



GENUINE VOLVO MAINTENANCE PARTS, LUBRICANTS, COMPETITIVE COMPARISON



Competitive Comparison

This competitive comparison focuses on the main competitive arguments that can help the sales discourse.

GENUINE VOLVO LUBRICANTS

Introduction

Volvo Engine oil

Volvo Hydraulic oil

Volvo Automatic Transmission Fluid

Volvo Wet Brake Oil

Volvo Gear Oil

Volvo Lubricants performance

Conclusion

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Volvo invests significant resources in the development, testing and approval of Volvo Lubricants. New and improved generations of Volvo Lubricants are always in the pipeline. The key drivers behind this investment are the desire to continually enhance the performance and uptime of Volvo machines for Volvo customers, while reducing the cost. It can take several years from the initial concept to the final launch of a lubricant. Dedicated personnel work exclusively with lubricant development and thousands of hours annually are spent testing Volvo Lubricants in Volvo machines. This is a clear indicator of Volvo's commitment to Volvo Lubricants and to Volvo customers.

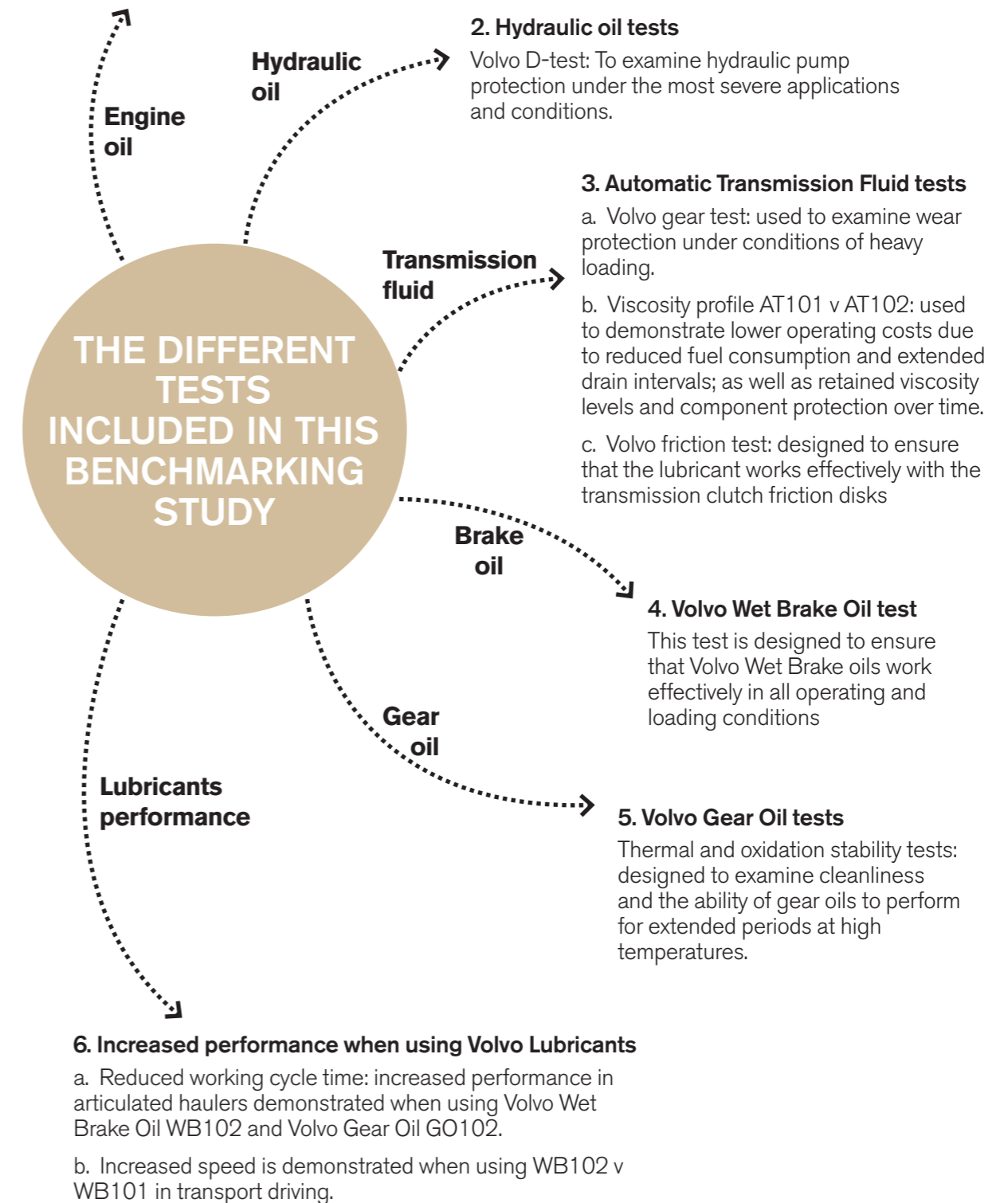
Volvo Lubricants are quality assured, fit for purpose and tested for applications in real life environments. Only by using Volvo Lubricants is it guaranteed that the machine will function as originally intended, with the same performance capabilities, component protection and optimized service intervals. This leads to less downtime, less waste and a longer machine life.

A series of tests were set up to demonstrate the advantages of the different classes of Volvo Lubricants versus market general oils. Many of these tests are routinely performed to ensure the quality and performance of Volvo Lubricants.

WHILE VOLVO CAN GUARANTEE THE QUALITY OF VOLVO LUBRICANTS IT IS EVIDENT FROM THE TEST RESULTS THAT THE QUALITY OF MARKET GENERAL PRODUCTS VARIES GREATLY.

1. Engine oil tests: employed to compare Volvo Engine oil versus market general engine oils to determine engine and component protection.

- a. Hot tube test: designed to examine the resistance of oils to deposit formation at high temperatures, which is a measure of engine cleanliness.
- b. Component wear test – to determine component wear after 250h
- c. Piston deposit test: a complete engine test to measure soot deposits, a measure of engine protection.



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Different tests were identified to examine the performance of Volvo Engine Oils versus market general engine oils. It is very important for long engine life that engine oils protect the engine against all sources of corrosion and component wear, and that they are resistant to oxidation at high temperatures whilst also preventing deposit formation (keeping a clean engine).

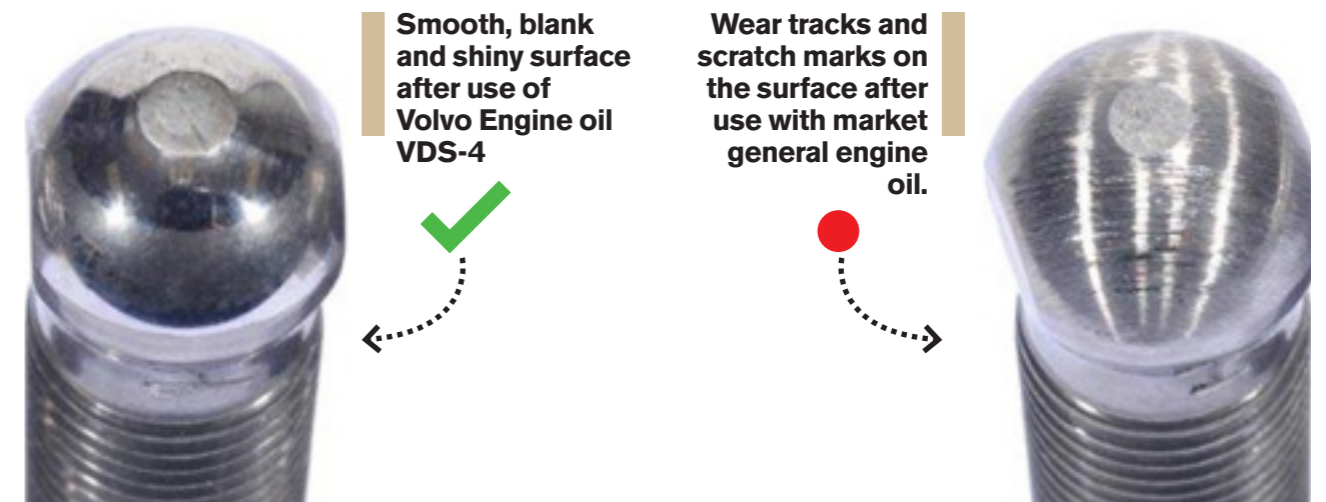
A) HOT TUBE TEST:

Designed to examine the resistance of deposit formation at high temperatures. Volvo Engine Oil VDS-3 and VDS-4 were compared to a market general product. The results show that Volvo Engine Oils have a minimal risk of deposit formation and hence engine cleanliness and efficiency are maintained. The market general engine oil exhibits a considerably elevated risk of deposit formation. This risk increases at higher temperatures. (Deposits lead to increased friction and reduced engine efficiency).

	Volvo Engine Oil VDS-3	Volvo Engine Oil VDS-4	Market general engine oil
Test at 290°C	Minimal risk ✓	Minimal risk ✓	Medium-high risk ●
Test at 300°C	Minimal risk ✓	Minimal risk ✓	High risk ●

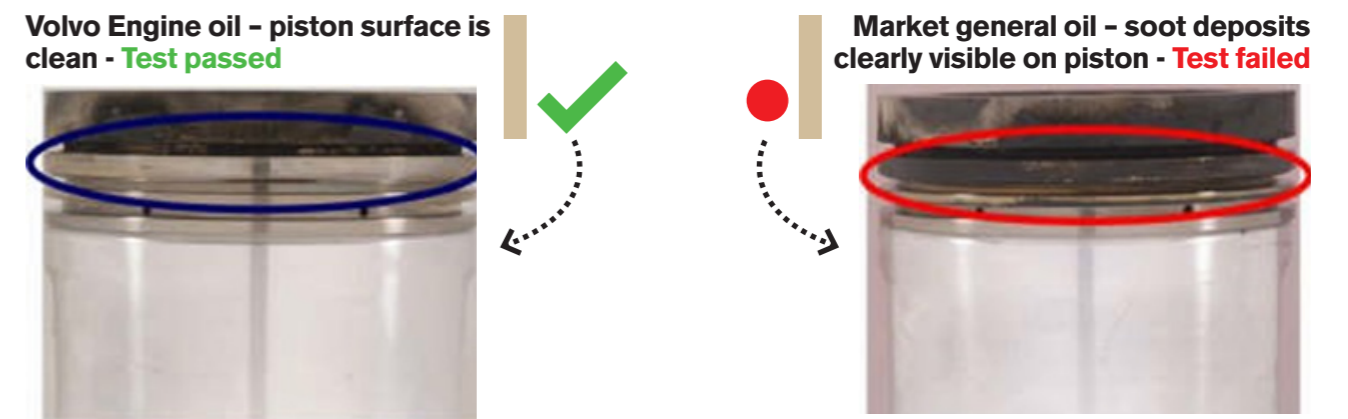
B) COMPONENT WEAR TEST:

Component wear was compared after a complete engine test run for 250h. After use with Volvo Engine Oil VDS-4 the injector adjuster screw head remains shiny with minimal wear. After use with the market general oil clear signs of component wear (wear tracks/ scratch marks) are evident. This demonstrates that Volvo Engine Oil VDS-4 gives superior protection against component wear.



C) PISTON DEPOSIT TEST:

This test is designed to demonstrate piston deposits after 400h. This is an indicator of the engine oil performance and life. Piston deposits have a significant impact on the life of the engine, as an increase in piston deposits can lead to an increase in bore polish and wear. With Volvo Engine Oil the piston surface remains clean. whilst soot deposits are evident on the piston surface after use with the market general oil.



It is clear from the results above that significant variation exists in the quality of engine oils on the market. However Volvo Engine Oil provides superior engine cleanliness and protection against component wear, corrosion and deposit formation thereby increasing engine life.

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The hydraulic system is critical to the operation of all construction machines. If the hydraulic system does not operate efficiently it will result in increased time and costs for performing a task.

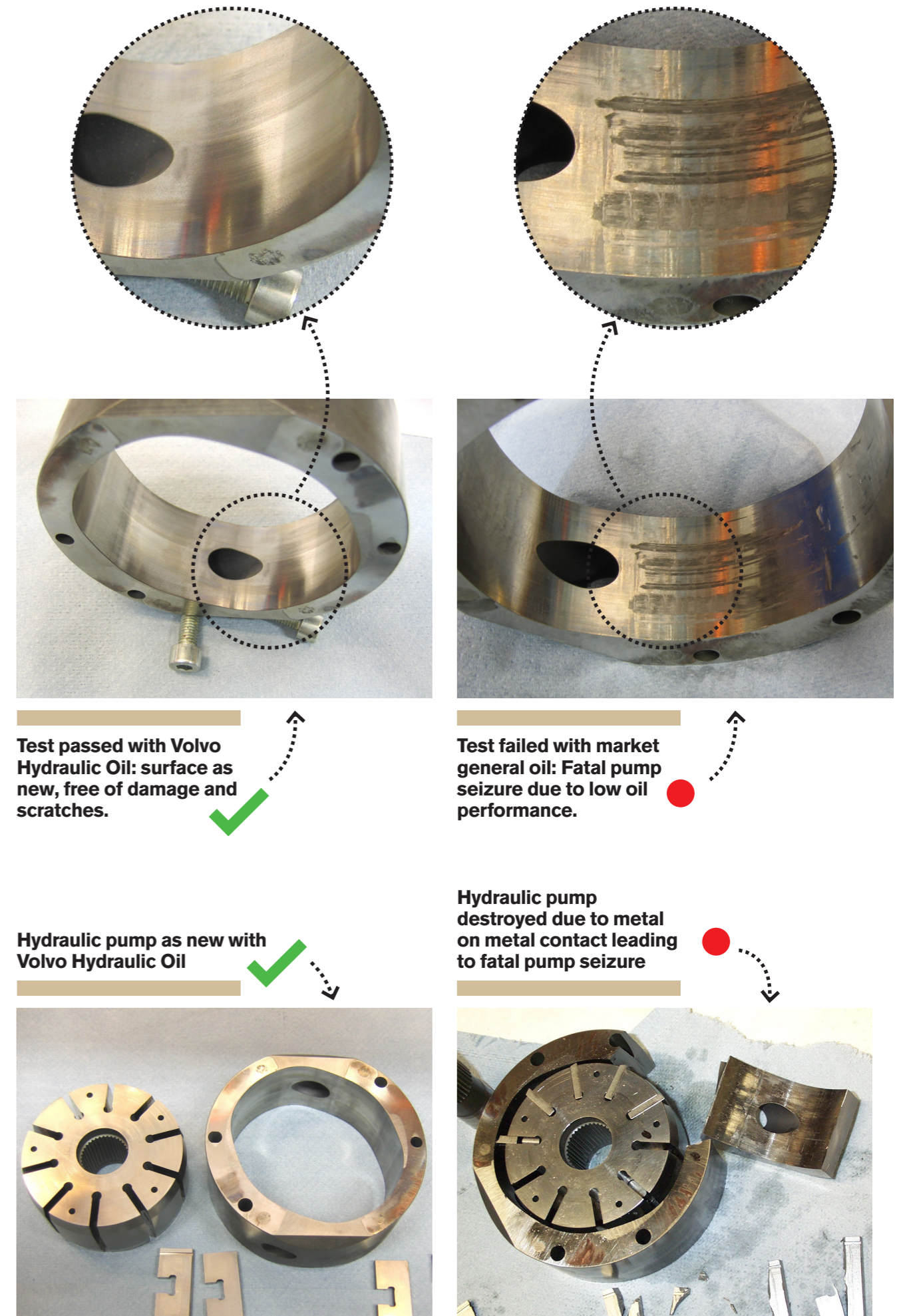
It is therefore essential to ensure that the hydraulic oil that is used enables optimal performance of the hydraulic system while offering effective component protection.

VOLVO D-TESTS:

Bench tests designed to determine protection against corrosion and wear given by the hydraulic oil to the hydraulic pumps in the most severe applications under the most severe operating conditions. Only those hydraulic oils demonstrating outstanding wear protection will pass these tests. Volvo Hydraulic oil* was tested against a market general product in the Volvo D-test. Results confirmed that Volvo Hydraulic oil offered outstanding corrosion and wear protection, even under the most severe conditions. The market general product failed to pass the Volvo D-test.

*Volvo Super Hydraulic Oil, Volvo Ultra Hydraulic Oil and Volvo Biodegradable Hydraulic Oil have all passed the Volvo pump tests.

Volvo Hydraulic Oils offer the necessary protection for the hydraulic pump in all applications and under all operating conditions ensuring optimal performance and uptime.



Test passed with Volvo Hydraulic Oil: surface as new, free of damage and scratches.

Test failed with market general oil: Fatal pump seizure due to low oil performance.

Hydraulic pump as new with Volvo Hydraulic Oil

Hydraulic pump destroyed due to metal on metal contact leading to fatal pump seizure

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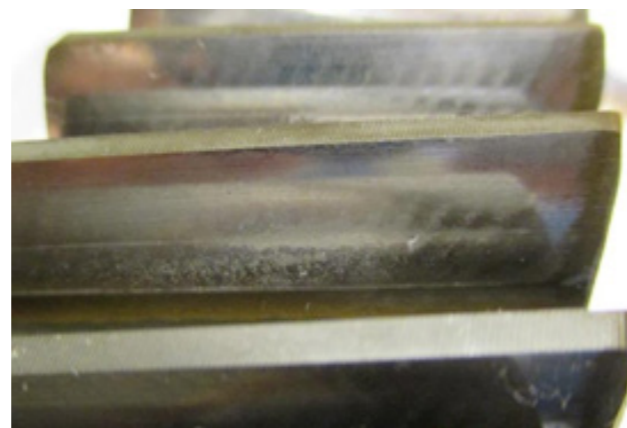
DOUBLED SERVICE INTERVAL UP TO 4 000 HOURS

It is important that the oils used in Volvo machines provide component protection under conditions of heavy loading whilst also reducing operating costs. The following tests outline the performance of Volvo Automatic Transmission Fluid in these key areas.

A) VOLVO GEAR TEST:

This test is designed to recreate the type of loadings which Volvo machines undergo. The main factors being examined are gear pitting and scoring. This is an indicator of the ability of oils to protect against wear in extreme conditions of heavy loading. With the competitor oil, cracks have formed leading to pitting on the surface of the gears, indicating insufficient protection under loading. No damage to the gears is evident when using Volvo Automatic Transmission Fluid, outlining the superior protection that is provided against pitting even in the harshest conditions.

Note: This test is routinely performed on all Volvo Automatic Transmission fluids and Volvo Gear Oils.



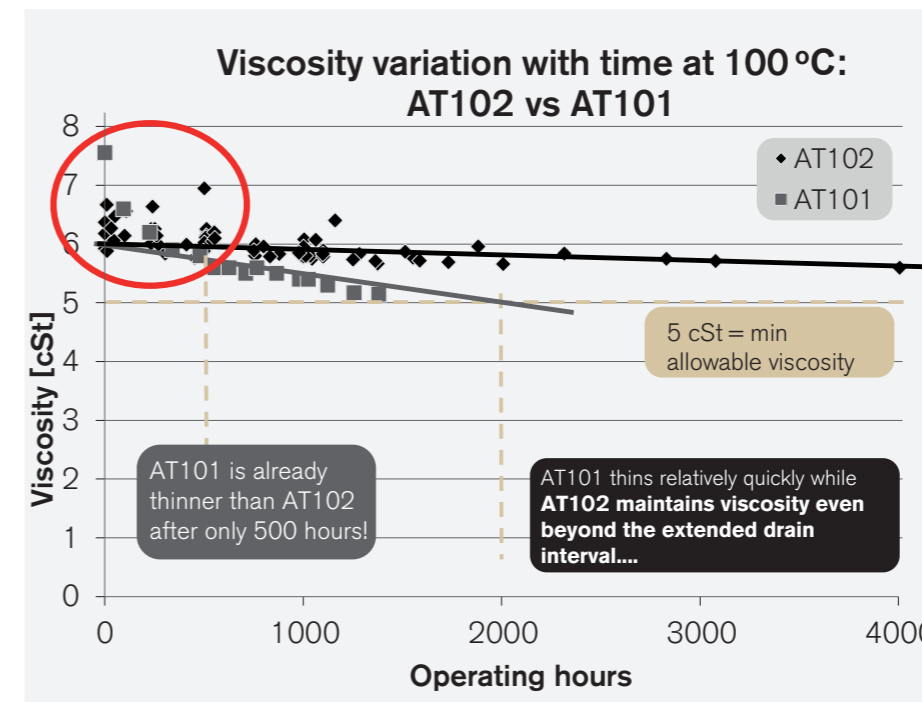
Volvo ATF - no damage to the gears



Market general ATF - Clear evidence of pitting damage on the surface of the gears

B) VISCOSITY PROFILE AT101 V AT102:

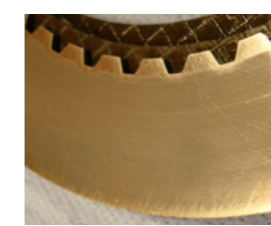
Volvo places huge importance on the development of new lubricants with the key drivers being increased performance and uptime. By examining the viscosity profile of AT101 versus AT102, it becomes clear how using AT102 leads to a doubling of the service intervals and a reduction in fuel consumption. Both contribute to a significantly lower operating cost for Volvo customers, while having a positive effect on the environment. In addition, viscosity levels and component protection are maintained over time.



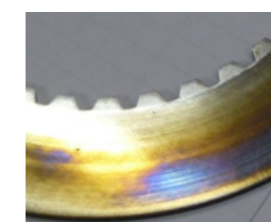
AT102 demonstrates a stable viscosity over 4000h while friction characteristics are maintained, with indications that the drain interval can even be extended further.

AT101 has a higher viscosity at time 0 which leads to higher fuel consumption (i.e. more energy is required to move thicker oil.)

AT101 reaches the minimum allowable viscosity (5cSt) after 2000h, reflective of its service interval.



Undamaged steel clutch plate with Volvo Automatic Transmission Fluid



Hot spots evident on the steel clutch plate

C) VOLVO FRICTION TEST:

For this test the type of speeds and loadings that are commonly found in Volvo CE's transmissions were recreated. The results show hot spots on the metal surface when using the market general oil. This indicates that the steel material has been exposed to too high a temperature and that the oil does not meet the demands required by Volvo machines. In contrast when Volvo Automatic Transmission Fluid has been used the steel surface remains as good as new showing the superior oxidative and high-temperature protection of Volvo Automatic Transmission Fluid.

Note: This test is routinely performed on all Volvo Automatic Transmission fluids.

In conclusion by using Volvo oils, customers are offered longer service intervals (compared to non-Volvo oils) which can be depended upon, to allow for planned maintenance. Reductions in fuel consumption are also achieved.

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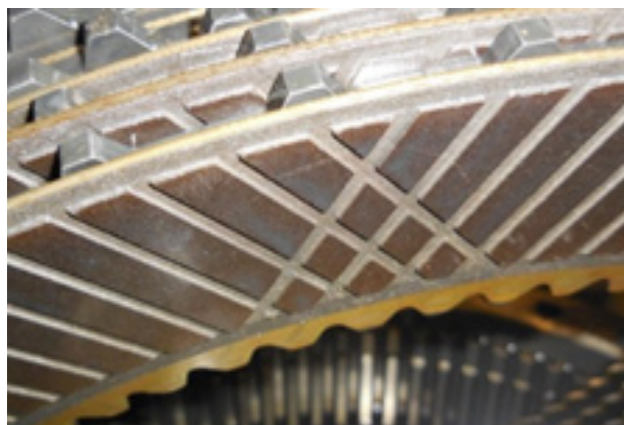
Different tests were identified to examine Volvo Wet Brake Oil performance versus market general oils. It is very important that Volvo Wet Brake Oils provide efficient and effective performance under all operating conditions, thereby meeting the demands of Volvo machines.

VOLVO WET BRAKE TEST:

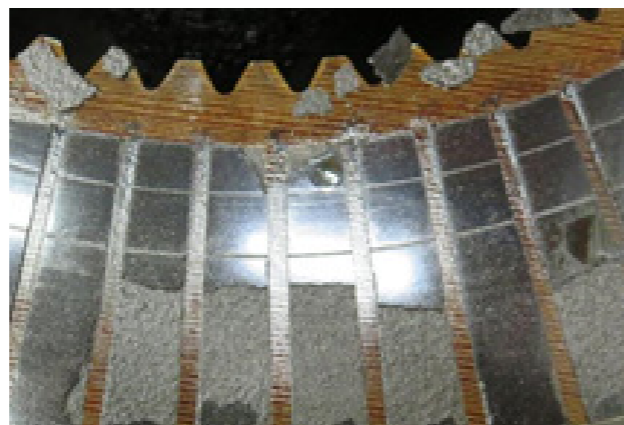
This test is designed to determine if wet brake oils exhibit the correct friction profile needed for smooth and effective operation of the brakes in all conditions and under all possible loadings. The market general wet brake oil fails the Volvo Wet brake test and clear signs of wear and glazing are evident on the brake plates from the field trial. No damage is evident with the use of Volvo Wet Brake Oil indicating superior performance under all conditions.

Note: This test is routinely run for Volvo Wet Brake oils.

Successful field trial with Volvo Wet Brake Oil. Undamaged brake plates. Test passed



Failure of market general oil during field trial. Clear signs of wear on the brake plates. Test failed



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Gear oils: the chemical and physical properties of a lubricant and the ability to function properly in the application are affected by the temperature and the amount of time the fluid is exposed to the elevated temperature.

VOLVO GEAR OIL GO102 OUTPERFORMS THE MARKET GENERAL PRODUCT INDICATING ITS ABILITY TO FUNCTION IN A GIVEN APPLICATION WHEN EXPOSED TO HIGHER TEMPERATURES FOR LONGER PERIODS.

THERMAL AND OXIDATION STABILITY TEST:

This test was designed to look at the performance of Volvo Gear Oil GO102 and a market general gear oil under conditions of elevated temperatures for extended periods.

The results show that use of the market general product results in gears which are heavily coated in oil 'varnish', which affects performance and can flake and block filters. When Volvo Gear Oil GO102 is used the gears remain clean.



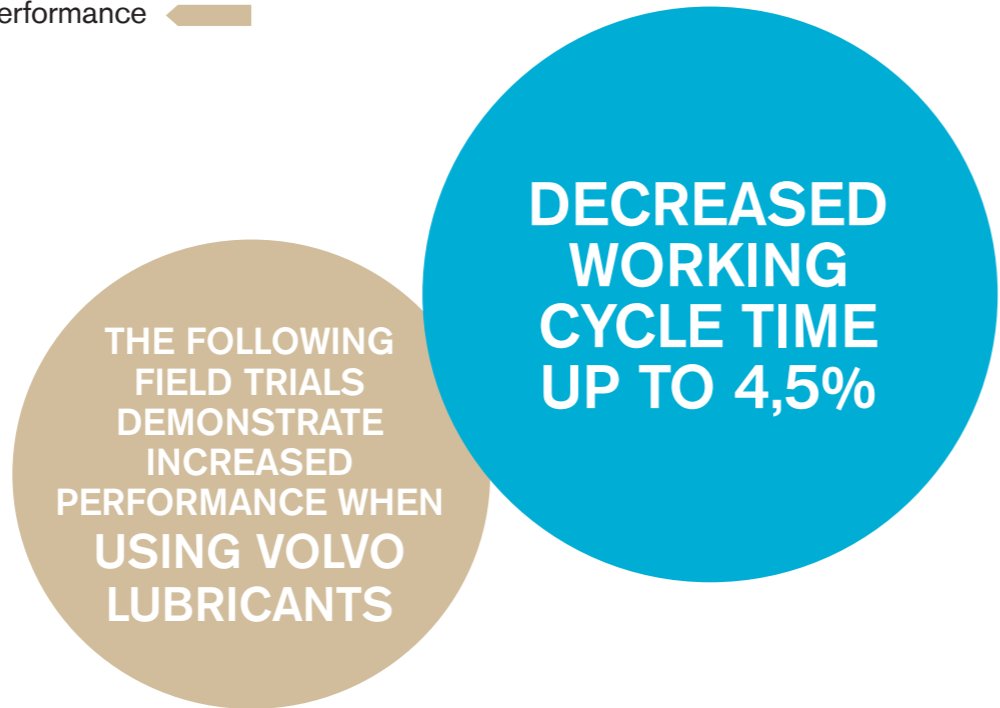
Gears are clean after use of Volvo Gear Oil GO102.



Gears after use of market general GL-5 gear oil showing thick varnish.

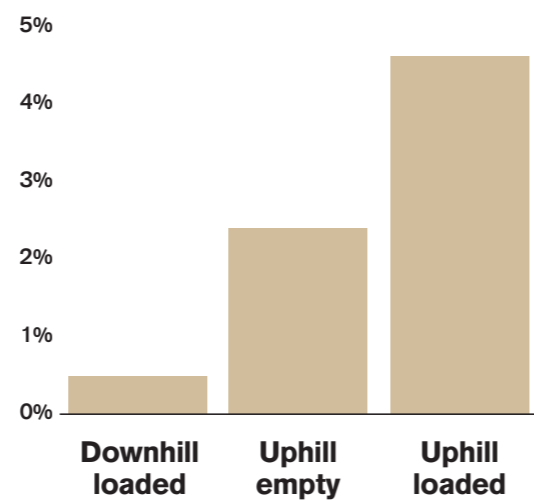
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A reduction in working cycle time is demonstrated in articulated haulers when Volvo Wet Brake Oil WB102 and Volvo Gear Oil GO102 are used. In this study the performance was measured under different conditions and varying loads. The results show that there is a decrease in cycle time up to 4.5%. Greater reductions are seen under tougher operating conditions i.e. uphill loaded. These decreases in the working cycle time enable an increase in machine productivity and performance.

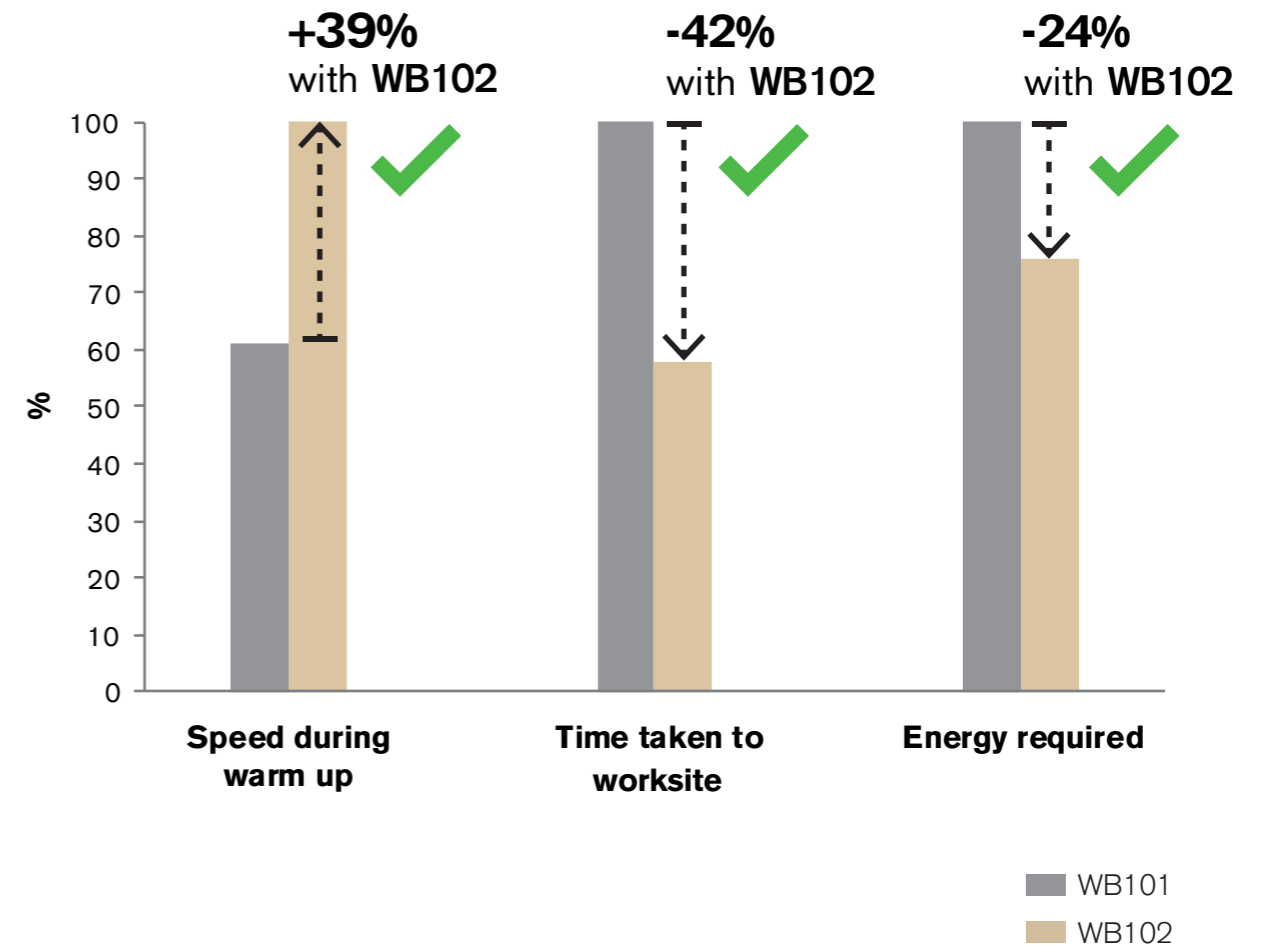
Cycle time reduction A35E



Improved performance with WB102: Machine performance (speed) was examined with a L60F for WB102 v WB101 during cold start from machine standstill.

WB102 reduces the energy required to move your machine. Measurements for an L60F wheel-loader show that, from cold start, the time to reach the worksite was reduced by 42% because the machine could travel faster due to less energy wastage. The maximum measured speed difference during this warm-up journey was as much as 39%.

WB102 v WB101



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As a summary of the tests outlined above, Volvo Lubricants outperform the other oils in terms of cleanliness, protection against deposit formation and wear under all operating conditions and temperatures, thus ensuring longer engine and component life. The latest generation of Volvo oils exhibit significant advances in terms of reduction in fuel consumption and cycle time. With Volvo Lubricants, machine availability is increased by the offer of extended drain intervals and a service programme that can be depended upon meaning maintenance can be properly planned. This not only has a positive effect on performance but also on the customer's pocket and the environment.

Volvo guarantees the quality, reliability and compatibility of Volvo Lubricants with Volvo machines. Volvo also guarantees customer peace of mind with the assurance that Volvo Lubricants are the best choice for Volvo machines.

Volvo continues its commitment and investment in Volvo Lubricants with further advances in performance, uptime and cost savings to come in the future.



VOLVO

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