Question 38: What do you see for the future of ebullated bed technology considering changes in crude quality and availability?

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With the worldwide requirement for higher conversion of residue into lighter, more valuable transportation fuels such as diesel remaining firmly in place, we very much see ebullated-bed (EB) residue hydrocracking building on its current trend as a bottom-of-the-barrel upgrading technology of choice going forward. Investment in this commercially proven, well-established technology is a way to increase complexity and ensure long-term survival in an increasingly volatile marketplace.

Ebullated-bed residue hydro cracking is a Bottom of the Barrel Upgrading technology spanning 16 operating units commissioned over six decades since the first commercial unit came onstream in 1968. The early generation EB resid units were designed to process 100% vacuum resid (VR) feeds from a fixed crude slate targeting high removal of contaminant metals, CCR, and sulfur. With the push for higher bottoms conversion emerging in the 1990s, the key operational objective shifted to maintain an economical onstream factor by ensuring that the associated higher fouling rates leading to cycle-limiting higher sediment formation were adequately controlled.

With the dawn of the opportunity crudes era, the trend has been to use these units more as the key component in driving refinery crude diversification economics. Accordingly, more and more of the existing operating EB resid units are moving away from processing their design crude slate. Simultaneously, grassroots units are incorporating additional innovative designs (including interstage stripping, optimized hydrogen management, and integration in the same high-pressure loop with hydrotreating and hydrocracking units) to handle more variability in crude diet.

Investing in an EB resid unit not only brings with it the Best Practices learned from the very long operational history and proven upgrades, but also the opportunity to use the catalyst as a dedicated process variable in itself. Working in tandem with hydrogen partial pressure and the use of aromatic diluents such as slurry oil, the EB resid catalyst is the first line of defense that can be most readily applied. When there is a frequent change in crude slate, the catalyst addition rate can be varied as required. In addition, EB resid sediment control catalyst development in Criterion is based on a customized 4Cs approach wherein the Catalyst development, the Chemistry of the upgrading process is fully delineated; the Composition of the varying feed is very well characterized; and reaction and workup section Conditions, including unit limitations and key fouling locations, are closely monitored.

There is no doubt that processing vacuum residue(VR) feeds from a variable crude diet does present greater operational challenges for maintaining economical onstream factors in ebullated bed residue hydrocracking units. However, with proper management of crude changes, effective unit monitoring and application of Best Practices, such an operation, can also be a keyprofit-generating opportunity.

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