Question 18: What are your key strategies to maximize the heavy diesel barrels in the diesel pool without cracking? Do you consider blending and dewaxing etc. to meet product specifications?

Vern Mallett (UOP)

Generally maximizing heavy diesel barrels in the total refinery diesel pool would be based on distillation cut points the diesel processing units, mainly crude atmospheric columns. The objective is to maximize barrels by increasing distillation cut points up to distillation cut point maximum or to product quality specifications. Most likely the diesel derived from distillation will need to be further hydrotreated to sulfur specifications. Cetane requirements for finished diesel products will also need to be taken into consideration when blending straight run diesel. There may also be regulations and constraints on other product qualities such as olefin content, or aromatics for example which will need to be taken into consideration when maximizing total diesel refinery pool

Blending is commonly considered and used to increase the overall distillate blend pool for refiners. Hydrotreated diesel and or distillate are used to blend lesser quality diesel. This is evident in cetane barrels upgrading where high-quality hydro processed diesel range products are blended with lower cetane product to upgrade the overall diesel pool cetane value.

Heavying up the distillate end point may introduce cold flow property problems. This is especially common with virgin and paraffinic feedstock sources. Depending on local specifications for cloud point, pour point or cold filter plugging point it may not be possible to year-round end point extension to increase distillate yield. There are 3 main ways to mitigate cold flow problems: blending in lighter components (typically kerosene), using cold flow improving additives and catalytic dewaxing.

Kerosene blending is an effective remedy if available. The margin differential to jet must be considered to determine if the blending is economically viable. Cold flow improvers can be quite effective, especially for relatively small improvements in properties. These additives can be costly so large improvements in cold flow properties using additives may be cost prohibitive. Catalytic dewaxing for distillate fuel production is usually accomplished fixed bed hydrocracking catalyst utilizing shape selective zeolites. Cold flow properties are improved by selectively cracking paraffins, with selectivity to naphtha. Distillate yield loss is normally proportional to the degree of cloud point reduction. Yield loss could be minimized using dewaxing plus Isomerization, but the noble metal Isomerization process is very seldom economically justified for fuels production.

Dewaxing catalyst can usually be incorporated into the same reactor as used for distillate hydrotreating. Raising temperature in the dewaxing catalyst bed controls the amount of cracking and thus cloud point reduction. Since the cracking temperature is typically higher than required for desulfurization, the dewaxing function can be reduced in the summer when cold flow specifications may be less severe, thus increasing distillate yield. Obviously there will be some reduction in distillate hydrotreater cycle life because of the reduced hydrotreating catalyst volume in the reactor as well as the higher operating temperature required to achieve dewaxing. The UOP-Albemarle Hydroprocessing Alliance offers

catalysts and processes for catalytic dewaxing.

Brian Slemp (CITGO)

Choosing the proper crude slate is the best starting point for ultimate maximization of the refinery's diesel product capabilities. The proper crude slate will allow the refinery to hit multiple constraints and process unit limits. The newer higher activity desulfurizing catalysts and customized reactor loading philosophies have presented the refiners with the opportunity to dig deeper into the light cycle oil and light coker gas oils and help increase overall diesel production. Depending on the refinery configuration, hydrogen availability, and ULSD unit operating conditions the addition of a hydrocracking catalyst layer in the ULSD reactor is being considered as a means to increase the recovery of incremental diesel material from FCC feed pool and FCC bottoms product.

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