

# A GUIDE TO CHANGING OILS AND FLUSHING WIND TURBINE GEAR DRIVES



Having reached the end of their warranty, gear oils can deteriorate. To prevent unexpected component failure, unplanned downtime and lost revenue, turbines must be completely cleared of harmful contaminants. The best way to do this is by a thorough flush and new refill, rather than a simple drain. We aim to make this process as straightforward as possible, using specialist products and processes, and an easy step-by-step procedure.

**Note: This is a guide only and does not replace your wind-turbine manufacturer's processes. Please always refer to the processes outlined by your wind-turbine manufacturer.**

## OPTIGEAR SYNTHETIC X

### OPTIGEAR SYNTHETIC X TO OPTIGEAR SYNTHETIC X (SAME OIL)

- Use Castrol Magna 320\* as the flushing oil. The flush volume should be 50-60% of the normal fill volume of the gearbox
- Systems with high residues or heavy contamination should follow the Different Oil to Optigear Synthetic X process below

### DIFFERENT OIL TO OPTIGEAR SYNTHETIC X

- Add Castrol Detergen System Cleaner 320, then flush with Castrol Magna 320\* or Optigear Synthetic X
- Use 5% Detergen System Cleaner 320 or 10-15% for high residues/heavily contaminated systems
- Take care not to exceed 15% maximum of Detergen System Cleaner 320

Optigear Synthetic X has detergent and cleaning properties to help ensure clean gearbox operation and an additive system designed to protect gears and bearings. To achieve the optimum performance level of these oils, we recommend that you remove any previous oil to avoid compatibility issues.

#### \*Flushing oil guidance

Removing all of the old oil may sometimes require a double flush, or possible double flushing of the oil coolers where oil residue can remain. Take special care to flush hoses and pipes between the gearbox and oil cooler. It may be necessary to dismantle and reassemble them after flushing. If the gearbox and cooler show severe residues it is likely that hoses and pipes will as well.

In certain circumstances an ISO 32 oil like Castrol Hyspin AWS 32 can be used, particularly when the oil temperature has cooled and a lower viscosity oil is required. After flushing with an ISO 32 oil, the oil must be removed as it could dilute the viscosity too much for gearbox oil.

## OPTIGEAR SYNTHETIC CT

### OPTIGEAR SYNTHETIC CT TO OPTIGEAR SYNTHETIC CT (SAME OIL)

- Drain the gearbox, hoses and coolers using 150 litres of flush oil, preferably using Optigear Synthetic CT 320 as the flush oil, which can be used twice

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Further information about Castrol's range of products and services is available on the Castrol website and the Lubricant Oracle. Visit [Castrol.com/windenergy](https://www.Castrol.com/windenergy).

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## PROCEDURE INFORMATION

After adding Castrol Detergen System Cleaner 320 operate the turbine from 36 to 200 hours. Carefully monitor how the filtration system functions during this time as filters may be plugged by deposits and/or residues removed by the system cleaner additive.

1. Shut down the turbine and drain the reservoir, cooler, lines and piping completely while oil is still hot. To get the best results, we recommend an oil temperature of over 30°C. This helps give a better draining viscosity and means that contaminants remain evenly dispersed while the oil is being drained.	9. Fill the gearbox with flushing oil (such as Magna 320) to 50-60% of the normal fill volume (or to the level for flushing recommended by the supplier) so that the circulation system works.
2. Change the oil filter element, keeping the old element for reference if required.	10. Turn on the pump and let the flushing oil circulate for a minimum of 30 minutes to remove any contamination and residues from the system.
3. Before removing inspection covers, clean the outer surfaces with a lint-free cloth and check gaskets for damage, replace them if necessary.	11. Thoroughly drain the flushing oil at the operating temperature. Carefully remove any remaining oil from the bottom of the gearbox and bearing reservoirs.
4. Purge remaining oil by applying dry pressurized air to all the pipelines of the lubrication network.	12. Remove and clean the oil drain's permanent magnet and plug, and reinstall.
5. Carefully check the pumps and the large valves to make sure they are completely free from the previous used oil and from any residues.	13. Check the filters and filter housings of the system, and clean them if required.
6. Clean the internal parts of the gearbox with lint-free cloths and/or a plastic scraper.	14. Change oil filter element, keeping the old element for reference if required.
7. Check all the elastomer seals thoroughly for wear and leaks, and replace them if necessary.	15. Fill the gearbox with the new gear oil to the recommended level and start its operation in line with the gearbox supplier's guidelines or turbine's operation manual.
8. Remove the oil level control and low level indicator, clean carefully and reinstall.	16. Collect an oil sample as reference. Check for leaks and function. We recommend that you take an oil sample for analysis after six months of operation for comparison analysis.

**Note:** If it is possible, check heating elements and if necessary wash them. Make sure the heating elements are completely dry and clean before reinstalling them. If the above procedure is not followed, an additional filter change might be required during the first three months of operation. To avoid contamination, we recommend that you use a two-pump system on site, one for waste oil and flushing oil and the other for new gear oil.

Unless the manufacturer specifies otherwise, the flushing oil can be used for more than one gearbox according to the matrix below:

GEARBOX STATE	GEARBOX SIZE > 1.5MW	GEARBOX SIZE < 1.5MW
Heavy residues	2 gearboxes	3 gearboxes
Moderate residues	4 gearboxes	5 gearboxes
Low residues	5 gearboxes	8 gearboxes

Alternatively, the flushing oil could be checked with oil analysis for its suitability for further use as a flushing oil.

Castrol's world-class products and liquid engineers help ensure that turbines function effectively, long after warranties expire. Discover how Castrol can improve the performance and lifespan of your turbines by exploring [www.castrol.com/windenergy](http://www.castrol.com/windenergy).

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