



FOCUS ON WIND TURBINES

YOUR ADVANTAGE IN AN INDUSTRIAL WORLD



MAXIMUM EFFICIENCY MINIMUM DOWNTIME

CASTROL **FOCUSES** ON ALL LUBRICATION AREAS OF YOUR WIND TURBINE, USING PROVEN APPLICATIONS EXPERTISE AND **GLOBALLY AVAILABLE PRODUCTS** TO SUPPORT ALL YOUR NEEDS. CASTROL HAS EXCELLENT OPERATIONAL INSIGHT DUE TO ITS CONNECTION TO BP ALTERNATIVE ENERGY, ONE OF THE LEADING WIND ENERGY DEVELOPERS IN THE UNITED STATES.

WIND ENERGY TECHNOLOGY IS ADVANCING RAPIDLY. TURBINES HAVE GROWN IN POWER FROM KWS TO SEVERAL MWS OUTPUT TODAY, PLACING FAR HIGHER DEMANDS ON TURBINE LUBRICATION.

Heavier duty cycles are leading to increased bearing, drive and gearbox loadings. Accessibility problems associated with service and repair in different climates are growing. With the added need to extend the cost-competitiveness of wind energy against conventional energy sources, reliable operation of all equipment has never been more important, with gearbox and bearing

problems ranking as the highest cause of costly downtime.

At Castrol, we focus on all aspects of lubrication for your wind turbine throughout its operating lifetime. Using our proven application expertise, advanced product technology and world-class logistics, we can deliver solutions that provide reliable and economical performance.

Working together with key component manufacturers, we can better understand your needs and deliver innovative technology.

Our dedicated team also brings knowledge and expertise to the global aftermarket, monitoring lubricant quality and performance to ensure maximum efficiency and minimum downtime.



A COMPLETE SOLUTION DESIGNED AROUND WIND TURBINES

CASE STUDY

AUTOMATIC GENERATOR BEARING LUBRICATION

By using **Castrol Longtime PD 2** with single point lubricators, the amount of maintenance required was considerably reduced. Additionally the risk of contamination and premature bearing failure due to manual re-lubrication was minimised. Each bearing was automatically supplied with 0.64 cm^3 every 12 hours and the lubricant cartridges only had to be replaced every six months. Previously, the same components were re-lubricated manually every three months using a lever-type hand gun.





CASE STUDY

400% INCREASE IN OIL SERVICE LIFE

Replacing a mineral-oil based product with fully synthetic **Castrol Optigear Synthetic X** in a wind turbine gearbox resulted in a significant increase in oil-change intervals. The service life of the oil was increased by more than four times from 18 months to 84 months.

ENSURING EQUIPMENT AVAILABILITY AND UPTIME THROUGH SUPERIOR LUBRICATION OF CRITICAL COMPONENTS

- With careful product selection and extensive testing against Original Equipment Manufacturers (OEM) and turbine manufacturers' specifications we can reduce customer risks from product trials and lubricant changeovers.
- We understand the need for the strictest levels of quality control and cleanliness to provide consistent and predictable product performance.
- We can provide global consistency in supporting all aspects of our solution, from product availability, product quality and support services to best practice transfer.

PROVIDE EFFECTIVE AFTERMARKET SERVICES TO MAINTAIN EQUIPMENT EFFICIENCY

- We can provide a comprehensive monitoring service, **Castrol LabCheck**, to highlight any trends within the lubricant, identify potential problems and optimise equipment maintenance plans.
- We will help you avoid unnecessary breakdowns with **Castrol Predict**, using analytical ferrography to determine the extent of any particles present and predict any abnormal wear.
- By supplying the same products recommended by your suppliers for first fill, we can minimise risks at lubricant changeovers.
- We comprehensively train OEMs, wind energy developers, wind farm operators and service staff in all aspects of lubrication.
- We supply our product range globally and in a variety of different sizes from small packs to bulk.

INCREASE EFFICIENCY AND IMPROVE YOUR ECONOMIC COMPETITIVENESS AGAINST OTHER ENERGY SOURCES

- We can reduce friction and minimise energy losses across a range of operating conditions through the use of synthetic lubricants with friction-modifying properties.
- By extending product life (in some cases beyond five years), we can lower your maintenance and servicing costs.
- Through skilful application of our products we can ensure optimum performance without excessive use.

WE WORK CLOSELY ON RESEARCH AND DEVELOPMENT TO UTILISE ADVANCED TECHNOLOGY SOLUTIONS

- In addition to our own global technology centres, we work with research and development and design engineers at major component manufacturers to understand future performance targets and lubrication solutions.
- We help keep you at the forefront of technology and ahead of your competitors through on-going technological developments.
- We use our specialised test facilities to screen technologies and simulate specific operating conditions.

PRODUCT AND APPLICATION AREAS

1. MAIN BEARING

Castrol Spheerol LC 2
Castrol Optigear Synthetic X
Castrol Optitemp SW

2. PITCH ADJUSTMENT

Castrol Optitemp SW
Castrol Spheerol LC 2

3. YAW BEARING

Castrol Optipit
Castrol Optitemp SW

4. HYDRAULIC SYSTEMS

Castrol Hyspin AWH-M
Castrol Hyspin AWW 32
Castrol Hyspin HVI
Castrol Carelube HES

5. MAIN GEAR & AUXILIARY GEAR DRIVES

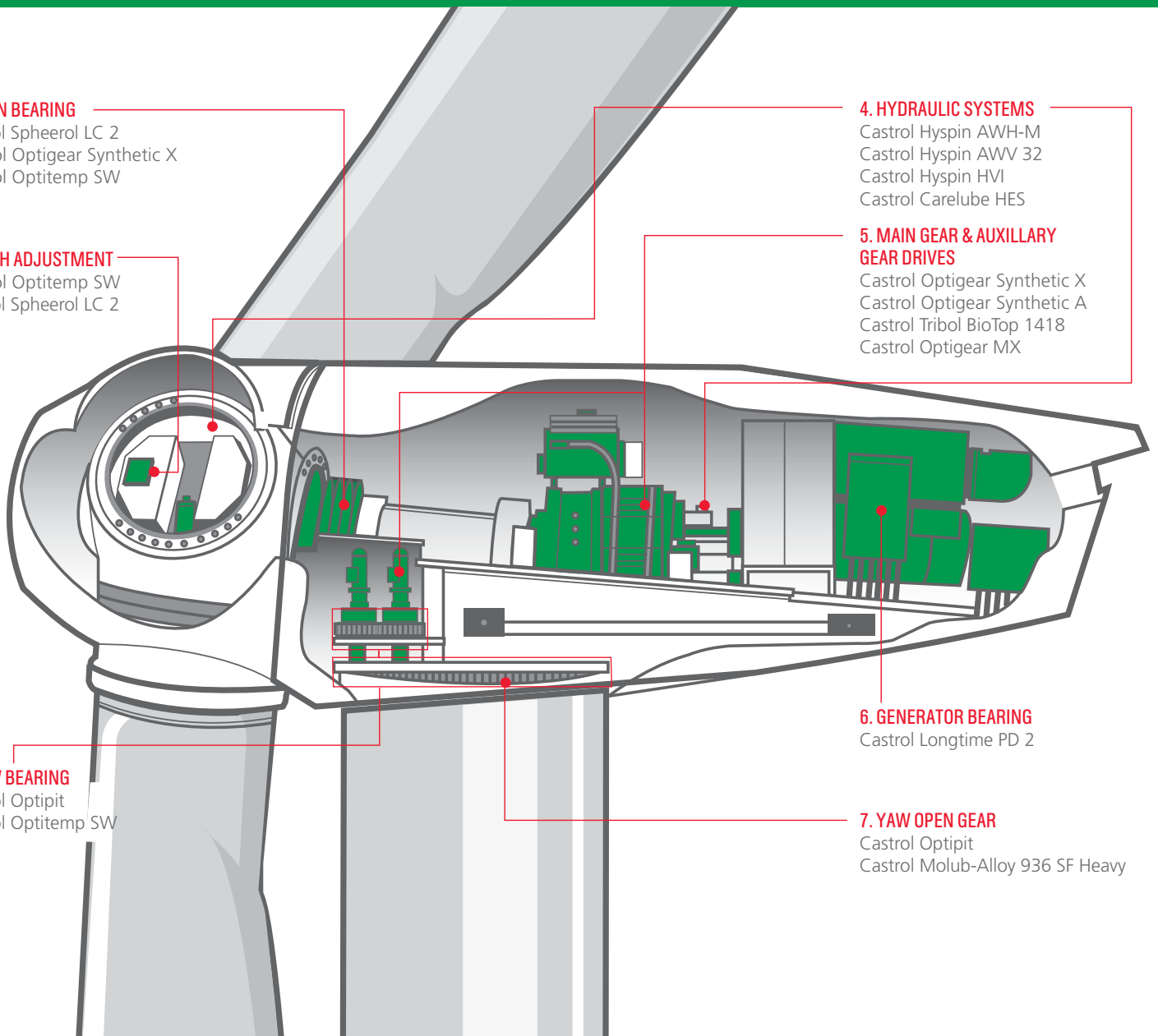
Castrol Optigear Synthetic X
Castrol Optigear Synthetic A
Castrol Tribol BioTop 1418
Castrol Optigear MX

6. GENERATOR BEARING

Castrol Longtime PD 2

7. YAW OPEN GEAR

Castrol Optipit
Castrol Molub-Alloy 936 SF Heavy



GEAR OILS

Castrol offers a complete range of high performance gear oils based on mineral or various synthetic base oils to ensure optimised lubrication of your gearbox. Our high performance gear oils combine a high load carrying capability with a low coefficient of friction, reducing wear and lowering in-service operating temperatures. Our range of gear oils, including advanced **Castrol Optigear Synthetic X**, can also provide vital protection to rolling element bearings, cutting gearbox failure risks to a minimum.

HYDRAULIC OILS

Our comprehensive range of hydraulic oils are based on highly refined mineral oils or synthetic esters enhanced with rust and oxidation inhibitors. Castrol hydraulic oils have been formulated using the latest thinking in raw materials and then rigorously tested in both laboratory and manufacturing conditions, in close collaboration with leading hydraulic systems and wind turbine manufacturers.

GREASES

Improved operational reliability and optimised lubricating performance can be achieved by using Castrol greases in generator bearings, main bearings, pitch and yaw bearings, and open gears. Automatic lubricators reduce maintenance work and simplify service interval planning. Castrol greases are formulated around your specific application, giving you the confidence that you are receiving the maximum protection for your equipment.

OTHER APPLICATIONS

A range of brake fluids, corrosion preventives, assembly, screw and high temperature pastes cover your applications during assembly, operation and maintenance of your wind turbines. You can trust Castrol to provide the right product for the right application across all your operations.

CASE STUDY

OUTSTANDING PUMP PROTECTION

The OEM specified hydraulic fluid, **Castrol Hyspin AWH-M**, has achieved the best long-term performance in high pressure hydraulic systems used for yaw, pitch and brake applications in wind turbines. Apart from the unchanged physical and chemical properties, the hydraulic oil maintained excellent cleanliness, filterability and low wear rate of the pump components.

A RANGE OF CHOICES

CASTROL OFFERS A DIVERSE RANGE OF HIGH PERFORMANCE PRODUCTS AND SERVICES FOR WIND TURBINES - MINIMISING MAINTENANCE WHILE MAXIMISING OPERATIONAL RELIABILITY.

OUR SERVICES:

CASTROL LABCHECK

- Routine lubrication monitoring and advanced analytical techniques to optimise your lubrication performance, e.g. viscosity, neutralisation number, wear element and contamination measurements, automatic particle counting and water content.
- Online access to your oil and trend analysis data.
- Mechanical and dynamic testing to measure long-term oil performance.

CASTROL PREDICT

- Wear particle analysis service using analytical ferrography and laser diffraction to determine and monitor the exact wearing mode and the source and nature of all particles present.

LUBRICANT DISPENSERS

- Lubricators or small-scale central lubricating systems.
- Suitable and reliable technology for all climates.

TRAINING

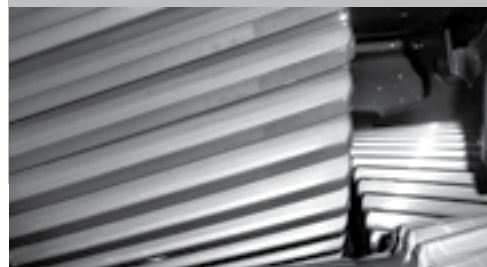
- Customised training focusing on tribology, lubrication basics and applications for OEMs and wind park operators.
- Health and Safety training, risk assessments and waste oil handling and disposal.

CASE STUDY

BEST PRACTICE WITH CASTROL OPTIGEAR SYNTHETIC X IN THE AFTER MARKET

Introducing **Castrol Optigear Synthetic X** in out-of-warranty wind turbine gearboxes completely eliminated pump damages during the winter period due to its excellent pumpability at low temperatures. Additionally, the fully synthetic product reduced gear teeth wear, improved gear surfaces and prolonged the life of the gear box.

Gears with over two years of running time with **Castrol Optigear Synthetic X**



Legal entity
Address line 1
Address line 2

Tel ...
Fax ...
Email ...

www.castrol.com/industrial

Castrol, the Castrol logo, LabCheck, Predict, Carelube, Hyspin, Longtime, Molub-Alloy, Optigear, Optipit, Optitemp, Spheerol and Tribol are trademarks of Castrol Limited, used under licence.
Castrol part of the BP Group.

