Question 21: What needs to be considered when processing LCO or increasing the amount of cracked feed in a hydrocracker?

Tim Lewer (Shell)

It is important to ensure that sufficient H2 is available to satisfy the minimum required H2/oil ratio because hydrogen consumption will increase significantly. Review the make-up gas compressor design and H2 sources to ensure that adequate H2 can be provided. Also, it is important to consider the additional heat release/reactivity of LCO type feeds. Adequate heat removal and furnace turndown/controllability can be issues. Activity grading of the catalyst can help to address heat release issues at the top of the reactor. Finally, increasing the amount of LCO will increase the feed nitrogen content leading to higher ammonia passivation of the cracking catalyst requiring higher temperatures. Watch out for a runaway reaction in the cracking beds if there is a rapid drop in LCO feed rate.

Minh Dimas (CITGO)

H2 availability is a key parameter here (since cracked feed will consume more H2 and has a higher tendency to make coke). Also, attention should be taken in relation to higher bed exotherms due to the higher heat released by the aromatic saturation reactions.

Kaspar Vogt (Albemarle)

Processing more cracked feeds will increase the olefins content and typically also the aromatics content. Hydrotreating these in the pretreat section of a hydrocracker will lead to an increase in H2 consumption and exotherms. For LCO the aromatics concentration will be up to 3 times the straight run diesel concentration. The LCO nitrogen and sulfur content vary depending on the presence or absence of an FCC feed pre-treater. Increasing the blend of cracked stock to straight run feed means more exotherm, especially in the first bed as more olefins and aromatics are saturated. So one of my concerns is how you introduce or increase the blend ratio of cracked stocks. Quench control and available reserve hydrogen quench becomes more important as the cracked stock ratio increases. This is especially true if the unit is processing above design feed rates. With increased bed exotherm there also is increased H2 consumption at the same conversion level.

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