



Focus on filters

Field testing of CLAAS ORIGINAL filters –
Everything you need to know about filters.

CLAAS



Real-world performance is what counts.

Only CLAAS tests in the field.

This guide tells you everything you need to know about up-to-date filtration in agriculture and the consequences which can result from the use of inferior filters in agricultural machines. Furthermore, we provide detailed insights into the sophisticated test set-ups used to compare the performance of CLAAS ORIGINAL filters and non-genuine filters in the field.

Only CLAAS has compared ORIGINAL filters and non-genuine filters in the field during an entire harvest season. In order to ensure that the tests were conducted under real-world conditions, established non-genuine filters were purchased in the market. The filters were then used on identical machines under comparable operating conditions. The interesting results of this field test are presented clearly and comprehensibly.

The differences in quality between ORIGINAL and non-genuine filters are also shown. There is a huge and bewildering range of aftermarket filters. CLAAS conducted test purchases and closely examined various non-genuine filters. Take a look at the shortcomings of what are apparently compatible filters and see what happens when the non-genuine filters fail to meet the CLAAS quality standards.

Exhaustive field testing is the final stage in the development of every product. CLAAS always develops products as complete systems, in which filtration is considered as an integral part from the very start. Working in partnership with experts from the filtration industry, we develop the best solutions for your CLAAS machine. The complete machine must then undergo intensive testing in tough, everyday working conditions to prove that the entire system functions perfectly in every detail.

See the benefits of CLAAS ORIGINAL filters for yourself.





Contents.





Filter tests in the field	
Preparations	6
CLAAS filter range	10
Air filters	
Characteristics	12
Comparison in the field	14
Hydraulic oil filters	
Characteristics	18
Comparison in the field	20
Engine oil filters	
Characteristics	24
Comparison in the field	26
Fuel pre-filters	
Characteristics	28
Comparison in the field	30
Fuel filters	
Characteristics	32
Comparison in the field	34
Cab air filters	
Characteristics	36
What kind of things can happen if ...?	38
Filter test purchases	40

Filter tests in the field – The preparations.



Hermann Thomsen, Deula Rendsburg

Since 2010, working in partnership with the Rendsburg branch of Deula (German Training Centres for Agricultural Engineering), CLAAS has carried out intensive field tests with CLAAS ORIGINAL parts and non-genuine parts.

The testing process places great emphasis on using the parts in parallel under identical conditions. Only in this way is it possible to compare them and carry out a reliable assessment of their performance.

Deula is an independent organisation whose activities include conducting comparative tests on behalf of the agricultural industry. CLAAS uses this external organisation in order to ensure the impartiality and independence of the tests.

Reality cannot be simulated – CLAAS carries out testing in the field.

Today's filtration technology is usually tested in laboratories. These sophisticated tests ensure that factors such as fit and performance parameters are matched to each CLAAS machine. However, laboratory tests cannot replace every aspect of real-world operation.

Working in cooperation with a contractor in the Eifel region of Germany, CLAAS compared ORIGINAL and non-genuine filters in two CLAAS JAGUAR forage harvesters over the course of an entire harvest. The non-genuine filters tested were selected carefully with regard to their comparability.

No other manufacturer in the agricultural machinery sector has yet performed such sophisticated tests. Only CLAAS has tested in the field under real-world conditions instead of relying on the usual laboratory tests which can only approximate to reality. Only field tests, with their extremely demanding moisture, dirt and dust conditions, clearly demonstrate the differences in quality between ORIGINAL and non-genuine filters.



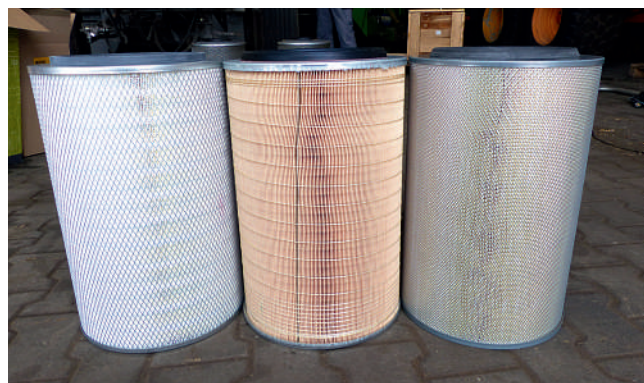
The field tests were conducted using two identical CLAAS JAGUAR machines in order to ensure comparability between ORIGINAL and non-genuine filters.



Before starting grass harvesting, both machines were connected to a dynamometer and their performance was measured. At the start of the test, the performance of both machines was identical. The fuel consumption figures obtained during the test could therefore be compared and conclusions drawn about the effect of the filters.



A professional customer was selected in order to make the field tests as authentic as possible. In professional use during the harvest season, a forage harvester clocks up as many as 1000 operating hours, sometimes even working double shifts. Such intensive use of a machine provides an ideal basis for conducting meaningful wear tests in a short time. As the contractor works on farms in a radius of up to 60 km at harvest time, it was possible to cover a range of different operating conditions. The operating profile of both machines is comparable.



In order to ensure the comparability of the filters, the non-genuine filters were purchased through established sales channels (e.g. online shops). According to the suppliers, the non-genuine filters tested corresponded to the CLAAS ORIGINAL filters in terms of quality, filtration performance and dimensions. On the following pages you can find out if the non-genuine filters were able to withstand the demands of real-world operation.



Data collection

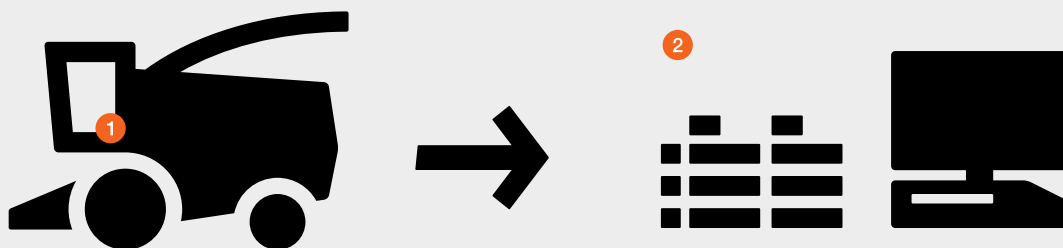
A central measurement box was installed next to the cab. The purpose of this measurement box was to record all the collected data securely at one second intervals. The measured data were read out on a daily basis and analysed in an evaluation system. In this way, more than 5.5 million data records were collected for each machine.

Data records were generated for the following parameters: air filter differential pressure, pressure before and after the engine oil filter, engine oil temperature, engine speed, fuel consumption and diesel temperature.

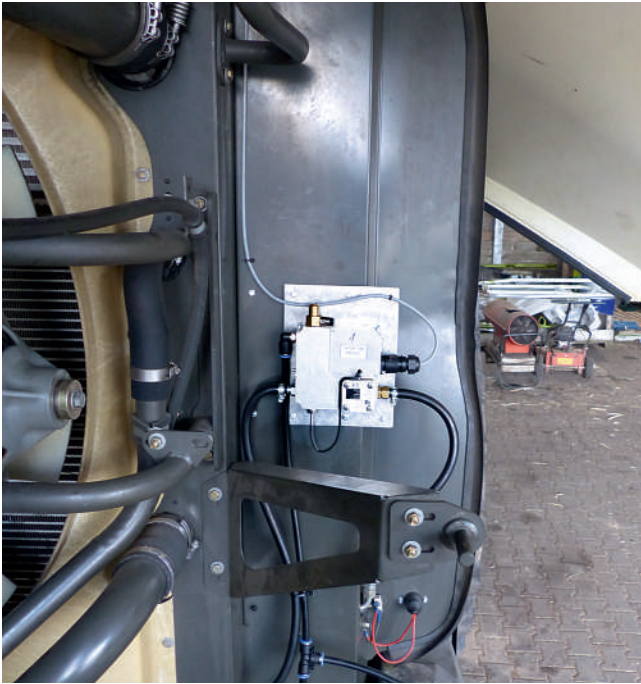
GPS technology was used to determine the ground speed while the outside temperature, relative humidity and atmospheric pressure were also measured.

The right-hand picture shows clearly the high level of dirt and dust from which the complex measuring technology had to be protected.

Information about the measurement box



- 1 Position of measurement box
- 2 Measurement and evaluation of data (approx. 5.5 million data records per machine)



Test set-up for diesel consumption measurement.

In order to determine the precise diesel consumption of both CLAAS JAGUAR machines, each was equipped with a measurement cell with a repeat accuracy of 0.03%. This unit measures the actual amount of diesel fuel consumed, taking account of the excess fuel returned from the engine.

Overview of CLAAS ORIGINAL filters.

Most of the filtration systems used in the agricultural sector today are depth filters. These special filter elements are used when particles - ideally 100% of them - are to be removed from liquids (oil and fuel) or gases (air). The requirements of the agricultural sector are regarded as the toughest test for a modern filter. The challenges here are even greater than those encountered in quarrying, for example.

The separation of particles is carried out in the depth structure of the medium on the surface of the individual fibres. These impurities may include dust, metal wear debris or soot particles resulting from an incomplete combustion process.

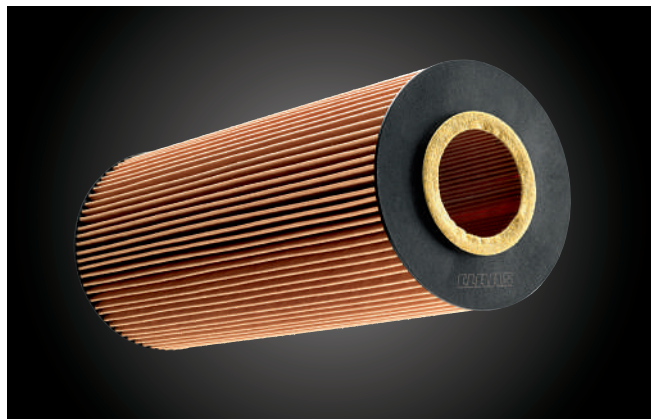
In addition to removing the solid particles, the fuel filters and fuel pre-filters also have to remove water residues in the fuel lines.

You can count on CLAAS for the perfect filter for your CLAAS machine, designed precisely to work as an integral part of the system and optimised for the operating conditions. You can find a wealth of valuable information about our filter range on the following pages.



Engine air filters

CLAAS ORIGINAL engine air filters protect your engine from contamination, ensure long-term operational reliability and are tailored perfectly to the performance characteristics of CLAAS machines.



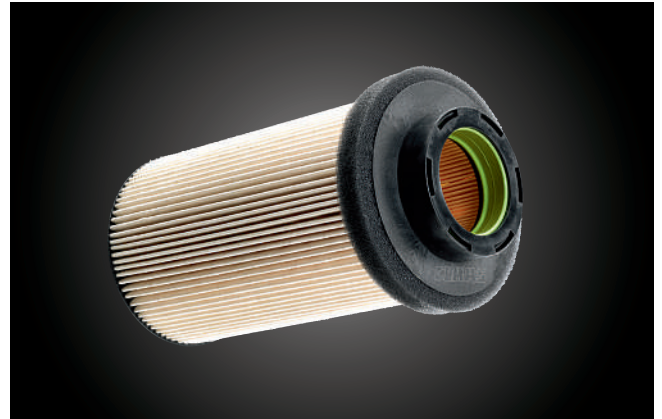
Engine oil filters

CLAAS ORIGINAL engine oil filters provide your engine with lasting and reliable protection against damage to connecting rods, bearings and the crankshaft.



Fuel pre-filters

CLAAS ORIGINAL fuel pre-filters protect your fuel system against excessive moisture and contaminants which can result from refuelling in the field.



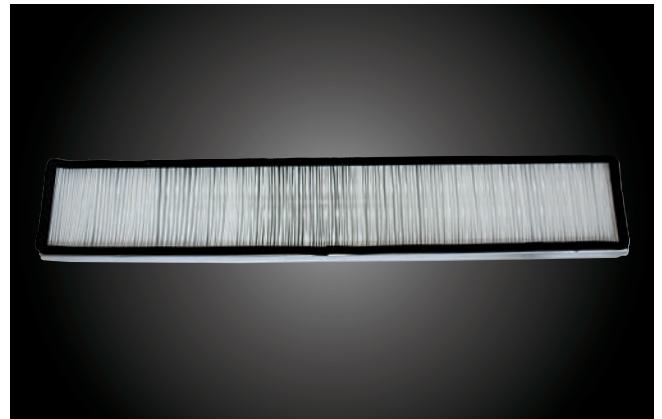
Fuel filters

CLAAS ORIGINAL fuel filters protect your injection system against residual contaminants and microparticles in order to prevent damage to your injectors and high-pressure pumps.



Hydraulic oil filters

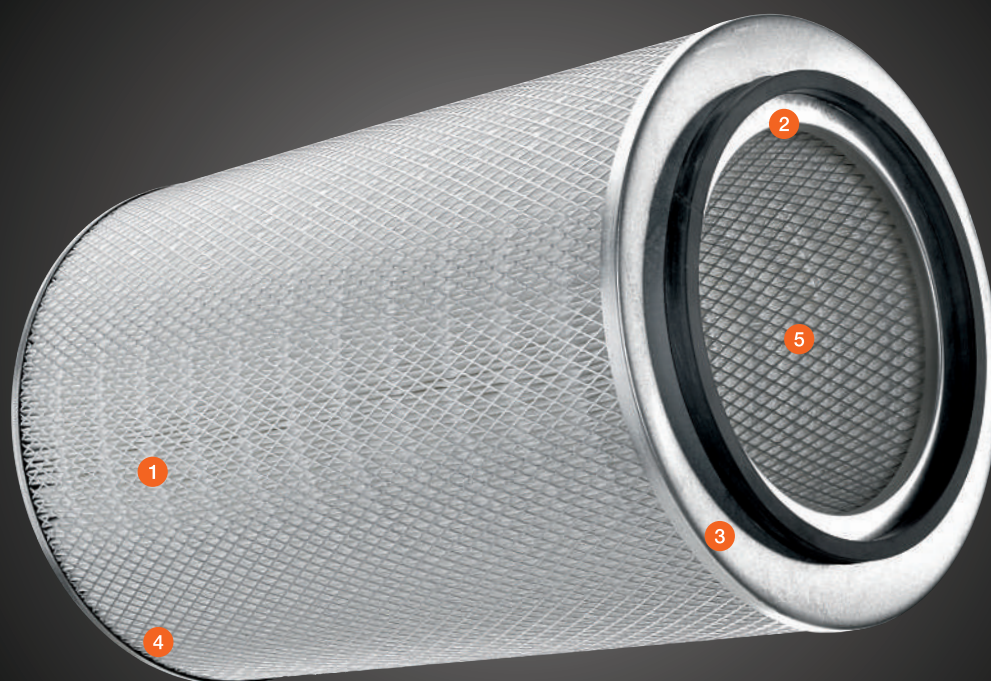
CLAAS ORIGINAL hydraulic oil filters protect your machine's hydraulic system optimally against wear debris and particles.



Cab air filters

CLAAS ORIGINAL cab air filters protect the operator in the cab from environmental emissions and especially from spray vapours.

Characteristics of a CLAAS ORIGINAL air filter.



Why CLAAS ORIGINAL air filters?

Air filters are exposed to extreme conditions, especially as a result of high levels of dust and moisture. During harvesting in particular, dust exposure is extremely high. Engine air filters clean the engine intake air and so ensure correct combustion of the fuel.

ORIGINAL air filters protect the engine from contamination, ensure long periods of operational reliability and are tailored perfectly to CLAAS machines' performance characteristics.

They undergo continuous improvement to ensure that your machine has the highest possible degree of protection. Optimisation for their function within the overall concept begins during the machine development phase.

The next page shows you the key characteristics which define a CLAAS ORIGINAL air filter.



1 High-quality filter paper

With their special fold design, ORIGINAL air filters guarantee an unobstructed inflow of dust-laden air into the folds. The special fold geometry prevents the filter paper surfaces from coming into contact with one another. The evenly spaced pores ensure a high standard of dirt separation.

How you benefit:

- Long replacement intervals
- Optimised filter performance
- High engine protection



2 Precisely fitting gasket

Even the most minor of gasket integrity defects between gasket and filter housing can allow dirt to enter the engine directly, causing wear. A gasket that remains perfectly intact after many hours of operation will increase the engine's service life.

How you benefit:

- Long service life
- Optimal engine output

3

Filter service life

Thanks to the ingenious fold geometry of our filters, a large filter surface area can be incorporated into an extremely small space. Our filters feature a high dirt absorption capacity and boast long replacement intervals.

How you benefit:

- Long filter service life
- Low operating costs

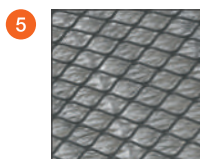


4 Impregnation of filter paper

The impregnation process provides optimal protection against mechanical, thermal and climatic influences, and against operating fluids.

How you benefit:

- Inhibits moisture uptake
- Ensures lasting robustness



5 Optimal cleaning performance

Up to 99.9% of all particles are filtered out. The virtually particle-free intake air increases the service life of the engine in all conceivable dust conditions.

How you benefit:

- Long service life of the engine
- Highest possible fuel efficiency

Air filters – The results of the field tests.



Hermann Thomsen, Deula Rendsburg

“ Failure to observe the recommended replacement intervals means risking significantly higher fuel consumption and reduced area output. ”

Air filters are exposed to extreme conditions, especially as a result of high levels of dust and moisture.

In addition to the two forage harvesters shown, two identical combine harvesters (CLAAS LEXION models) were used for air filter tests. Use in combine harvesters during grain harvesting represents the most extreme operating scenario imaginable for an air filter.

In order to determine the quality of the air filters, the differential pressures (before and after the filters) as well as the fuel consumption (at the start and end of the tests) were measured. The detailed results can be seen on the following pages.

Test set-up for air filters in combine harvesters.



Piezometer ring on the air filter housing measures the differential pressure before the filter.



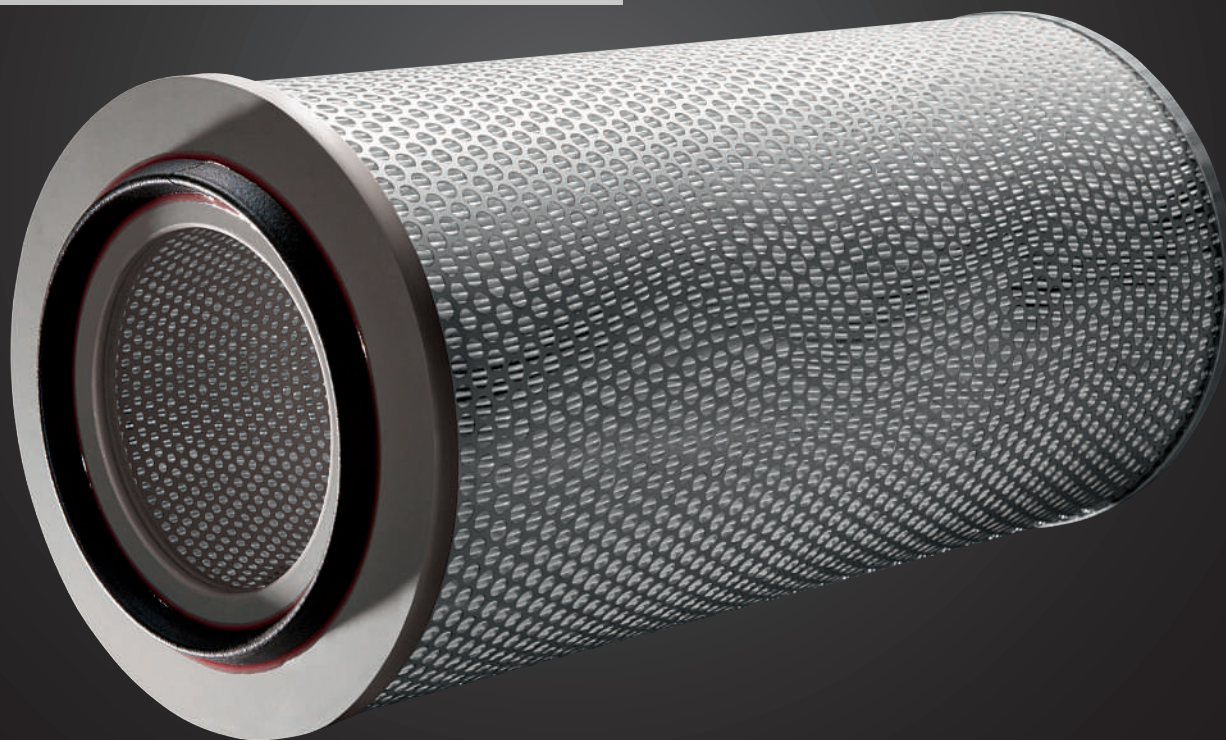
Piezometer ring on the air baffle measures the differential pressure after the filter.



Differential pressure sensor records measured values, and relays them to the measurement box.

Conclusion

- Higher filtering performance
- Lower suction resistance
- Up to 10 % lower fuel consumption
- Reduced cleaning effort
- Reduced changeover times (negative costs)

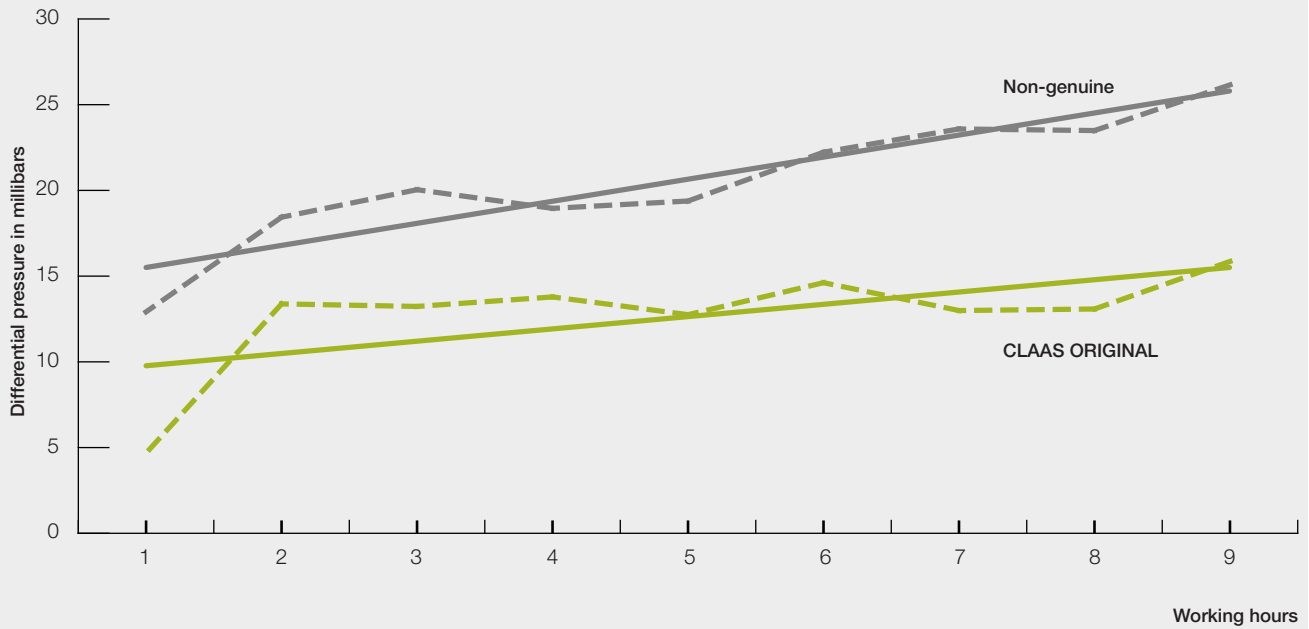


Process costs for air filters.

CLAAS ORIGINAL air filters are remarkable for their reliable filtering performance over long periods of use. The suction resistance is lower, with the result that engine load and fuel consumption are substantially reduced. At the same time, the load is also reduced on both the fuel filter and the overall fuel system. The engine is reliably protected against any dirt getting in.

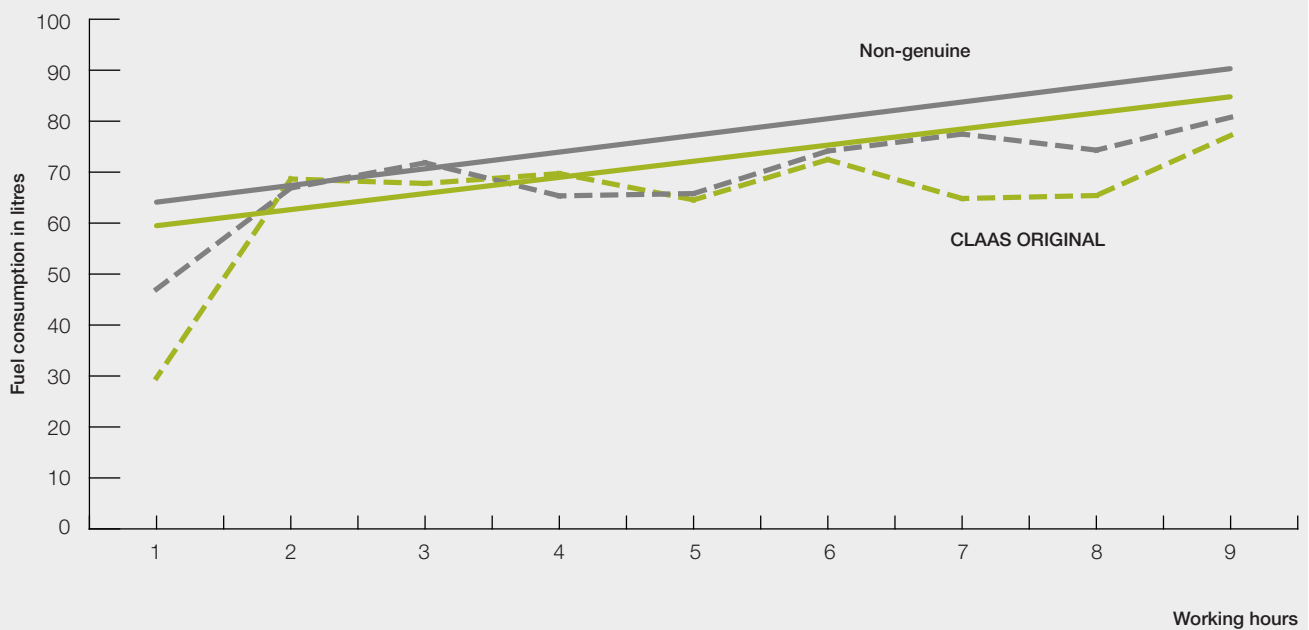
	Price per unit	Total time used	Possible lifetime	Fuel per hour	Costs per hour	Total cost
ORIGINAL	100 %	164 h	500 h	67 l	100 %	100 %
Non-genuine	53 %	164 h	164 h	73.5 l	141 %	110 %

Differential pressure at start of test



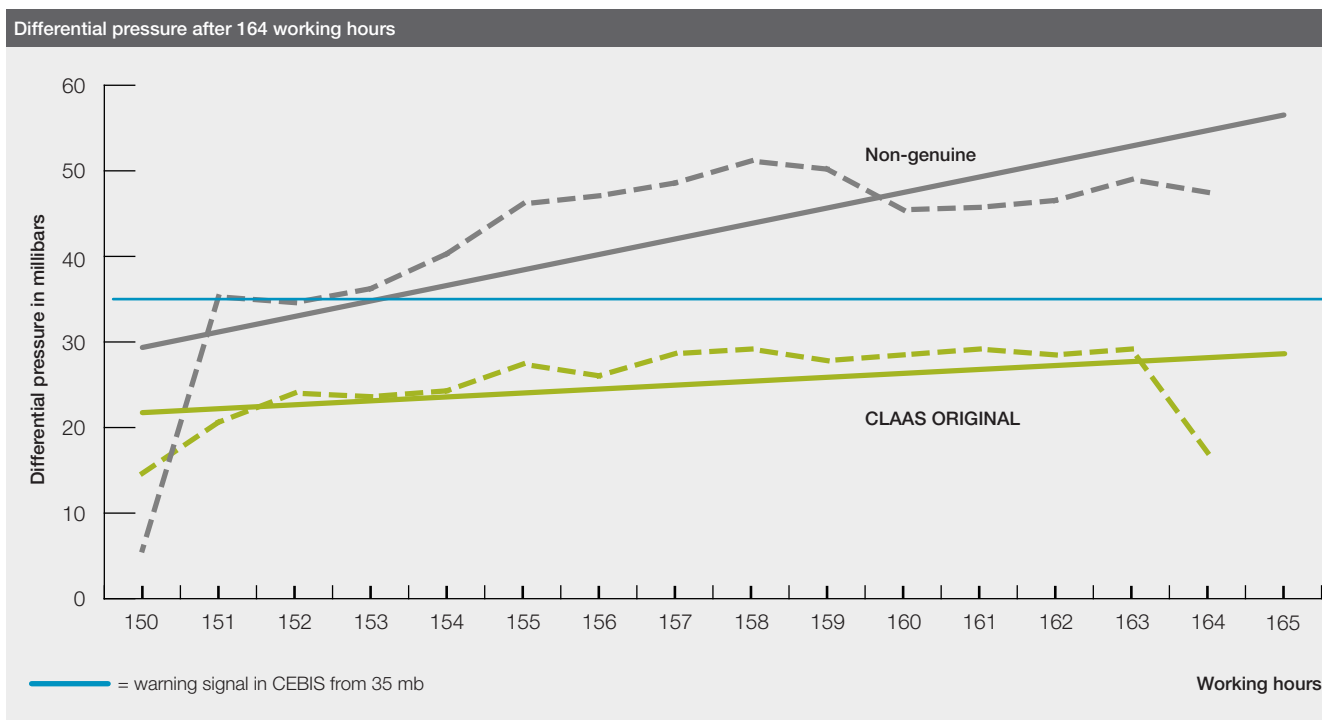
The differential pressure in the ORIGINAL air filter is well below that of the non-genuine filter to begin with. This means there is less load on the engine with the ORIGINAL filter.

Fuel consumption at start of test

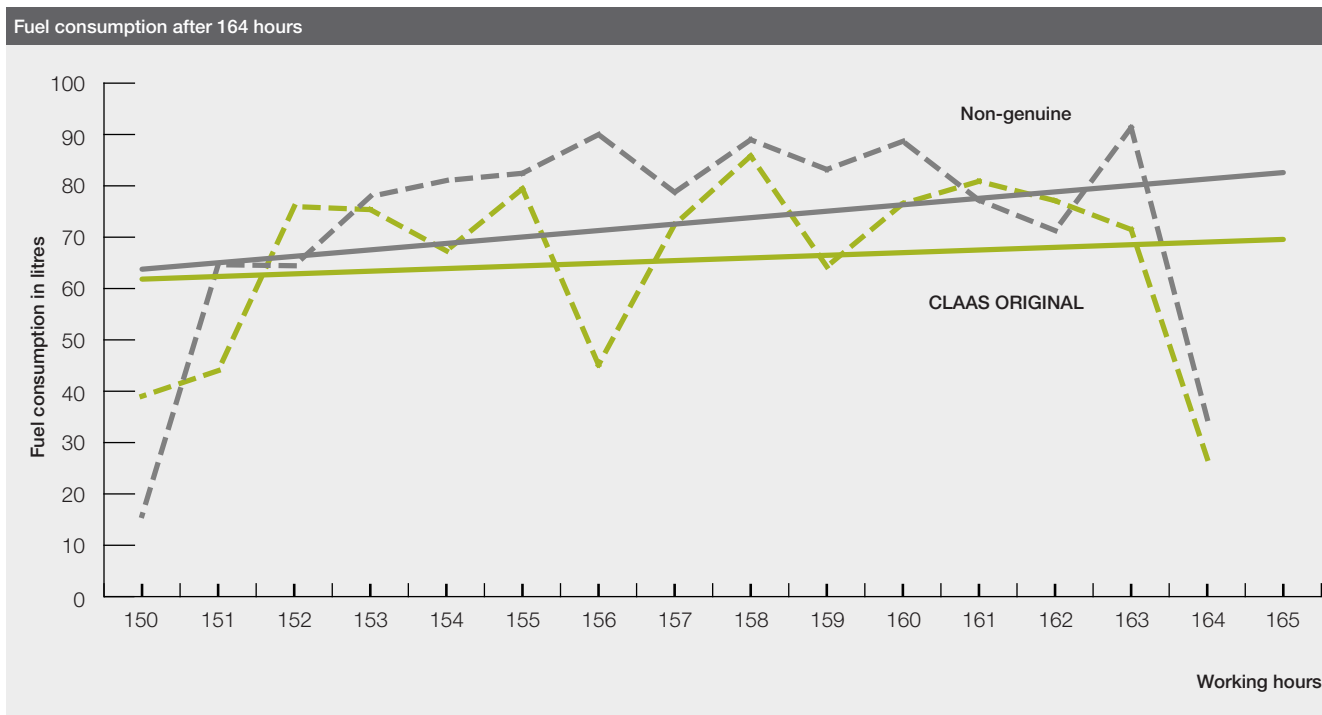


The higher differential pressure in the non-genuine filter and the resulting increase in engine load results in higher fuel consumption.

- = CLAAS ORIGINAL trend line
- = CLAAS ORIGINAL absolute values
- = Non-genuine trend line
- = Non-genuine absolute values



After 164 operating hours, the non-genuine filter needs to be replaced. The differential pressure is so great that the filter needs to be cleaned during work operations. The CLAAS ORIGINAL filter continues to operate reliably and is cleaned only at the end of the day. It can continue to be used.



The trend lines show that fuel consumption increases significantly with the non-genuine filter over the course of the day. If the non-genuine filter is used over the entire harvest period, this amounts to substantial additional fuel consumption.

Characteristics of a CLAAS ORIGINAL hydraulic oil filter.

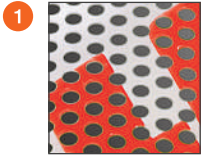


Why CLAAS ORIGINAL hydraulic oil filters?

Today's harvesting machines have complex and costly hydraulic systems whose sensitive hydraulic valves and hydraulic pumps require clean, thoroughly filtered hydraulic oil. Wear debris and particles should not reach these sensitive points.

ORIGINAL hydraulic oil filters protect your machine's hydraulic system optimally against wear debris and particles. Damage to expensive hydraulic components (such as the hydraulic motor and hydraulic pump) can therefore be avoided.

The following page shows the key characteristics which define a CLAAS ORIGINAL hydraulic oil filter.



Outer sheath for protection of filter mat

The star-shaped folded filter mat is encased in a robust outer sheath made of plastic. The texture of the material ensures that the oil is spread evenly across the mat, while being highly durable and resistant to damage.

How you benefit:

- Uniform oil distribution
- High operational reliability, thanks to robust outer sheath



Filter mat structure

An optimised filter mat structure makes for low pressure losses at the filter element accompanied by a high contaminant absorption capability.

How you benefit:

- Long maintenance intervals
- Improved component protection
- High-performance separation



Zinc-free construction

Used with current synthetic hydraulic oils, the zinc-free construction prevents the formation of zinc soap, thereby overcoming the risk of blockages.

How you benefit:

- Ideal for use with modern hydraulic oils
- Reliable protection of expensive hydraulic components

Hydraulic oil filters – The results of the field tests.



Hermann Thomsen, Deula Rendsburg

Today's harvesting machines have complex and costly hydraulic systems. It is particularly important that the sensitive hydraulic valves and hydraulic pumps are supplied with clean, thoroughly filtered hydraulic oil in order to avoid potential damage. In order to measure the filter performance, the volume and size of the particles were measured using the online measurement system (see photos at right) before and after the hydraulic filter element. Particle measurements were conducted for the 4 µm class which is regarded as the standard for determining contamination.



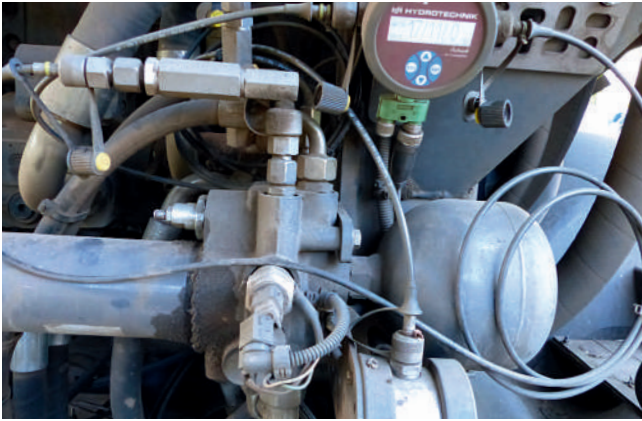
As the test shows the significantly higher oil quality where an ORIGINAL Filter is fitted, the additional cost of purchase is of no significance.



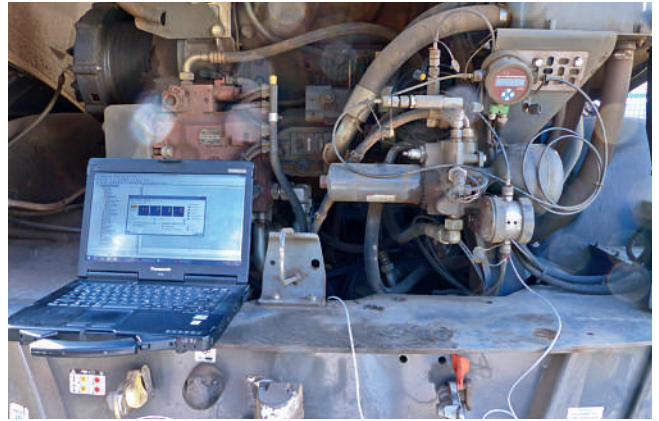
The measurement process was conducted on the basis of DIN ISO 4406 and indicates the cleanliness class of the hydraulic oil in the form of range codes (see table). The higher the range code, the greater the degree of contamination. If the contamination per 100 ml is 8,000 to 16,000 particles equal to or greater than 4 µm, the range code is 14.



Test set-up for hydraulic oil filters.

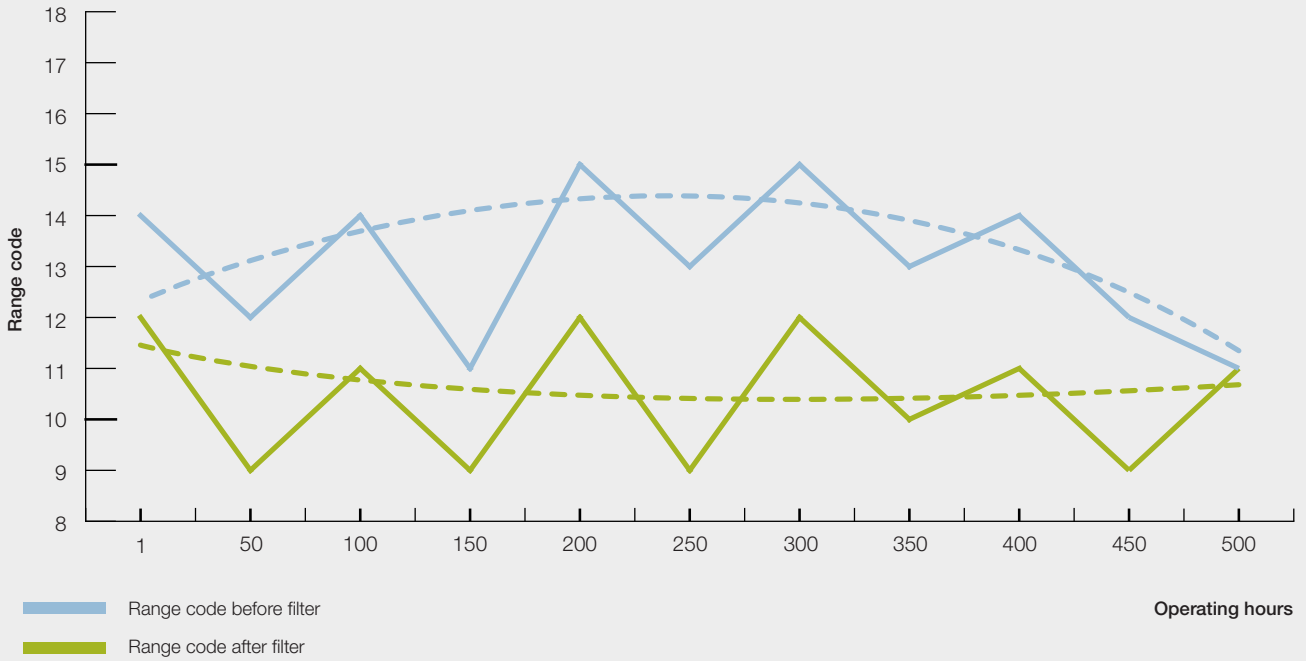


An online measurement system was installed to determine the performance of the hydraulic oil filters during the field test.



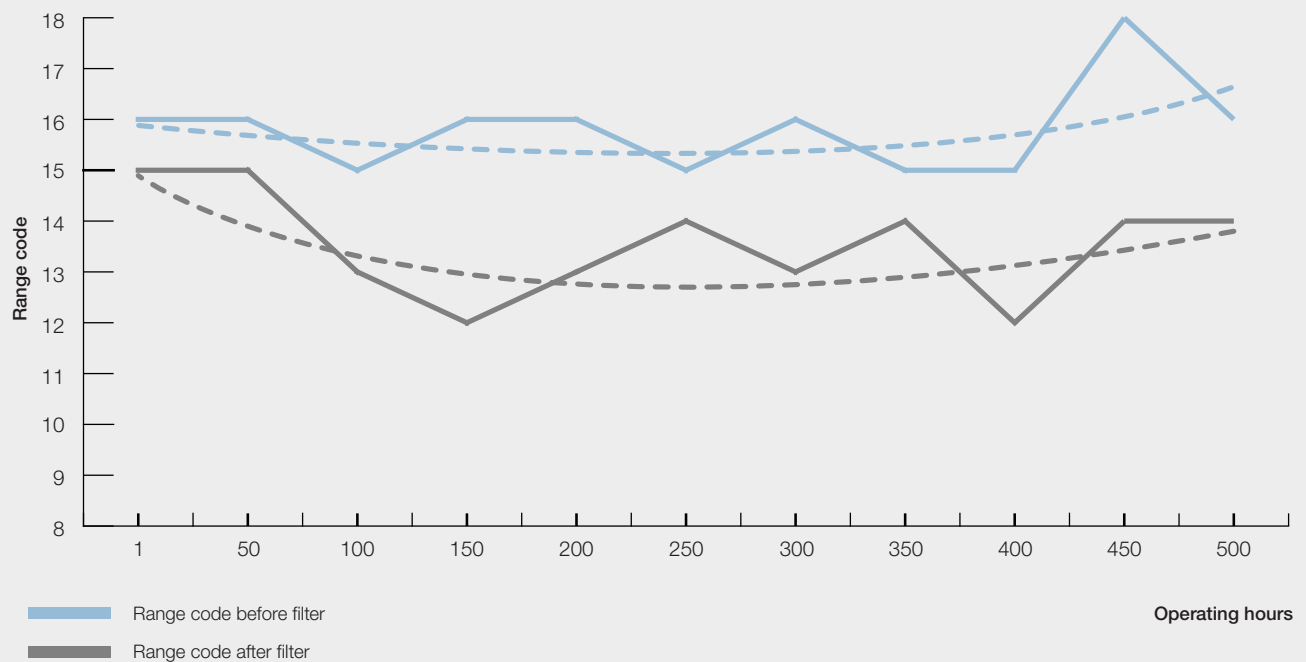
The data were recorded in the internal memory of the measurement system and were read twice a day.

CLAAS ORIGINAL filter

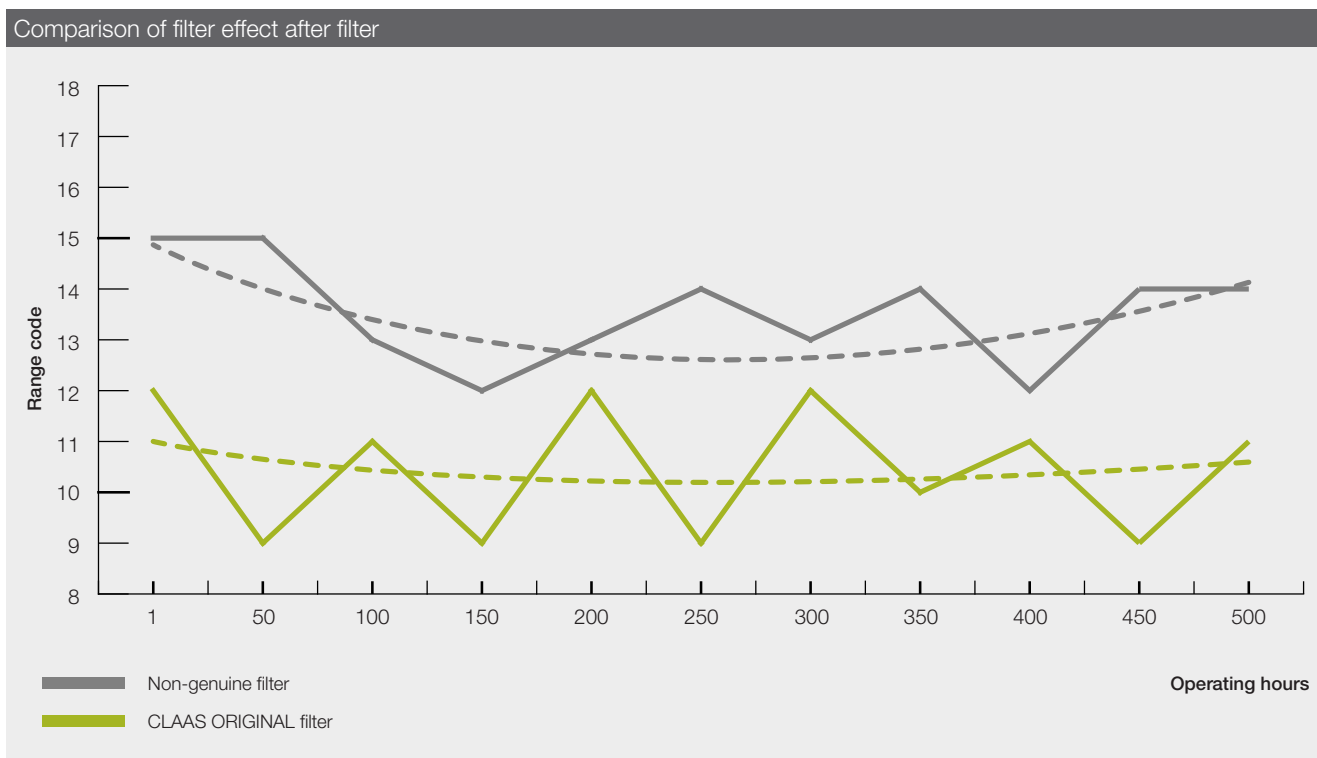


The range codes for the ORIGINAL filter are a maximum of 15 before the filter and a minimum of 9 after the filter.

Non-genuine filter



The range codes for the non-genuine filter are a maximum of 18 before the filter and a minimum of 12 after the filter.



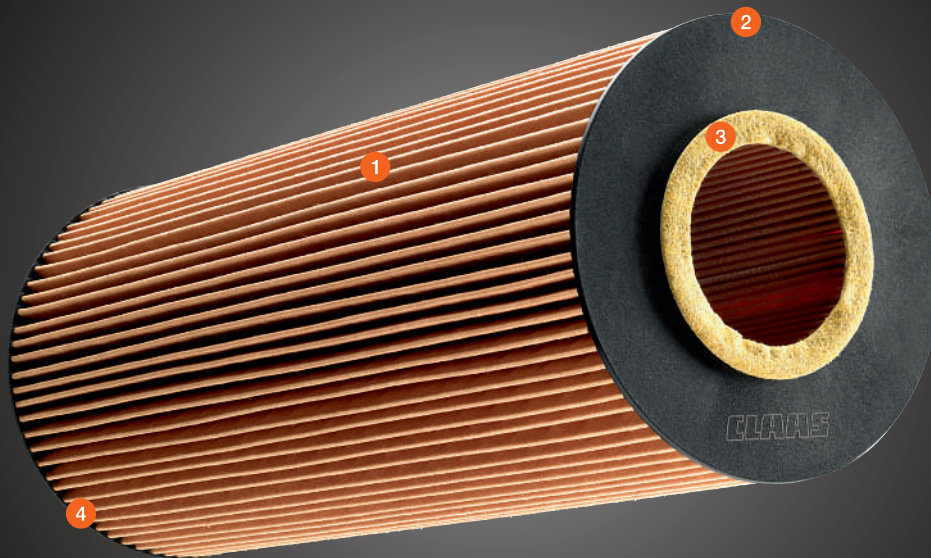
The graph clearly shows the difference between the ORIGINAL filter and the non-genuine filter. The range codes after the ORIGINAL filter are far lower than those after the non-genuine filter.

Cleanliness classes as specified in ISO 4406:99

No. of particles per 100 ml		
More than	Up to and including	Range code
2,000,000	4,000,000	22
1,000,000	2,000,000	21
500,000	1,000,000	20
250,000	500,000	19
130,000	250,000	18
64,000	130,000	17
32,000	64,000	16
16,000	32,000	15
8000	16,000	14
4000	8000	13
2000	4000	12
1000	2000	11
500	1000	10
250	500	9

Conclusion
 The graphs clearly illustrate the reality: the CLAAS ORIGINAL hydraulic oil filter is able to filter significantly more foreign particles out of the hydraulic oil. It is clear from the measurements that the hydraulic oil in the machine with an ORIGINAL filter is cleaner.

Characteristics of a CLAAS ORIGINAL engine oil filter.

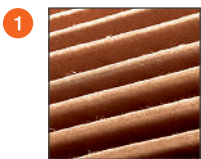


Why CLAAS ORIGINAL engine oil filters?

CLAAS ORIGINAL engine oil filters provide your engine with lasting and reliable protection against in-engine wear.

If very fine dust and dirt should enter the engine oil circuit during harvesting (as a result of an inferior air filter, for example), these contaminants act like sandpaper and can cause damage to the connecting rods, crankshaft and bearings.

The next page shows you the key characteristics which define a CLAAS ORIGINAL engine oil filter.

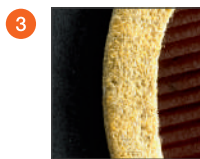


High-quality filter paper

The filter paper consists of a special mix of cellulose and synthetic fibres. Despite the fine-meshed fibre structure (good filtration characteristics), the filter element allows a high oil throughput. This ensures that the oil is able to reach the sensitive lubrication points quickly. The mixed friction phase is therefore quickly overcome.

How you benefit:

- Perfectly matched to the requirements encountered in the agricultural sector.
- Extremely durable
- Reliable performance within the prescribed maintenance interval

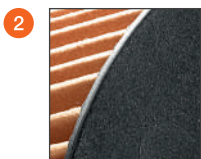


Felt gasket

The felt gasket prevents internal leakage as it completely seals the filter cover.

How you benefit:

- Custom-fit seal in filter casing

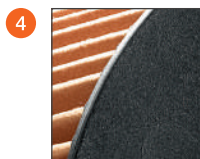


Upper end disc

The lasting, leakproof connection between the filter paper and the end disc is produced through a sophisticated welding process. Internal leaks are therefore impossible.

How you benefit:

- High strength of the filter
- Protection against collapse in the event of excessive pressure differences



Lower end disc

The lower end disc is designed to fit the base of the casing precisely and so form a high-quality seal. This makes for long-term avoidance of leaks, even under high pressures.

How you benefit:

- Strength of the filter
- Prevents internal leaks

Engine oil filters – The results of the field tests.



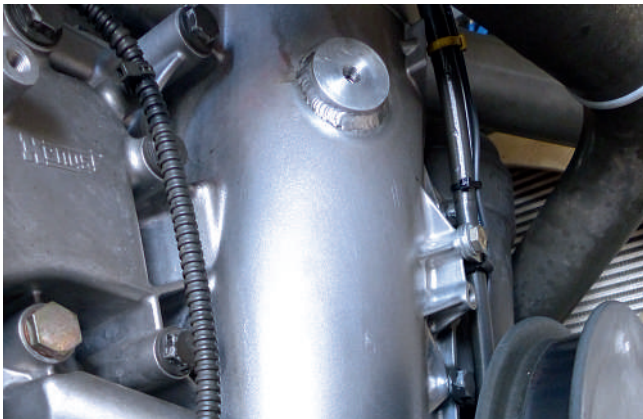
Hermann Thomsen, Deula Rendburg

“ A maintenance interval of up to 500 hours is all the more demanding at harvest time. Can every oil filter cope? ”

Harvesting machines often operate at their performance limits during harvesting. In the commercial vehicle sector, by contrast, engines operate predominantly in the lower partial-load range. It therefore follows that there are fundamental differences in the requirements which an oil filter has to meet.

In order to determine the quality of the oil filters, the oil pressure was measured before and after the filter element. Using the resulting differential pressure as a basis, it is possible to deduce if the bypass valve opens. Opening of the bypass valve should be avoided, as it means that unfiltered oil can reach the lubrication points. Furthermore, oil samples were taken and subjected to laboratory analysis for signs of oxidation, wear debris and silicates.

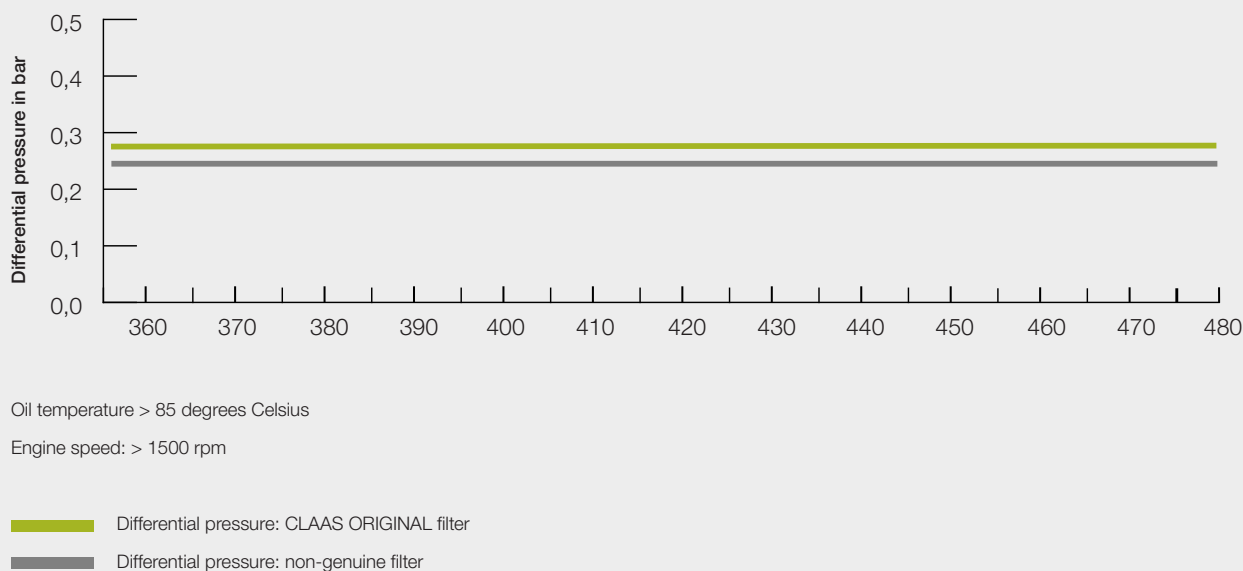
Test set-up for engine oil filters.



The oil pressure before and after the filter element was measured accurately to the second and recorded. This was performed using two oil filter modules which were equipped with pressure measurement points before and after the filter element, as specified by the manufacturer. These two pressure readings were used to calculate the differential pressure. If the outside pressure increases excessively, as a result of viscous oil or a blocked oil filter for example, the oil pressure after the filter element falls. If the pressure difference

(differential pressure) is too great, the bypass valve opens to maintain the oil supply to the engine. The bypass valve is a self-contained, spring-loaded and non-adjustable valve which is not monitored or indicated.

Comparison of engine oil filters (measured over the last 100 operating hours)



At the end of the tests, the differential pressure of both filters is unchanged.

Conclusion

The test showed that this non-genuine filter is able to offer almost comparable performance. Nevertheless, doubts remain as to whether the maintenance interval prescribed by the engine manufacturer can be maintained. Furthermore, it is important to bear in mind that a non-genuine filter is not approved by the engine manufacturer. The consequences of using a non-genuine filter can be seen on page 38.

Characteristics of a CLAAS ORIGINAL fuel pre-filter.



Why CLAAS ORIGINAL fuel pre-filters?

Refuelling in the field is associated with particularly high risk at harvest time as it can allow dirt and water to enter the fuel system. CLAAS fuel pre-filters reliably prevent your fuel system from being contaminated by an excessive proportion of coarse dirt particles and an excessive concentration of water.

The next page shows you the key characteristics which define a CLAAS ORIGINAL fuel pre-filter.

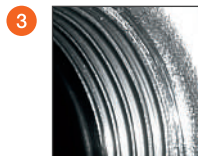


Gasket integrity

The precisely fitted and acid-resistant gasket was specially developed for use in the agricultural sector.

How you benefit:

- Ideal seal between gasket and filter flange



Spin-on thread

The spin-on thread is engineered precisely to fit your CLAAS machine.

How you benefit:

- Straightforward fitting
- Fits your CLAAS machine perfectly



Filter paper

The filter paper consists of a special mix of cellulose and synthetic fibres and is also impregnated. This ensures that the fuel system has reliable and long-lasting protection against the ingress of coarse dirt particles and water.

How you benefit:

- High water separation ability
- High absorption capacity for coarse dirt particles



Feed bores

Special feed bores ensure the unimpeded flow of the diesel fuel. Undersupply of fuel to the engine and a consequential loss of power can be avoided reliably.

How you benefit:

- Reliable fuel flow
- Consistent machine performance

Fuel pre-filters – The results of the field tests.



Hermann Thomsen, Deula Rendsburg

Refuelling in the field is frequently associated with a particularly high risk. By its very nature, this operation makes it all too easy for dirt and water to enter the fuel tank. It was precisely this type of situation that CLAAS addressed in its programme of field tests. The machines were refuelled in the field during harvesting.

The filtration performance of a fuel pre-filter is measured on the basis of the amount of water and dirt that it filters out of the fuel. It is indicated in mg (of contaminants) per kg (of fuel).



The superior filtration performance of the ORIGINAL filter is the decisive factor. Injection system components are sensitive and costly.

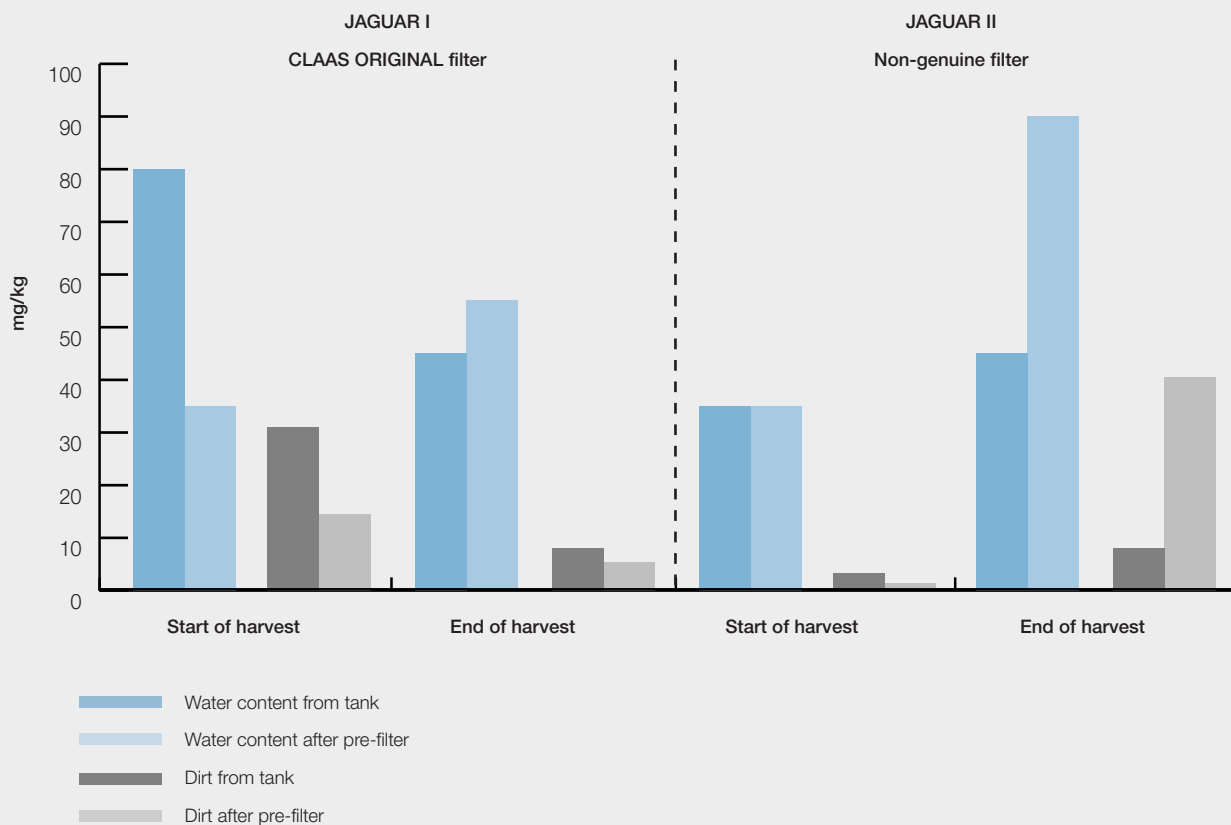


Test set-up for fuel pre-filters.



The fuel pre-filters were fitted with diesel sampling points. These allowed diesel fuel samples to be taken from before the pre-filter and after it (filtered fuel) at predefined intervals. These samples then underwent laboratory analysis.

Fuel samples from tank and pre-filter



The higher degree of fuel contamination recorded for the ORIGINAL filter at the start of harvesting is due to older fuel which was already in the tank. The graph shows that, at the end of harvesting, the water content of the fuel was clearly lower with the ORIGINAL filter than it was with the non-genuine filter.

Conclusion

The non-genuine filter does not reach the scheduled maintenance interval. It would have to be replaced earlier. In addition, considerably greater amounts of water and dirt particles entered the fuel system (e.g. through refuelling in the field) than were filtered out. The overall contamination level actually exceeds the limit set for the sale of diesel fuel in the EN 590 diesel fuel standard (24 mg of dirt per kg of diesel fuel). The CLAAS ORIGINAL filter, by contrast, protects your injection system against contamination by dirt and water all the way to the scheduled maintenance interval.

Characteristics of a CLAAS ORIGINAL fuel filter



Why CLAAS ORIGINAL fuel filters?

CLAAS ORIGINAL fuel filters protect your injection system reliably against dirt. The main filter has a significantly finer filtration action than the pre-filter.

The next page shows you the key characteristics which define a CLAAS ORIGINAL fuel filter.

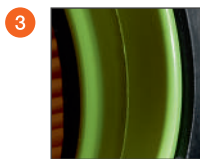


Filter paper

The filter paper consists of a proven mix of cellulose and synthetic fibres. It has a finer structure than the filter paper of the pre-filter. This ensures that ultra-fine particles are separated reliably. The filter paper is also impregnated.

How you benefit:

- Costly components (injectors, high-pressure pumps) are protected against damage



Rubber gasket

In order to avoid internal leaks, this precisely fitting gasket made of special, acid-resistant rubber ensures a lasting seal.

How you benefit:

- Lasting protection against dirt ingress



End disc

A perfect connection between the filter paper and the end disc is ensured through a sophisticated welding process.

How you benefit:

- High product quality
- Consistently high filtration performance

Fuel filters – The results of the field tests.



Hermann Thomsen, Deula Rendsburg



In view of the difficulties associated with measuring fuel filter performance, we decided to adopt a method based on sampling followed by laboratory analysis.



Fuel filters are subject to the same requirements as fuel pre-filters. Here, too, in-field refuelling represents a high risk. Dirt can enter the fuel tank freely. This was precisely the type of situation that CLAAS addressed in its programme of field tests. The machines were refuelled in the field during harvesting.

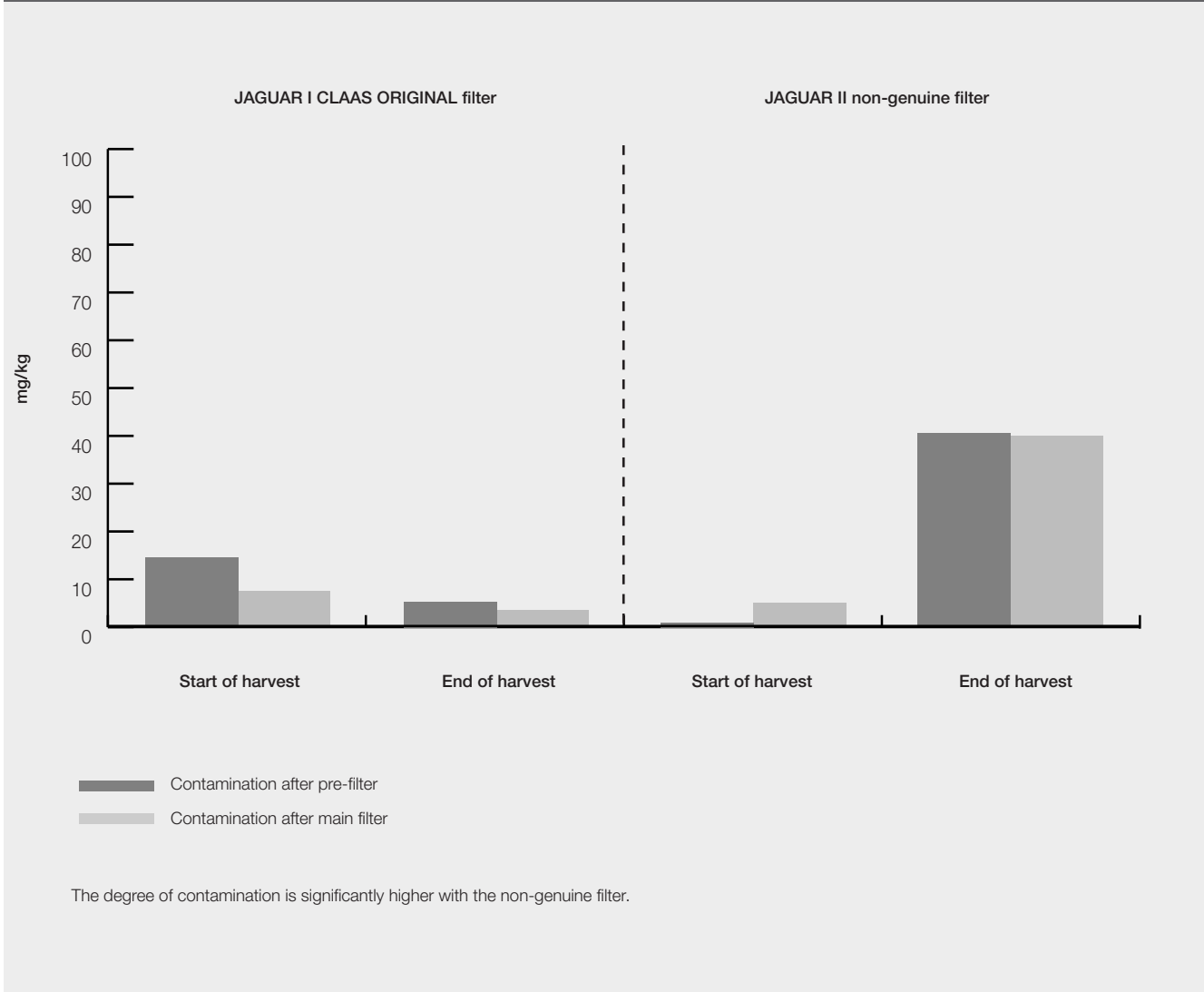
As with the fuel pre-filters, the test focused on determining the degree of contamination. A sampling point after the main fuel filter (see picture below) allowed diesel samples to be taken. These samples then underwent laboratory analysis for contamination.

Test set-up for fuel filters.



In order to test the performance of the fuel filters, several sampling points were fitted to the fuel system. The picture shows the sampling point after the main filter.

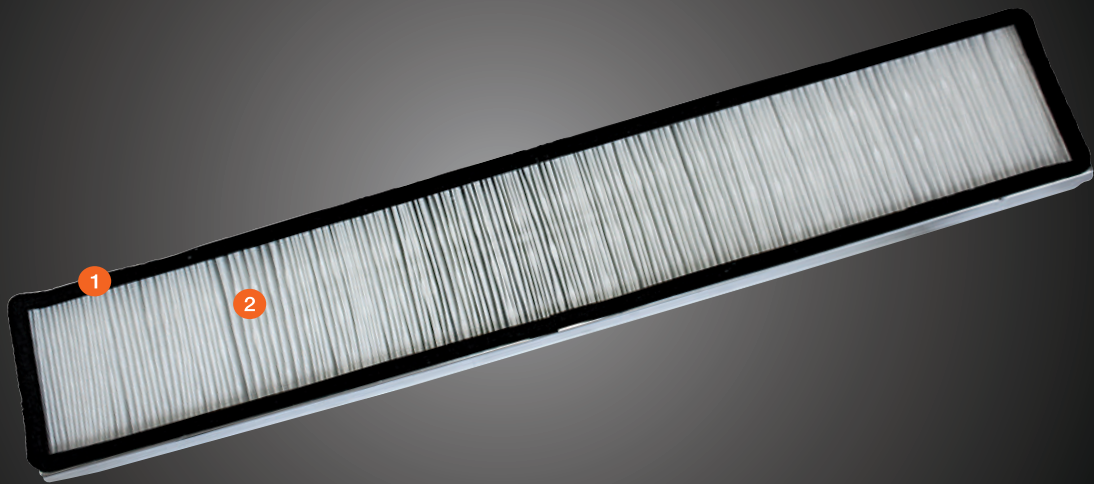
Fuel sample from pre-filter and main filter



Conclusion

The inferior filtration performance of the non-genuine filter resulted in more dirt particles entering the fuel system. The contamination level actually exceeds the limit set for the sale of diesel fuel in the EN 590 diesel fuel standard (24 mg of dirt per kg of diesel fuel). It seems likely that the dirt content that was initially retained was suddenly released when the filter became oversaturated. In view of the degree of contamination, it would have been necessary to change the filter before the replacement interval.

Characteristics of a CLAAS ORIGINAL cab air filter.



Why CLAAS ORIGINAL cab air filters?

The cab of every modern agricultural machine is a workplace. As such, it is covered by the workplaces ordinance. CLAAS ORIGINAL cab air filters protect the operator in the cab against environmental emissions and especially against spray vapours. The cab air filters are integrated optimally in the overall concept of every CLAAS cab.

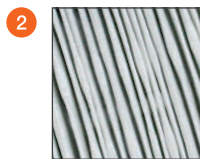
The next page shows you the key characteristics which define a CLAAS ORIGINAL cab air filter.

**Gasket**

This gasket is matched optimally to the cab geometry.

How you benefit:

- Lasting protection against pollutant penetration

**Filter paper/activated charcoal**

Depending on the application, it is possible to use a paper filter or an activated charcoal one. The fresh air supply to the cab forms a single unit with the filter and the fan. These two components must be coordinated perfectly.

How you benefit:

- Controlled and protected fresh air supply

What can happen if unsuitable filters are used?

The natural contamination of the engine oil, e.g. through internal engine friction, must be filtered out quickly and efficiently. Engine oil contaminants coming from outside, in the form of dust, place an additional burden on the filter and must not reach the lubrication points in the engine.

Furthermore, in contrast to the commercial vehicle sector, agricultural machines operate at high engine revs which are detrimental to the filters. They generate higher lubrication oil pressures which non-genuine filters are not always able to withstand in the long term.

The pictures on page 39 show what can happen to an engine when an unsuitable filter is fitted. The high external pressure has caused the filter paper of the engine oil filter to be compressed into bundles. As a result, the filter area, which was already smaller than that of the CLAAS ORIGINAL filter, has been reduced even further. The remaining filter area was

subject to ever greater loads which increased the pressure and led to internal leaks. These leaks go unnoticed in use as the normal oil pressure is attained. But they allowed the contaminated oil to reach the lubrication points of the engine without having been filtered. The result was catastrophic engine damage.

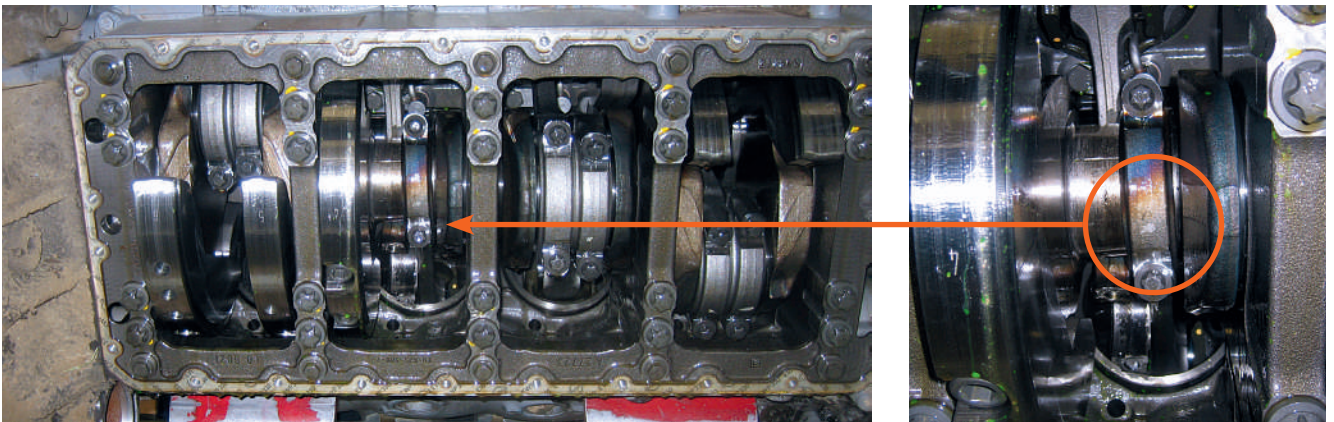
What made the situation particularly annoying for the customer was that the engine manufacturer refused to accept a warranty claim for the damage or to handle it on a goodwill basis because an approved oil filter had not been used. The customer therefore not only suffered from the non-availability of the machine, but also had to pay for a costly replacement engine.

Only CLAAS ORIGINAL filters are approved. So only use the correct CLAAS ORIGINAL filter for your particular application.

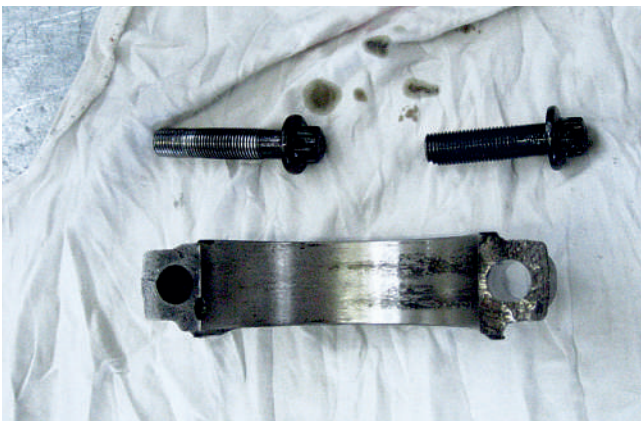
Note

Possible consequences of using unsuitable filters:

- Interior leaks as a result of increased oil pressure
- Dirty oil reaches engine lubrication points which are subject to extreme loads
- Engine damage
- Loss of warranty cover
- Machine unavailable for work
- High repair costs



View of the damaged connecting rod bearing. Clearly visible from outside: discolouration (temper colour) of the connecting rod bearing cap. This discolouration is a result of an excessive thermal load caused by increased friction within the engine.



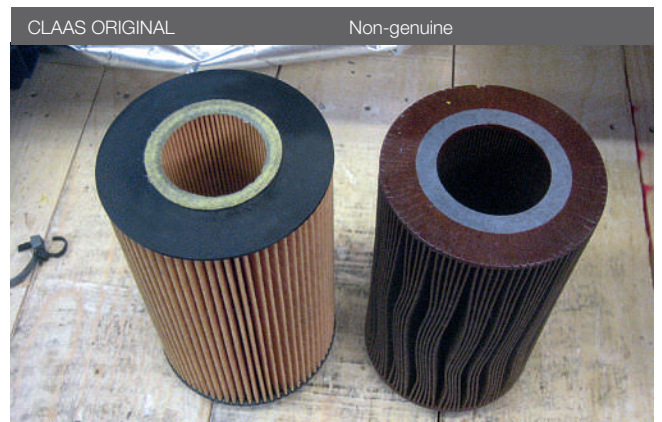
Connecting rod bearing bolts damaged or broken.



Connecting rod bearing cap with brittle fracture surfaces.



Wrecked connecting rod bearings with fragments of the cylinder liner.



On the left, a new CLAAS ORIGINAL filter, on the right, a defective non-genuine filter (in use <20 hrs.) This comparison shows that there is no gasket on the non-genuine filter. This results in internal leakages which cannot be detected when the engine is running as oil pressure remains available. This leads to bundle formation in the filter paper which can cause the filter to collapse.

Filter test purchases – Comparison of ORIGINAL and non-genuine filters.

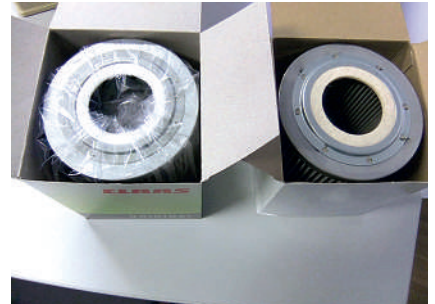


There is a huge choice of apparently compatible filters at extremely favourable prices in the accessories market. But how do these non-genuine filters differ from the ORIGINAL? CLAAS purchased a selection of current filters and assessed them visually.

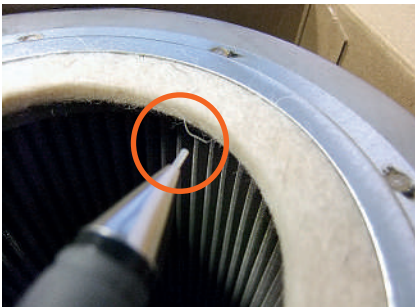
We have summarized the differences between CLAAS ORIGINAL and non-genuine filters on the pages which follow.

Hydraulic oil filter

A proper manufacturing process is essential for today's filters. Damage or dirt ingress resulting from the manufacturing process must be prevented right from the start. This is essential to ensure that the filter functions reliably.



As soon as they are manufactured, CLAAS ORIGINAL filters are packaged in protective plastic bags to ensure immediate protection against dirt ingress. No such measure is taken in the case of the non-genuine filter.



On the non-genuine filter, fibres can already be seen separating from the felt gasket (on the filtered oil side). This can result in contamination of the hydraulic system and lead to malfunctions.



A careless manufacturing process can leave clearly visible welding spatter on the end disc. It may be assumed that the resulting weld burns also made small holes in the filter paper. Proper filtration of the oil can therefore no longer be guaranteed.



CLAAS ORIGINAL filter: no weld spatter, a properly sealed end disc, no fibre residues. Lasting filtration performance is ensured from the very start.

Engine oil filter

The internal seal between the unfiltered side and the filtered side is considerably wider in the CLAAS ORIGINAL filter than in non-genuine filters. This means that there is better separation and sealing between the two sides in the ORIGINAL filter. The inadequate strength of the seal in the non-genuine filters can lead to an internal leak which would allow unfiltered oil to reach the lubrication points.



As soon as they are manufactured, CLAAS ORIGINAL filters are packaged in protective plastic bags to ensure immediate protection against dirt ingress. No such measure is taken in the case of the non-genuine filter.



The packaging of the non-genuine filter is badly damaged. There is a risk of dirt entering the filter.



The non-genuine filter only has a narrow sealing lip. There is a risk of an internal leak.



CLAAS ORIGINAL filter: the wide sealing lip significantly reduces the risk of an internal leak.

Cab air filter

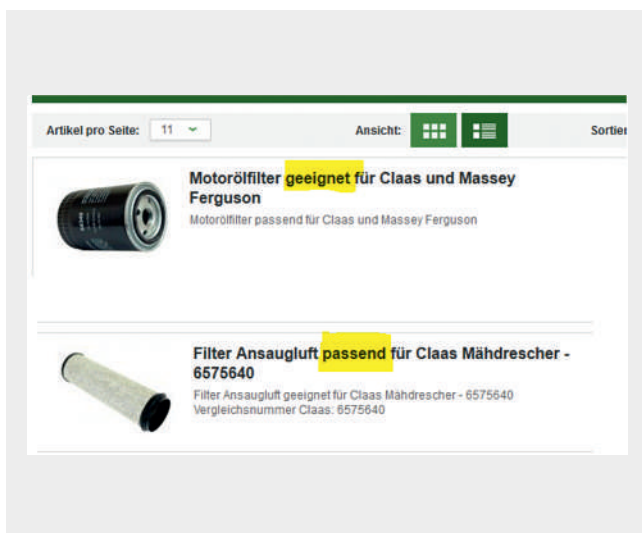
Deficient bonding means there is nothing to stop pollutants from reaching the operator in the cab.



The bonding of the important sealing lip on the non-genuine filter is inadequate. As a result, unfiltered air can reach the operator in the machine.



CLAAS ORIGINAL filter: tested in accordance with European Standard 15695-2:2009. Compliance with this standard means that the filter provides the operator in the cab with sufficient protection against environmental factors (dirt, dust, pollen). There is no such certification of compliance on the non-genuine filter.



Example of website selling non-genuine filters.



Points to remember when buying filters

Caution: do not rely on "vague" claims, such as "compatible with" and "suitable for". Important characteristics concerning dimensions, filtration performance and quality (see examples) may not correspond to the high standards of the ORIGINAL filter products. Order all filters for CLAAS machines through official CLAAS sales channels in order to be certain that they are 100% correct for your machine.



CLAAS Service and Parts GmbH
Mühlenwinkel 1
33428 Harsewinkel
Germany
Tel. +49 (0)52 47 12-0
claas.com