BASE OILS

MOGUL

> General abstract

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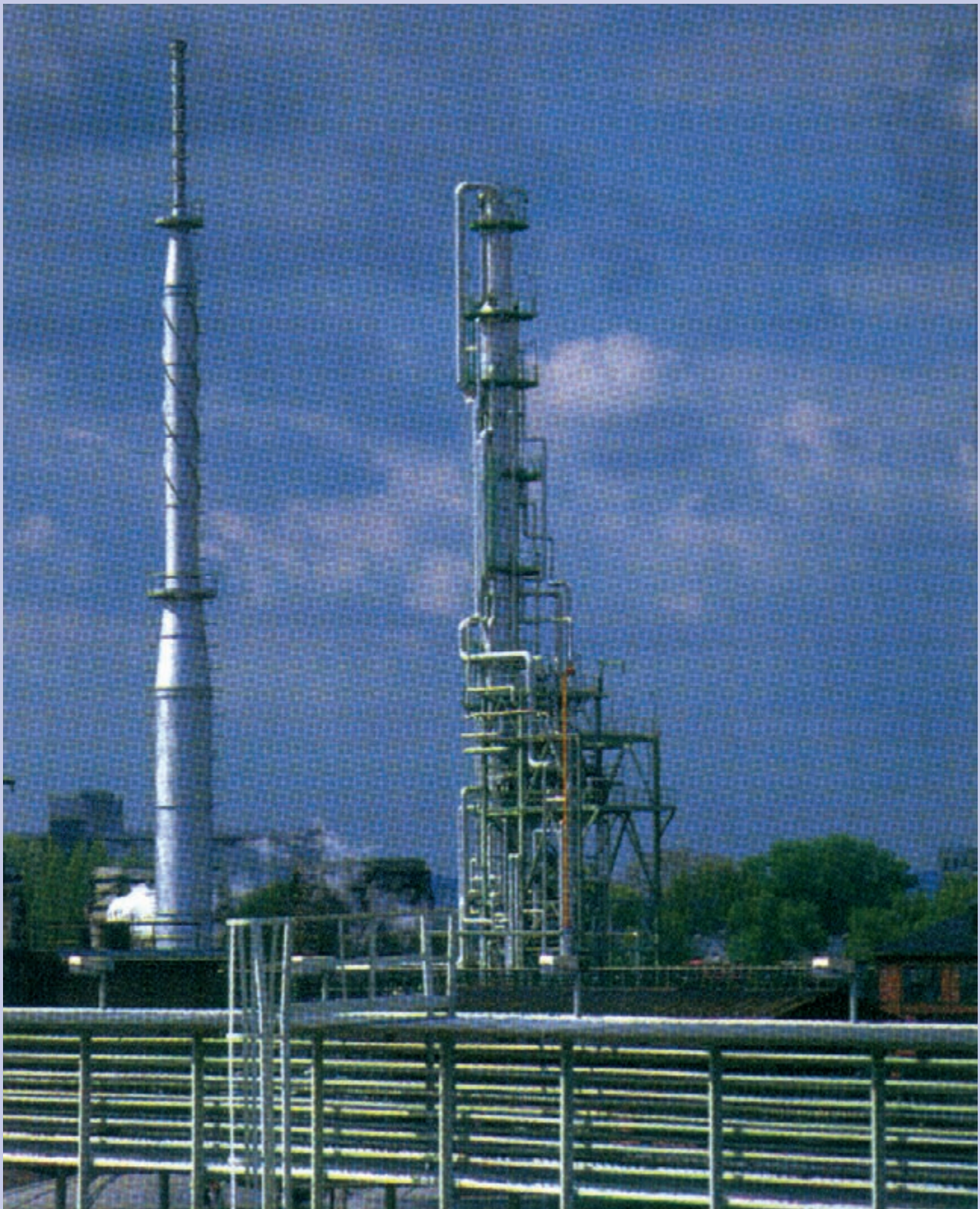
PRODUCTION PROCESS

The first step of MOGUL base oils production process is a high pressure catalytic hydrocracking of crude oil vacuum distillates. A re-distillation in a modern vacuum distillation column follows after. Hydrocracked base oils acquire by this re-distillation very narrow distillation range, high flash point, low volatility and good stability.

The production process of hydrocracked base oils MOGUL continues by solvent de-waxing and is finalized by active bleaching clay treatment.

The production technology provides a great extent of flexibility and allows production of various types of base oils in a wide viscosity range and viscosity index higher than 130 (ATIEL Group III).

Hydrocracked base oils of a new generation sold under the brand names “MOGUL HC” and “MOGUL N” fully meet the needs of latest demanding requirements on high quality modern lubricant formulations.



OVERVIEW

MOGUL hydrocracked base oils are fully comparable with similar oils produced world-wide. The main advantages of MOGUL hydrocracked base oils over the traditional solvent neutral are as follows:

Chemical structure stability	Chemical structure independent from crude oil quality
Stability	Excellent oxidation stability in the presence of suitable additives
Low sulphur content	Sulphur content lower than 0.01%wt
Low nitrogen content	Very low content of nitrogen compounds (traces)
Low aromatics	Cut-down of aromatics content
Light colour	Hydrocracked oils have light colour
Non-toxic	They do not contain potentially carcinogenic poly-aromatic hydrocarbons.

MOGUL HC base oils are available in wide viscosity range from ISO VG 2 to ISO VG 68, oils of viscosity from 2 to 10 mm^2/s at 40 °C are indicated as LOW VISCOSITY OILS

Base oils MOGUL HC with a very high viscosity index are ranged in viscosity grades from 4,0 to 6,0 mm^2/s at 100 °C

Wide variety of MOGUL products is completed by MOGUL N base oils of viscosity from 15 to 70 mm^2/s at 40 °C ranged into conventional viscosity grades N 85, N150, N300).

MOGUL HC LOW-VISCOSITY OILS

MOGUL HC low viscosity oils are successfully used in metal-working, hydraulic and shock absorber fluids, automatic transmission fluids, transformer and insulating oils, mould release oils etc.

Main advantages:

- very narrow distillation cuts, 15-35 °C wide
- low aromatics content
- very low sulphur and nitrogen content
- low volatility
- light colour
- naturally low pour and cloud point
- relatively environmentally friendly
- biodegradability 40-45 % according to CEC-L-33-A-93, 40-60 % OECD 301B

MOGUL HC LOW-VISCOSITY OILS

Parameter	Unit	HC 2 B	HC 2 C	HC 5 A	HC 5 B	HC 10 A	HC 10 B
Density at 15 °C	kg/m^3	840	850	860	840	870	840
Kin. viscosity at 40 °C	mm^2/s	2.1-2.8	2.1-2.8	4.0-5.0	4.0-5.0	8.0-11	8.0-11
Flash point	°C	85	80	120	125	155	160
Pour point	°C	-48	-42	-33	-24	-12	-6
ISO colour		0	0	0	0	0.5	0.5
TAN	mg KOH/g	0.01	0.01	0.01	0.01	0.01	0.01
CCR	%	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulphur	%	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PCA IP 346	%	-	-	-	-	< 1.5	< 1.5
Distillation		235	235	275	285	320	325
5 %-95 %	°C	260	255	310	315	345	360

MOGUL HC 10 oils are also available de-waxed to pour point under – 40 °C.

MOGUL HC BASE OILS

MOGUL HC base oils are classified according to ATIEL (API) into Group I (MOGUL HC 22), Group I"+" (MOGUL HC 68) and Group II (MOGUL HC 20 and HC 46).

MOGUL HC base oils find their use in wide variety of automotive and industrial oils; in industrial area they are especially suitable in hydraulic, turbine and compressor oils formulation. Together with appropriate additives it is possible to meet the most demanding requirements of present lubrication and extent machine component lifetime.

Main advantages:

- low volatility
- very low sulphur and nitrogen content
- light colour
- high oxidation stability and affinity for additives
- viscosity index up to 115

MOGUL HC BASE OILS

Parameter	Unit	HC 20	HC 22	HC 46	HC 68
Density at 15 °C	kg/m^3	840	860	860	870
Kinematic viscosity					
at 40 °C	mm^2/s	19.0-22.0	19.8-24.2	44	55
at 100 °C		4.1-4.4	4.3	6.5-7.0	7.0-8.3
VI		115	86	112	100
Flash point	°C	200	180	235	235
Pour point	°C	-12	-12	-12	-12
ISO colour		< 1.0	< 1.0	1.0	< 1.5
TAN	mg KOH/g	0.01	0.05	0.05	0.05
CCR	%	0.01	0.01	0.01	0.01
Volatility Noack 1h/250 °C	%	20	30	6	6
Sulphur	%	< 0.01	0.01	0.01	0.01
PCA IP 346	%	< 1.0	< 1.0	< 1.0	< 1.0
Distillation		350	350	400	400
5 %-95 %	°C	450	450	510	520

MOGUL HC
VERY HIGH VISCOSITY INDEX BASE OILS

VHVI MOGUL HC base oils are classified Group III according to ATIEL (API).

VHVI MOGUL HC base oils represent modern technology for top lube oil production. These oils have excellent affinity for additives, performance packages, viscosity modifiers, depressants, etc.

VHVI MOGUL HC are ideal base for formulation of high quality oils particularly for latest vehicle specifications and also for modern industrial hydraulic, turbine, compressor, gear, and other application.

VHVI MOGUL HC base oils are fully comparable with VHVI and XHVI oils on the world market.

Main advantages of VHVI MOGUL HC for production of high quality engine oils:

- very low volatility close to synthetics (PAO)
- very high viscosity index
- excellent low temperature performance
- good thermal and oxidation stability
- very low content of aromatics and poly-aromatics
- very high degree of sulphur and nitrogen compounds reduction
- high saturated hydrocarbons level

VHVI MOGUL HC BASE OILS

Parameter	Unit	HC 18/120	HC 22/130	HC 22s/130	HC 32/130
Density at 15 °C	kg/m^3	838	843	840	845
Kinematic viscosity					
at 40 °C	mm^2/s	19.5	19.8-24.2	25.0	31.5
at 100 °C		4.0-4.4	4.6	4.8-5.3	5.5-6.2
VI		125	125	130	130
Flash point	°C	210	210	225	230
Pour point	°C	-21	-18	-18	-18
ISO colour		0.5	< 1.0	< 1.5	< 1.5
TAN	mg KOH/g	0.01	0.01	0.01	0.01
CCR	%	0.01	0.01	0.01	0.01
Volatility Noack 1h/250 °C	%	16	15	10	7
Sulphur	%	< 0.01	< 0.01	< 0.01	< 0.01
PCA IP 346	%	< 1	< 1	< 1	< 1
Distillation		360	370	380	400
5 %-95 %	°C	490	500	510	510

MOGUL N BASE OILS

MOGUL N base oils can be classified as Group I" +" due to low sulphur content, higher saturated hydrocarbons content and high viscosity index.

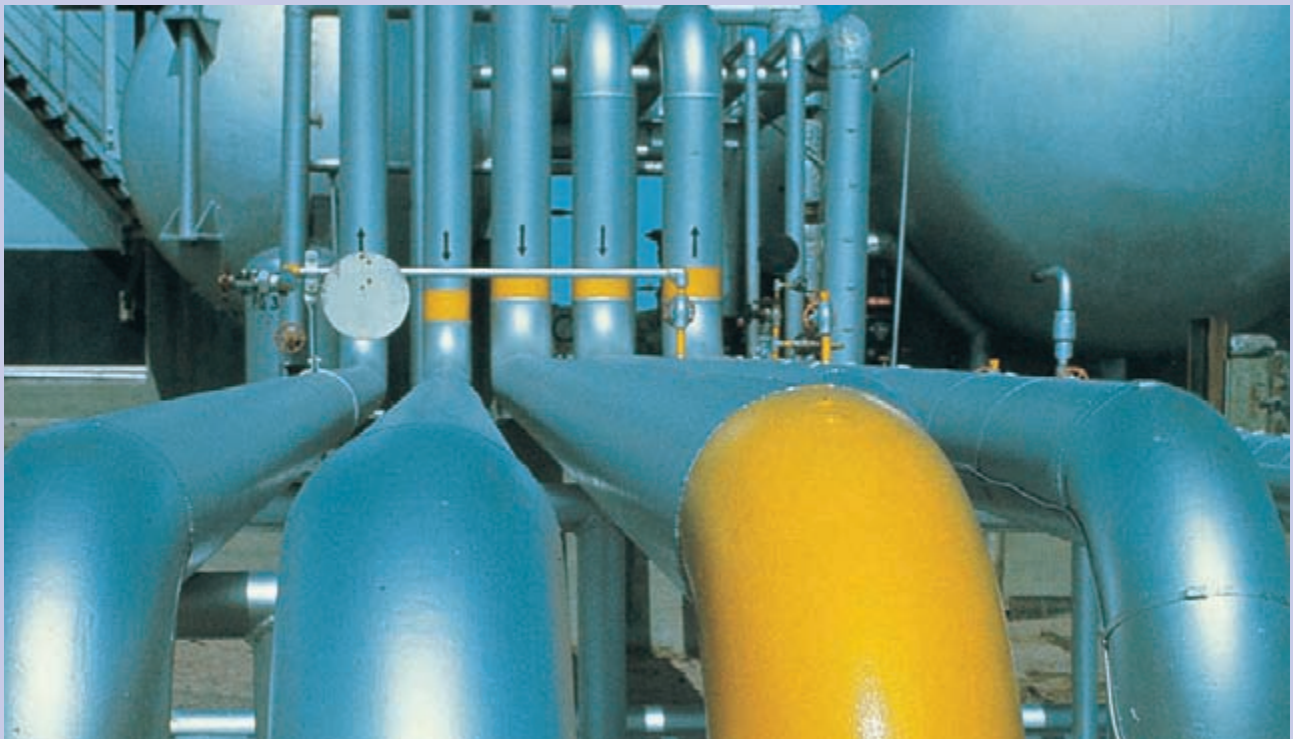
Typical characteristics of MOGUL N base oils:

- high degree of sulphur and nitrogen compounds reduction
- light colour
- low volatility
- higher viscosity index than typical for group I
- higher content of saturated hydrocarbons than typical for group I

MOGUL N base oils are especially recommended for formulations of both engine and industrial oils, e.g. for hydraulic, compressor, preserving, hardening and other oils.

MOGUL N BASE OILS

Parameter	Unit	N 85	N 150	N 300
Density at 15 °C	kg/m³	860	865	870
Kinematic viscosity at 40 °C at 100 °C	mm²/s	 15.0-18.5 3.5	 29.0-35.0 5.5	 62.0-75.0 8.5
VI		94	110	105
Flash point	°C	190	220	245
Pour point	°C	- 12	- 12	- 12
ISO colour		0.5	< 1.0	1.5
TAN	mg KOH/g	0.01	0.01	0.01
CCR	%	0.01	0.01	0.01
Volatility Noack 1h/250 °C	%	-	12.0	5.0
Sulphur	%	< 0.01	< 0.01	< 0.01
PCA IP 346	%	< 1	< 1	< 1
Distillation 5%-95%	 °C	345 415	390 465	420 530



MOGUL

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