



## AMBER™

### Gas oil catalyst benchmark for maximizing transportation fuels

AMBER catalysts are frequently used, high-quality catalysts from the Albemarle portfolio and are manufactured using ADM-20 matrix technology, which is common to its high-accessibility catalysts. AMBER is the benchmark for maximum transportation fuels against which all other gas oil catalysts are measured. In addition, AMBER catalysts are solutions for non-residue processing refiners that require both excellent bottoms conversion and the gasoline and olefin selectivity that these catalysts offer.

AMBER catalysts possess high accessibility (high mass transfer, as measured by the Albemarle Accessibility Index, AAI). Albemarle FCC catalysts feature the highest AAI in the industry. The high-accessibility structure offers large heavy-feed molecules quick access to the active sites and facilitates rapid egress of the products without secondary reactions (Figure 1).

AMBER catalysts contain specialty ADZ zeolites with high activity and exceptional hydrothermal stability. The advanced matrix technology (ADM-20) in AMBER catalysts protects the zeolite, thereby enhancing its activity and enabling selective cracking of bottoms to the lowest possible levels.

#### The advantages of AMBER

- Maximized gasoline and distillates production
- Improved bottoms conversion and higher intrinsic activity
- Controlled hydrogen transfer and overcracking, which results in higher LPG olefinicities
- Improved resistance to poisons (nitrogen, coke and metals)
- Improved strippability

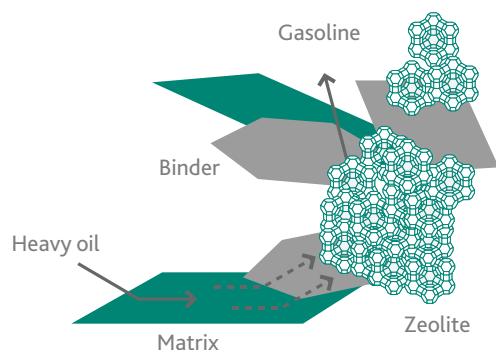


Figure 1: AMBER's high-accessibility structure offers large heavy feed molecules quick access to the active sites

Yield	Competitor	AMBER
Fuel gas, barrels of fuel oil equivalent	4.6	4.2
LPG, vol %	27.5	28.1
Gasoline, vol%	58.4	60.8
LCO/slurry	2.2	2.8
C3=/TC3	0.76	0.76
C4=/TC4	0.58	0.58

Table 1: AMBER gives higher LPG and gasoline yield compared with a competitor's catalyst

The AMBER family was designed to equal or exceed the yield selectivity obtained with the previous generation of high-accessibility, gas oil catalysts and to provide improved physical properties. AMBER catalysts have higher average bulk densities and lower attrition indices.

AMBER is a proven gas oil FCC catalyst and has been applied in numerous applications. Thanks to its robust design, it provides the user with the additional advantage of being able to process opportunity feedstocks and thereby enhance refinery profitability.

A North American refiner was processing a moderately heavy feed but had an iron on equilibrium catalyst of up to 1.1 wt%. The high iron content, in combination with the larger feed molecules, made catalyst accessibility and bottoms-cracking ability of paramount importance. Using a competitor's catalyst, the slurry yield was too high and the gasoline yield was unacceptably low, as shown in Table 1.

Changing to AMBER™, with its high AAI and excellent bottoms cracking ability, significantly improved the yield structure and profitability of the FCC unit: the slurry yield decreased by nearly 1.5 vol% and the gasoline yield increased by more than 2 vol%.

The benefits of the higher AAI and bottoms cracking potential of the ADM-20, as used in AMBER, are highlighted by another application: a low-severity operation processing a low-sulfur gas oil feedstock (Table 2). In this case, AMBER replaces a traditional Albemarle catalyst. The typical feed has a low sulfur content of 0.5 wt% and a specific gravity of 0.8905.

In summary, AMBER is the FCC catalyst of choice for gas oil feed applications requiring:

- Maximum transportation fuels
- Highest bottoms conversion
- Higher catalyst activity
- Maximum accessibility and resistance to poisons
- Increased LPG olefinicities

Yield, wt%	Competitor	AMBER
Dry gas	Base	Base - 0.2
LPG	Base	Base + 0.4
Gasoline	Base	Base + 1.6
LCO	Base	Base + 0.1
Slurry	Base	Base - 1.9
Coke	Base	Base

**Table 2:** AMBER gave higher LPG and gasoline yields compared with the base catalyst in a low-severity operation with a gas oil feed

Amber catalysts are a solution for non-residue processing refiners that require excellent bottoms conversion and target maximum transportation fuels.



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