made in PARAMO

MOGUL

# BASE oils

PARAMO

PARAMO

The refinery PARAMO, a.s. founded in the year 1889 is a traditional producer of fuel, lubricants and a leading producer of bitumen and related products in the Czech Republic. Research and manufacturing processes of fuel, lubricants, bitumen, bitumen products and paraffins at Paramo adhere to the management system conforming to the standards of ISO 9001:2008, ISO 14001:2004, and OHSAS 18001:2007.

PARAMO, a.s., (The Pardubice Refinery of Mineral Oils) has two plants. Hydrogenated and hydrocracked distillation cuts are processed in Kolín for production of base oils with extremely low sulphur content and lubricants. Our lubrication oils meet the requirements of renowned machinery and equipment manufacturers, such as VW, BMW, GM, FORD, MB, VOLVO, MAN, SCANIA, RENAULT, DAF, CATERPILLAR, TATRA, TEDOM, DAEWOO AVIA, ZETOR and others.

Plant in Pardubice focuses on vacuum gas oil processing into refinery and bitumen products, lubricants and process oils, including auxiliary and secondary products.

made in PARAMO
MOGUL

# 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 dewaxing 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 carbon content**
Carbon 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**
Very low content of 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 to10 mm2/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 mm2/s at 100 °C

Wide variety of MOGUL products is completed by MOGUL N base oils of viscosity from 15 to 68 mm2/s at 40 °C ranged into conventional viscosity grades N70, N 85, N100, 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 40-60 % according to OECD 301B

| Parameter | Unit | HC 2 H | HC 5 A | HC 5 B | HC 10 A | HC 10 B |
|---|---|---|---|---|---|---|
| **Density at 15 °C** | kg/m³ | 840 | 860 | 840 | 870 | 840 |
| **Kin. viscosity at 40 °C** | mm²/s | 2.1 - 2.8 | 4.0 - 5.0 | 4.0 - 5.0 | 8.0 - 11.0 | 8.0 - 11.0 |
| **Flash point** | °C | 85 | 120 | 125 | 160 | 160 |
| **Pour point** | °C | -48 | -33 | -24 | -12 | -6 |
| **ISO colour** | | 0 | 0 | 0 | 0.5 | 0.5 |
| **TAN** | mg KOH/g | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| **CCR** | % | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| **Sulphur** | % | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| **PCA IP 346** | % | - | - | - | < 1.5 | < 1.5 |
| **Distillation 5% - 95%** | °C | 248<br>260 | 275<br>310 | 285<br>315 | 325<br>345 | 325<br>360 |

MOGUL HC 10 oils are also available de-waxed to pour point under – 36 °C.

# 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

| Parameter | Unit | HC 18/120 | HC 22/130 | HC 25/130 | HC 32/130 |
|---|---|---|---|---|---|
| **Density at 15 °C** | kg/m³ | 838 | 840 | 840 | 840 |
| **Kin. viscosity at 40 °C<br>at 100°C** | mm²/s | 19.5<br>4.0 - 4.4 | 25.0<br>4.8 - 5.2 | 25.0<br>4.9 - 5.2 | 31.5<br>5.5 - 6.2 |
| **VI** | | 125 | 125 | 130 | 133 |
| **Flash point** | °C | 210 | 210 | 225 | 240 |
| **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** | % | 16 | 15 | 10 | 7 |
| **Sulphur** | % | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| **PCA IP 346** | % | < 1 | < 1 | < 1 | < 1 |
| **Simdist<br>5% - 95%** | °C | 360<br>490 | 370<br>500 | 380<br>510 | 400<br>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 carbon content
- 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.

| Parameter | Unit | N 70 | N 85 | N 100 | N 150 | N 300 |
|---|---|---|---|---|---|---|
| **Density at 15 °C** | $kg/m^3$ | 860 | 860 | 860 | 865 | 865 |
| **Kinematic viscosity at 40°C at 100°C** | $mm^2/s$ | 12.1 - 12.8<br>3.0 | 15.0 - 18.5<br>3.5 | 20.6 - 22.6<br>4.2 | 29.0 - 35.0<br>5.5 | 62.0 - 68.0<br>8.9 |
| **VI** | | 85 | 94 | 95 | 110 | 110 |
| **Flash point** | °C | 170 | 190 | 190 | 220 | 260 |
| **Pour point** | °C | -12 | -15 | -15 | -15 | -12 |
| **ISO colour** | | 0.5 | 0.5 | 0.5 | < 1.0 | 1.5 |
| **TAN** | mg KOH/g | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| **CCR** | % | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| **Volatility Noack** | % | - | - | - | 12.0 | 5.0 |
| **Sulphur** | % | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| **PCA IP 346** | % | < 1.5 | < 1.5 | < 1.5 | < 1 | < 1 |
| **Simdist 5% - 95%** | °C | - | 345<br>415 | 350<br>460 | 390<br>465 | 420<br>530 |

made in PARAMO

# MOGUL

**PARAMO, a. s.**
Přerovská 560, 530 06 Pardubice
phone: (+420) 466 810 111
fax: (+420) 466 335 019
e-mail: paramo@paramo.cz
http://www.paramo.cz

**Department of base oils sale:**
Miroslaw Poplawski
phone: (+420) 736 507 435
e-mail: miroslaw.poplawski@paramo.cz

PARAMO