

The following points are important for the correct use of lubricating oils:

1. Kind and quality of oil
2. Capacities
3. Oil change intervals
4. SAE grade (viscosity)

1. Kind and quality of oil

Details on the specified type and quality of oil are included in Sheets 221.0, 223.1/2 and 231.0 to 231.3.

The type and quality of oil are clearly stipulated by brand names. The designations on the lubricant containers must therefore accurately match the brand names approved by us.

2. Capacities

A distinction is to be made between the following terms depending on the purpose and timing of the oil fill:

- 2.1 initial fill quantity
- 2.2 filling capacity
- 2.3 topping-up quantity

2.1 **The initial fill quantity** is that oil quantity which is required to fill the empty and dry major assembly. It is always larger than the filling capacity which is normally specified.

2.2 **Filling capacity** is understood to mean the oil quantity which is required for the oil change. Because the oil change is included in the regular maintenance operations, only the filling capacities are always specified in the Specifications for Operating Fluids.

2.3 **Replenishment quantity** is the quantity which is required to supplement the oil consumed between the oil change intervals.

3. Oil change intervals

The quality of the lubricating oil is reduced in operation. The more difficult the operating conditions, the quicker the good properties of the oil are used up. It is therefore important that the oil remains in the major assembly as long as it still performs its lubrication task and carries out its other functions satisfactorily. For economic reasons, however, it is not too soon to be replaced for new oil.

The question "**which oil change interval is right**" cannot therefore be answered easily even with a precise knowledge of the operating conditions.

Reason: The quality changes of the oil due to operation can be accelerated or slowed down due to various factors with different effect.

Except for the quality and degree of alloying of the oil, the following factors are decisive for the oil change:

1	Design of engine	gasoline/diesel
		prechamber/direct injection
		naturally aspirated/supercharged
2	Specific capacity of engine oil circuit	
3	Oil load/temperatures	
4	Oil consumption and topping-up quantities	
5	Oil filter efficiency/maintenance	
6	Air cleaner efficiency/maintenance	
7	Operating conditions on	Urban traffic
		construction site
		long distance
8	Aggravating fuel characteristics	Sulfur content
		Components
		additives
9	Thinning by fuel	Boiling characteristics
		Final boiling point
10	Water/antifreeze compound	
11	Oil quality	
12	Oil viscosity/season	

As each of these factors alone and together with one or more can cause different effects, it is understandable why the question concerning the correct oil change interval cannot generally be answered.

Above all it is the operating conditions which necessitate different oil change intervals. In addition to this fuel quality plays a part. We therefore distinguish between oil change intervals for

- 3.1 Running-in period
- 3.2 Aggravated operating conditions
- 3.3 Normal operating conditions
- 3.4 Vehicle subject to low level of stress
- 3.7 Diesel fuel with increased sulfur content
- 3.9 Flexible Service System for commercial vehicles (Telligent)
- 3.10 Trucks fitted with longlife oil filter (code M 18)
- 3.12 Active Service System - ASSYST

In general at each oil change the filter element should also be replaced.

- 3.1 During the **break-in period** parts sliding on each other must run in and metal abrasion is therefore greater than after the break-in period. On some major assemblies therefore the oil is to be changed sooner than in subsequent operation (see Service documents).

On trucks, buses and vans there are different subdivisions of operating conditions on which the oil change intervals depend. Depending on the vehicle type, class or generation for example a distinction is made between maintenance categories I, II, or I, II, III or between aggravated operation, short-distance haulage and long-distance haulage.

With aggravated conditions the operating hours counter or engine maintenance counter is an exact measure for the engine oil change cycle given in distance d

- 3.2 Many motor vehicles, especially commercial vehicles, are driven under **aggravated operating conditions**.

These mainly include:

Extremely short-distance traffic, very poor road conditions, all-wheel drive operation, high incidence of dust, construction site operation; operation of municipal vehicles, firefighting vehicles, taxis and doctor's vehicles, agricultural and forestry vehicles and more of the same.

With commercial vehicles a mileage of less than 10 000 km a year counts as aggravated operating conditions.

For cars a distinction is made between normal and aggravated operating conditions: under aggravated conditions the oil change intervals are to be reduced in accordance with the maintenance booklet.

The following applies as aggravated operating conditions on passenger cars:

- . More than 50% short-distance traffic (less than 8 km per journey) in conjunction with a coolant temperature below 80 °C. This applies in particular for low outside temperatures.
- . More than 50% of journeys in the lower gears in combination with high engine load (hill-climbing, towing a trailer, etc.).

-
- 3.3 Alternating town, country roads and expressway journeys are understood to be **normal operating conditions**. In this mode relatively long oil change intervals can be stipulated. The oil change interval for normal operating conditions is mostly specified in accordance with distances covered in kilometers (km). The normal distances traveled for commercial vehicles are between 10,000 and 100,000 km in **maintenance category II** and **over 100,000 km** in **maintenance category III**.

- 3.4 On vehicles which only travel **short distances** in the course of a year, the oil change interval is not determined by distance traveled, operating hours, engine maintenance counter or fuel throughput, but rather by time. Depending on the vehicle model and type of use, the usual time periods for an oil change are twice a year, once a year or once every two years. The specifications in the respective maintenance booklet are decisive.

3.5 Maintenance categories for industrial engines

With industrial engines the three maintenance categories are determined on the one hand by operating time per year, on the other hand by the assignment to "aggravated operation", "normal operation" and "continuous operation".

3.6 Diesel fuel with high sulfur content

If the sulfur content of the diesel fuel is more than 0.3% by weight, then the oil change intervals must be halved, provided aggravated operating conditions do not exist in any case. If the sulfur content of the diesel fuel is above 0.8% by weight, then the oil change on all commercial vehicle and industrial engines must be carried out in accordance with maintenance category I as for aggravated operation, i.e. oil change intervals divided by three.

3.7.1 Used oil analyses for early damage recognition by determining abrasion elements

Attempts for early damage recognition are based on determining abrasion elements, such as e.g. iron, copper, chromium, etc.

The Service Companies will encounter difficulties when evaluating such an analysis. Limits to be used are not only dependent on the analysis method used (often differs from laboratory to laboratory), but also on the type of engine used (knowledge of components necessary), on the oil change interval driven, on the type of oil, on the fuel and not least also on the operating conditions.

Such evaluation problems often lead to uncertainty or to improper responses.

It is also very important to take a proper sample. It has to be taken from the oil circuit when the engine is running. A sample taken from the oil sump often results in incorrect analyses as a result of the residues which are present in the sump.

Unfortunately for cost and capacity reasons it is not possible for us to take counter-samples. We also cannot issue any certificate of non-objection for investigation results not determined by us.

3.9 Commercial vehicles which are equipped with the **Flexible Service System (Telligent)** are not maintained in accordance with fixed maintenance intervals. The system determines the correct time for the service depending on the stress and for each major assembly separately. In particular it is **not** necessary to classify the vehicle in a particular "maintenance category" depending on the operating conditions.

Maintenance operations due are automatically announced on a display in the instrument panel; the vehicle owner decides which operations are to be completed combined with other operations. Alternatively the system can also provide a summary itself.

3.7 Used oil analysis for stipulating oil change intervals

Oil change intervals do not take place in accordance with a rigid system. They take place in accordance with distance traveled, operating hours or fuel flow rates as well as depending on operating conditions, fuel and oil quality. In addition we offer our Flexible Service System (Telligent). Here, engine and vehicle data, e.g. number of cold starts, oil temperatures and engine rpms, are also used to calculate the optimal use period for the engine oil.

To determine the specific intervals, field, test stand and laboratory studies as well as years of experience are required.

If our specifications are followed correctly, an oil change is not necessary prior to the stated period. For technical warranty reasons, it is not possible to extend the oil change intervals.

It is absolutely essential to adhere to the max. oil change intervals - even if used oil analyses are carried out.

3.7.2 Used oil analyses as an aid to workshop practice

Used oil analyses may be sensible if they are needed to identify undesired components in the oil, such as fuel, water, glycol or sand/silicon.

It is possible to react at short notice and possible damage can also be avoided or rectified.

3.7.3 General recommendation

There is no good reason for regular used oil analyses (cost/benefit relationship). Due to oil analyses it is possible to shorten the oil change interval but not to extend it under any circumstances.

Observing our maintenance and care instructions as well as our Specifications for Operating Fluids can prevent damage from occurring and guarantees the long service life expected.

3.8 Controlled vehicles

For vehicles with three way catalytic converter, or with three way catalytic converter and oxygen sensor, the same oil recommendations apply (approved products, oil change intervals, etc.) as to vehicles without three way catalytic converter.

For the control unit of the Flexible Service System to operate correctly, the default setting of the oil quality (in accordance with sheet no. of this Specifications for Operating Fluids), the oil viscosity and fuel sulfur content in percentage by weight is required. For more detailed information on this, refer to operator's manual, service booklet and workshop literature.

3.10 Engine oil change interval in combination with MB longlife oil filters (code M18)

Via code M18, for the MK and SK including industrial engines, a long-life oil filter has been available for a long time for particular model designations/code combinations. This is an additional engine oil filter which is attached to the frame. The oil is additionally filtered in the bypass flow.

After the positive conclusion of detailed long-term trials, it is possible to redefine the interval for engine oil and filter change for vehicles fitted with a longlife oil filter: double interval in comparison to vehicles not fitted with this special equipment.

Account is also taken, as before, of the operating conditions (long-haul working, short-haul working, aggravated operation), the oil quality and the sulfur content of the fuel.

The filter element of the long-life oil filter is not longer changed at the inspection. However, the engine oil in the filter bowl must be replaced at the inspection.

i After changing the engine oil, run the engine at idle speed for about 10 minutes.

The stipulation also applies retroactively to vehicles which were equipped with code M18 at an earlier point in time. It goes without saying that it only applies to long-life oil filters approved and tested by us. The maintenance booklets and maintenance sheets have been revised accordingly. Vehicles with the Flexible Service System (FSS/code Y88) can of course be equipped with the long-life oil filter. As a result, they likewise achieve double the engine oil change intervals which are certainly determined depending on load here.

3.11 Installation of external bypass oil filters

Various companies have advertised intensely in recent times with the retrofitting of bypass flow oil filters and have stated that this makes it possible to dispense with changing the oil.

We should like to take this occasion to inform you on the possibilities and limitations of bypass flow oil filtering.

3.11.1 Approved MB longlife oil filter (code M 18) for MK / SK trucks

Primarily the interval extension is attributable to the significant increase in oil quantity with this special equipment. Above all the additional filter serves to increase the filter capacity.

3.11.2 The chemical/physical changes to the engine oil as well as their consequences

A modern engine oil consists of a highly-complex mixture of base stock and additives. Additives are oil-soluble agents for protection against scuffing and wear, for neutralization of acid combustion products and for the prevention of sludge and deposits to name but a few examples.

The additives reduce in continuous operation. The base stock also suffers under the engine's influences. This limits the service life of the engine oil. The performance limits are reflected in the specified oil change intervals.

General statements according to which oil change intervals can be extended beyond certain overall travel distances or even dispensed with when using external bypass oil filters, are not justifiable from a technical standpoint.

As the bypass oil filter can only filter dirt and abrasion out of the oil, the exhausted oil is not refreshed. The replenishment quantities due to oil consumption and filter change are not sufficient for refreshing the oil.

The most important negative effects when installing external bypass oil filters, linked with exceeding of the oil change intervals specified by us:

Effect	Consequence
Additives not refreshed	Engine oil exhausted
Reduction in dirt conveying capacity, increase in oil oxidation	Sludging, deposits, wear
Increase in content of iron and solid foreign bodies	Increased wear, increase in oil viscosity
Increase in oil viscosity and friction resistance	Increased fuel consumption, poorer cold starting performance
Reduction in neutralization capacity, formation of acids	Corrosion, wear, deposits

There are not any oil filters through which the oil quality in operation is improved.

3.11.3 External bypass oil filter and environmental protection

Manufacturers outside of MB frequently advertise their bypass oil filters with environmental protection. For this one should know:

- . Used engine oil is not waste but a high-quality raw material. The used oil disposal in workshops and gas stations is organized and safeguarded so that the used engine oil can be added to recycling.
 - . The bypass filter manufacturers on the free market specify changing the filter elements frequently (as a rule every 10 000 km). Used oil filters are special waste and must be burnt under particular safety precautions and with comparatively high costs in a manner which has neutral effect on the environment.
 - . As a consequence of exhausted engine oil and engine wear, there is a deterioration in exhaust gas emissions, an increase in fuel consumption, a worse CO₂ balance and a reduced service life of the engine.
-

3.11.5 Additional technical risks and warranty provisions

Bypass oil filters are not usually attached to the engine but to the chassis or body. Particular attention is to be paid to the connection between the engine and filter in the design layout, testing and assembly to avoid leaks (chafing, slipping, breakage, etc.). Defects can result in expensive engine damage due to oil loss, but also be a danger to traffic and pollute the environment due to the oil which runs out.

We must point out that damage which has a causal relationship with the installation of parts not approved by us as well as the resultant consequential damage and irregularities do not fall within our area of responsibility. Our company also does not take over any warranty for parts which do not originate from MB and which are retrofitted to our vehicles.

3.12 ASSYST Active Service System

With a production breakpoint of February 1997 the previous maintenance system for passenger cars with rigid intervals was superseded by an **Active Service System** named "ASSYST".

Beginning with the W 210 4-Matic in 02/97 and phased in on the remaining model series as of 06/97 (except G 463, 09/97) the introduction followed.

3.11.4 Costs with a remote bypass oil filter

- . No cost advantage due to installation costs and due to frequent filter change (procurement and disposal of the filter)
- . Increased fuel costs due to increased viscosity and friction
- . Shorter service life of the engine due to higher wear
- . No warranty in the event of engine damage due to an external bypass oil filter

Alone the costs for the filter change, the installation and fuel consumption are higher than the savings which are possible with the engine oil.

3.11.6 Advantages of Mercedes-Benz long-life oil filter

- . Doubling of oil change intervals
 - . Filter change only in combination with oil change
 - . Service and warranty as a package
 - . Can be ordered from the plant, no idle times for retrofit
 - . Easy to retrofit and tried and tested
 - . Special equipment and retrofitting are competitive
-

i see also:

- Introduction into Service manual passenger cars model series 210 Innovations February/March 1997
- Video "Model series 210 Innovations model year 1997"
- WIS (microfilm) complete system description, GF00.20-P-0999AZ

With "ASSYST" service intervals up to 40,000 km or 2 years (min. 15,000 km or 1 year) are made possible for the first time at Mercedes-Benz. The system takes into account individually the driving style of the customer by evaluating engine speed, engine temperature, engine load and time. The timing of the service required is calculated and the due date is displayed to the customer in the instrument cluster.

The following information is also available in
SI14.40-P-0001A dated September 15, 2003.

As of October 2003, 4-cylinder diesel engines will be available
for the first time in a combination of the engine version
EURO-4 standard as an option with a diesel particulate filter, CODE474. The Mercedes-Benz diesel particulate filter, also known in the press as a soot filter, enables

Specified engine oil to be used is described in Sheet 229.31
"Low SPAsh":
For EURO-4 engines with a diesel particulate filter, a specific
engine oil has been developed which when operated generates
less combustion residue and thus safeguards the filter's high
mileage life. In the event of an engine oil change vehicles with
the filter (CODE 474) must use the engine oil as specified in
Sheet 229.31. Following an oil change the vehicle - after
having been filled with oil as specified in Sheet 229.31 - will
have a startup distance of 15,000 km. Oil refilling by the
customer with oils as under Sheets 229.3 and 229.5 is possible.
Part number for the 1 liter container "Low SPAsh" engine oil":
A000 989 89 01 10

4. SAE grade (viscosity)

The SAE grades refer to the viscosity of the lubricating oils. The
SAE class indicates the viscosity at low and high temperatures
Viscosity is of importance at low temperatures for cold-starting
and at high temperatures for adequate lubricating properties at full
load or at high speeds. It is therefore important to pay attention to
the SAE grades specified on Sheets 224.1/224.2 and 231.1./2./3.