



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 to deliver lubrication solutions that provide reliable and economical performance.

Wind energy technology is advancing rapidly. Turbines have grown in power from a few kW to 6MW or more today, placing far higher demands on turbine lubrication. Heavier duty cycles leading to increased bearing and gearbox loadings, and accessibility problems associated with service and repair all require specific solutions. With the added need to reduce dependence on fossil fuels, and extend the cost-competitiveness of wind energy against conventional energy sources, the reliable operation of all equipment has never been more important.

Gearbox and bearing lubrication is particularly challenging due to the complexity of the gearbox and the high mechanical loads that are experienced. Gearbox and bearing problems are a common cause of costly downtime.

At Castrol, we have focused on all lubrication areas of your wind turbine, using proven applications expertise and advanced products to deliver solutions that provide reliable and economical performance. Working with key component manufacturers, we can better understand and deliver on the technical demands of the industry, pioneering innovative technology for the future.

A COMPLETE SOLUTION DESIGNED AROUND WIND TURBINES:

WE CAN EXTEND UPTIME THROUGH CONSISTENCY IN LUBRICATING CRITICAL COMPONENTS

- With careful product selection and extensive testing against OEM and turbine manufacturers' specifications we can lessen 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 and support services to best practice transfer.

WE CAN INCREASE EFFICIENCY AND IMPROVE 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 we can lower maintenance and servicing costs.
- By skilful application of lubricants we can ensure optimum performance without excessive lubricant use.

WE WILL WORK CLOSELY WITH RESEARCH AND DEVELOPMENT TO UTILISE ADVANCED TECHNOLOGY SOLUTIONS

- We engage with research, development and design engineers at major component manufacturers to understand future performance targets and work together towards solutions for tomorrow.
- We help keep the turbine manufacturer at the forefront of technology and ahead of competitors through on-going technological developments.
- We use our specialised test facilities to screen technologies and simulate specific operating conditions.

CASE STUDY

AUTOMATIC GENERATOR BEARING LUBRICATION
BY USING CASTROL LONGTIME PD 2 WITH SINGLE POINT LUBRICATORS, THE AMOUNT OF MAINTENANCE REQUIRED WAS CONSIDERABLY REDUCED. EACH BEARING WAS AUTOMATICALLY SUPPLIED WITH 0.64 CC 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.



MAIN GEAR

- Castrol Tribol BioTop 1418/320
- Castrol Tribol 1100/320
- Castrol Tribol 1710/320
- Castrol Optigear Synthetic A 320
- Castrol Optigear Synthetic X 320
- Castrol Optigear BM 460

GENERATOR BEARING

- Castrol Longtime PD 2
- Castrol Tribol 4020/220-2

YAW GEAR RING

- Castrol Optipit
- Castrol Molub-Alloy BioTop 9488
- Castrol Molub-Alloy 936 SF Heavy

YAW GEAR RING AND BEARING

- Castrol Optipit
- Castrol Molub-Alloy BioTop 9488
- Castrol Molub-Alloy 3036

PITCH ADJUSTMENT

- Castrol Tribol 3020/1000-2
- Castrol Optitemp TT1

ROTOR BEARING

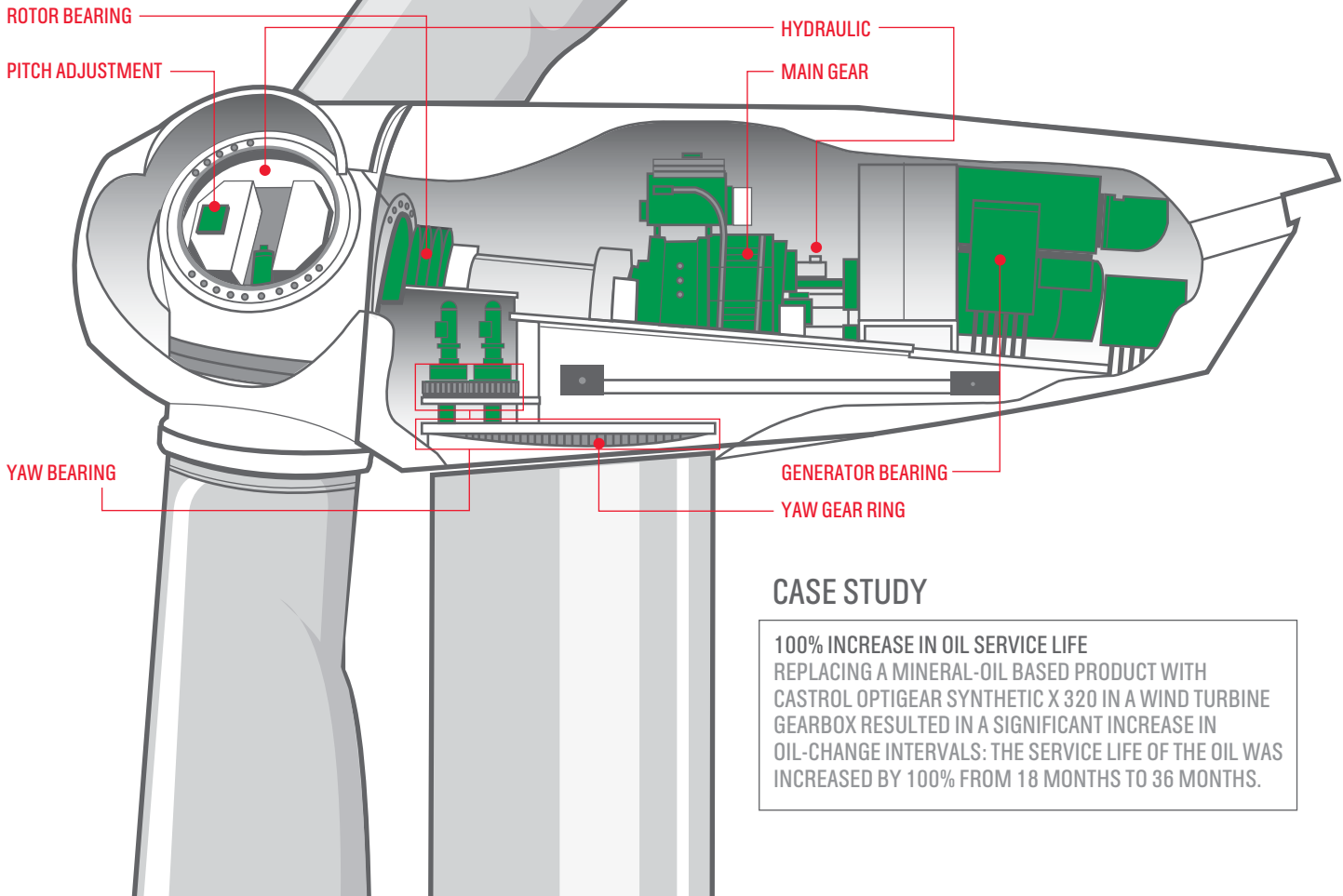
- Castrol Tribol 3020/1000-2
- Castrol Tribol 1510/680
- Castrol Optigear Synthetic X 680

HYDRAULIC

- BP Bartran HV 32

CASE STUDY

STOP MICRO-PITTING DAMAGE
 BOTH IN TESTS AND SERVICE USE, CASTROL OPTIGEAR SYNTHETIC A AND CASTROL TRIBOL 1710 RELIABLY STOPPED MICRO-PITTING DAMAGE HAD BEEN OCCURRING. IN SOME CASES, THE SPECIAL PLASTIC DEFORMATION ADDITIVE TECHNOLOGY INCORPORATED IN THESE PRODUCTS REPAIRED THE DAMAGED SURFACE.



CASE STUDY

100% INCREASE IN OIL SERVICE LIFE
 REPLACING A MINERAL-OIL BASED PRODUCT WITH CASTROL OPTIGEAR SYNTHETIC X 320 IN A WIND TURBINE GEARBOX RESULTED IN A SIGNIFICANT INCREASE IN OIL-CHANGE INTERVALS: THE SERVICE LIFE OF THE OIL WAS INCREASED BY 100% FROM 18 MONTHS TO 36 MONTHS.



A RANGE OF CHOICES

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

OUR SERVICES:

- Oil analysis, e.g. viscosity, neutralisation number, contamination measurements
- Particle counting as a specialised test
- On-line access to your oil analysis data and trend analysis
- Used oil examination in mechanical/dynamic tests to verify the long-term characteristics
- Lubricators or small-scale central lubricating systems
- Customised training focusing on tribology, lubrication basics and applications

LUBRICATING MAIN BEARINGS

Castrol offers a complete range of greases and high-performance oils for lubricating highly loaded rolling element bearings. These are tailor-made for the operating conditions encountered in the main rotor bearing, ensuring sustained and reliable lubrication.

LUBRICATING GENERATOR BEARINGS

Improved operational reliability and optimised lubricating performance can be achieved by using Castrol rolling element bearing greases that are approved by generator manufacturers. Automatic lubricators reduce maintenance work and simplify service interval planning.

LUBRICATING MAIN GEARS

A complete range of high-performance gear oils based either on mineral or various synthetic base stocks ensure optimised lubrication of your gearbox. Castrol's high-performance oils combine high load carrying capacity with a low coefficient of friction, reducing wear and lowering in-service operating temperatures. They are also suitable for lubricating rolling element bearings.

CORROSION PREVENTIVES

Castrol's comprehensive range of synthetic and mineral oil products provide better and more consistent protection against corrosion, reducing costly scrap and re-work.

ASSEMBLY

A broad range of assembly, screw, and high-temperature pastes cover all applications during assembly, operation and maintenance of wind turbines.



PRODUCTS AND APPLICATION AREAS

CASTROL'S OILS AND GREASES ARE DESIGNED FOR EVERY PURPOSE.

OILS

PRODUCT NAME	BASE OIL	ANTI-WEAR ADDITIVES	ISO VG	TEMPERATURE APPLICATION RANGE °C	APPLICATION
CASTROL OPTIGEAR SYNTHETIC X	PAO	MFT 2	100 - 680	-30 to + 95	New fully synthetic gear oil for cylindrical, bevel gears and planetary gears, for the main gear of wind power plants, as well as for oil-lubricated rolling bearings.
CASTROL OPTIGEAR SYNTHETIC A*	PAO	MFT	100 - 320	-30 to + 95	Fully synthetic gear oil, highly suitable for wind energy sector, use in sliding and rolling bearings, industrial gears at high temperatures and under high mechanical loads.
CASTROL TRIBOL 1710*	MINERAL OIL/PAO	TGOA	220 - 460	-30 to + 95	Partially-synthetic gear oil with special high-performance additives for wind-power gears but also suitable for other industrial areas.
CASTROL TRIBOL BIO TOP 1418*	ESTER	EP/AW	150 - 460	-25 to + 90	Biodegradable high-performance gear oil based on synthetic esters, used in gears, rolling and sliding bearings, as well as in revolving equipment, oil sump temperature to +90°C, CEC L-33- A94>80%.
CASTROL TRIBOL 1100	MINERAL OIL	TGOA	68 - 1500	-20 to + 90	Modern cylindrical and worm gear pairs, rolling and sliding bearings, revolving equipment, oil-temperature under high mechanical loads to +90°C.
CASTROL OPTIGEAR BM	MINERAL OIL	MFT	68 - 1500	-10 to + 90	Spur and bevel gear units, even under severe operating conditions, worm gear units, rolling and sliding bearings, gear couplings, circulating systems.
BP BARTRAN HV 32	MINERAL OIL	ZINC-FREE	32	-20 to + 80	Severely stressed hydraulic systems requiring a high level of anti-wear performance or ultra fine filtration.

MFT = MicroFlux Trans MFT 2 = Second Generation Microflux Trans TGOA = Tribol Grease and Oil Additive EP = Extreme Pressure AW = Anti-Wear PAO = Poly Alpha Olefin

Note:* Not all products may be available in every region.

CASE STUDY

OUTSTANDING BEARING PROTECTION

INVESTIGATIONS ON ROLLER-BEARING TEST STANDS DEMONSTRATED THAT CASTROL OPTIGEAR SYNTHETIC X OFFERS OUTSTANDING WEAR PROTECTION WITH VARIOUS DEGREES OF LUBRICATION. FURTHERMORE, IT HAS AN EXTREMELY LOW TENDENCY TO FORM AGGRESSIVE, INSOLUBLE AGEING PRODUCTS. THESE ARE JUST TWO REASONS WHY LEADING BEARINGS MANUFACTURERS RECOMMEND CASTROL OPTIGEAR SYNTHETIC X FOR LUBRICATING WIND TURBINE GEARS.

GREASES

PRODUCT NAME	BASE OIL	THICKENER/ SOAP-BASE	NLGI-GRADE	ISO VG	TEMPERATURE APPLICATION RANGE °C	APPLICATION
CASTROL LONGTIME PD 2	MINERAL OIL	LITHIUM-12-HYDROXYSTEARATE	2	100	-35 to +140	High-performance grease with MFT technology (plastic deformation) for high-speed rolling and sliding bearings or those subjected to high mechanical loads.
CASTROL TRIBOL 4020	MINERAL OIL	LITHIUM COMPLEX	1 2	220 460	-30 to +150	Sliding and rolling bearings, medium and high mechanical load conditions, water resistant, permanent temperature up to +150°C (short-term +160°C).
CASTROL TRIBOL 3020/1000*	MINERAL OIL	LITHIUM	000, 00, 0,1,2	1000	-40 to +120	Rolling and sliding bearings at low speeds, gears that are not oil-tight, general grease lubrication.
CASTROL OPTIPIT	MINERAL OIL	LITHIUM-12-HYDROXYSTEARATE	2-3	1350	-10 to +140	Adhesive grease for rolling and sliding bearings with MFT, very high base oil viscosity, especially suitable for large units with low peripheral speeds in damp, dusty environments, as well as for open gears.
CASTROL MOLUB-ALLOY 936 SF HEAVY	MINERAL OIL	MIXED SOAP	0	1660	-15 to +100	Adhesive lubricant with solid lubricants (incl. molybdenum disulphide MoS ₂) under high mechanical loads and at low speeds, water-resistant, sprayable and solvent-free.
CASTROL OPTITEMP TT1*	SYNTHETIC OIL	ORGANIC/ INORGANIC	1	15/22	-60 to +120	Low-temperature grease, can be used at temperatures as low as -60°C due to a special grease thickener and a low viscosity synthetic base oil. Used for long-term lubrication at high speeds or where large temperature differences exist.
CASTROL MOLUB-ALLOY 3036/680-1*	MINERAL OIL	LITHIUM	1	680	-20 to +120	Rolling and sliding bearings at low speeds and high loads or shock loads under unfavourable ambient conditions. The shear-stable thickener has an excellent sealing effect.

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