BOGE Compressors

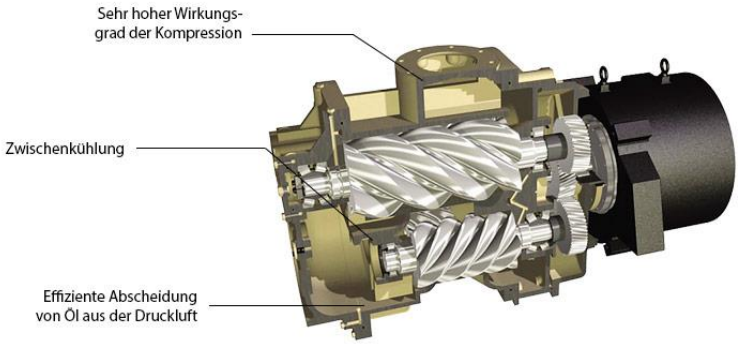
Field Trial at BASF SE side with COVA-setral-SHB/A 46

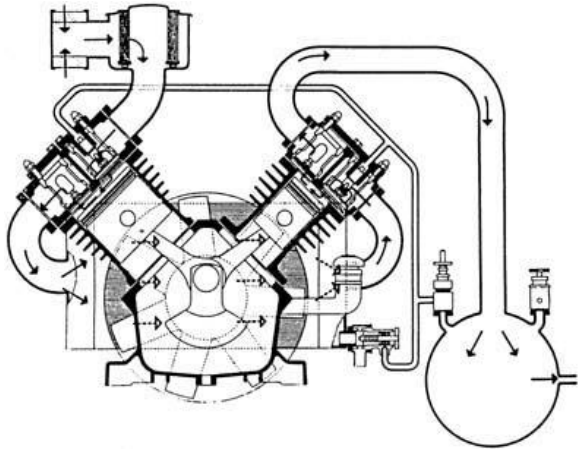
Alexander Hubaleck

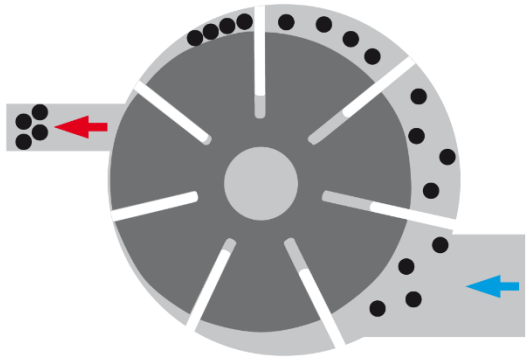
May 2020

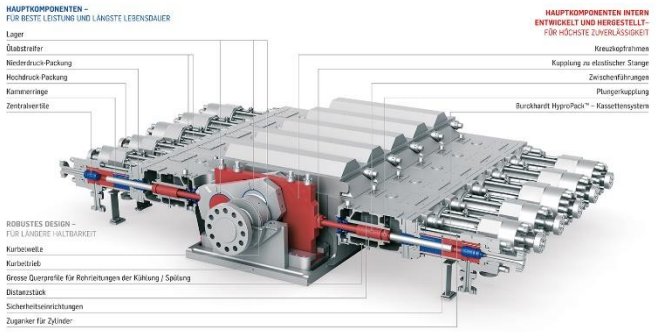
Types

- Screw compressors
- Piston compressors
- Rotary vane compressors
- Hypercompressors
- Turbocompressors









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Well known manufacturer

- Atlas Copco
- Boge
- Burckhardt Compression
- CompAir (Denver Gardner)
- GE (Nuove Pignone)
- Ingersoll Rand (GHH Rand)
- Kaeser

Atlas Copco

BOGE
DRUCKLUFTSYSTEME

Burckhardt Compression

Compressors for a Lifetime™

GHH RAND

Designs

Stationary compressors

Mobile compressors

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Application areas

Industrial air compressors

- Screw compressors
- Rotary vane compressors
- Piston compressors

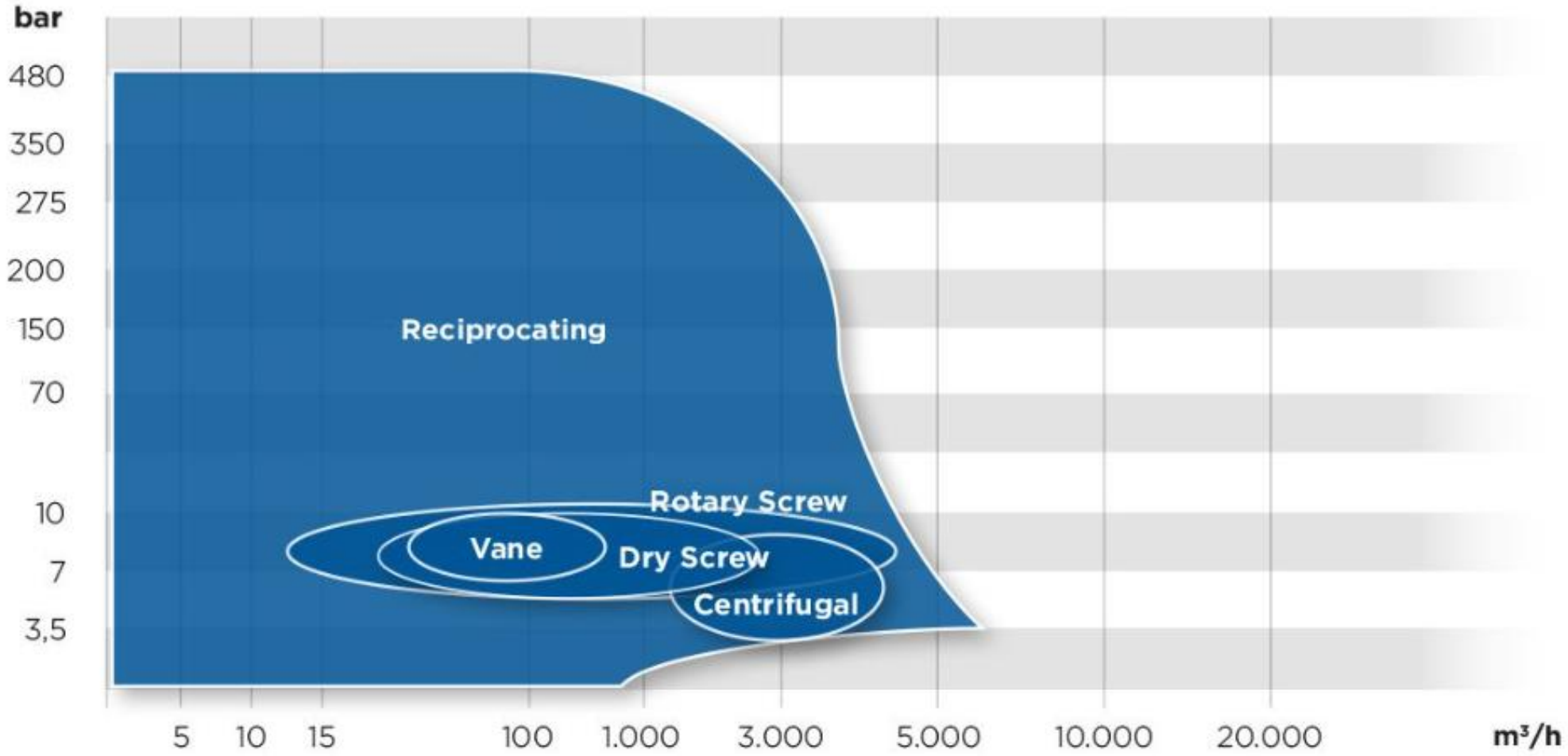
Compressors for reactive gases

- Screw compressors
- Piston compressors

Special applications

- LDPE hypercompressors
- Raffineries/ oil platforms

Capacities and performances of compressor types



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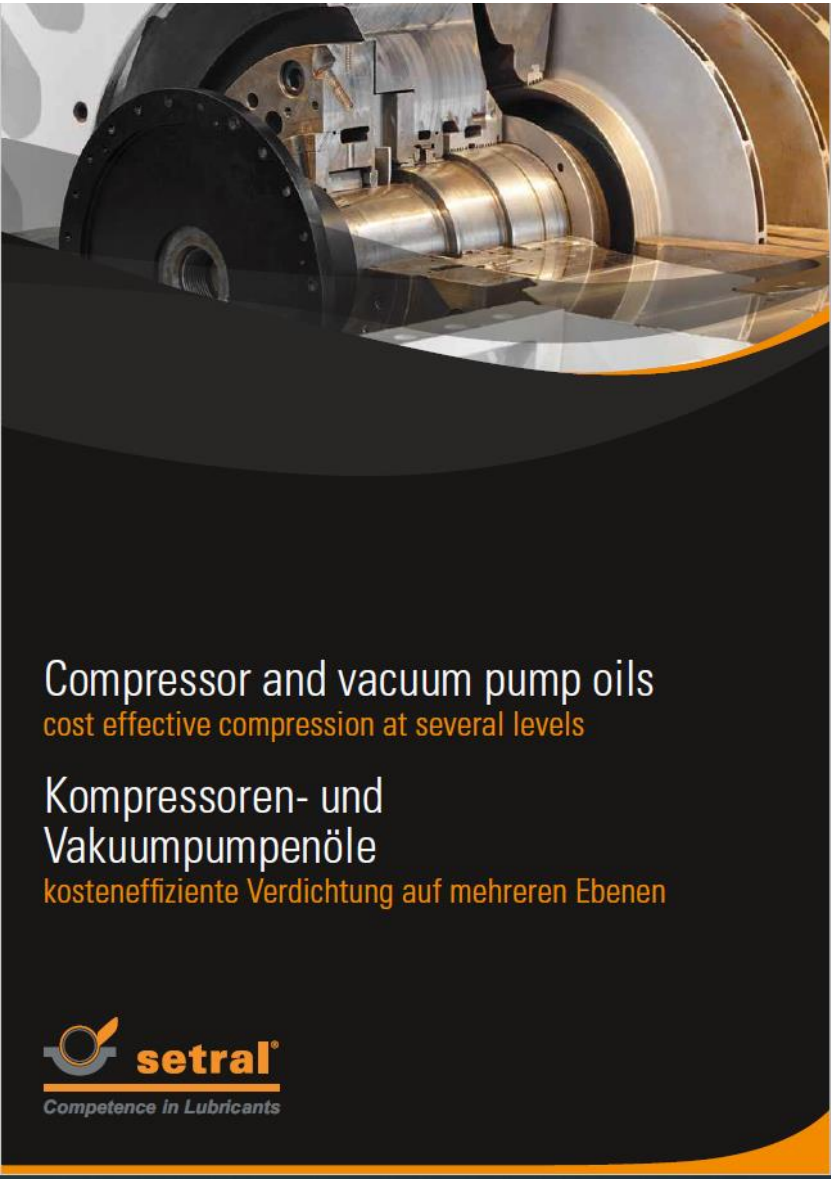
Task of the oil

- Lubrication of the parts (srews/pistons/vanes/bearings)
- Reduction of wear
- Cooling effect via heat dissipation from the part
  - → Modern stationary compressors have heat recovering systems
- No attack of surfaces
- As few deposits as possible
- Sealing effect

Temperature requirements

- 60 – 90 °C normal operating temperatures for air compressors
  - screw
  - piston
  - rotary vane
- Exeptions operate at temperatures up to 110 °C

  e.g. Atlas Copco



Compressor and vacuum pump oils

cost effective compression at several levels

Kompressoren- und Vakuumpumpenöle

kosteneffiziente Verdichtung auf mehreren Ebenen

setral®
Competence in Lubricants

product Produkt	area of application Einsatzbereich	speciality Spezialität	registrations/certifications Registrierungen/Zertifizierungen	base oil type Grundöltyp	ISO VG	temperature range Temperaturbereich	piston compressors Kolbenkompressoren	dosing/flushing Reinigung/Spülung	rotary compressors Kälteverdichter	vacuum pumps Vakuumpumpen	screw / rotary vane compressors Schrauben-/Drehschieberkompressoren	compatibility with coatings Lackverträglichkeit	compatibility with seals Dichtungsverträglichkeit	behaviour against other oils [1] Verhalten gegenüber anderen Ölen [1]	typical oil change intervals [2,4] Typische Ölwechselintervalle [2,4]
COVA-setral-PGB/G 100	gas compression Gasverdichtung	compatible with reactive gases verträglich mit reaktiven Gasen	-	PG	100	-35 to +175 °C	++			+	+	+	+	miscible with most other PGs, not miscible with E, MI, PAO mischbar mit den meisten anderen PG, nicht mischbar mit E, MI, PAO	8 000 h
COVA-setral-PGB/G 150	gas compression Gasverdichtung	compatible with reactive gases verträglich mit reaktiven Gasen	-	PG	150	-35 to +175 °C	++			+		+	+	miscible with most other PGs, not miscible with E, MI, PAO mischbar mit den meisten anderen PG, nicht mischbar mit E, MI, PAO	8 000 h
COVA-setral-PGB/G 190	gas compression Gasverdichtung	compatible with reactive gases verträglich mit reaktiven Gasen	-	PG	190[1]	-35 to +180 °C	++			+		+	+	miscible with most other PGs, not miscible with E, MI, PAO mischbar mit den meisten anderen PG, nicht mischbar mit E, MI, PAO	8 000 h
COVA-setral-SMG 32	air compression Luftverdichtung	high flash point hoher Flammpunkt	-	PAO	32	-40 to +120 °C					++	++	++	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	10 000 h
COVA-setral-SMG 46	air compression Luftverdichtung	high flash point hoher Flammpunkt	-	PAO	46	-35 to +120 °C					++	++	++	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	10 000 h
COVA-setral-SMG 68	air compression Luftverdichtung	high flash point hoher Flammpunkt	-	PAO	68	-35 to +130 °C	+				++	++	++	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	10 000 h
COVA-setral-SHB/A 32	air compression Luftverdichtung	miscible with common mineral oils mischbar mit handelsüblichen Mineralölen	-	PAO	32	-35 to +120 °C					++	+	+	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	8 000 h
COVA-setral-SHB/A 46	air compression Luftverdichtung	miscible with common mineral oils mischbar mit handelsüblichen Mineralölen	-	PAO	46	-35 to +120 °C					++	+	+	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	8 000 h
COVA-setral-SHB/A 68	air compression Luftverdichtung	miscible with common mineral oils mischbar mit handelsüblichen Mineralölen	-	PAO	68	-35 to +120 °C	+				++	+	+	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	8 000 h
COVA-setral-SE 100	air compression Luftverdichtung	low tendancy towards gumming and carbonisation geringe Verharzungsneigung	-	E	100	-30 to +200 °C	++			+	+	+	+	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	8 000 h
COVA-setral-SE 150	air compression Luftverdichtung	low tendancy towards gumming and carbonisation geringe Verharzungsneigung	-	E	150	-30 to +200 °C	++			+	+	+	+	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	8 000 h
COVA-setral-PGB/A 32	air compression Luftverdichtung	high viscosity index hoher Viskositätsindex	-	PG	32	-25 to +120 °C					++	+	+	miscible with most other PGs, not miscible with E, MI, PAO mischbar mit den meisten anderen PG, nicht mischbar mit E, MI, PAO	10 000 h
COVA-setral-PGB/A 46	air compression Luftverdichtung	high viscosity index hoher Viskositätsindex	-	PG	46	-25 to +120 °C					++	+	+	miscible with most other PGs, not miscible with E, MI, PAO mischbar mit den meisten anderen PG, nicht mischbar mit E, MI, PAO	10 000 h
COVA-setral-PGB/A 68	air compression Luftverdichtung	high viscosity index hoher Viskositätsindex	-	PG	68	-25 to +120 °C	+			+	++	+	+	miscible with most other PGs, not miscible with E, MI, PAO mischbar mit den meisten anderen PG, nicht mischbar mit E, MI, PAO	10 000 h
COVA-setral-SHF 32 FD	air compression Luftverdichtung	for food and pharmaceutical industry für Lebensmittel- und Pharmaindustrie	H1, kosher, halal, produced according to ISO 21469 H1, koscher, halal, nach ISO 21469 hergestellt	PAO	32	-35 to +145 °C					++	++	++	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	8 000 h
COVA-setral-SHF 46 FD	air compression Luftverdichtung	for food and pharmaceutical industry für Lebensmittel- und Pharmaindustrie	H1, kosher, halal, produced according to ISO 21469 H1, koscher, halal, nach ISO 21469 hergestellt	PAO	46	-30 to +150 °C					++	++	++	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	8 000 h
COVA-setral-SHF 68 FD	air compression Luftverdichtung	for food and pharmaceutical industry für Lebensmittel- und Pharmaindustrie	H1, kosher, halal, produced according to ISO 21469 H1, koscher, halal, nach ISO 21469 hergestellt	PAO	68	-30 to +150 °C	+			+	++	++	++	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	8 000 h
COVA-setral-SHF 100 FD	air compression/vacuum pumps Luftverdichtung/Vakuumpumpen	for food and pharmaceutical industry für Lebensmittel- und Pharmaindustrie	H1, kosher, halal, produced according to ISO 21469 H1, koscher, halal, nach ISO 21469 hergestellt	PAO	100	-25 to +160 °C	++			++	++	++	++	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	8 000 h
COVA-setral-SHF 150 FD	air compression/vacuum pumps Luftverdichtung/Vakuumpumpen	for food and pharmaceutical industry für Lebensmittel- und Pharmaindustrie	H1, kosher, halal, produced according to ISO 21469 H1, koscher, halal, nach ISO 21469 hergestellt	PAO	150	-25 to +160 °C	++			++	+	++	++	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	8 000 h
COVA-setral-SHF/C 68 FD	cooling compressors Kältekompressoren	suitable for ammonia operated cooling compressors geeignet für ammoniakbetriebene Kältekompressoren	H1, kosher, halal, produced according to ISO 21469 H1, koscher, halal, nach ISO 21469 hergestellt	PAO	68	-50 to +140 °C			++			++	++	miscible with E, MI, PAO, not miscible with PG mischbar mit E, MI, PAO, nicht mischbar mit PG	8 000 h
CLEAN-setral-COVA	cleaning/flushing of compressors Reinigung/Spülung von Kompressoren	excellent flushing oil ausgezeichnetes Spülöl	-	-	70	-30 to +140 °C	??	++	??	??	??	??	??	miscible with most other common oils, not with PG mischbar mit den meisten handelsüblichen Ölen, nicht mit PG	-

PG: polyglycol; E: ester; MI: mineral oil; PAO: polyalphaolefine; ++ very well suited; + well suited
[1] no ISO-VG; [2] not relevant, because not used in pure form; [3] serves as a guide, checking of the miscibility is always recomended in any case;
[4] depending on the respective operating conditions

PG: Polyglykol; E: Ester; MI: Mineralöl; PAO: Polyalphaolefin; ++ sehr gut geeignet; + gut geeignet
[1] keine ISO-VG; [2] nicht relevant, da nicht in reiner Form verwendet; [3] dient als Richtschnur, es empfiehlt sich dennoch in jedem Einzelfall die Mischbarkeit zu überprüfen;
[4] abhängig von den jeweiligen Betriebsbedingungen

PAO-based compressor oils

- COVA-setral-SMG series: high performance product with broad application range; ISO-VG: 32, 46, 68 cSt
- COVA-setral-SHB/A series: formulation on customer request (BASF SE);
- COVA-setral-SHF FD series: broad application range, H1-registered, mainly food industry

  ISO-VG: 32, 46, 68, 100, 150 cSt
- COVA-setral-SHF/C 68 FD: especially suited for application in ammonia operated cooling compressors

  ISO-VG: 68 cSt

Ester-based compressor oils

- CLEAN-setral-COVA
- COVA-setral-SE series

PG-based compressor oils

- COVA-setral-PGB/G-series: especially developed for the compression of reactive gases

  ISO-VG: 100, 150, 190 cSt
- COVA-setral-PGB/A-series: suitable for the compression of air

  ISO-VG: 32, 46, 68 cSt

Observe the following points when changing the lubricant

- sealing compatibility
- Paintings
- Filter systems
- Flushing
- filling quantity + Operating losses

Field Trial at BASF SE side with COVA-setral-SHB/A 46

- Reference test in a BOGE SF 100-2 screw compressor
- replacing a common compressor lubricant by COVA-setral-SHB/A 46
- 1st replacement practice for Boge genuine oil “BOGE 3000plus” at BASF SE
- Goal: at least 6000-8000 h
- Field trail will be monitored by Andreas Minke Tech Service Fuel and Lubricant Solution in coordination with Christian Pawlitschko BASF Rotating Equipment and Alexander Hubaleck Sales Manager Setral Chemie GmbH

Source: BOGE

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Field Trial at BASF SE side with COVA-setral-SHB/A 46

Compressor type:

Modell / Type	Boge SF 100-2	
Power	75	KW
Medium	Air	
Machine Nr.	5047197 (V9100 B)	
Capacity	9,65	m³/min
Pressure output	10	bar
Yearly running hours	~ 7500	Bh
Min. Room. Temp.	15	°C
Max Room. Temp.	40	°C
Average / Max Oil Temp.	74 / 85	°C

Former oil	Boge 3000plus	
Oil Type	Compressor Oil synthetic	
Oil Base Stock	synthetic	
Oil Volume	40 + 5 (radiator)	L
Last Oil Change	62462 (Usually 3000h)	h
Oil Filter Change	62462	h
Running hours	65200	Bh
Runtime full load	constantly	
Start / Stop		
Manufacturing year	2011	

Source: BASF SE

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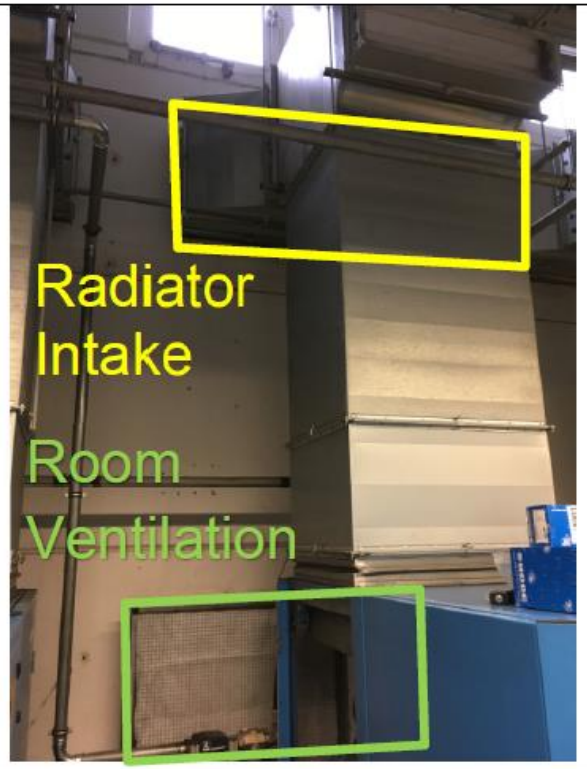
Running environment

Ventilation and Radiator Intake	Compressor Unit	Compressor type plate
		

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Field Trial COVA-setral-SHB/A 46 – Oil monitoring

Sampling: COVA-setral-SHB/A 46

fresh oil, drained oil, flushed oil after 2 h, Operating oil at start

Sampling : Frequenz & Volumen

Frequenz	1	2	3	4	5	6	7	8
operational time [Bh]	0	500	1000	2000	4000	6000	8000	10000
Volume [ml]	200	200	200	200	200	200	200	200

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Field Trial COVA-setral-SHB/A 46 – Oil monitoring

Defined monitoring parameters and limits for oil changes

	Method	Warning limit	Action limit
V40 [mm²/s]	D 445	±15% compared to fresh oil	**±20% compared to fresh oil**
TAN [mgKOH/g]	D 664	+1 compared to fresh oil	**+2 compared to fresh oil**
H_2O [ppm]	D 6304	500	**1000**
Wear, Fe [ppm]	D 5185	20	**50**
Wear, Cu [ppm]	D 5185	20	**30**
Contamination, Si [ppm]	D 5185	15	**20**
Additive, P [ppm]		**<70% compared to fresh oil**	**<50% compared to fresh oil**

Preliminary Technical Report

- Boge 3000 plus was replaced with COVA-setral-SHB/A 46 at 65377 h
- Oil filter was changed
- Flushing
- Sample of used BOGE oil
- Sample at 0h
- Monitoring every 1000h

Date		17.09.2019	17.09.2019	29.10.2019	11.12.2019	07.02.2020	23.03.2020
Machine Type		SF-100-2	SF-100-2	SF-100-2	SF-100-2	SF-100-2	SF-100-2
Machine Number		V9100B	V9100B	V9100B	V9100B	V9100B	V9100B
Compressor Fluid		Boge 3000 plus	COVA-SETRAL SHB A	COVA-SETRAL SHB A	COVA-SETRAL SHB A	COVA-SETRAL SHB A	COVA-SETRAL SHB A
Oil running hour	h	2915	0	957	1992	3383	4460
Total running hours	h	65377	65377	66334	67369	68760	69837
Wear metals							
Iron	Fe	0	0	0	0	0	pending
Aluminum	Al	0	0	0	0	0	pending
Nickel	Ni	0	0	0	0	0	pending
Copper	Cu	0	0	0	0	0	pending
Molybdenum	Mo	3	0	0	0	0	pending
PQ-Index		<25	<25	<25	<25	<25	pending
Contamination							
Silicone	Si	0	2	0	2	1	pending
Potassium	K	1	0	0	2	0	pending
Sodium	Na	3	0	2	0	1	pending
Water		<0,0030	0,0066	0,0069	0,0069	0,0050	pending
Oil Contrition							
Viscosity at 40°C		49,6	47,14	48,3	48,5	49,37	pending
Viscosity at 100°C		7,24	8,06	8,18	8,22	8,31	pending
Viscosity index		105	144	143	143	143	pending
Oxidation		3	1	1	2	2	pending
Color		7,5	2,5	7,0	7,5	**8,0**	pending
Additive Elements							
Calcium	Ca	4	0	0	1	0	pending
Zinc	Zn	69	8	6	9	7	pending
Phosphorus	P	410	110	103	92	82	pending
Sulphur	S	0,0563	0,0197	0,0200	0,0204	0,0170	pending
Additional Tests							
Total Acid Number		0,31	0,30	0,31	0,37	0,42	pending
Cleanliness class		20/17/12	21/17/11	19/16/12	18/15/12	17/15/12	pending
Cleanliness class		10A	11A	10A	8A	7A	pending

Bildquelle: BASF

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The information should not be considered a warranty of product features and they do not guarantee the suitability of products in particular cases. They do not absolve the user from test selected products in the corresponding application.

All data are based on empirically determined values or on guideline values taken from technical literature.

Depending on the type of mechanical, dynamical chemical and thermal stress lubricants change their technical values. These values may affect the function of components.

Bildquelle: BASF

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