Explosion at Hydrogenation unit

EPSC Learning Sheet December 2022

EPSC

What Happened:

A rupture of an 8” pipe elbow in high pressure (280 bar) and high temperature (320° C) service in a hydrogenation plant was followed by a release and ignition of hydrogen. The construction material of the elbow was carbon steel which is not a resistant alloy and prone to high temperature hydrogen attack (HTHA) at mentioned conditions.

Aspects:

- Hydrogen under high pressure and high temperature will cause hydrogen attack resulting in micro fissuring and decarburization due to methane formation. Suitable material (Cr/Mo alloys) need to be used within their Nelson curves (API-941 ed 8th), checked regularly. Material selection need to be reviewed during revalidation of the hazard assessments.
- Make sure to check the correct material of construction sufficiently during assembly and posterior maintenance. Verify the equipment marks to avoid installing a non-suitable piece of equipment.
- A proper MOC process needs to ensure that all potential risks are checked including material aspects. When replacing components, a “real in-kind replacement” needs to be guaranteed.
- A Pre-Start-up Safety Review with elaborated checklists can assist to unveil deviations in materials of construction.

Use correct Material of Construction in Hydrogen Services