Stress Corrosion Cracking Failure of an Extractor Vessel and Brittle Fracture of a Hot Separator Vessel

Gerrit Buchheim, The Equity Engineering Group, Inc.

This talk discusses two failures that although they occurred in the US are relevant to the Alberta industries.

A facility experienced a through wall SCC crack in a low P settling drum. The mechanism was determined to be carbonate SCC, a form of alkaline SCC. It showed how sensitive this mechanism can be to residual stress. Where there had been previous repairs and local PWHT, cracks formed. Cracks even emanated from pits. A coating was installed as a barrier after inspection and repair of the vessel. Some forms of Alkaline SCC really require a higher PWHT temp than Code to get below the low threshold stress needed for SCC.

A vessel failed due to brittle fracture during start-up when it reached 400F operating temperature in a diesel hydrotreater unit. Fortunately there was no ignition of the gas release. The saddle support fillet welds were very poor quality and a fatigue crack developed at both supports. The crack was oxidized heavily showing that it was there for some time. The saddle support was supposed to slide to accommodate thermal strains during start-up, but was inadequate. The metallurgy of the drum was unusual and is expected to be brittle even at 400F. The drum was inspected, repaired, support system improved, and returned to service.