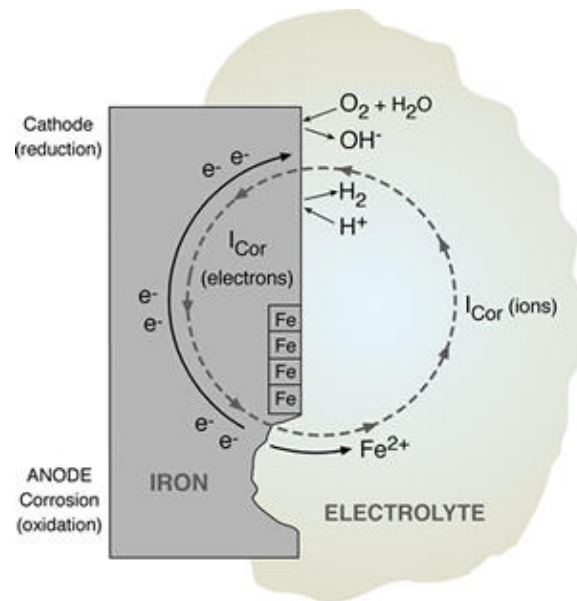


Figure 2

Effects of corrosion

Losses are economic and safety:

- Reduced Strength
- Downtime of equipment
- Escape of fluids
- Lost surface properties
- Reduced value of goods

The consequences of corrosion are many and varied and the effects of these on the safe, reliable and efficient operation of equipment or structures are often more serious than the simple loss of a mass of metal. Failures of various kinds and the need for expensive replacements may occur even though the amount of metal destroyed is quite small.

Underground corrosion



Buried gas or water supply pipes can suffer severe corrosion which is not detected until an actual leakage occurs, by which time considerable damage may be done.

Corrosion influenced by flow-1



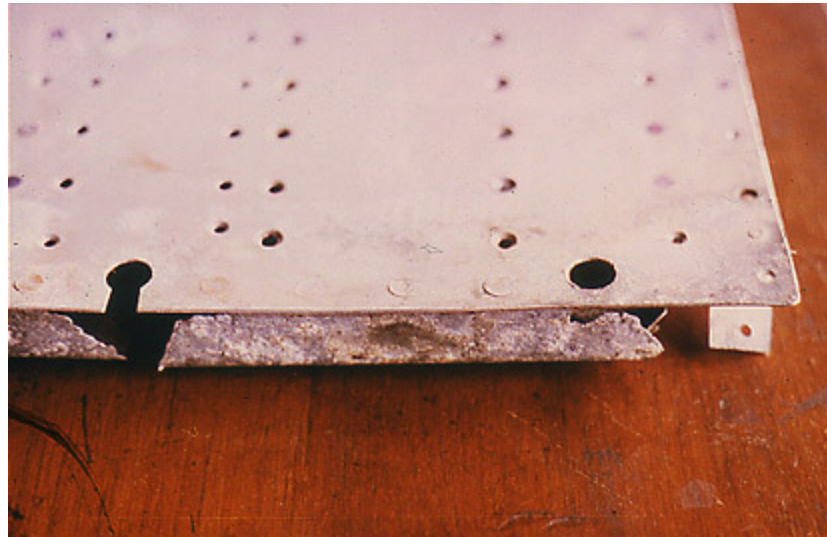
The cast iron pump impeller shown here suffered attack when acid accidentally entered the water that was being pumped. The high velocities in the pump accentuated the corrosion damage.

Corrosion influenced by flow – 2



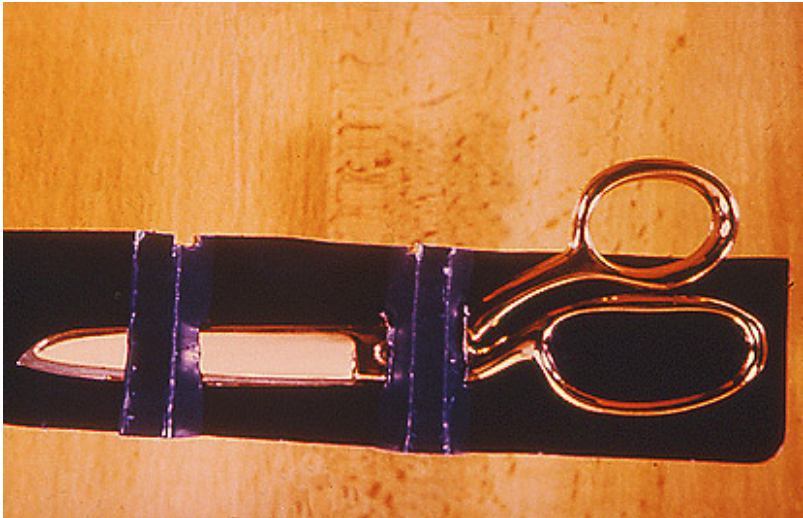
This is a bend in a copper pipe-work cooling system. Water flowed around the bend and then became turbulent at a roughly cut edge. Downstream of this edge two dark corrosion pits may be seen, and one pit is revealed in section.

Safety of aircraft



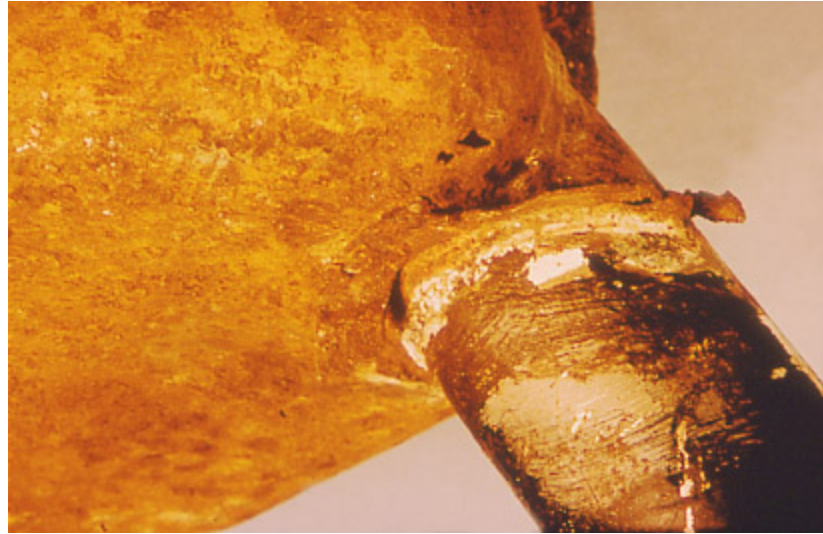
The lower edge of this aircraft skin panel has suffered corrosion due to leakage and spillage from a wash basin in the toilet. Any failure of a structural component of an aircraft can lead to the most serious results.

Influence of corrosion on value



A very slight amount of corrosion may not interfere with the usefulness of an article, but can affect its commercial value. At the points where these scissors were held into their plastic case some surface corrosion has occurred which would mean that the shop would have to sell them at a reduced price.

Motor vehicle corrosion and safety



The safety problems associated with corrosion of motor vehicles is illustrated by the holes around the filler pipe of this petrol tank. The danger of petrol leakage is obvious. Mud and dirt thrown up from the road can retain salt and water for prolonged periods, forming a corrosive “poultice”.

Corrosion at sea



Sea water is a highly corrosive electrolyte towards mild steel. This ship has suffered severe damage in the areas which are most buffeted by waves, where the protective coating of paint has been largely removed by mechanical action.

Aluminium Corrosion

The current trend for aluminium vehicles is not without problems. This aluminium alloy chassis member shows very advanced corrosion due to contact with road salt from gritting operations or use in coastal / beach regions.



Damage due to pressure of expanding rust

The iron reinforcing rods in this garden fence post have been set too close to the surface of the concrete. A small amount of corrosion leads to bulky rust formation which exerts a pressure and causes the concrete to crack. For structural engineering applications all reinforcing metal should be covered by 50 to 75 mm of concrete.



“Corrosion” of plastics

Not only metals suffer “corrosion” effects. This dished end of a vessel is made of glass fibre reinforced PVC. Due to internal stresses and an aggressive environment it has suffered “environmental stress cracking”.



Galvanic corrosion



This rainwater guttering is made of aluminium and would normally resist corrosion well. Someone tied a copper aerial wire around it, and the localised bimetallic cell led to a "knife-cut" effect.

Galvanic corrosion



The tubing, shown here was part of an aircraft's hydraulic system. The material is an aluminium alloy and to prevent bimetallic galvanic corrosion due to contact with the copper alloy retaining nut this was cadmium plated. The plating was not applied to an adequate thickness and pitting corrosion resulted.

Galvanic corrosion

This polished Aluminium rim was left over Christmas with road salt and mud on the rim. Galvanic corrosion has started between the chromium plated brass spoke nipple and the aluminium rim.



Galvanic corrosion

Galvanic corrosion can be even worse underneath the tyre in bicycles used all winter. Here the corrosion is so advanced it has penetrated the rim thickness.



Corrosion prevention

Corrosion prevention

Treatment of metal

Surface coating - zinc, tin, plastic
paint, phosphate

Alloy - stainless steel

Treatment of environment

Removal of oxygen

Control of pH

Inhibitors

Change of potential

Cathodic protection

Anodic protection

A photograph of a sun-dappled forest path lined with tall, leafy trees. The path leads into the distance, creating a sense of depth. The overall atmosphere is peaceful and natural. Overlaid on the center of the image is the text "THANK YOU" in a large, red, serif font with a white outline and a slight drop shadow.

THANK YOU