Ketjen

Unleash the Potential

MD FCC CATALYSTS

Boosting middle distillates production in fluidized catalytic cracking

Maximizing middle distillates in FCC units

A range of catalysts is available from Ketjen for increasing the production of middle distillates in the FCC process while retaining the many other attractive features of this versatile bottom-of-the-barrel upgrading process. The key to success is to adjust the catalyst properties for maximum production of LCO while maintaining maximum bottoms (slurry oil) destruction and good product quality.

The middle distillate catalyst family caters to a wide range of feedstocks and operating conditions to enable a refiner to take full advantage of the profit potential in FCC. The catalysts designated AMBER™ MD is formulated for use with gas oils. CORAL™ MD and UPGRADER™ MD have been designed for upgrading residue feedstocks. All three provide excellent selectivity to LCO, exceptionally high bottoms conversion and superior metals resistance, stability and coke selectivity. CORAL MD is the catalyst of choice for residue units limited by FCC unit regenerator temperature, whereas AMBER MD and UPGRADER MD are suited to the most demanding operations without this constraint.

Figure 1 illustrates what is achievable as a function of conversion. Maximum advantage is taken by operating in Zone 2, where, with increasing conversion, the cracking of bottoms to LCO exceeds the cracking of LCO to lighter products, or in Zone 3, where small losses in LCO yield are compensated for by increasing gasoline and lower bottoms production.

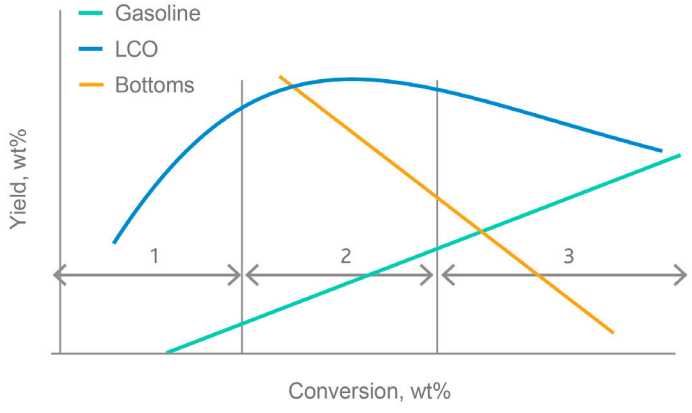

Figure 1: FCC cracking zones

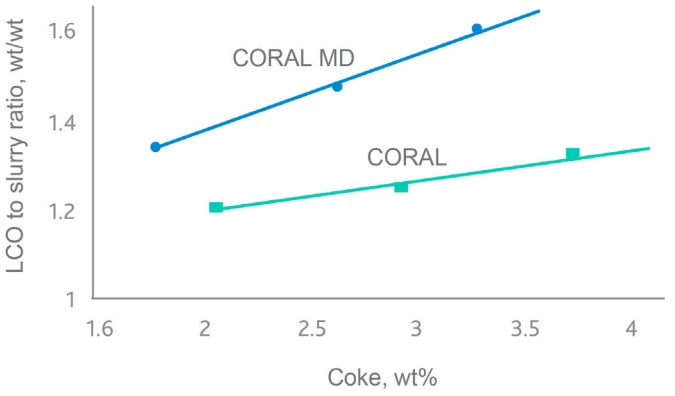

Figure 2: CORAL MD enhances the LCO/slurry ratio

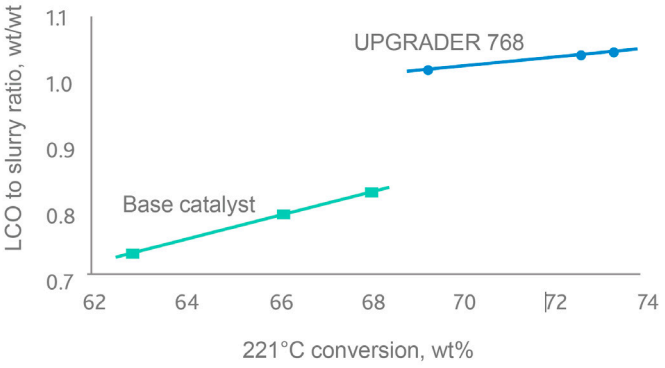

Figure 3: UPGRADER MD enhances the LCO to slurry ratio

A winning combination

To ensure high primary cracking activity while limiting secondary cracking of middle distillate products, catalysts must have the right combination of activity and accessibility for reactant molecules. Ketjen achieves this by increasing the ratio of matrix to zeolite activity and by applying proprietary technology to make the catalyst extremely accessible to molecules diffusing in and out. Activity is effectively dispersed throughout the entire matrix, which is opened up to molecular traffic.

These measures result in direct enhancement of the LCO to slurry product ratios, as shown by the laboratory results in figures 2 and 3. In commercial use, this data translates into a more valuable product package at a good conversion level without increased bottoms yield. Also, the catalysts can operate with increasingly heavy feedstocks.

The highest accessibility and bottoms cracking potential are reached with UPGRADER™ MD, which is designed for processing demanding residue feeds. A novel enhancement is applied in Ketjen's high accessibility manufacturing technology to give UPGRADER MD unique diffusivity characteristics for reactant molecules, particularly in heavy residue processing. Measuring the Ketjen Accessibility Index, a laboratory test parameter that characterizes diffusivity, give values over twice those of conventional FCC catalysts for both fresh and equilibrated UPGRADER MD samples. This enhanced accessibility gives the added bonus of increased stability by counteracting the effect of the pore blocking caused by metals deposition during residue processing.

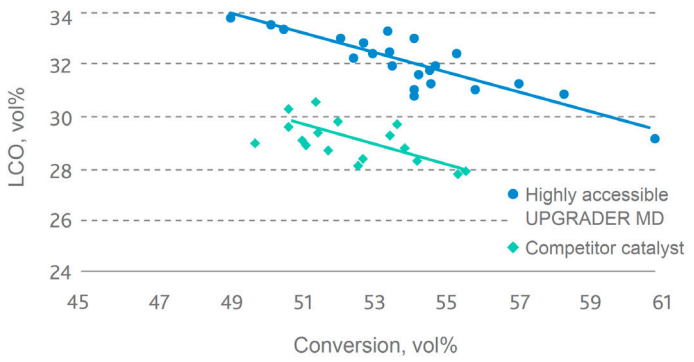

Figure 4: Ketjen's unique catalysts offer higher yields of diesel components.

Proven in FCC units

The new catalysts have proved their value in commercial operations for many Ketjen clients. The following examples illustrate the benefits achievable.

- Figure 4 shows the effect of a complete change out of the UPGRADER MD catalyst in an FCC unit processing residue. A structural step change takes place to a more favorable regime for LCO production. In this case, moderate conversion levels were applied to give LCO yields in the range 30–35 vol%.
- Ketjen has customers with units continuously producing close to 40 vol% LCO. This operation is particularly attractive if there is a demand for good-quality FCC unit bottoms as bunker fuel blending stock, which gives an additional benefit.
- In certain situations, the most valuable product mix may come at higher conversion levels, as shown in Table 1 for a unit processing VGO and targeting maximum LCO and propylene. For this refiner, the benefits of increased propylene and LCO yields outweighed that of reduced gasoline production.

These examples demonstrate the versatility of the MD range of catalysts in adapting to specific local situations while maximizing the economic benefits. As the global market demand for high quality diesel grows, the MD catalyst family will continue to be the cornerstone of a winning strategy. Development efforts continue at Ketjen in relentless pursuit of ever better catalysts for the future.

Yield, wt%	Competition	AMBER™ MD
Dry gas	2.7	2.8
Total LPG	26.4	27.4
C3=	9.8	10.9
C4=	7.3	7.5
Gasoline, C5 - 170°C	37.5	36.1
LCO, 170-370°C	21.7	22.6
Bottoms, > 370°C	6.4	5.8
Coke	5.3	5.3
C3 - LCO	85.6	86.1
Gasoline RON	93.4	93.8
Gasoline MON	81.9	82.0

Table 1: A commercial FCC unit processing low-sulfur VGO and maximizing LCO and C3/C4 olefins

FOR MORE INFORMATION ON THIS OR OTHER KETJEN PRODUCTS AND TECHNOLOGIES, PLEASE CONTACT YOUR KETJEN REPRESENTATIVE.

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