



Everything about oil analysis

Why is an oil analysis useful?

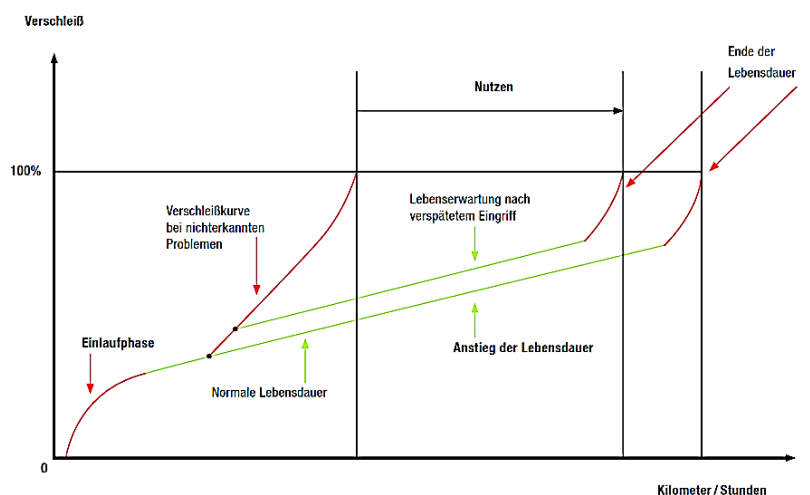
Are the oil ageing processes expected for the mileage? Is there previously undetected damage or unusual wear? Do you think your engine is not running smoothly and damage is imminent? Is the engine oil you are already using the best for your car? An oil analysis brings clarity and provides information on necessary repair measures or a required oil change.

- The highly additivated lubricants of today are usually not suitable for classic cars. They require unalloyed or very mildly alloyed lubricants.
- Classic car enthusiasts appreciate regular oil analyses. This is because any damage that occurs can be detected at an early stage before an expensive component has to be replaced.
- With lubricant and oil analyses, you produce less waste oil due to longer oil change intervals and thus relieve the environment. You extend the service life of your machines and their components and use your resources more effectively.

It's as simple as that:

- Remove a small amount of oil, send it in, done
- Laboratory testing by one of the world's largest certified companies
- Detailed analysis report with recommendations for action
- Be safe & prevent engine damage

Verschleißkurve





7 reasons for oil analyses at a glance:

- 1 Early detection of wear and prevention
- 2 Condition assessment, risk minimisation, obtaining certainty
- 3 Extending the service life
- 4 Minimisation of repair costs
- 5 Optimisation of oil change intervals
- 6 Monitoring of the oil parameters
- 7 Protect the environment

What statements do I get?

► Increased iron in the oil can mean, for example, that the injection nozzles, injection pump or oil pump are showing wear, or shows wear due to corrosion (water, acids...) or fine rod wear/fretting wear.

A lot of aluminium in the oil often indicates that something is wrong with the cylinders.

► A lot of silicon indicates dirt, sand and dust that is abrasive and thus promotes wear. The air filter system should be checked.

► Lead and copper indicate that all bearings have increased wear and may therefore be damaged.

► Increased fuel content may be due to the vehicle having been driven frequently on short journeys. The oil has not been heated for a long period of time so that the fuel has evaporated. Too much fuel dilutes the engine oil and impairs the build-up of a load-bearing lubricating film.

► Values of potassium and sodium indicate coolant, the head should be analysed for cracks or other causes of coolant ingress.

► Increased water content may indicate a defective head gasket.

A lubricant analysis provides information about the state of wear in the innermost part of the technology in a simple way. The examination shows whether the oil can still absorb foreign substances and how well the car is really doing. In this way, expensive consequential damage can be avoided and costly and time-consuming oil changes can be better planned.



Which parameters are measured?

- 1. the ICP method can determine more than 30 different wear metals, impurities and additives at an optimal detection limit. The wear metals present in the oil are important data carriers. Their presence allows direct conclusions to be drawn about the wear of the components or machine elements from which the particles could originate. It does not matter whether the wear is corrosive or mechanical. 2.*
- 2. in contrast to AES (atomic emission spectroscopy), which cannot detect iron particles $> 5 \mu\text{m}$, the PQ index detects all wear particles that can be magnetised, regardless of their size. The difference in AES iron content is assessed with the result of the PQ index. If the iron value in mg/kg is high, but the PQ index is low, then the iron abrasion is probably due to corrosion. This is because rust is hardly magnetisable and therefore provides a low PQ index. A high value for the PQ index with simultaneously low iron values from the AES always indicates an acute wear process such as seizure wear. 3.*
- 3. The determination of viscosity is used to describe the flow behaviour of liquids. The ISL Houillon viscometer consists of a $40\text{ }^{\circ}\text{C}$ or $100\text{ }^{\circ}\text{C}$ temperature control bath, in each of which 4 capillary viscometers are inserted. The time required for the oil to pass through a certain measuring section is converted into the kinematic viscosity at $40\text{ }^{\circ}\text{C}$ and at $100\text{ }^{\circ}\text{C}$ with the aid of the capillary constants. With the viscosity values at $40\text{ }^{\circ}\text{C}$ and $100\text{ }^{\circ}\text{C}$, the VI (viscosity index) is calculated. The higher the VI, the lower the temperature-related viscosity change. 4.*
- 4. The infrared spectrum of a sample provides information about oil changes or impurities in comparison to the spectrum of a corresponding fresh or reference oil. For example, oil ageing can be inferred from oxygen bonds newly found in a sample. Changes in wavenumbers characteristic for OH groups can be interpreted as water and given in %. By comparison with the stored fresh oil spectra, the method also provides quick and reliable information as to whether an unknown oil is a mineral oil, "bio-oil" or synthetic oil. Mixing of different oil types can also often be detected. 5.*
- 5. The dirt-carrying capacity of engine oils, which provides an indication of engine cleanliness, deteriorates due to additive degradation, oxidation and acidic reaction products from fuel combustion. In addition to IR spectroscopy, the dot shows by a uniform distribution of soot particles whether the oil is still able to hold impurities in suspension in such a way that they are transported to the filter and filtered out. The intensity of the dark colouring shows the soot content. A transparent outer ring shows*



fuel. In the case of antifreeze glycol, the oil droplet does not spread. Due to the incorruptible eye of the camera, the subjective sensation can be objectively and reproducibly converted into numerical values during a personal visual inspection.

- 6. Fuel gets into the engine oil as condensate during cold starts, via blow-by gases, due to incorrectly adjusted carburetors or incorrect timing, due to clogged air filters or defective injection nozzles. Even the comparatively less ignition-friendly "biodiesel" can be found as fuel in the oil. Too much fuel dilutes the engine oil and impairs the formation of a load-bearing lubricating film. 7.*
- 7. The BN indicates the alkaline reserve of a lubricant for neutralising acids that may arise, for example, during a combustion process. The change in BN allows a significant statement about the further use of oil in a fresh oil comparison.*

What are the types of oil analysis ?

- 1. lubricant analyses in the oil analysis laboratory* **OELCHECK, ANAC, SGS**
- 2. **Spot test** / chromatography = quick test* **MOTORcheckUP**

Stefan Mitterer, Head of Technology, Service & Sales at OELCHECK GmbH, says the following about the spot test: "We do a similar spot test for diesel or petrol engine oil. But for us it is first of all simply a visual impression. If you have seen many of these spots, you can initially suspect extreme fuel ingress, a lot of soot in the oil or coolant ingress. I would not dare to make more precise statements about the oil condition or the extent to which various values are really elevated from this one quick test. I think it is even more difficult with gearbox or hydraulic oil. Here, other parameters than those of the engine play a role, which can hardly be read from a dot. If the assessment is primarily based on the brightness of the dot, I would not want to recommend a measure or oil change to one of our customers without further information.

Comparison: OELCHECK, SGS, ANAC, Motor Check Up, OILYSE



OELCHECK GmbH

Over 2,500 samples are analysed and evaluated daily in the OELCHECK laboratories. In addition to engine, transmission and differential oil, hydraulic oils, water samples and coolants are also analysed. OELCHECK is the leading laboratory for lubricant and fuel analysis in Europe. Our oil analysis laboratory in Brannenburg is state-of-the-art. The basis for an accurate laboratory report is always the sample form, which you should fill out as completely as possible. Only in connection with the information on the lubricant type, the time of use of the oil and the details of the machine can our experienced tribologists draw precise conclusions as to the cause of any changes in the lubricant. They also use their extensive background knowledge of plants, machines, production processes and lubricants. OELCHECK tribologists have a sound general knowledge of mechanical engineering and extensive professional experience from a wide range of industries. This knowledge of the plants, machines and production processes in which you are involved is just as important in the preparation of the laboratory reports as the technical application experience with lubricants. The tribologists comment on each laboratory report individually, taking into account all the data and using their years of experience.

LABORBERICHT

Probenbezeichnung: **2110010554**

Komponente: **Getriebe**

Nummer der aktuellen Probe: **4705711**

OELCHECK
SINCE 1991

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KFZ-Sachverständigenbüro Kukuk
Herr Klaus Kukuk
Kaldauer Höhe 11-13
51491 Overath

Maschinentyp: **300**

Hersteller: **Mercedes Benz**

Ölbezeichnung: **Keine Angabe**

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Diagnose der aktuellen Laborwerte

Eisen ist durch Verschleiß oder Korrosion stark angestiegen. Der PO-Index zeigt einen hohen Anteil von magnetisierbaren Eisernpartikeln. Dies ist ein Hinweis auf anomalen Verschleiß, z.B. auf Fitings, Freaser, Materialausbrüche, Splänchen oder andere eisenhaltige Partikel. In der Probe sind Verunreinigungen (Partikel >10µ) mit bloßem Auge sichtbar. Die Probenentnahme könnte die ermittelten Werte beeinflusst haben. Sie haben uns die Ölbezeichnung nicht angegeben. Damit fehlen vergleichende Frischölwerte und mögliche Veränderungen der Additive und des IR-Spektrum können nicht oder nur unter Vorbehalt kommentiert werden. Barium erhöht. Mögliche Ursache: Vermischung bzw. Verunreinigung mit einem bariumhaltigen Korrosionsschutzmittel bzw. Schmieröl oder einem Schmierfett bzw. Montagefettmittel. Der Lithiumgehalt ist leicht erhöht. Wahrscheinlich ist dieser Wert durch einen Eintrag bzw. Abblösen von Schmierfett, Montagepaste o.ä. entstanden. Ich rate Ihnen, falls nicht schon geschehen, möglichst bald einen Ölwechsel vorzunehmen.

Gesamtbewertung

Dipl.-Ing. Andy Böhme (MLA II + CLS)

ANALYSEERESULTATE

LABORNUMMER	Aktuelle Probe	Frühere Untersuchungen	Probe und Deckel
4705711			

GESAMTBEWERTUNG

Untersuchungsdatum	06.10.2021
Datum Probenentnahme	01.10.2021
Datum letzter Ölwechsel	-
Nachfüllmenge seit Wechsel	-
Laufzeit seit Wechsel	-
Laufzeit gesamt	38377
Öl geschlecht	-

VERSCHEISS

Eisen	Fe	mg/kg	285
Chrom	Cr	mg/kg	7
Zinn	Sn	mg/kg	1
Aluminium	Al	mg/kg	7
Nickel	Ni	mg/kg	8
Kupfer	Cu	mg/kg	51
Blei	Pb	mg/kg	6
Mangan	Mn	mg/kg	3
PO-Index			1544

VERUNREINIGUNG

Bismut	Bi	mg/kg	32
Kalium	K	mg/kg	3
Natrium	Na	mg/kg	8
Lithium	Li	mg/kg	20
Titan	Ti	mg/kg	1
Wasser	H ₂ O	%	< 0.10

ÖLZUSTAND

Viskosität bei 40°C	mm ² /s	42.68
Viskosität bei 100°C	mm ² /s	6.91
Viskositätsindex		196
Oxidation	Atom	19

ADDITIVE

Kalium	Ka	mg/kg	40
Magnesium	Mg	mg/kg	9
Bor	B	mg/kg	66
Zink	Zn	mg/kg	150
Phosphor	P	mg/kg	265
Barium	Ba	mg/kg	155
Molybdän	Mo	mg/kg	8
Schwefel	S	mg/kg	1033

Achtung

Infrarot-Spektrum



ANAC

ANAC is a powertrain diagnostic system based on the scientific interpretation of analytical data obtained from used oil analysis. It enables the fleet manager to reduce the cost of his vehicle / machine fleet and optimise its use. ANAC is recommended for:

- Systematic control of powertrain components through analysis of wear and lubricant.
- Prevention of damage
- Extending the service life of the drive components
- Cost reduction per kilometre, mile or operating hour by optimising the required maintenance work

Maschinennummer / Referenz →

Referenzdaten der Ölprobe →

Charakteristik der untersuchten Ölprobe →

Additivierung →

Verschleißelemente →

Unlösliche Stoffe →

Technischer Kommentar →

Historie Nummer : 420301501

Maschine: WINDKRAFTANLAGE GETRIEBE / GETRIEBE SW 3.4

Marke und Typ: Kapazität : 800 L TOTAL DEUTSCHLAND / DE-DELBRÜCK
 Maschine: Datum Diagnose: 12 juni 2018
 Öl : Total Carter WT 320

		CLASSIC
Probenahme		31/MA/18
Probe-Nummer		201507203
Vignetten Nr.		SO3489
Entleerung		No
Laufleistung		0 Bh
Ölverweilzeit		26967
Proben ID		
Aussehen		Klar
Wasser KFO	ppm	<700
Sedimente	%	0.019
Neutral.zahl	mgKOH/g	0.66
Visk. 40°C	cSt	316.12
Phosphor	ppm	407
Bor	ppm	30
Zink	ppm	6
Kalzium	ppm	<2
Molybdän	ppm	<10
Zinn	ppm	<10
Blei	ppm	<5
Nickel	ppm	<2
Eisen	ppm	<2
Chrom	ppm	<2
Aluminium	ppm	<2
Kupfer	ppm	<2
Silber	ppm	<2
Silizium	ppm	3
Magnesium	ppm	<2
Natrium	ppm	<5
Berium	ppm	<5
Lithium	ppm	<2
Kalium	ppm	<2

Interpretation der Diagnose

- Zufriedenstellende Funktion

Bemerkungen

- Die Einheit mg/kg wurde ersetzt durch die äquivalente Einheit ppm ab dem 02/02/2018.



SGS

SGS is the world's leading inspection, verification, testing and certification company. With more than 89,000 employees, it operates a network of more than 2,600 offices and laboratories around the world. Until now, special oil analyses were only available for the industrial sector. In the Fuel Technology Center and Lubricant Laboratory of SGS in Speyer (Rhineland-Palatinate), the quality of fuels from more than 150 countries has been analysed for over 30 years for the world's leading vehicle manufacturers and mineral oil companies. Thanks to SGS's all-round service, this long-standing know-how can now also be used by everyone for their own vehicle.

With the oil test kit, which is particularly suitable for older cars and motorbikes as well as motorboats, SGS is now opening up this possibility to workshops, for example.

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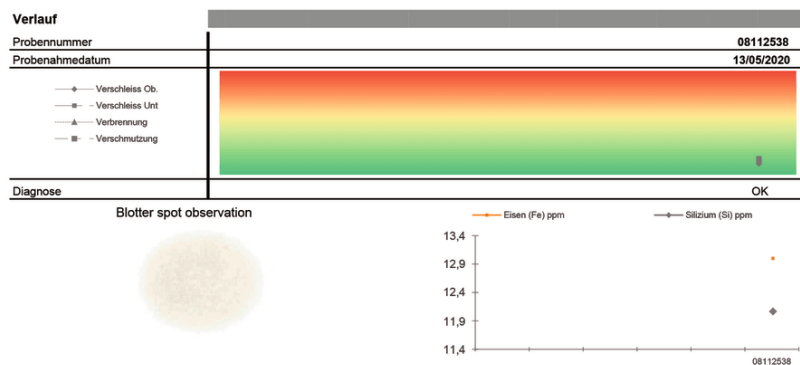
Diagnose 20/05/2020

SGS VERNOLAB - DIAGNOSTICS
 MORE THAN OIL ANALYSIS

Matthias Moetsch
 Amselstieg 8
 21465 Reimbek
 DEUTSCHLAND

MASCHINE	PROBE
Registrierungsnr. 01408260/AMOT	Probennummer 08112538
Maschinenbeschreibung Jaguar Sovereign (XJ 40) 4.0 (BJ. 1991)	Probe entnommen am 13/05/2020
Bauteilbeschreibung Motorendl	Probe registriert am 18/05/2020
Fuhrpark/Werknr. 222 PS	Verwendetes Öl SHELL HELIX HX7 5W40 (SM/CF A3/B4)
Inventarnummer	Analyseset GWWT

Die Analysenergebnisse zeigen einen zufriedenstellenden Zustand im Hinblick auf Verschmutzung und Verschleiss. Die gemessenen Eigenschaften des Öles bewegen sich im normalen Bereich.





MOTORcheckUP

MOTORcheckUP is a chemical-based analysis and evaluation system. With this system, the components of the engine oil, brake fluids, power steering oil (hydraulic oil) and transmission oil are examined. In advance, an analysis procedure is offered that allows initial conclusions to be drawn about the condition of the engine without a great deal of laboratory work.

This procedure is based on the principle of chromatography. In chemistry, chromatography is the name given to a process that allows the separation of a mixture of substances by different distribution of its individual components between a stationary and a mobile phase. The results can be used to determine which possible defects are present and what measures need to be taken. MOTORcheckUP: Just a drop of the oil or fluids is enough to look into the engine, brake, steering or gearbox.

Schablone	Benzin-Motor	Diesel-Motor
<p>Bitte trennen Sie die rot schraffierten Felder heraus!</p> <p>Der innere Kreis zeigt an, ob das Öl durch kleine Partikel verunreinigt ist – z.B. durch Ruß, Staub, Metallabrieb oder sonstige Substanzen.</p>	<p>RUSS</p> <p>1 2 3 4 5 6 7 8 9 gut mittel schlecht</p>	<p>RUSS</p> <p>1 2 3 4 5 6 7 8 9 gut mittel schlecht</p>
<p>Der zweite Kreis zeigt Ihnen, ist das Öl noch in Ordnung? Vergleichen Sie die Färbung des Öls.</p>	<p>ZUSTAND</p> <p>1 2 3 4 5 6 7 8 9 gut mittel schlecht</p>	<p>ZUSTAND</p> <p>1 2 3 4 5 6 7 8 9 gut mittel schlecht</p>
<p>Der Zackenkreis. Wasser im Öl bildet deutliche Zacken an den Randzonen. Bei Kühlwasser entsteht ein gelber Ring um den Zackenkreis.</p>	<p>WASSER</p> <p>kein Wasser im Öl etwas Wasser im Öl viel Wasser im Öl</p>	<p>WASSER</p> <p>kein Wasser im Öl etwas Wasser im Öl viel Wasser im Öl</p>
<p>Der Treibstoffkreis. Halten Sie das Testblatt gegen Licht. Je größer der helle Ring außen herum, desto mehr Treibstoff befindet sich im Öl.</p>	<p>TREIBSTOFF</p> <p>kein Treibstoff im Öl etwas Treibstoff im Öl viel Treibstoff im Öl</p>	<p>TREIBSTOFF</p> <p>kein Treibstoff im Öl etwas Treibstoff im Öl viel Treibstoff im Öl</p>
<p>WWW.MOTORCHECKUP.DE</p>	<p>TESTAUSWERTUNG IMMER VON INNEN NACH AUSSEN.</p>	<p>DIE SICHERE DIAGNOSE FÜR ALLE AUTOS.</p>