KF 780 STARS — A more intelligent catalyst for both diesel and VGO hydrotreating

KF 780 is the latest addition to Albemarle’s hydroprocessing catalyst portfolio and is ideal for cascading in different applications. KF 780 is applicable as both a standalone catalyst and in various STAX® configurations, utilizing Albemarle’s proprietary reactor loading technology.

KF 780 is a high-activity desulfurization catalyst in the STARS catalyst family with an extremely high metals efficiency. This step-out feature was achieved via improved metals dispersion and tailored distribution of active sites coupled with better pore accessibility.

This new, novel catalyst was specifically designed to achieve very high stability — in even the most demanding conditions — throughout the entire commercial cycle.

KF 780 has close to 100% Type II active sites which, in combination with its high metal efficiency, give it exceptional activity and stability in VGO hydrotreating applications. Higher activity catalyst solutions help refiners overcome constraints and exploit opportunities.

VGO STAX® FCC-PT Solutions

FCC-PT operations typically only have two reaction zones that vary in length and position during the operating cycle.

Catalyst application strategy must account for reaction Zone 1 growth and Zone 2 shrinkage throughout the cycle, as well as feed properties, operating conditions, constraints and product targets. Depending on refinery objectives, conversion may also be a target.

<table>
<thead>
<tr>
<th>ZONE 1 (30–60 VOL%)</th>
<th>ZONE 2 (40–70 VOL%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H₂ partial pressure</strong></td>
<td>Higher</td>
</tr>
<tr>
<td><strong>Main HDS reaction</strong></td>
<td>Direct</td>
</tr>
<tr>
<td><strong>Main HDS inhibitor</strong></td>
<td>Organic nitrogen</td>
</tr>
<tr>
<td><strong>Main HDN/HDA reaction</strong></td>
<td>Hydrogenation</td>
</tr>
<tr>
<td><strong>Main HDN/HDA inhibitor</strong></td>
<td>Org. nitrogen, aromatics</td>
</tr>
<tr>
<td><strong>HDS reaction rate</strong></td>
<td>Fast</td>
</tr>
<tr>
<td><strong>HDN/HDA reaction rate</strong></td>
<td>Very Slow</td>
</tr>
<tr>
<td><strong>Preferred catalyst types</strong></td>
<td>CoMo (Low-Med P)</td>
</tr>
<tr>
<td><strong>(general guidance may vary for specific cases)</strong></td>
<td>(Ni)CoMo (Med P)</td>
</tr>
<tr>
<td></td>
<td>NiMo (High P)</td>
</tr>
</tbody>
</table>

Table 1: VGO STAX® FCC-PT system design for robust operations

Unparalleled Performance, Higher ROI

“KF 780 STARS, Albemarle’s premier all-rounder hydrotreating catalyst, is built on our history of innovation and commitment to our customers. Its operational flexibility and economical fill cost make it ideal for refiners looking to expand their margins.”

Luca Moraca
Business Director, VGO FCC-Pretreatment

Figure 1: KF 780 gives value to refiners at all H₂PP levels.

FCC-PT catalysts for any refining objective

Albemarle’s portfolio for FCC pretreatment includes many different catalysts (each available in two different sizes), providing a solution for any refining objective in terms of activity, stability, hydrogen consumption and pressure drop.

These catalysts can be deployed in many different ways according to Albemarle’s proprietary VGO STAX® FCC-PT technology to generate tailored solutions for specific customer requirements.
KF 780 STARS — The new flexible performer for middle distillates hydrotreating

KF 780 is a flexible performer catalytic solution, both as a standalone catalyst and in various STAX® configurations, utilizing Albemarle’s proprietary reactor loading technology.

KF 780 is ideal for low- and medium-pressure middle distillates operations and gives refiners operational flexibility at a competitive fill cost. KF 780’s main features are high DDS/HYD high DDS/HYD selectivity, boosted metals efficiency and excellent pore mouth accessibility.

KF 780 is ideal in low- to medium-pressure middle distillates applications

KF 780 can be applied as a standalone solution and in STAX® configurations in all Middle Distillates HT applications, including SRGO/cracked stock/HGO blends as well as block mode VGO/LGO applications.

The unique features of KF 780 make it particularly suited for low-pressure (<30 bar PP\text{H}2 in) and medium-pressure (30-50 bar PP\text{H}2 in) middle distillates hydrotreating, particularly where H\text{2} availability, feed quality, high operating temperature and thermodynamic limitation are a constraint for hydrogenation reactions.

KF 780 is a versatile, all-rounder catalyst. KF 780 STARS, provides outstanding metals efficiency at a competitive fill cost as well as very high stability — even in demanding conditions — throughout the whole commercial cycle.”

Peter-Paul Langerak
Business Director, Distillates

Operational flexibility at a competitive fill cost

An extensive ULSD catalyst portfolio for any objective

Albemarle’s ULSD catalyst portfolio contains an extensive array of catalyst functionalities that enable customizable catalyst system solutions to fit any possible combination of unit performance objectives and constraints.

Albemarle employs STAX® technology to generate tailored solutions for specific customer requirements.

Stand-alone

<table>
<thead>
<tr>
<th>Low &amp; Medium Pressure</th>
<th>STAX® Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>KF 780</td>
<td>Top</td>
</tr>
<tr>
<td>Higher HYD/premium grade</td>
<td>KF 780</td>
</tr>
<tr>
<td>Bottom</td>
<td>to increase N/PNAs tolerance and/or reduce mass transfer limitation</td>
</tr>
<tr>
<td>KF 780</td>
<td>to increase activity and stability when HYD is limited by thermodynamics (typically at low pH2, out &amp; high RGT)</td>
</tr>
</tbody>
</table>

Figure 3: KF 780 is a versatile, all-rounder catalyst.

Figure 4: Albemarle's distillates hydrotreating portfolio

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