ZETCHEMIE®

Hochleistungsprodukte und Service für die Metallbearbeitung

DIN-Oils

About us…

Hochleistungsprodukte und Service für die Metallbearbeitung

ZET-CHEMIE GmbH

Established: 1989

CEO: Jürgen Zimmerhackl

Office: Heisenbergstraße 3 und 7

Employees: 25

Production and sale: 8.000.000 liter

Product range:

- Lubricants for metal working
- Corrosion protection fluids
- Industrial lubricants
- Cleaners
- Greases

Base oil

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The base oils used gives the lubricants basic specific characteristics which increase the performance of the finished products.

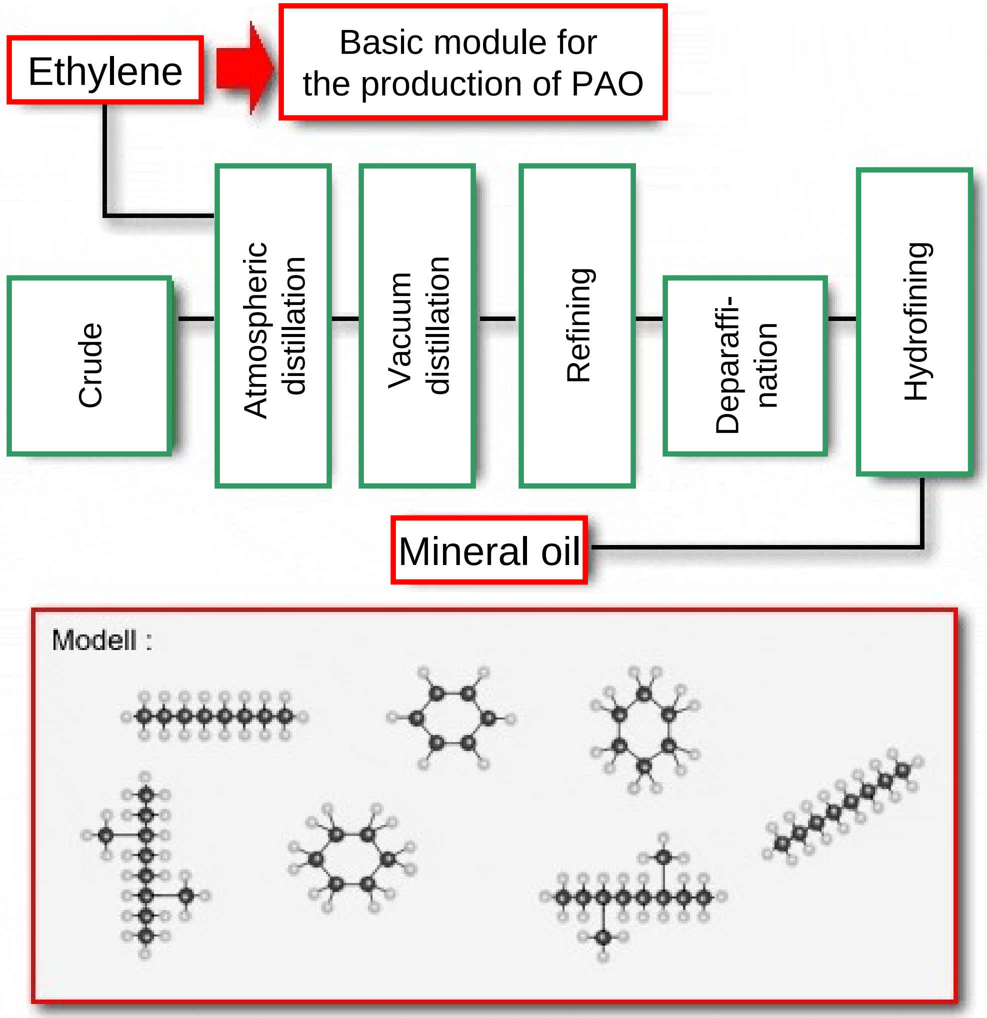
Mineral oils: hydrocarbon compounds of different shapes, structure, size and type (VI: 80-95)

Hydrocracking oils: refined mineral oils with higher purity and improved molecular structure (VI: 130-140)

Polyalphaolefins (PAO's): synthetic petrochemical products – chemically engineered linear hydrocarbon compounds (VI: 130-145)

Synthetic esters: chemically produced compounds of organic acids with alcohols, consisting of mloecules with defined shape, structure, size and type (VI: 140-180)

Manufacturing process



Viscosity of lubricants

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- The viscosity is the best known property of lubricating oils. It is the measure of the internal friction during the flow of an oil. Viscosity is a temperature-dependent variable. If the temperature is low and the oil cold, the internal friction is large and the viscosity is high. The hotter the oil is, the lower the internal friction and the lower the viscosity becomes.
- A distinction is made between the kinematic and dynamic viscosity.

SAE-Viscosity grades

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The lubricants for vehicles (engine and transmission oils) are described with SAE classes (SAE = Society of Automotive Engineers).

Herein are specified:

- temperatures for the viscosity measurement
- viscosity limits
- class assignments

In the hot operating range, the viscosity is determined uniformly for all SAE classes at 100 ° C for engine and transmission oils. In cold operating range, depending on the SAE, different measuring temperatures are prescribed. Oils, for which viscosity limits consist in the cold state, in addition to the numerical value of the respective SAE have the letter "W".

Viscosity classification according ISO 3448

With the exception of the vehicle, engine and transmission oils dicribed in the SAE classes, every other lubrication oils are classified according to the ISO viscosity classification.

This ISO-VG (International Organization for Standardization – Viscosity Grade) standardized 18 viscosity grades from 2 mm²/s to 1500 mm²/s. There is only a „central viscosity“ at 40°C required, the up and down may vary in viscosity grade by 10%.

Comparison of ISO-VG / SAE

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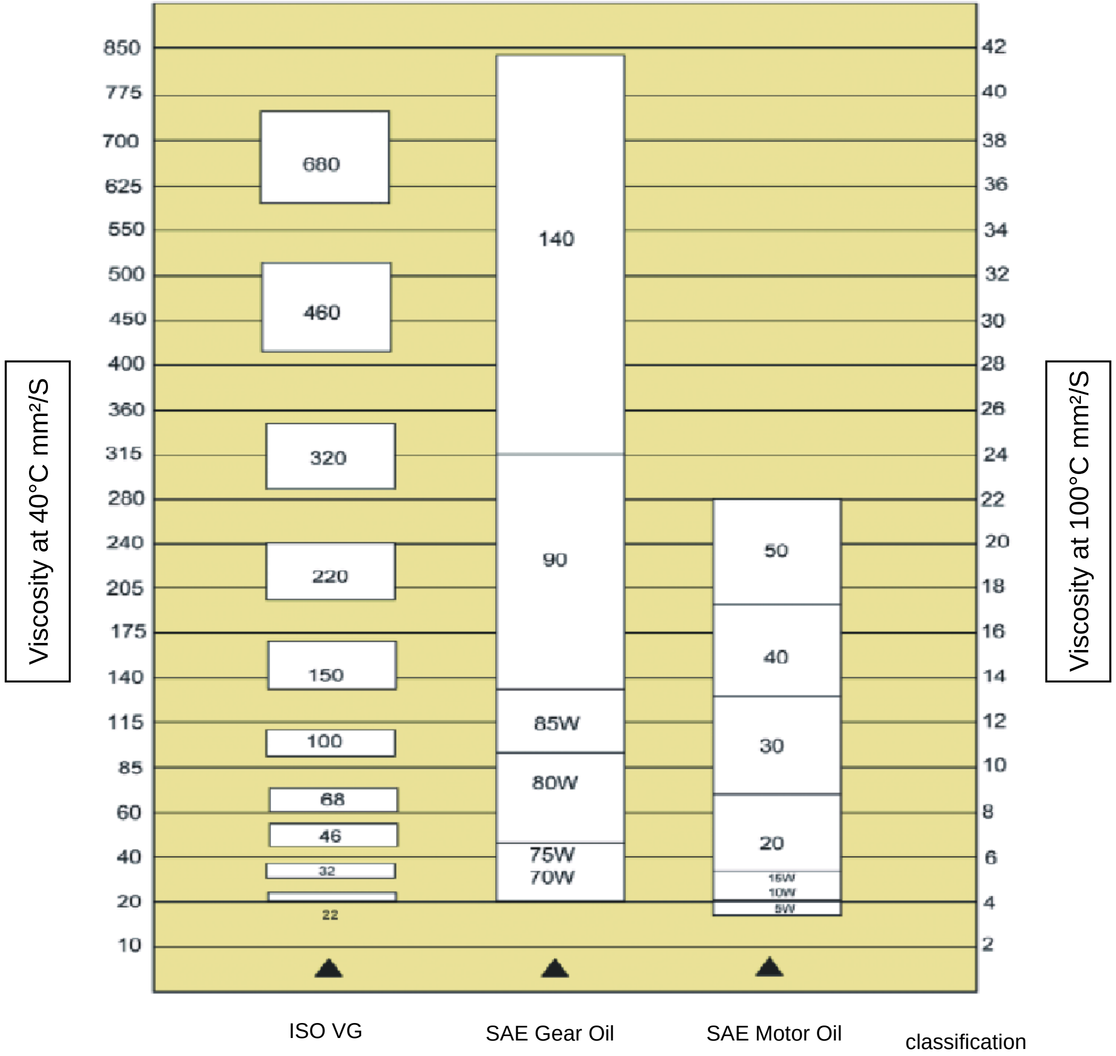

Additives for lubricants

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Antioxidants

- Lubricants tend under the influence of heat and oxygen to oxidation (aging). This decomposition process is accelerated by acidic reaction products from the combustion and traces of metals that act catalytically (abrasive or corrosive wear).
- The addition of antioxidants results in a significantly improved aging. You can not stop, but slow down the aging process.

Additives for lubricants

Antiwear additives

- Suitable additives build a very thin layer on sliding surfaces, whose shear strength is substantially less than that of metals.
- Under normal conditions it is solid, under wear conditions (pressure, temperature) slippery. Excessive wear (galling or welding) is prevented so.
- If necessary (after metal/metal-contact), the layers are formed constantly new by a chemical reaction.

Additives for lubricants

Extreme Pressure and Antiwear (EP / AW) additives

- The oldest EP additive is pure sulfur.
- EP / AW additives are surface-active substances and may contain in the polar group the elements zinc, phosphorus and sulfur in various combinations.
- The most known representative of this kind is the zinc dithiophosphate – ZDDP – which acts additionally as aging and corrosion protection additive.

Additives for lubricants

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Anticorrosive additive

- Corrosion is generally the chemical or electrochemical attack on metal surfaces.
- Preferably suitable for corrosion protection are surfactant additives, which can be ashless or ash causing.
- The polar group binds to metal surfaces, the alkyl radical forms dense furry hydrophobic (water-hostile) barriers.
- Because of their polar structure, the corrosion inhibitors are competing with EP / AW - additives, they may interfere with their effectiveness.

Additives for lubricants

VI-improver

- The use of VI-improvers (VI = viscosity index [/]) allows the production of multi-grade engine oils.
- VI-improvers increase or stretch the viscosity of an oil and thus improve the viscosity-temperature-behavior
- VI-improvers are metaphorically spoken very long, fibrous molecules which are coiled in the oil in cold conditions. They do not oppose resistance to the movement of the oil.
- With increasing temperature they uncoil itself, occupy a larger volume and form a network of mesh that slows down the movement of the oil molecules. VI-improvers delay the excessively rapid „thinning“ of the oil.

Additives for lubricants

Anti-foam additives

- Polysilicones (silicone polymers), polyethylene and others reduce the foaming tendency of an oil. This is achieved by generally less gases (air) in the oil.
- Entrapped gases can escape more rapidly from the oil.
- Foaming impairs the lubricating properties of a lubricant greatly. A lubricant with a bad foam behavior can lead to significantly higher oil temperatures and wear.

Additives for lubricants

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Pour point improvers

- The pour point is the lowest temperature (in degrees Celsius °C) at which the oil flows barely.
- The „stagnation“ of an oil is determined by the crystallization of the in the base oil present paraffins at low temperatures.
- By adding pour point depressants the crystallisation of paraffins is delayed and improves the low temperature performance of oils.

Additives for lubricants

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Friction Modifier

- Friction-reducing additives, so-called friction modifiers, can only act in the scope of mixed friction.
- These substances form furry films on the surfaces that can separate metal surfaces apart.
- Friction modifiers are very polar. There is a high affinity for the surface connected with friction-reducing properties.

Additives for lubricants

Detergents

- Keep hot surfaces free from deposits.
- Solid dirt particles are coated microscopically small, held in suspension in oil and can thus hardly accumulate.
- Soft sediments are washed off.

Dispersants

- Keep oil-insoluble, liquid contaminants that are formed during the warm-up phase in the engine mainly in the oil in suspension.
- The additives prevent agglomeration of the dirt particles and thus the formation of sludge

Industrial gear oils CLP

Industrial Gear Oil CLP is a combination of high-quality refined products and well designed additives. It contains highly effective, wear-reducing EP additives, antioxidants and corrosion inhibitors.

Application:

- Industrial gear oil CLP is designed for heavy-duty industrial gear units, for lubrication of:
  - Spur, bevel and worm gears, gear transmissions, bearings with immersion and circulation lubrication, claw clutches, thrust bearings of the roll neck and heavily loaded sliding surfaces, gears and bearings of rolling mill stands, mining machines, winches and hardware shredders.

Properties:

- Neutral towards cuffs, gaskets and elastomers
- Steel, non-ferrous and light metals and alloys are not attacked
- good corrosion protection, resistance to oxidation, no foaming, preventing the start of devouring, high load carrying capacity of the lubricant film, excellent wear protection (FZG> 12).

Hydraulic oils based on mineral oils

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The most commonly used hydraulic fluids are produced based on mineral oil with appropriate additives. The requirements for these hydraulic fluids are specified in ISO 6743/4 with the designations HL, HM, HV. In Germany the designations H, HL, HLP, HVLP to DIN 51 524 are common.

H: without additive, meet the lubricating oils according to DIN 51 517. These hydraulic oils are now rarely used.

HL: with additives to increase corrosion protection and aging resistance (to DIN 51 524, Part 1). They are used at pressures up to 200 bar and meet the usual thermal loads.

HLP: with additives to increase corrosion protection, resistance to aging and for reducing scuffing wear in mixed-friction areas (according to DIN 51 524, Part 2)

HVLP: with additives to increase corrosion protection, resistance to aging, to reduce scuffing wear in mixed-friction areas and to improve the viscosity-temperature behavior (according to DIN 51 524, Part 3)

HLP-D: with additives to increase corrosion protection, resistance to aging and detergent forming additives (German name, not standardized)

Besides these standardized hydraulic oils, engine and transmission oils for mobile hydraulic applications can be used. Especially the ATF oils (Automatic Transmission Fluid) can be used in hydrodynamic converters.

Environmentally friendly hydraulic fluids

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For the use in biologically critical environments (Construction machine in water protection areas, forest machines , snowcats in the mountains, etc.) biodegradable hydraulic fluids are designed.

These fluids can be produced from petroleum, but often they are based on renewable resources such as vegetable oils. These following eco-friendly hydraulic fluids are distinguished:

HETG (based triglycerides = vegetable oils): These fluids are readily biodegradable and usually not hazardous for water. Compared to mineral oils, they have a lower resistance to aging and can be used under limited temperature loading.

HEPG (base polyglycols): polyglycols are made from petroleum, they are easily biodegradable and not hazardous for water. Its properties are comparable to those of mineral oils, they are soluble in water and not miscible with mineral oils or vegetable oils.

HEES (synthetic ester based): Synthetic esters can be produced both on the basis of renewable raw materials as well as on the basis of mineral oil. They are easily biodegradable and not hazardous to water or meet the Water Hazard Class 1. They have a high resistance to aging and are not sensitive to extreme working temperatures.

HEPR (other base liquids, primarily Polyalfaolefine).

Greases

Greases are pasty lubricants, which consist of a lubricating oil and a thickener. As a rule, greases consist of approximately 80% oil, 5 - 10% thickener and about 10 - 15% additives.

At the most common greases the thickener is a light or alkali metal soap which forms a sponge-like scaffold that surrounds the oil droplets. Through friction and fulling the lubricating oil is discharged gradually to the surfaces to do its job there. This process is also called "bleed out".

In addition to the lubrication, corrosion protection is an important function of greases, which is usually achieved by additives; these additives may also contain dry lubricants.

Greases

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Greases are not always miscible with each other, since the thickeners to each other (usually alkali and alkaline fatty acid) are not always compatible.

By selecting appropriate oils, thickeners and additives, the properties of greases can be optimized for different applications. So there are greases for high or very low temperatures, for applications in a vacuum, particularly water-resistant and weatherproof, pressure-resistant or capable of creep, food-safe or particularly adhesive greases.

Greases

Dropping point

- The dropping point indicates the temperature at which the heated grease sample starts to drip from the nipple of the test instrument.
- It is determined to DIN ISO 2176.
- The dropping point indicates not the maximum service temperature of the grease.

Mechanical stability

- The mechanical stability of a roller bearing grease is given if its consistency does not (or just little) change during the operating period.
- It can be determined based inter alia on the V2F-test described below.

Greases

Worked penetration

- The grease sample is filled into a vessel and in an automatic test equipment (a grease shaper) the sample is fulled 100.000 double acts long. The worked penetration is measured and the difference between the worked penetration is stated in 10-1mm at 60 and with 100.000 double acts.

Conduct to water

- The behavior of a grease to water (water-resistance) is determined in accordance with DIN 51807-1.
  For this purpose, a coated glass with the grease strip is hung in a stationary water bath at a certain temperature for three hours. The then occurred change to the fat sample is determined by visual inspection and in accordance with specified severity levels from 0 (no change) to 3 (major change) along with the test temperature.

Greases

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The greases produced using these thickeners generally have the following characteristics:

Soap type	Service temperature range (°C)	Conduct to water
Lithium	-30 to +140	resistant
Calcium	-30 to +60	repellent
Sodium	-30 to +100	not resistant
Lithium-complex	-30 to +160	resistant
Calcium-complex	-30 to +140	resistant
Natrium-complex	-30 to +120	not resistant
Gel	-20 to +160	resistant

Greases

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Consistency classification for lubricating greases according to DIN 51 818

The classification of lubricating greases is based on the worked penetration in NLGI grades and serves to differentiate the greases according to their consistency (ductility) and their structure.

NLGI-consistent class Nr.	Worked penetration acc. DIN ISO 2137	Visual assessment of ductility	Application
000 00	445-475 400-430	similar to very thick oil, very soft	Gear greases
0 1	355-385 310-340	soft	
2 3 4	265-295 220-250 175-205	unctuous almost solid solid	Rolling Bearing greases Bearing greses
5 6	130-160 85-115	Very solid	Block greases

Example: Greases

Example of a greae according to DIN 51825: **KP 2 G-20**		
Greases for lubricating roller and plain bearings with mineral oil as the base oil and thickener		K
Greases with mineral oil and EP agents		KP
Greases with mineral oil and solid lubricant additives		KF
Greases with mineral oil, EP agents and solid lubricant additives		KPF
Greases with ester oil as the base oil		KE
NLGI consistency index	2	(see NLGI classes acc. to DIN 51818)
Maximum service temperature and conduct to water	G	(see table below)
Lower service temperature	-20	-20 °C

Example: Greases

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Additional code letters for greases		
Letter	Upper service temperature (°C)	Conduct to water acc. to DIN 51807
C	+60	0 - 40 to 1 – 40
D	+60	2 - 40 to 3 – 40
E	+80	0 - 40 to 1 – 40
F	+80	2 - 40 to 3 – 40
G	+100	0 - 90 to 1 – 90
H	+100	2 - 90 to 3 – 90
K	+120	0 - 90 to 1 – 90
M	+120	2 - 90 to 3 - 90
N	+140	on appointment
P	+160	on appointment
R	+180	on appointment
S	+200	on appointment
T	+220	on appointment
U	>+220	on appointment

Selection criteria for greases

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The criteria for the selection of a suitable grease are the bearing size, the operating temperature, the operating speeds and the bearing load as well as the required service life and the lubrication intervals.

- **Consistency class (NLGI class):** this indicates how soft / tough a grease is. The most common multi-purpose greases are classified in class 2.
- **The temperature resistence:** Friction generates heat and what moves quickly and is highly loaded, provides a lot of heat. Fats must be designed for this. Multipurpose greases may be typically operated to 100 or 120 degrees, high temperature greases typically up to 150 degrees, for a short time even more.
- **Type of saponification:** Most greases are lithium saponified. To get added special features, there are also hydrolysis to calcium, sodium, barium. Important is the saponification when mixing greases. Many greases are compatible with each other, but you should not mix greases with different saponifications together.

Selection criteria for greases

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- **Solid lubricants:** Some fats also contain solid lubricants, they lubricate even then when the grease film tears off. Typically these are molybdenum disulfide (MoS2), PTFE or graphite. It has "integrated emergency running properties".
- **Corrosion protection:** Greases should have a corrosion protection ability beside the lubrication. Some greases are suitable, others not. They contain, for example, Corrosion inhibitors which inhibit rust.
- **Adhesion:** Environmental influences affect not enclosed areas. Water can rinse of the grease. Therefore are greases with a good adhesion.
- **Chemical resistance:** Chemicals may affect machines. Suds act at washing.
- **Compressive strenght:** In some bearings are high pressures. For this purpose there are special high-pressure greases, where a correct lubrication is maintained. EP additives increase the compressive strength.

Selection criteria for greases

- **Long-term stability:** Fats can gum up or decompose / bleed out. This is no problem for lubrication points that are greased regularly. The situation is different for lubrication points which need a long-term lubrication throughout the life, eg final drives and gearboxes. The fat must remain fully functional over many years.
- **Viscosity of the base oil:** The viscosity has a major influence on the lubricating properties. The thicker the base oil, the thicker is the lubricant film. However, this increases the internal friction, resulting in fast movements to higher heating. It depends on the application, which viscosity is suitable.

Selection criteria for greases

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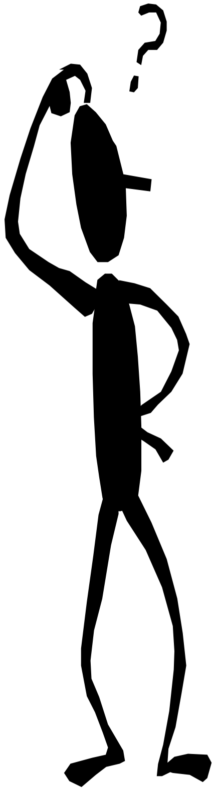
Oil type:

- Most universal greases are based on mineral oils.
- High-grade greases are based on synthetic oils. Benefits of synthetic oils can be for example: suitability for food industry (low toxicity), better long-term stability, better viscosity-temperature behavior, better low-temperature behavior, resistant to oxidation, better compatibility with elastomers, do not gum up.
- More rarely there are greases based on vegetable oils. Benefits here: Ecologically compatible, faster degradable.
- Greases based on silicone oils come for use for special applications where mineral oils are not working. Particular advantages are the high temperature resistance, compatibility with many materials and the physiological safety. Silicone greases also have disadvantages: The lubricating properties are significantly worse and the corrosion protection is not very good. Often silicone greases are used in conjunction with plastic and rubber - materials which often can't bear with mineral oil.



Any questions?

Please contact us !

Thank you for your attention !