Question 84: What effects, if any, have you observed concerning slurry pump-around exchanger fouling when processing shale oil/tight oil feeds?

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Our expectation would be that there could be issues on both the slurry side (tube side) of the exchangers and the shell side in FCC feed preheat service. Of the two, we would expect fouling on the feed side of a slurry/feed exchanger to be most impacted due to the waxy nature of shale oils with the propensity of paraffins to undergo thermal cracking to form coke in high temperature services. On the slurry side of the exchanger tubes, the potential problems may be related to lower slurry oil product yield from the FCC unit. With the lower slurry product rates, issues with lower tube velocity and higher slurry residence time in the tower bottoms circuit could increase tube fouling with coke and catalyst fines.

One refinery shared with us that they have not seen a change in slurry pump-around fouling from shale oil or tight oil feeds. In their case, the slurry APIs tend to be low (less than 0); so, they are very aromatic. However, on occasion, the refinery has seen fouling issues in the HCO pump-around reboilers, which they were never able to explain. In the prior run, they added a dispersant due to the unexpected rapid fouling. During the present run, they have seen fewer problems and currently do not use a dispersant. At another refinery, processing waxy crudes resulted in a high API (high paraffin content) slurry bottom that was more susceptible to rapid fouling at low slurry product rates and high slurry bottoms temperature with slurry APIs at around 2 API. To keep from this limit, the refinery has set a minimum slurry product rate and maximum slurry bottoms temperature less than 690°F.They note that this can be exacerbated due to the relatively low bottoms yields with waxy feeds. The slurry exchangers in in this refinery are more susceptible to fouling due to low velocities [around 4 fps in the tubes. At one point, they fouled the exchangers to the point that these exchangers required cleaning after just three weeks.

Tags

Aromatics

Mechanical

Reliability

Year

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