

Shell PANOLIN

Change Over Advice

April 2024



**SHELL
LUBRICANT
SOLUTIONS**



**Shell
PANOLIN**

Lubricants play a vital role in keeping the world moving and machinery operating efficiently. As the world's need for mobility, construction and industrial production grows, the demand for lubricants will also increase. There is a shared responsibility to meet this rising demand while reducing the environmental impact of lubricants.

Shell PANOLIN biodegradable lubricants are advanced synthetic fluids specifically developed to have reduced environmental impact and to help customers to meet the requirements of the US EPA 2013 VGP (Vessel General Permit) and other standards such as the Swedish Standard. In addition, many products in the Shell PANOLIN range hold EU Ecolabel certification.

The Shell PANOLIN range offers biodegradable lubricants designed to provide excellent equipment protection in harsh conditions.

For customers looking to take concrete steps towards improving their sustainability, Shell PANOLIN lubricants present an easy choice. The products can help extend service intervals (compared with conventional mineral oils), extend equipment life and improve efficiency.¹ They are well-balanced technically and readily biodegradable,² with low ecotoxicity.³

Shell PANOLIN lubricants are a single solution to protect equipment and the environment to help customers navigate regulatory requirements and improve environmental stewardship.




1 Shell PANOLIN S4 HLP Synth, the first Bosch Rexroth-approved biodegradable hydraulic oil, is designed to help equipment operate without interruptions. Measured using industry standards. Actual effects and benefits may vary. No guarantees provided.




2 Source: ASTM D6384-99, "Standard Terminology Relating to Biodegradability and Ecotoxicity of Lubricants" and as defined by EU Ecolabel, particularly when using test adaptations focused on lubricants, such as in EN.

3 Shell PANOLIN finished lubricants are tested in accordance with OECD 202 to determine toxic potential; ecotoxicity terminology is defined by ASTM D 6384-99, "Standard Terminology Relating to Biodegradability and Ecotoxicity of Lubricants".





Changeover and maintenance is a seven-stage process, which is detailed in the following pages. Stages 1-4 cover the changeover process, stages 5-7 cover maintenance.



Stage 	Process 	Additional Guidance 
1. Draining	<ul style="list-style-type: none"> • Run the system up to operating temperature • Take an oil sample • Drain oil from the entire system • Wipe tank with a clean, dry rag • Check oil tank for cleanliness and clean if necessary 	<p>Warm fluid will be easier to drain, therefore run the system until operating temperature is reached. Take a sample for Shell Lube Analyst analysis. Drain oil from the entire system (e.g. tank, cylinder, gearbox housing, oil pan, coolers, tubes, hoses, etc.). To remove as much of the existing oil as possible, wipe any reservoir, tank or accessible space with a clean, dry rag. Check oil tank for cleanliness specifically at this stage, and clean if necessary. Cleaning the tank and draining the components will help eliminate contaminants during flushing.</p>
2. Flushing	<ul style="list-style-type: none"> • Prevent air in the system during flushing process • Fill the tank with 30 to 50% of system capacity or according to OEM specification • Run the system up to operating temperature • Drain the flushing fluid • Flushing fluid should be the lubricant you intend to flush with 	<p>During the flushing process, no air should enter the system or suction inlet of the pumps. Air in the system will prevent thorough flushing and could create cavitation or cause further damage to your system. From our experience, filling the tank with 30 to 50% of the system capacity is adequate for flushing. Do not operate the system with less than the OEM-specified minimum fluid requirements. Please be aware that some systems might require complete filling for the flushing procedure. Run the system up to temperature by operating all functions. Then drain the flushing fluid. This will help to release contaminants and eliminate residual fluid. To avoid any negative impact on the Shell PANOLIN product, please use the replacement fluid in the correct viscosity when flushing. Using alternative fluids for flushing can jeopardise the correct viscosity grade, performance and environmental benefits of the new fluid.</p>
3. Filter	<ul style="list-style-type: none"> • Replace filter cartridges • Check filters regularly • Replace the necessary seals and strainers 	<p>Replace filter cartridges (if applicable). Shell PANOLIN fluids may have a cleaning effect on your system and remove deposits produced by former lubricants. This cleaning effect will start during the flushing process, therefore please check your filters regularly. Replace the necessary seals and strainers. Shell does not specify or require any particular filter material.</p>
4. Filling	<ul style="list-style-type: none"> • After flushing the system completely, fill with Shell PANOLIN lubricant • Top up fluid if you need to remove air or perform a system bleed 	<p>After flushing the system completely, fill with the replacement Shell PANOLIN fluid. Make sure the system is adequately filled to OEM specifications and always use the viscosity class prescribed by the equipment manufacturer. If you need to remove air from the system or perform a system bleed, make sure to top up fluid levels afterwards if necessary.</p>



Stage 	Process 	Additional Guidance 
5. Operating and Control	<ul style="list-style-type: none"> • Start with a time zero sample after initial warm-up procedure • Check oil samples regularly • Water content must not exceed max limit of 0.1% (1000 ppm) • In case of problems, inform Shell and conduct an oil analysis with Shell LubeAnalyst 	<p>We recommend establishing a regular sampling schedule by starting with a zero sample after an initial warm-up procedure for Shell LubeAnalyst analysis. If you already have a fluid testing program in place, our general recommendation is to check oil samples regularly. Water content must not exceed the maximum limit of 0.1% (1000 ppm). This corresponds to the general recommendation for conventional mineral oils. Measures recommended by Shell after the oil examination, such as dehydration, filtration or the like, must be implemented/adhered to. After implementation of the measures, a further control sample must be taken after an initial warm-up procedure.</p> <p>In case of problems, the machine operator/owner is in any case obliged to inform Shell immediately. In addition, the machine operator/owner must immediately carry out an oil sample and send it to Shell for Shell LubeAnalyst analysis. Shell reserves the right to take an oil sample itself or to ensure that the sampling is carried out properly.</p>
6. Mixing	<ul style="list-style-type: none"> • Do not mix any mineral oils or synthetic fluids with Shell PANOLIN biodegradable lubricants • Mineral oil residue must not exceed 5% of total filling quantity • Some manufacturers and eco-labels set the limit for foreign oils below 5% (e.g. ISO 15380 max 2% of mineral oil-based fluids) 	<p>Do not mix any mineral oils or synthetic fluids with Shell PANOLIN lubricants. Mixing any incompatible fluids with Shell PANOLIN lubricants can lead to malfunctioning and damage to the system due to incompatibility. For technical reasons, the mineral oil residue must not exceed 5% of total filling quantity. Furthermore, mixing can negatively affect performance and/or environmental requirements with eco-labels, and seriously impair the high quality of Shell PANOLIN lubricants. Some manufacturers and eco-labels set the limit for foreign oil content below 5%. These regulations take precedence over Shell PANOLIN recommendations. According to the ISO 15 380 guideline, biodegradables may only be mixed with up to 2% mineral oil-based fluids.</p>
7. Microfiltration	<ul style="list-style-type: none"> • Microfiltration helps to filter out any residues, debris and water 	<p>Microfiltration can help to filter out any residues, debris and water that have accumulated over a longer period of time. It can also help to maintain the cleanliness level if oil drain intervals are prolonged.</p>

Product Specifications

Please consider the following product specifications in addition to the recommendations in the previous pages.

Product name	Additional Guidance
	
Hydraulic Fluids	
	<p>To ensure the operational safety, reliability and durability of machines, plants and components throughout their service life, particle contamination (abrasion, dust, etc.) must be minimised to comply with cleanliness class 17/13 or 21/17/13 (according to ISO 4406).</p> <p>Manufacturer's instructions must be followed at all times. According to the ISO 15 380 guideline, biodegradables may only be mixed with up to 2% mineral oil-based fluids. Shell PANOLIN hydraulic fluids may remove deposits produced by former hydraulic fluids (see section 2).</p> <p>For oil sampling, please consult the Shell LubeAnalyst Sampling Guidelines. When converting the system, attachments (e.g. hydraulic breakers and quick couplings on excavators, etc.) have to be included in the conversion procedure.</p>
<p>Shell PANOLIN S4 HLP SYNTH</p> <p>Shell PANOLIN S4 HLP SYNTH EAL</p>	<p>Depending on use and application, Shell PANOLIN HLP SYNTH* can greatly prolong oil change intervals up to lifetime filling compared to mineral oil-based hydraulic oils. Do not mix Shell PANOLIN S4 HLP SYNTH or Shell PANOLIN S4 HLP SYNTH EAL (Environmentally Acceptable Lubricant) with other readily biodegradable hydraulic fluids (such as HEES, HEPR, HETG or HEPG as per ISO 15380). Shell PANOLIN S4 HLP SYNTH and Shell PANOLIN S4 Hydraulic EAL are fully miscible and compatible with each other. The full performance (lifetime fill potential) of Shell PANOLIN S4 HLP SYNTH* will be achieved only if not mixed with any other fluid.</p> <ul style="list-style-type: none"> • HEES - Synthetic Esters • HEPR - Polyalphaolefins • HETG - Vegetable oils • HEPG - Polyglycols
<p>Shell PANOLIN S4 Hydraulic H1 EAL</p>	<p>Due to the fact that this lubricant is used in food processing machinery, special care must be taken with regard to cleaning and flushing the system. Mineral oil is unacceptable in food-grade applications.</p>

Product name	Additional Guidance
	
Gear Oils	
S4 Gear S4 Gear EAL S4 Gear RS 80W90	<p>Due to their anti-wear properties, Shell PANOLIN gear oils reduce micro-wear of surface roughness on friction surfaces in aggregates. For optimal benefit from the characteristics, a prolonged and smooth running-in procedure is recommended. Shell PANOLIN gear oils may remove deposits produced by former gear oils (see section 2).</p>
Stern Tube Oils	
S4 Stern Tube EAL	<p>As a supplier of lubricants, Shell is not directly involved in the design or installation of stern tube lubrication systems. Lubrication systems and stern tube bearing designs differ from vessel to vessel. For these reasons, the information provided below should be treated as generic guidance that may contain steps that are not relevant to all installations. Shell recommends in all cases that the original equipment manufacturer (OEM) should be consulted for advice before to converting to Shell PANOLIN products.</p> <p>In stern tube applications, Shell recommends no more than 5% of the old oil being present in the new oil, regardless of the previous oil type. This thorough flushing will remove any water present and dilute the additives of the previous oil to a safe level, thereby ensuring the lubrication performance and biodegradability of Shell PANOLIN S4 Stern Tube Fluid.</p> <p>Before commencing any changeover, ensure that the materials used for seals, flexible hoses, O-rings and tank coatings are compatible with Shell PANOLIN S4 Stern Tube Fluid. Check with the OEMs concerned to confirm compatibility or approvals for use of Shell PANOLIN S4 Stern Tube Fluid in the system.</p> <p>The best option is to draw the shaft and to clean the stern tube manually. Of course, this is not practical in most cases. Consequently, the general flushing recommendations are as follows:</p> <ol style="list-style-type: none"> 1. If possible, operate the system until the normal working temperature is reached. 2. Take an oil sample for Shell LubeAnalyst analysis. 3. Drain the existing stern tube oil through the drain line. 4. Drain the aft seal, including the aft seal tank, through the drain line. 5. Drain the forward seal, including the forward seal tank, through the drain hole on the forward seal housing. 6. Using Shell PANOLIN S4 Stern Tube Fluid, fill the stern tube oil tank, the forward seal tank and the aft seal tank. 7. If the vessel has a circulation pump, circulate the fluid for 2–3 hours. 8. Drain the oil from the whole system using pneumatic pumps if required. 9. Blow air through the aft seal chambers to remove any remaining oil. 10. Fit new filters. 11. Continue with maintenance and replace seals (Note: Check to ensure that the seals are compatible with Shell PANOLIN S4 Stern Tube Fluid). 12. Fill system again with Shell PANOLIN S4 Stern Tube Fluid. 13. Take a sample of the new oil charge for Shell LubeAnalyst analysis.
UTTO Lubricants	
Shell PANOLIN Biofluid PRS 32 Shell PANOLIN Biofluid ZFH	<p>Do not mix any mineral oils or synthetic fluids with Shell PANOLIN PANOLIN Biofluid lubricants as they might be incompatible and modify the friction characteristics. This can lead to malfunctioning of gear shifting or noisy wet brakes. When converting the system, attachments fed from tractor hydraulic systems (e.g. tractor trailers, hay balers, etc.) have to be included in the conversion procedure.</p>

Product name	Additional Guidance
	
Engine Oils	
Shell PANOLIN Biomot LX 10W-40 Shell PANOLIN Biomot LE-X 5W-30	As an oil sampling schedule for diesel and petrol engine oils, we recommend taking an oil sample before the recommended oil drain interval (OEM maintenance specifications).
Cable/chain Lubricants and Greases	
Shell PANOLIN S5 Grease EAL V320 2 Shell PANOLIN S5 Grease EAL A600P 1 Shell PANOLIN S5 Grease EAL A460 0	Clean surfaces before applying new lubricant/grease. Pump out former grease from central greasing systems and pivot points to avoid contamination. Do not mix different greases due to incompatibility.
Greases	
S5 GREASE V120P 2	Shell PANOLIN S5 Grease V120P 2 is a fully saturated, ester based product that uses a lithium thickener. It is compatible with most existing lithium- and calcium-based greases used in the marine environment. To meet the biodegradability requirements of the VGP, it is recommended to remove as much of the old product as possible when it is being used in an oil-to-sea application. Please consult your OEM or rudder stock installation document for further guidance. The changeover to Shell PANOLIN S5 Grease V120P 2 can be completed quite easily for most deck applications where an extreme-pressure (EP) grease is required. In this case, Shell PANOLIN S5 Grease V120P 2 should be dispensed through standard lubrication equipment or by brushing.

Minimising water content and ensuring continuing product performance:

Water and/or moisture ingress to systems using biodegradable lubricants can cause severe issues such as microbial activity, which can lead to hydrolysis of the fluid. Hydrolysis may cause corrosion, seal damage and degraded performance. It is, therefore, very important to keep the system free from water by implementing the following processes:

1. Fit desiccant driers to all vents and check the saturation levels regularly. Replace as necessary.
2. Ensure any oil filters fitted can be checked for water. Check or change filters after the first 50 hours' use; additional in-line driers may be required.
3. Ensure all tankage has effective bottom water drain valves.
4. Check and routinely drain water from bottom water drain valves in accordance with your standard onboard operating procedure. This is particularly important after a prolonged period of settling.
5. Regular Shell LubeAnalyst analysis should be undertaken to monitor water content.

Societies such as Lloyd's Register provide recommendations regarding the testing frequency of critical pieces of equipment.

Health and safety

Shell PANOLIN products are unlikely to present any significant health or safety hazard when properly used in the recommended application and good standards of industrial and personal hygiene are maintained. Avoid contact with skin. Use impervious gloves when handling used fluid. If skin contact occurs, wash immediately with soap and water. For further guidance on product health and safety, please refer to the appropriate Shell product safety data sheet.

Disposal

All biodegradable lubricants are subject to the same special disposal requirements as mineral oils. Please ensure that spilt or splashed fluids are absorbed with appropriate adsorbents or removed using a technique that will prevent contamination of seawater, watercourses and ground and sewerage systems. Comply with local and national legal requirements concerning the disposal of lubricants.

Disclaimer

The information and guidance offered for use of Shell PANOLIN products is based on experience and understanding gained through the development and manufacturing of lubricants. The performance of the products can be influenced by a number of variables, not limited to, contamination, operating temperature, equipment application, external environment and material type.

You must check suitability of the Shell PANOLIN product for your application with your OEM or your local Shell technical representative before the product is used. It is important to check the compatibility of sealing materials and to ensure the fluid has the necessary OEM approval for your specific make and model of equipment.

The advice given is non-binding and Shell will not be held liable for any consequence as a result of or through misuse of the fluid. Although future production will conform to Shell's specification, variations in technical specification may occur.

General note: Before changing over to Shell PANOLIN lubricants, we recommend checking that the intended machines, vehicles, systems or applications are suitable for use with environmentally friendly lubricants. You should pay particular attention to any integrated seals, tubing materials and coatings (paints, varnishes, coatings inside tanks, etc.).

Please contact your local Shell Partner if you require further information.

Shell also encourages you to contact the Original Equipment Manufacturer (OEM) regarding lubricant conversions.

Disclaimer: Shell PANOLIN provides these general instructions and recommendations according to their level of knowledge and experience. No warranty or warranted characteristics with regard to the products mentioned, and no liability of Shell can be derived therefrom.

The manufacturer's instructions and regulations take precedence over Shell PANOLIN's recommendations.



Expert advice from the Shell technical team designed to ensure that you use the right Shell lubricants, at the right time, every time. By helping to improve lubrication and maintenance practices, this service enables you to achieve significant benefits, including increased productivity, less downtime and, ultimately, a competitive advantage. In addition, more-efficient operations can help to reduce your carbon footprint.



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