Question 52: What areas of a delayed coker are susceptible to naphthenic acid corrosion? How do you determine the maximum allowable TAN for these areas?

Frank Tracy (ConocoPhillips)

The primary areas of concern include:

•Coker feed circuit above 450 °F

•Bottom section of the fractionator, including internals

•Heater charge pumps and associated piping

•Heater tubes

After entering the Coke Drum, conventional wisdom is that the naphthenic acids have been held over 750 °F for a sufficient time that they no longer exhibit the naphthenic acid type corrosion behavior.

Considerations in determining the acceptable level of TAN include:

•The type of acid in the stream

•The amount of reactive sulfur in the stream.

•The presence/absence of continuous coke layer on the metal surface

•Velocities & turbulence can accelerate corrosion rates

•Short periods of high TAN levels in a stream can cause serious damage.

Acceptable TAN levels are calculated by our metallurgical experts based on the above considerations. When unable to manage acid levels to the acceptable levels by crude selection we must address the problem with metallurgy upgrades. Our approach is to use 317L SS for most components with Alloy 625 used for weld overlay or for tower internals.

We have quite a bit of experience with Naphthenic Acid Corrosion in the crude vacuum unit, but not a lot of experience with NAC in the coker. However, we have one unit that upgraded the metallurgy of the piping between the coker fractionator and the heater due to NAC.

Eric Thraen (Flint Hills Resources) The Coker VTB feed piping and heater charge piping are most

susceptible to naphthenic acid corrosion. The metallurgy and TAN limits on these sections are similar to those in the upstream Vacuum Unit VTB section. The furnace coil needs to be evaluated also. Naphthenic acids are destroyed at the temperatures present in the coke drum. The Coker furnace coil metallurgy needs to be evaluated based on process temperatures in that section of the heater. 9 Cr tubes have been the standard but as TAN increases certain sections of the heater may need to be upgraded similar to what is done in the upstream Vacuum units, depending on the Inspection findings. The interaction between TAN and line velocity must also be understood as piping erosion greatly accelerates naphthenic acid corrosion.

Sam Lordo (Nalco Company) The delayed coker circuit most susceptible to naphthenic acid attack is the feed circuit, downstream of the furnace is a low risk are as the furnace conditions thermally degrade naphthenic acids. Even though typical guidelines are used with respect to the velocity (shear stress), temperature, metallurgy and TAN levels to identify the potential risk. The incident of identified naphthenic acid attack is minimal. In most cases the size of naphthenic acid molecule in coker feed is too sterically hindered to be very aggressive.

Print as PDF:

Year

2010

Submitter

Licensor

Operator