

BASICS OF CORROSION - STRESS CORROSION CRACKING (SCC)

What is SCC?

SCC is the conjoint action of stress and a corrosive environment which leads to the formation of a crack which would not have developed by the action of the stress or environment alone.

Why is it a problem?

Because, it can happen ‘unexpectedly’ and rapidly after a period of satisfactory service leading to catastrophic failure of structures or leaks in pipework.

Where does it occur typically?

Typical SCC failures are seen in pressure vessels, pipework, highly stressed components and in systems when an excursion from normal operating conditions or the environment occurs.

Where do the stresses come from?

The stresses that cause SCC are either produced as a result of the use of the component in service or residual stresses introduced during manufacturing.

Where does the corrosive environment come from?

The environment is either the permanent service environment i.e. sea water or a temporary one caused by operations such as cleaning of the system which can leave a residue, or if the stress is applied during the operation initiate cracking.

How is this different from ‘normal’ corrosion?

SCC is a corrosion mechanism that requires the pairing of a material with a very particular environment and the application of a tensile stress above a critical value. Corrosion can

occur in other environments without SCC. Examples of well-known material/environment pairs are:

MATERIAL	ENVIRONMENT
Brass	Ammonia
Stainless steel	Chlorides
High strength steels	Hydrogen

How can SCC be controlled?

By selecting a material that is not susceptible to the service environment and by ensuring that any changes to the environment caused by cleaning etc are not detrimental.

By controlling the service stresses through careful design and minimising stress concentrations to keep them below the critical value. Residual stresses can be reduced by heat treatments and careful design for manufacturing.

By using corrosion inhibitors during cleaning operations or to control the environment in a closed system

By coating the material and effectively isolating the material from the environment.

For more detailed information read our on-line guide to SCC