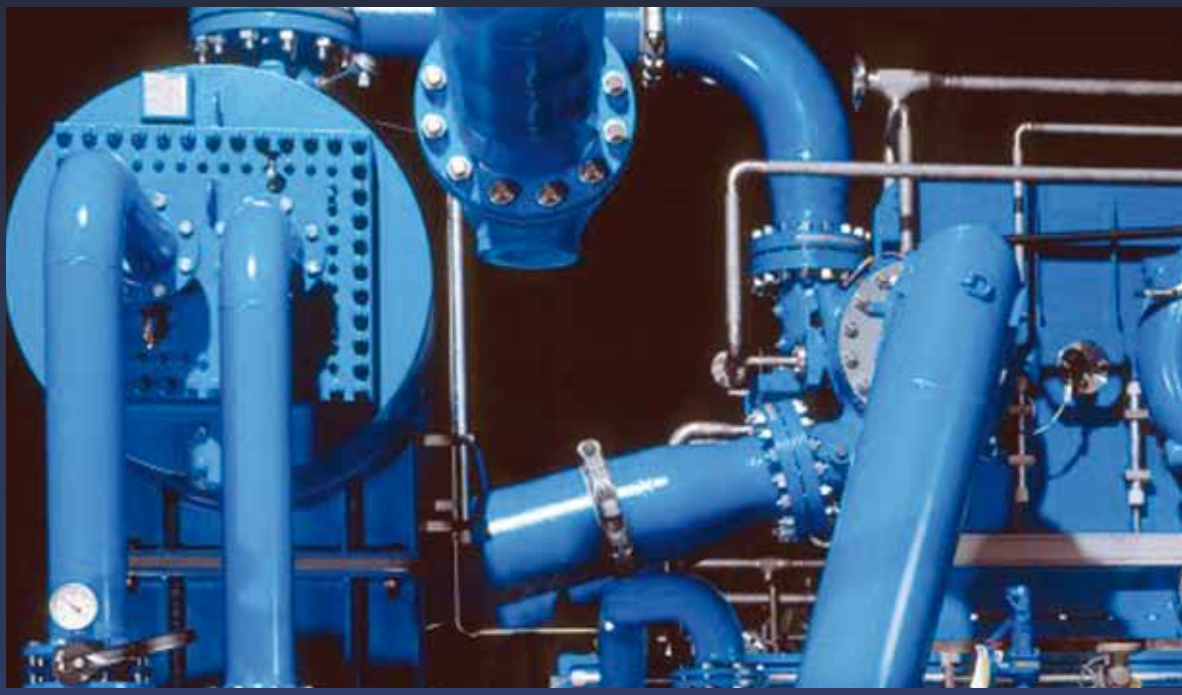
FUCHS Industrial Lubricants

RENOLIN

Lubricants for energy generation and energy transfer



Turbine oils
Air compressor oils

FUCHS

OUR LUBRICANTS KEEP THE WORLD MOVING

For more than 80 years, we have been concentrating all our activities and research efforts on the development of innovative lubricants. This specialization means that we are enjoying continuous growth – geographically, technically and in the number of application areas.

Today, FUCHS is a company that offers powerful lubricants and associated specialties worldwide in practically all areas of application and industries.






What makes our products more valuable.

We develop lubricants on an application-specific basis and tailored to our partners' processes. Together, we look for the best lubricant for our customers. This type of collaboration is unique in its form, scope and intensity. We call it a development partnership. This ability is based on one key feature: As a true lubricant specialist with its headquarters in Mannheim/Germany, we are the largest independent lubricant specialist, and this independence makes all the difference. We are open to new methods and visionary approaches – a prerequisite for innovations. And innovations are a FUCHS trademark.

Together, we move more.

FUCHS Industrial Lubricants

It all depends on the right lubricant.

The demands on turbine oils.

The global demand for energy continues to increase. Apart from the building of new power stations, an ever greater emphasis is also being placed on increasing the efficiency of energy production.

The use of new technologies in power stations and the increasing efficiency and performance of gas and steam turbines is placing greater demands on the performance of the lubricants used in these applications.

Significantly lower oil volumes for higher-performance turbines along with the use of oil circuits in combined cycle gas and steam turbines require long-life turbine oils which display, among others, outstanding thermal oxidation stability and excellent water and air release properties.

FUCHS has developed the **RENOLIN ETERNA series** and **RENOLIN ETERNA SGV series** to meet the demands of such machinery as well as highly-stressed gearboxes.

The demands on air compressor oils.

These days compressed air is an important energy transfer medium in a number of technical application areas. The reliable generation of compressed air is of crucial importance to many users and as a result, air compressors are vital equipment in many industrial areas.

As short life or breakdowns can lead to production stoppages, the use of the right lubricant is a prerequisite for the reliable and efficient operation of plant and machinery. In recent years, compressed air generation has been optimised and as a result, greater demands are now placed on air compressor oils.

Operators expect long machinery service intervals and thus also longer life of compressor lubricants. But not just oil change intervals were extended; oil temperatures have risen along with the reduction in oil volumes.

To safely satisfy these demands, FUCHS developed special **RENOLIN** air compressor oils and subjected them to the severest of practical trials.

Photo (also frontpage): Siemens AG

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High-tech turbine oils of the highest quality.

RENOLIN ETERNA

The RENOLIN ETERNA series was developed to satisfy the increasing demands of today's turbine oils and to facilitate a degree of rationalisation in gas and steam plants. These oils were also formulated for use in plants which integrate highly-stressed gearboxes.

RENOLIN ETERNA series products are perfect for use in gas, steam and expansion turbines as well as turbo-compressors with or without gearboxes. In addition, they can also be used as bearing and sealing oils in hydrogen-cooled generators and as mineral oil-based control fluids in the hydraulic control circuits of turbine plants.

The objective of our development of RENOLIN ETERNA turbine oils was to offer our customers excellent (EP/AW) wear protection, good ageing stability and minimal sludge and deposit-forming tendencies.

They are based on the very latest lubricant technology, containing premium, hydrogenated base oils. The outstanding properties of these base oils are further improved by the inclusion of carefully-selected additives. RENOLIN ETERNA products are free of organometallic compounds and are therefore zinc- and ash-free. RENOLIN ETERNA offers excellent corrosion protection.

Benefits

- Outstanding thermal oxidation stability. RENOLIN ETERNA achieves excellent life of >10,000 hours in TOST test according to ISO 4263 (see Figure 1) as well as RPVOT test >1,000 minutes according to ASTMD-2272 (see Figure 2).
- Good viscosity-temperature behaviour. RENOLIN ETERNA oils have high, shear-stable, natural Viscosity Index (VI >130).
- Rapid air release: Air release <4 minutes.
- Approved by important OEM's (e. g. SIEMENS, MAN Turbo, ALSTOM).
- Low foaming: Seq. I at +24.5°C = 30/0.
- Low pourpoint: -15°C.
- Good wear protection: FZG A/8, 3/90, damage load stage >10.
- Excellent water release after steam treatment: <50 seconds.
- Low sludging and deposit-forming tendency.
- Prevention of „Varnish" due to excellent ageing stability.

TOST test acc. to ISO 4263

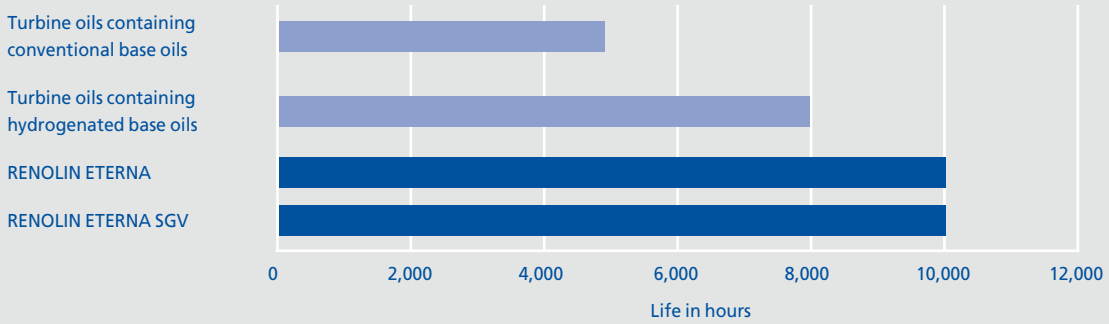


Figure 1: Typical oxidation stability in TOST test comparison of common turbine oils based on various base oils (TOST= Turbine Oxidation Stability Test)

RPVOT test acc. to ASTM D-2272

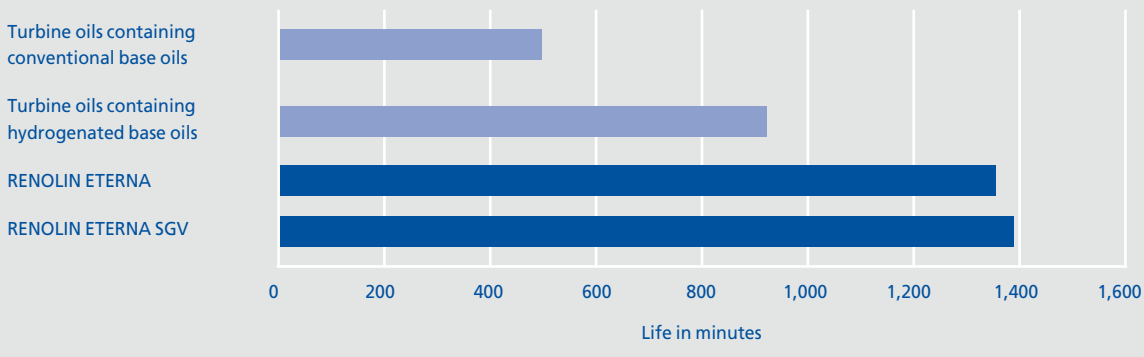


Figure 2: Typical oxidation stability in RPVOT test comparison of common turbine oils based on various base oils (RPVOT= Rotating Pressure Vessel Oxidation Test)

Oil ageing, 168 hours at +135°C in a beaker with a steel cylinder (FUCHS In-house test).

Thermal stability and deposit tendency of the various base oils in turbine oil formulations.

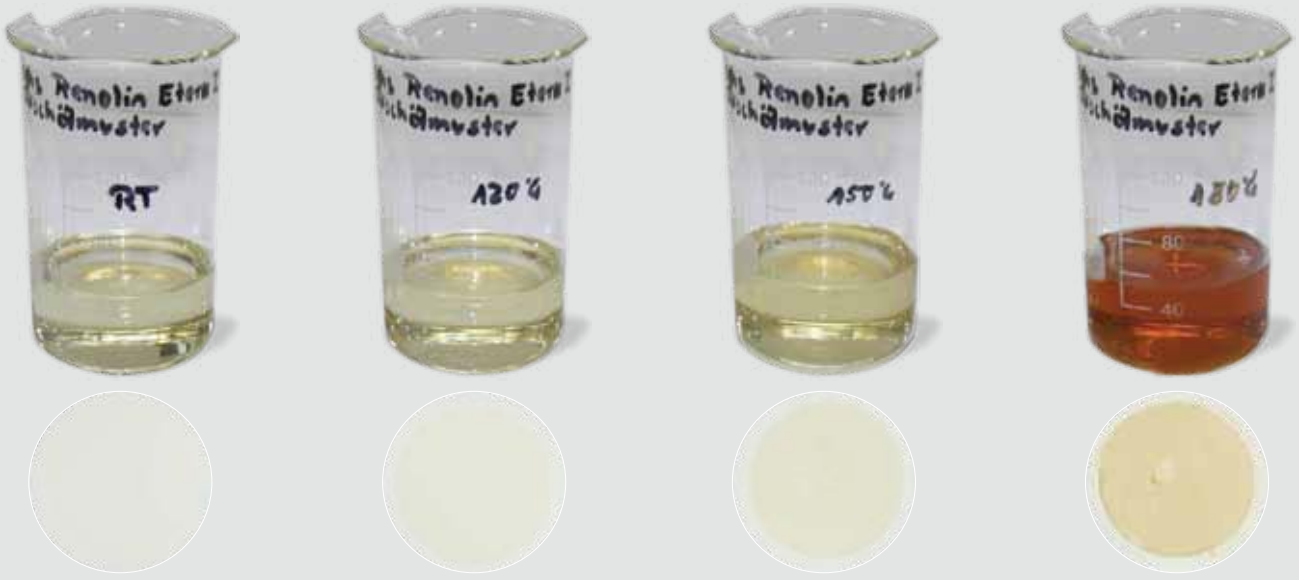
Poor thermal stability
Significant deposits

Moderate thermal stability
Moderate deposits

High thermal stability
No deposits

MAN HT-Test

RENOLIN ETERNA 32 meets and exceeds the requirements of the MAN HT test with excellent results.
RENOLIN ETERNA is characterised by very good wear protection, high oxidation stability and excellent thermal stability.



RENOLIN ETERNA 32
Fresh oil
Room temperature

RENOLIN ETERNA 32
Fresh oil
120°C

RENOLIN ETERNA 32
Fresh oil
150°C

RENOLIN ETERNA 32
Fresh oil
180°C

Photo: MAN Diesel & Turbo SE

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Air compressor oils – a major design element.

Lubrication has a significant influence on the behaviour of compressors and their reliability. It is therefore vital that the right lubricant is selected to ensure reliable, economical and safe operation. FUCHS can offer you the best air compressor oil for your compressor and your specific application.

The principal functions of a compressor lubricant include:

- Lubrication of bearings
- Sealing (minimisation of reflux losses)
- Dissipation of heat
- Corrosion protection (ferrous and nonferrous metals)

To satisfy these requirements, high-performance air compressor oils must have the following characteristics:

- Outstanding oxidation and thermal stability
- Low evaporation and coking tendency
- Good demulsification
- Low foaming
- Good long-term viscosity-temperature behaviour
- Good air release
- High corrosion protection
- Excellent ageing stability

Temperature and ageing resistance (thermal and oxidation stability, evaporation and coking tendency) is of particular importance because of safety and long product life considerations.

In recent years, not only the market share of screw compressors has risen, but their performance has also increased. Such compressors today are not only smaller but also offer higher specific performance. Amongst others, this has placed greater demands on the lubricants used because the volumes of oil available for cooling and lubrication progressively decreases.

And to lower operating costs and to cut down-time for servicing, maintenance intervals have also been extended. Such extensions automatically lead to longer oil change intervals. These and higher air-outlet temperatures are further loads on the compressor oils. Many compressor plants these days are operated with air-outlet temperatures of >110°C compared to +75°C to +85°C in the past.

Photo: BOGE GmbH & Co. KG

Typical oil volumes for screw compressors

Power (kW)	Oil volume (litre)	Oil circulation (litre/min)	Circulation factor
30	8	28	3.50
75	25	75	3.00
130	230	180	0.78
200	230	200	0.87
280	224	280	1.25

Typical oil change intervals for screw compressors*)

Product	Type	Temperature up to max. +85°C Oil change interval (h)	Temperature > +85 °C and < +120°C, Oil change interval (h)
Standard oils	Mineral oil	2,000–3,000	1,000–2,000
Semi-synthetic oils	Hydrocracked oils	4,000–6,000	2,000–3,000
Synthetic oils	PAO (polyalphaolefins)	>8,000	>4,000

*) The mentioned oil change intervals are guidelines and refer to normally-stressed industrial compressed air in European ambient temperatures between +10°C and +30°C. At higher temperatures and polluted atmospheres (waste dumps, water purification plants, chemical industry, etc.), the oil change intervals must be adjusted to prevailing conditions.

Thermal stability/Formation of deposits (FUCHS In-house test)

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Air compressor oils in practice.

FUCHS always offers you the right fluid for your screw compressor.

RENOLIN SC series

Premium-quality, oxidation- and ageing-resistant special cuts with corrosion protection and Anti-Wear additives. Available in the ISO viscosity grades 32, 46 and 68.

RENOLIN SC MC series

Screw compressor oils based on MC oils with a high, natural Viscosity Index for extended oil change intervals. Available in the ISO viscosity grades 46 and 68.

RENOLIN COOL +

Special screw compressor oil based on Group III oils with a high, natural Viscosity Index for extended oil change intervals even when subject to high thermal stresses (kinematic Viscosity at +40°C = 50 mm^2/s).

RENOLIN SYNAIR 46

High-performance synthetic air compressor fluid with excellent biodegradability OECD 301C >60%.

RENOLIN UNISYN OL series

Fully-synthetic screw compressor oils based on PAO with a high, natural Viscosity Index for extended oil change intervals even when subject to high thermal stresses. Available in the ISO viscosity grades 32, 46 and 68.

Oxidation stability RPVOT +150 °C acc. to ASTM D-2272

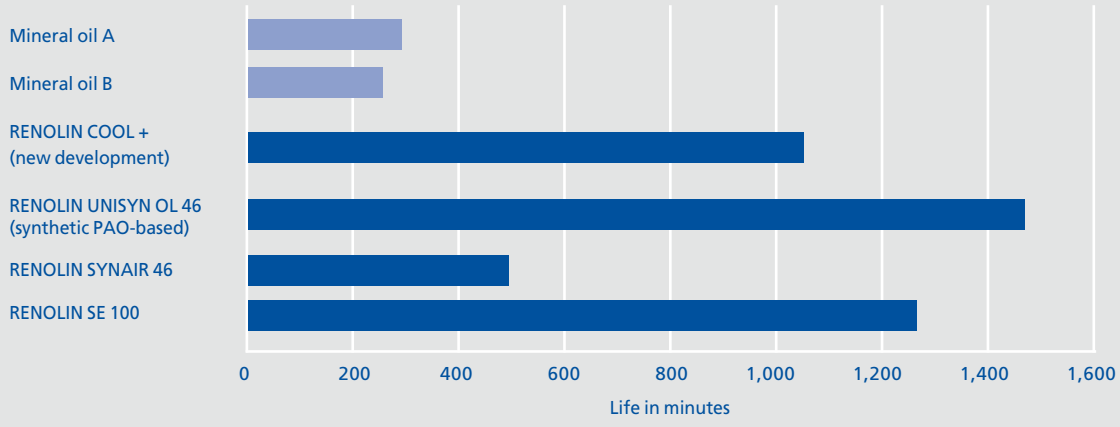


Figure 3: Typical results for common ISO VG 46 screw compressor oils (RPVOT test)

Determination of ageing behaviour acc. to DIN 51 352-2
Increase in coke residue acc. to Conradson

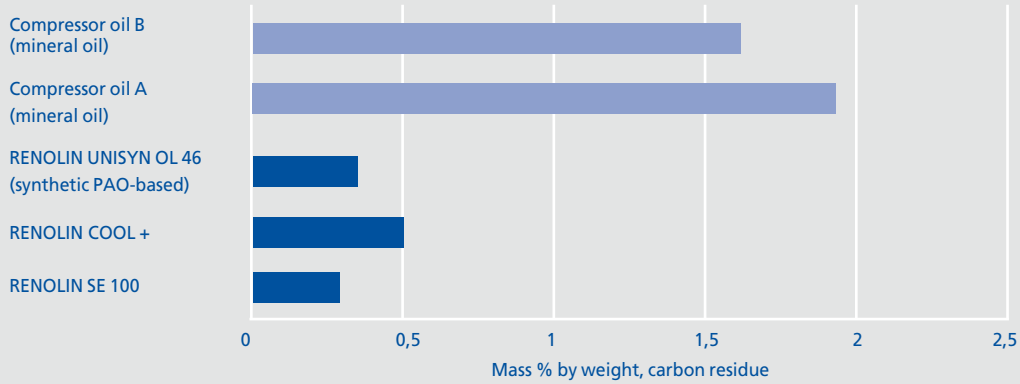


Figure 4: Typical results for common ISO VG 46 screw compressor oils (according to DIN 51 352-2)

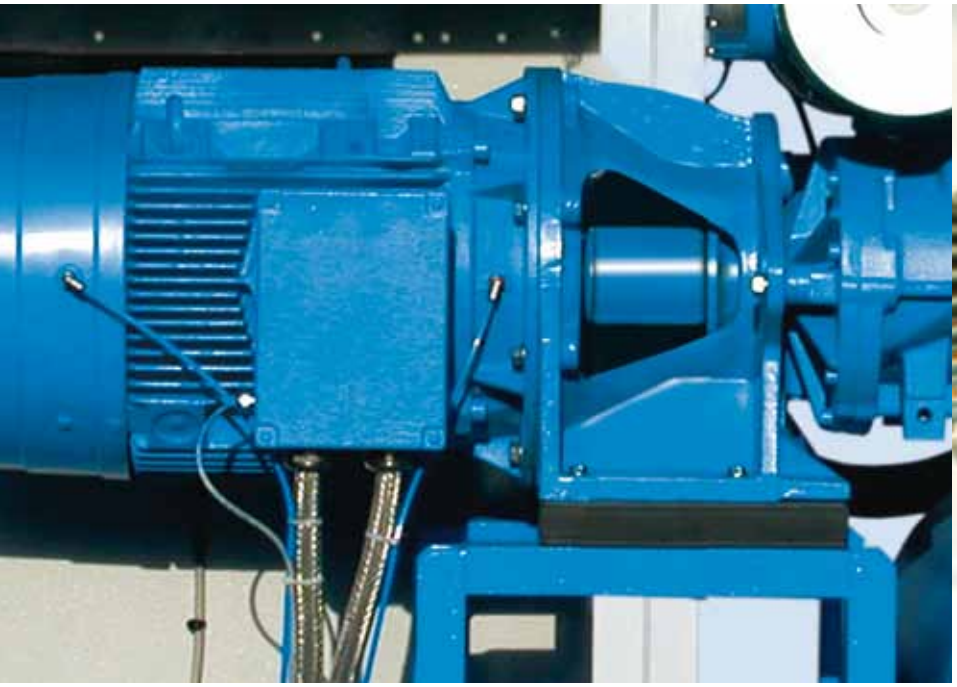
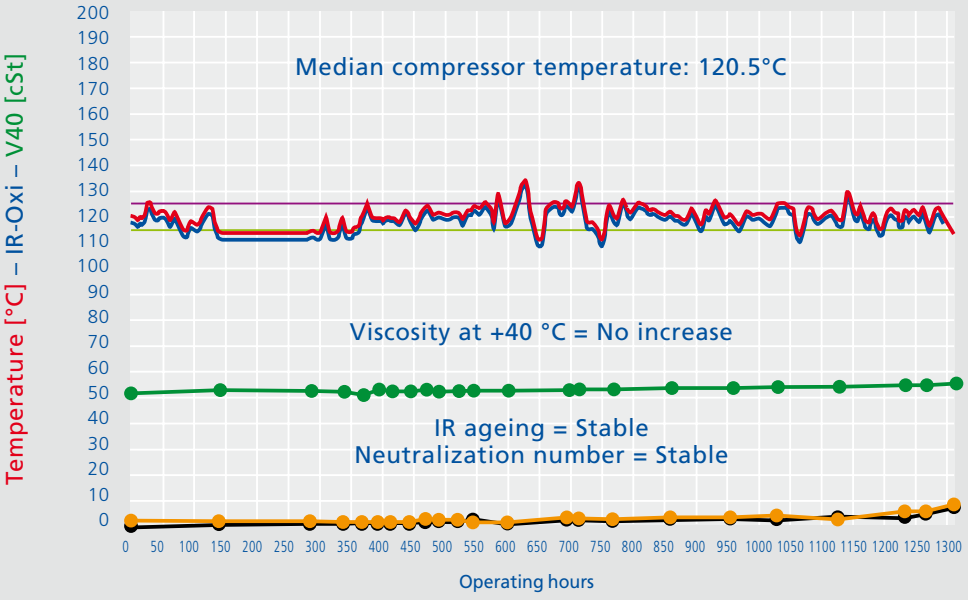


Photo: ALMIG Kompressoren GmbH

High-temperature test in an ALMIG SCK 15 screw compressor
Power P(el) 11 kW/oil volume: 5 litres



SCK 15 Tank temperature
SCK 15 Screw temperature
Lower temperature threshold
Upper temperature threshold
V 40
IR Oxi
NZ

Figure 5:
Screw compressor high-temperature test

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Air compressor oils in practice.

Air compressor oils for turbo-compressors and oil-free compressors (oil-free pressure chambers).

RENOLIN 200 series

Special cuts with good ageing resistance as circulating oils for turbo-compressors and oil-free compressors if compatible with the compressor manufacturer's lubricant recommendations.

RENOLIN ETERNA series

Turbine oils **based on Group III oils** with high ageing resistance and excellent wear protection for use as circulating oils in turbo-compressors and oil-free compressors if compatible with the compressor manufacturer's lubricant recommendations. (ISO VG 32,46 and 68)

RENOLIN ETERNA SGV series

High quality gas and steam turbine oils **based on Group III oils** with high thermal stability and good viscosity-temperature-behaviour. For use in steam and gas turbines without gearboxes. Especially suited for the compression of synthesis gas and ammoniac. (ISO VG 32 and 46)

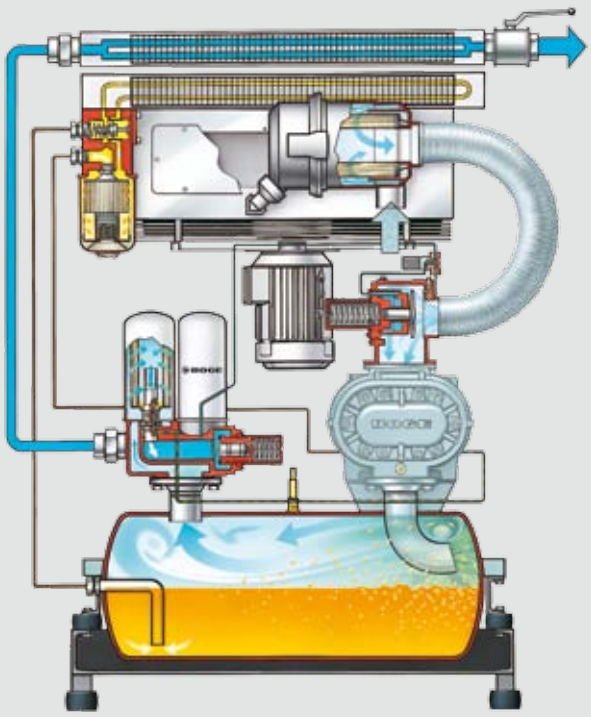

Photo: BOGE GmbH & Co. KG

Air compressor oils for vane type and piston compressors complying with DIN 51 506.

The general desire to extend oil change intervals also applies to piston and rotary compressors. In these cases, the compressed air-outlet temperatures have remained high but extended oil change intervals means that the oil remains in the compressor for longer and this represents a product formulation challenge. The still-frequently used HD monograde oils can no longer offer the necessary performance and special oils are necessary which generally have to fulfil the requirements of VDL oils according to DIN 51 506. Here again, FUCHS offers the following high-performance oils:

RENOLIN 200 series

Special mineral oil cuts with good ageing resistance for all air compressors for which VB/VC oils according to DIN 51 506 are specified, for turbo-compressors and as circulation oils if compatible with the compressor manufacturer's lubricant recommendations. (208 ~ ISO VG 100/210 ~ ISO VG 150/212 ~ ISO VG 220/213 ~ ISO VG 320)

RENOLIN 500 series

Highly **ageing-stable mineral oils** with ash-free anti-wear additives for thermally-stressed air compressors for which VCL/VDL oils according to DIN 51 506 are specified. (503 ~ ISO VG 68/504 ~ ISO VG 100/505 ~ ISO VG 150)

RENOLIN VDL DD series

Highly **ageing-stable mineral oils** with ash-free anti-wear additives and DD (Dispersant-Detergent) agents with powerful cleansing and good dirt transportation properties for highly-stressed air compressors for which VCL/VDL oils according to DIN 51 506 are specified. (VDL 100 DD ~ ISO VG 100/VDL 150 DD ~ ISO VG 150)

RENOLIN UNISYN OL series

Fully-synthetic air compressor fluids based on PAO with a high, natural Viscosity Index for extended oil change intervals even when subject to high thermal stresses and for compressors for which VCL/VDL oils according to DIN 51 506 are specified. (ISO VG 68, 100, 150)

RENOLIN SE 100

Synthetic air compressor lubricant **based on advanced synthetic ester** technology. Highly resistant to oxidation and low affinity to coking (carbon deposits). Extended air drain intervals (ISO VG 100).


RENOLIN

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Turbine and air compressor lubricants – an overview.

Product name	Classification Base oil	Density at 15°C [kg/m³]	Flash-point Cleveland [°C]	Kin. Visc. at 40°C [mm²/s]	Kin. Visc. at 100°C [mm²/s]	VI (Viscosity Index)	Pour-point [°C]	Main application area
RENOLIN ETERNA 32	L-TDP and L-TGP turbine oils acc. to DIN 51 515-1 and -2 MC/Group III oils	842	220	32	5.8	126	-15	Turbine oils for gas and steam turbines, also with gearboxes and as a control fluid for turbine plants and turbo-compressors.
RENOLIN ETERNA 46		846	220	46	7.6	131	-15	
RENOLIN ETERNA 68		851	230	68	9.9	128	-15	
RENOLIN ETERNA 32 SGV	Turbine oils L-TD und L-TG acc. to DIN 51515-1 and -2 Group III oils	838	220	32	5.8	126	-15	Turbine Oils for gas and steam turbines. Without EP-additives. Especially suited for the compression of synthesis gases and ammonia.
RENOLIN ETERNA 46 SGV		846	220	46	7.6	132	-15	
RENOLIN 208	Type VB/VC circulating and air compressor oils acc. to DIN 51 506 Mineral oils	883	260	100	11.0	94	-15	Oils for all air compressors which require a VB/VC lubricant. Also suitable as a type C circulating oil.
RENOLIN 210		886	274	150	14.2	91	-9	
RENOLIN 212		880	290	220	18.1	90	-9	
RENOLIN 213		900	276	320	22.0	95	-7	
RENOLIN 215		904	310	510	32.5	96	-10	
RENOLIN 503	VCL/VDL air compressor oils acc. to DIN 51 506 Mineral oils	878	248	68	8.6	97	-12	Oils for all air compressors requiring a VCL/VDL lubricant.
RENOLIN 504		880	226	100	10.8	95	-18	
RENOLIN 505		888	268	150	14.4	90	-15	
RENOLIN VDL 100 DD	VCL/VDL air compressor oils acc. to DIN 51 506 Mineral oils	882	250	100	11.2	100	-24	Oils for all highly-stressed air compressors which require a VCL/VDL oil with DD additives for good dirt dislodging and dirt transportation.
RENOLIN VDL 150 DD		881	260	150	14.3	92	-15	
RENOLIN UNISYN OL 68	VCL/VDL air compressor oils acc. to DIN 51 506 Synthetic PAO	845	265	68	10.6	144	-60	Fully-synthetic oils for all highly-stressed air compressors which require a VCL/VDL oil.
RENOLIN UNISYN OL 100		845	250	100	14.4	148	-60	
RENOLIN UNISYN OL 150		849	250	150	19.4	148	-57	
RENOLIN SC 32	Screw compressor oils Mineral oils	871	218	32	5.2	100	-15	Mineral oil-based screw compressor oils for normal oil change intervals.
RENOLIN SC 46		875	236	46	7.2	117	-12	
RENOLIN SC 68		879	251	68	8.7	99	-9	
RENOLIN SC 48 MC	Screw compressor oils MC/Group III oils	858	230	46	7.2	117	-18	Mineral oil-based screw compressor oils for extended oil change intervals.
RENOLIN SC 68 MC		852	240	71	11.8	160	-24	

Product name	Classification Base oil	Density at 15°C [kg/m³]	Flash-point Cleveland [°C]	Kin. Visc. at 40°C [mm²/s]	Kin. Visc. at 100°C [mm²/s]	VI (Viscosity Index)	Pour-point [°C]	Main application area
RENOLIN COOL +	Screw compressor oils MC / Group III oils with extra additive reserve	854	206	50	8.0	130	-18	Extended oil change intervals even when subject to high thermal loads.
RENOLIN UNISYN OL 32	Screw compressor oils Synthetic PAO	838	240	32	6.1	142	<-60	Fully-synthetic screw compressor oils based on PAO for extended oil change intervals even when subject to high thermal loads.
RENOLIN UNISYN OL 46		843	260	46	7.9	146	<-60	
RENOLIN UNISYN OL 68		845	265	68	10.6	144	-60	
RENOLIN SYNAIR 46	Synthetic air compressor oil Ester / Polyglycol	992	271	48	8.7	161	-50	For use in flooded or oil-injected screw air compressors. For applications at high temperatures to reduce oil-related residues, varnish and sludge. Extended oil drain intervals. Biodegradable acc. to OECD 301 C >60%.
RENOLIN SE 100	Synthetic air compressor oil Special saturated Ester	987	210	107	10.7	80	-33	High temperature stable ester oil for use in vane type and reciprocating compressors, even under severe conditions e.g. high temperatures. Especially suited for compressors where the use of a mineral oil can lead to coking and varnish.

FUCHS Industrial Lubricants

Innovative lubricants need experienced application engineers

Every lubricant change should be preceded by expert consultation on the application in question. Only then the best lubricant system can be selected. Experienced FUCHS engineers will be glad to advise on products for the application in question and also on our full range of lubricants.

Please contact:

FUCHS EUROPE SCHMIERSTOFFE GMBH
Friesenheimer Straße 19
68169 Mannheim/Germany
Phone: 0621 3701-0
Fax: 0621 3701-570
E-Mail: zentrale@fuchs-europe.de
www.fuchs-europe.de

Export Division
Friesenheimer Straße 19
68169 Mannheim/Germany
Phone: 0621 3701-703
Fax: 0621 3701-719

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