Question 79: What methods do you use to detect and monitor coke deposition in FCCU risers? What prediction methods have been successful?

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While coke deposition in reactor void spaces and overhead lines has been reported with some regularity, coking in risers is less common. Increasing riser pressure drop and decreasing riser shell temperatures provide an indication of riser coking, but gamma ray scans are the surest online indication of riser coking.

We are aware of two FCC units that have experienced severe coking in the riser feed injection zone where the catalyst and vapor velocities are lowest, and the vapor molecular weight is highest. The extent of the riser coking in both instances was enough that the increasing riser pressure drop, reduced catalyst valve differential pressure and increased catalyst valve opening so limited unit run lengths. In one case, gamma ray scans were conducted every month or two along the length of the riser, clearly identifying the location of the coking and correlating well with the observed thickness of the coke deposits.

Surface thermography has also been used successfully to indicate significant coking in the riser. Normally, the riser shell would be hottest below the feed injection elevation and steadily decline at higher elevations as the feedstock is vaporized and cracked. If the shell temperatures just above the feed injection location decline abruptly to lower-than-typical valuesbut then increaseto typical values at higher elevations, then coking in the lower riser section may be indicated.Riser coking is thought to be due to some combination of the following factors: heavier feed, higher feed zone pressure, lower dispersion steam rate, reduced catalyst circulation, lower feed zone temperature, poor catalyst distribution within the riser,and ineffective feed injection.

Tags

Catalysts

Fouling

Reactor Vessel

Reliability

Year

2016