

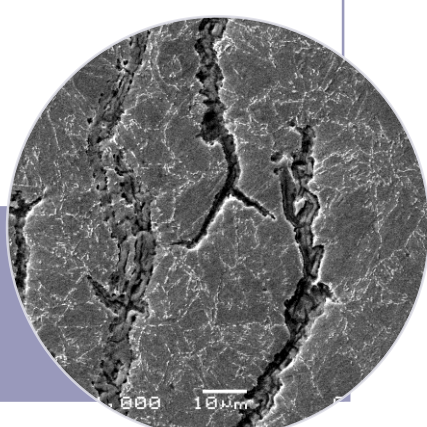
# Environmentally Assisted Cracking in Upstream Oilfield



In oilfield metallurgy, Environmentally Assisted Cracking (EAC) takes place when the combination of a corrosive environment, a susceptible microstructure and stress result in catastrophic cracking. EAC can take different forms depending on the production environment. This infographic provides basic EAC definitions for upstream oil & gas as well as guidance for further reading.

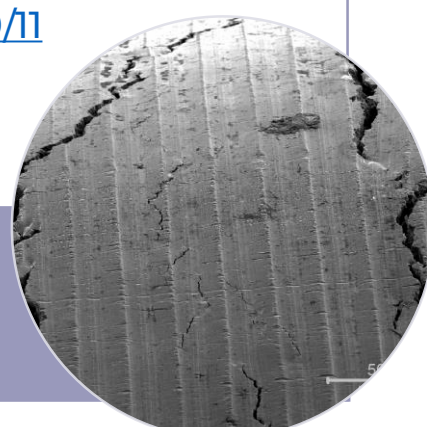


- **Description:** Sulfide Stress Cracking (SSC) is the cracking of metal under tensile stress and corrosion in the presence of water and H<sub>2</sub>S.
- **Materials at risk:** Carbon and low alloy steels, CRAs.
- **Mitigating Actions:** Materials need to comply with NACE MR0175 and operate within the safe limits.
- **Further reading:**
  - [NACE MR0175](#)
  - [NACE 1F192](#)
  - [Corrosion 97041](#)
  - [EFC 16 and 17](#)



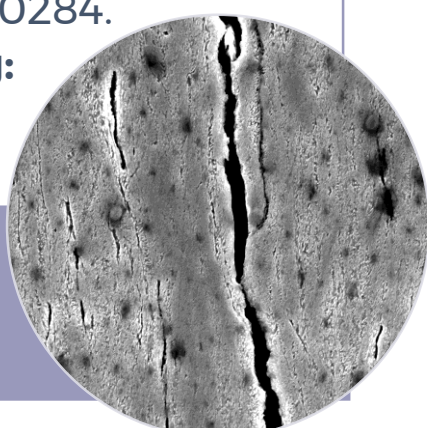
**SSC**

- **Description:** Stress Corrosion Cracking (SCC) is the cracking of metal involving anodic processes of localised corrosion and tensile stress.
- **Materials at risk:** Carbon and low alloy steels, CRAs.
- **Mitigating Actions:** Select suitable materials for the specific environment and design to controlled stress.
- **Further reading:**
  - [Nickel Institute TS No 10073](#)
  - [UKHSE ES/MM/10/11](#)
  - [Jones 2017](#)
  - [EFC 16 and 17](#)



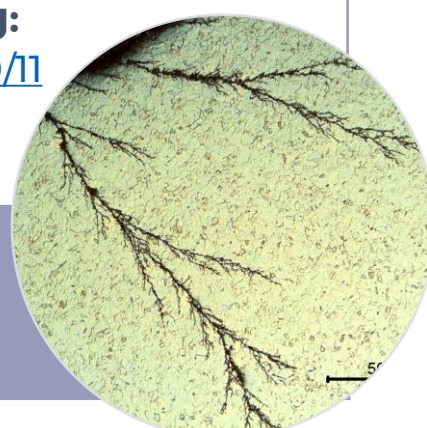
**SCC**

- **Description:** Hydrogen Induced Cracking (HIC) occurs when atomic hydrogen diffuses into steel and combines to form molecular hydrogen at discontinuities such as inclusions.
- **Materials at risk:** Carbon Steels (mainly flat rolled).
- **Mitigating Actions:** Control of steelmaking, segregation, inclusions and sulfur in steel. Confirm resistance by testing as per NACE TM0284.
- **Further reading:**
  - [Corrosion 99431](#)
  - [EFC 16](#)



**HIC**

- **Description:** Chloride Stress Corrosion Cracking (CSCC) in upstream production occurs under tensile stress and in the presence of oxygen and chloride. Piping under insulation is at higher risk of CSCC.
- **Materials at risk:** Mainly austenitic stainless steels.
- **Mitigating Actions:** Select suitable CRA and insulation avoid chloride contamination.
- **Further reading:**
  - [UKHSE ES/MM/10/11](#)
  - [Corrosion 02423](#)



**CSCC**

- **Description:** Hydrogen Induced Stress Cracking (HISC) is the cracking of metal under stress due to hydrogen embrittlement where a cathodic protection system is the source of hydrogen.
- **Materials at risk:** 13Cr, Super 13 Chrome, duplex and super duplex stainless steel.
- **Mitigating Actions:** Design loads and CP for HISC and microstructure control.
- **Further reading:**
  - [Corrosion 2016-6981](#)
  - [DNVGL-RP-F112](#)



**HISC**

All EAC images courtesy of [www.materials.life](http://www.materials.life)



Oil & Gas Corrosion Ltd. provides expert advice to the oil and gas industry to meet regulatory compliance, assure business continuity and optimise expenditure by managing the risks associated with corrosion.

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US toll-free:  
877-399-1010

UK: +44 (0)114 4000850