

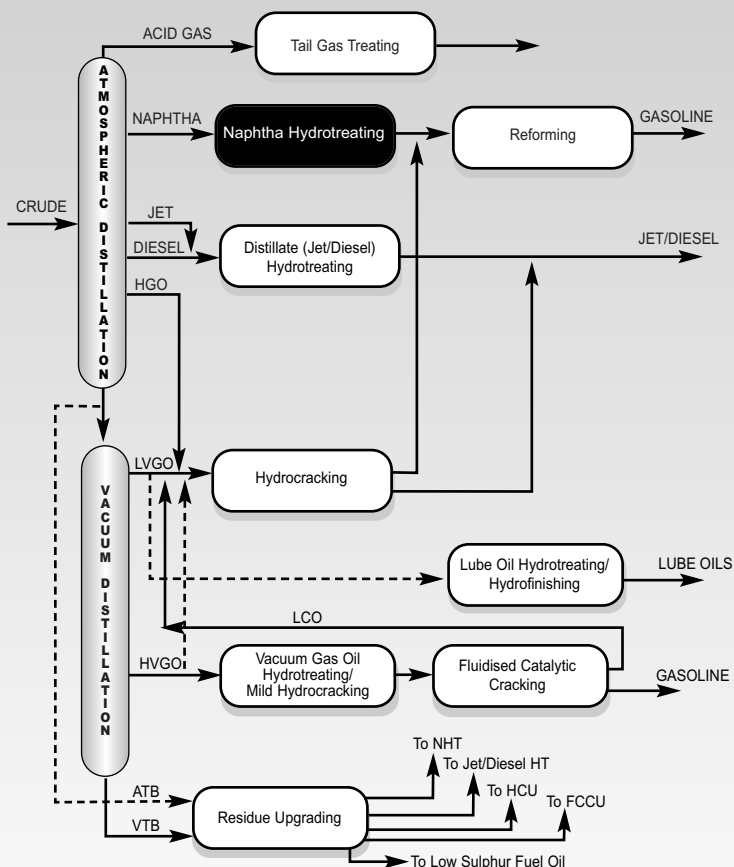
Catalyst & Technology

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News

Naphtha Hydrotreating

Your Refinery, Our Catalysts



Naphtha Hydrotreating (NHT) protects precious metal-containing downstream reforming catalysts from harmful contaminants. Our naphtha hydrotreating catalysts remove sulphur, nitrogen and silica, to levels required by the downstream reforming catalysts.

The use of cobalt-molybdenum (CoMo) or nickel-molybdenum (NiMo) catalysts depend on the properties of naphtha and operating conditions.

Recommended Criterion NHT catalysts:

DN-200 A NiMo catalyst that delivers high HDN and HDS activity, especially with cracked naphthas.

DN-140 A NiMo catalyst that is designed for high hydrotreating activity and improved silicon uptake.

DC-185 A CoMo catalyst that is low-density and recommended for use with straight run naphtha where sulphur removal is the primary treating objective.

Top Bed Catalyst

Particulates can lead to catalyst bed fouling and pressure drop. Often, particulates originating from feedstocks (especially cracked feedstocks) contain gum and coke precursors. The best way to prevent pressure drop build-up is to remove the particulates before they enter the reactor.

815HC, 834HC, 855MD

Criterion's top-bed catalysts and support material (active or inert) are designed to take up particulates via filtration and improve flow distribution. The active support material combines the high void fraction of a hollow cylinder and high capacity of macropores, to aid performance in fouling-troubled applications. If filtration is not possible, then grading the catalyst support will disperse the particulates resulting in lower catalyst bed pressure drop.

Arsenic Trap Catalyst

Arsenic(As) is a severe poison to hydrotreating catalyst. Depending on the crude origin, arsenic is observed in naphtha, distillate and VGO feedstocks. It is preferred to capture as much arsenic as possible in the upper portion of the catalyst bed.

Criterion has available, As-trap catalysts which are loaded at the top of a reactor, to prevent extensive penetration of arsenic into the catalyst bed and extend the hydrotreating catalyst's cycle length.

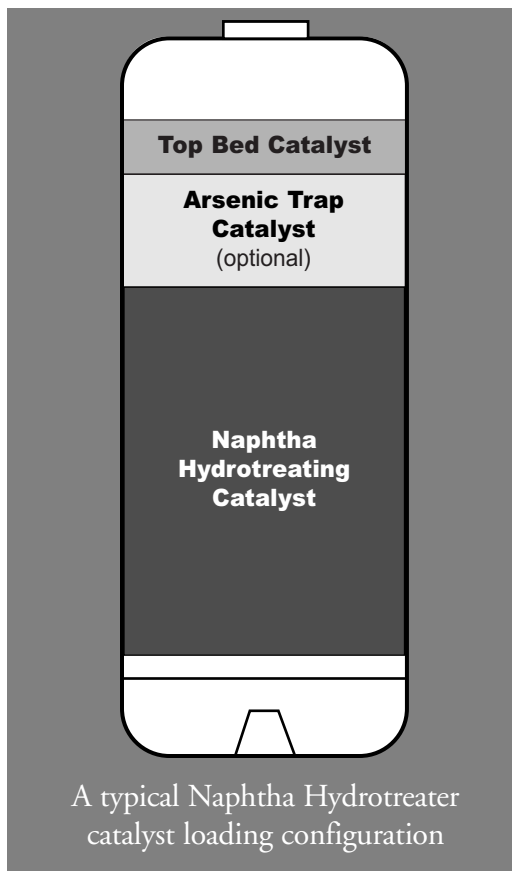
Naphtha Hydrotreating Catalyst

Process Description

Naphtha boiling range hydrocarbons are treated at elevated temperature and pressure in a hydrogen atmosphere with a catalyst primarily to remove contaminants harmful to the downstream reforming catalyst. Normally, the reactor is a downflow design with one or two beds of catalyst.

Goals of NHT

1. Product Sulphur - < 0.5 ppm
2. Product Nitrogen - < 0.5 ppm
3. Olefin Saturation - Bromine no. <1.0g/100g
4. Removal of Reformer Catalyst Poison - Si, As, Pb, etc.



Origins of Naphtha

1. Straight Run / Virgin Naphtha from Crude distillation unit
2. Cracked Naphtha from Pyrolysis unit, Coker unit, FCC unit, Visbreaking unit

Catalyst Selection Guidelines

- For straight run naphtha, CoMo catalyst, DC-185 is recommended for deep desulphurisation.
- For cracked naphtha, NiMo catalyst, DN-200, is recommended due to its high nitrogen removal activity.
- For a feedstock of SR / Cracked naphthas blend, or at low pressure conditions, a stacked NiMo / CoMo catalyst loading is to be considered.
- Where the level of feed contaminants such as silica is high, DN-140, a NiMo catalyst that is designed for silica removal, should be selected.

DN-200 Naphtha Hydrotreating Catalyst

For significantly efficient HDN and HDS performance in naphtha hydrotreaters, especially with cracked feedstocks.

DN-200 is a TRILOBE™ alumina extrudate promoted with nickel and molybdenum. Its promoter composition and pore size distribution have been optimised to improve catalyst cycle life. It has been embraced by the refining industry

for its application in naphtha hydrotreating. Besides being recognised for its excellent HDN and HDA functions, DN-200 has also delivered exceptionally high HDS activity and stability.

	Case A (Commercial Unit)	Case B (Commercial Unit)
Feed properties		
Composition	30%v SR Naphtha/ 70%v Cracked Naphtha	76%v SR Naphtha/ 24%v Cracked Naphtha
Sulphur	20,000 ppmw	242 ppmw
Nitrogen	50 ppmw	12 ppmw
Bromine No.	65 g/100g	2g/100g
Distillation, 90wt%	153°C	165°C
Operating conditions		
Catalyst	DN-140	DN-200
WABT	313°C	295°C
LHSV	3.4 hr ⁻¹	2hr ⁻¹
H ₂ partial pressure	2.0 MPa (20 bar)	1.2 MPa (12 bar)
Treat gas ratio	447 Nm ³ /m ³	100 Nm ³ /m ³
Product properties		
Sulphur	< 0.5 ppmw	0.1 ppmw
Nitrogen	< 0.5 ppmw	0.1 ppmw
Bromine No.		<1g/100g



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