

TK-558 BRIM™

FCC pretreater unit (B: Eastern Europe)

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In 2003, TK-558 BRIM™ was selected for the FCCU pretreater at a refinery in Europe. The pretreater mainly operates as a mild hydrocracker. It has a two-reactor configuration and processes 40,000 barrels VGO per day.

A full loading of TK-558 BRIM™ was installed and replaced a known competitor CoMo catalyst.

In the catalyst selection process, the refinery attached importance to the flexibility of the new Topsøe catalyst system. This should be a flexibility to provide excellent HDS activity when operating in sulphur removal mode (HDS) and to provide a high conversion activity when operating in mild hydrocracking mode (MHC).

The operation in HDS mode removes 88% sulphur, and in MHC mode the requirement is to achieve 15-25% net conversion. When operating in MHC mode, the desulphurisation increases to 98% (200-300 wtppm sulphur in unconverted VGO) (figure 1).

When making a direct comparison of the hydrodesulphurisation and cracking activities of TK-558 BRIM™ with those of the previous charge of competitor catalyst, it is remarkable that TK-558 BRIM™ after one year in HDS mode still exhibits an activity for sulphur removal which is 10°C better than the competitor SOR activity (figure 2).

The achieved net conversion of 360°C+ boiling material significantly increased in MHC mode as compared with that obtained with the previous catalyst charge. Even though the unit is operated at a 10°C lower temperature, the diesel production is 30% higher (figure 3). The increased diesel production is obtained as a result of the enhanced hydrogenation activity of the TK-558 BRIM™ catalyst.

The feed is VGO with addition of up to 5% visbreaker gas oil. Both originates from a north-west Siberian crude .

The operation is characterised by a low partial pressure of hydrogen. When operating in MHC mode, the temperature is high, and thus the ability of the catalyst to avoid heavy coking is of paramount importance in order to prolong the catalyst life.

This described cycle with the initial charge of TK-558 BRIM™ ends after 22 months of operation and because of the very good performance the refiner decides to install a re-load of TK-558 BRIM™.

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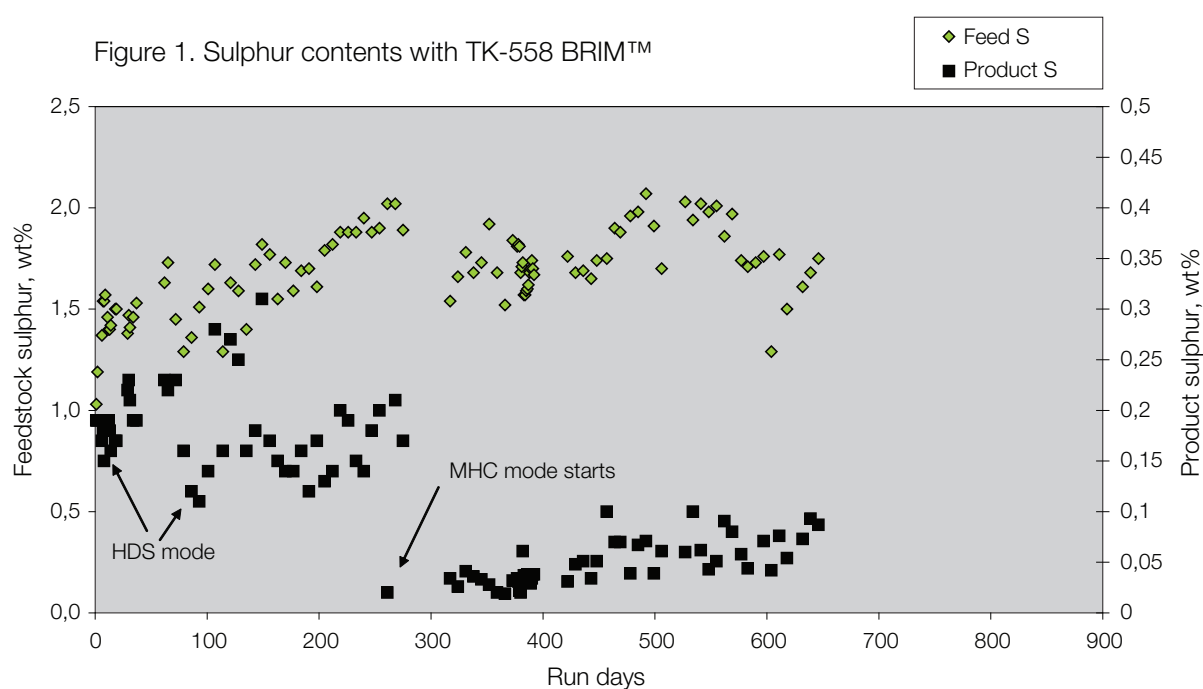
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The feed has the following properties:

Feed type	VGO + VBGO
Density, kg/m ³	910
Sulphur content, wt%	1.75
Nitrogen content, wtppm	1,100
Distillation (D-1160), °C	
5%	360
50%	440
95%	530

The unit is operated at the following conditions:

LHSV, hr ⁻¹	1.15
Hydrogen pressure, bar	45
Hydrogen to oil ratio, Nm ³ /m ³	280



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