FCC additive for the treatment of iron poisoning in catalysts

Albemarle has specifically developed BCMT 500, with its innovative matrix technology, to combat the effects of iron poisoning on FCC catalysts. The rapid action of BCMT 500 has been proven in many commercial applications.

In sufficient quantities, contaminant iron can form a layer around catalyst particles, acting as a barrier between the feed and the active sites. Elevated levels of calcium can significantly aggravate the problem. As a result, the larger feed molecules are not converted. In severe cases of iron poisoning, the loss of conversion can be up to 10 vol%.

In resid FCC units, iron contamination can be difficult to predict and prevent. High iron levels can often result from a single cargo of crude oil, but once the iron is deposited on the catalyst, the loss of conversion may persist for weeks.

BCMT 500 provides an immediate remedy. FCC unit conversion can be restored in days, rather than waiting weeks for the iron to be flushed from the unit.

When to use BCMT 500

BCMT 500 should be used whenever significant loss of conversion appears to result in iron poisoning. The common signs of iron poisoning include:

- Elevated equilibrium catalysts iron levels (>0.2 wt% added)
- Increased slurry yield
- Elevated calcium levels
- Reduced slurry density
- Low Albemarle Accessibility Index (AAI).

In most cases, a reduction in the equilibrium catalyst apparent bulk density (ABD) is also seen. This is due to the formation of iron nodules on the catalyst (Figure 1).

How BCMT 500 works

The matrix technology used in BCMT 500 captures iron from the host catalyst and restores the catalytic performance of the entire inventory. The meso-porous alumina matrix in BCMT 500 also provides accessible sites for the pre-cracking of large feed molecules that may otherwise be hindered from entering the host catalyst sites by the iron.

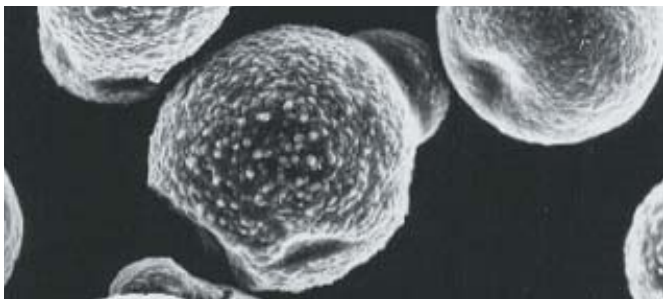

Figure 1: Scanning electron micrograph of iron-contaminated FCC catalyst particles at 500 times magnification

Through the course of treatment, BCMT 500 should be used to completely replace catalyst additions at the same addition rate as the base catalyst. A dose of only 15–20% of the unit inventory is required to restore bottoms conversion. At this point, normal catalyst additions can be resumed.

BCMT 500 commercial results

BCMT 500 was used to restore bottoms conversion in a unit experiencing high levels of contaminant iron and sodium (Table 1). BCMT 500 completely replaced additions of the base silica-sol catalyst until a change-out of around 20% was reached. The slurry yield returned to normal levels during the BCMT 500 trial, and remained low when the use of the base catalyst was resumed.

	Base catalysts	BMCT 500 12% of inventory
Feed quality	Base	Base
Total CAR	Base	Base
Conversion vol%	Base	+9.5
Slurry vol%	Base	-7.4
LCO vol%	Base	-2.1
Gasoline vol%	Base	+9.3
Equilibrium catalyst MAT wt%	70	73
Coke factor	1.4	1.0
Equilibrium catalyst ABD g/cc	0.80	0.89
Equilibrium catalyst AAI	2.1	7.5

Table 1: Results of BCMT 500 at 12% of inventory versus base catalyst.

The ABD of the equilibrium catalyst also returned to its typical value with only 12% BCMT 500 in the unit. The rapid increase in ABD indicated removal of the iron nodules from the surface of the host catalyst and demonstrated the effectiveness of BCMT 500 in capturing iron.

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