



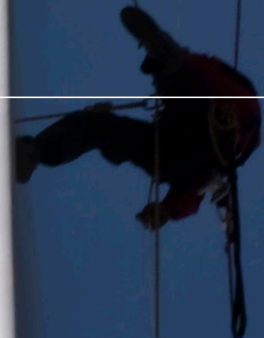
MARKET LEADING SOLUTIONS FOR THE WIND SECTOR

Next generation wind power lubricants, greases and services designed to maximise wind turbine performance and increase uptime.

www.shell.com/lubricants-power

SHELL LUBRICANTS

TOGETHER ANYTHING IS POSSIBLE



EXPERIENCE THE POWER OF A NEXT-GENERATION GEARBOX OIL

HELP TO BOOST WIND TURBINE PRODUCTIVITY WITH:

- World leading filtration technology.
- An approved lubricant developed with the latest metallocene PAO base oil technology.
- 14 times better corrosion protection than competitors.
- Highly diverse operating temperature range.
- Excellent performance against yellow metal materials.

**SHELL OMALA S5 WIND 320
10-YEAR WARRANTY**

UNDERSTANDING YOUR NEEDS:

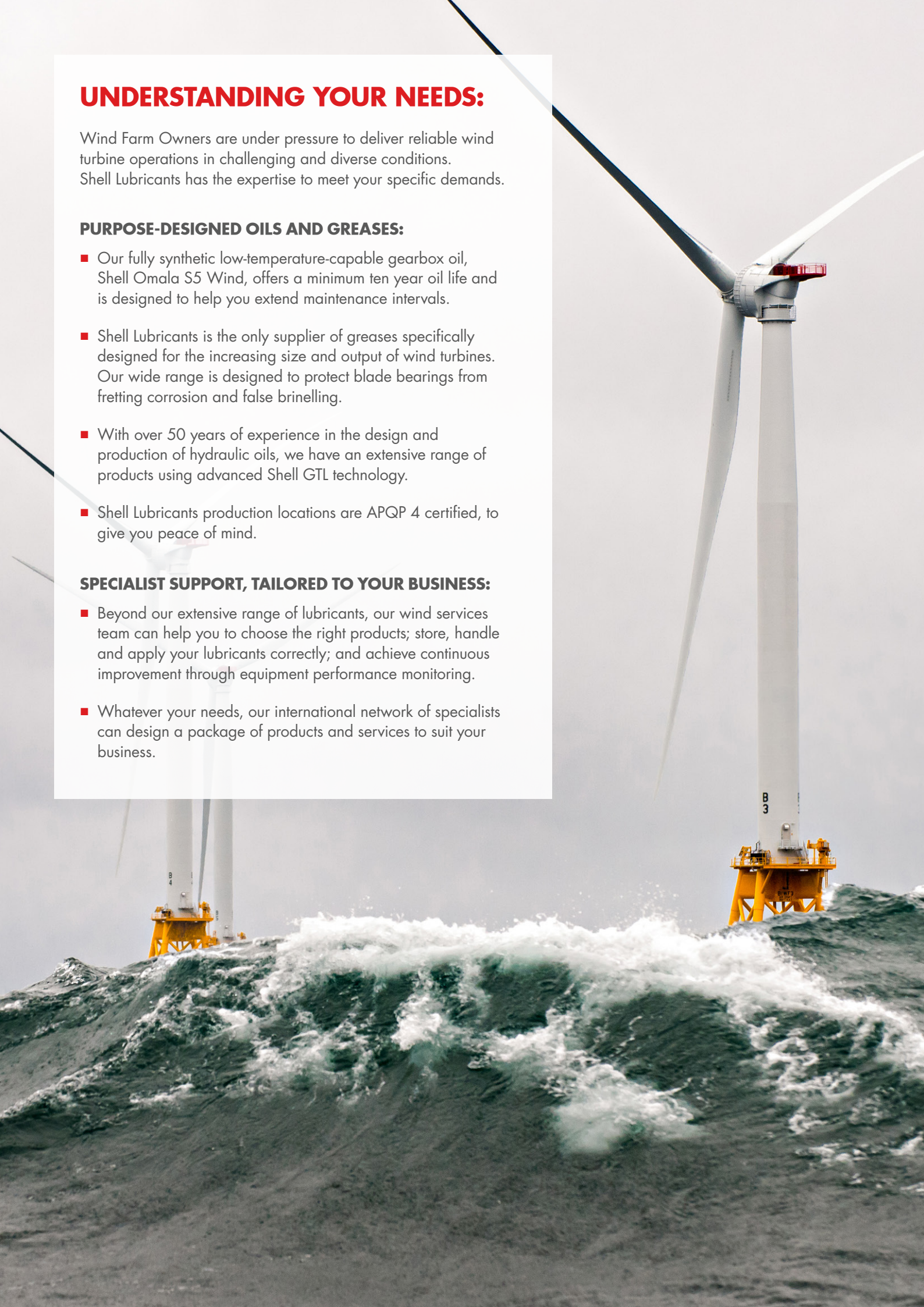
Wind Farm Owners are under pressure to deliver reliable wind turbine operations in challenging and diverse conditions. Shell Lubricants has the expertise to meet your specific demands.

PURPOSE-DESIGNED OILS AND GREASES:

- Our fully synthetic low-temperature-capable gearbox oil, Shell Omala S5 Wind, offers a minimum ten year oil life and is designed to help you extend maintenance intervals.
- Shell Lubricants is the only supplier of greases specifically designed for the increasing size and output of wind turbines. Our wide range is designed to protect blade bearings from fretting corrosion and false brinelling.
- With over 50 years of experience in the design and production of hydraulic oils, we have an extensive range of products using advanced Shell GTL technology.
- Shell Lubricants production locations are APQP 4 certified, to give you peace of mind.

SPECIALIST SUPPORT, TAILORED TO YOUR BUSINESS:

- Beyond our extensive range of lubricants, our wind services team can help you to choose the right products; store, handle and apply your lubricants correctly; and achieve continuous improvement through equipment performance monitoring.
- Whatever your needs, our international network of specialists can design a package of products and services to suit your business.



THE GUOHUA WIND FARM EXPERIENCES EXCELLENT LUBRICANT PERFORMANCE AFTER SWITCHING TO SHELL OMALA S5 WIND IN ITS WIND TURBINE GEARBOXES



ENHANCING PERFORMANCE

Guohua wind farm in Dailiji, Inner Mongolia, China, operates 33 1.5-MW turbines from Dongfang Electric New Energy Equipment that began productive operation in late 2009. The wind farm is in an area that experiences a yearly temperature range of -30.5 to $+38.9^{\circ}\text{C}$.

The wind farm operator, Guohua (Tongliao) Wind Power Co., Ltd, wanted to ensure maximum uptime and availability for the turbines by using a high-performance lubricant. Although the turbines' gearboxes are not prone to frequent faults, a failure would result in a long period of downtime for the affected turbine.

The management team enlisted the help of the Shell technical team and the equipment manufacturer, who recommended that the wind farm should trial Shell Omala S5 Wind 320, Shell's next-generation gear oil for wind applications, in two of its turbines.

Guohua wind farm tracked the operation of the two turbines and the properties of the oil during the two-year trial and found that

- the runtime of the turbines was significantly longer
- a foaming problem in the gearboxes had been alleviated
- the cold startup time of the turbines was shorter
- the additive content of the oil remained stable
- the amount of wear metals in the oil was much lower than the industry standard limit



Find out more by visiting

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SPANISH WIND FARM SEES COST SAVING BENEFITS AFTER TRIALLING **SHELL TELLUS S4¹**



The Valdesamario wind farm is located on a hill within the Pyrenean oak forests in the Spanish province of León. It includes 12 Gamesa G87/2000 wind turbines, with a hub height of 87 meters and a capacity (in operation) of 24.0 MW.

Over a 12 month trial, the Shell Lubricants technical team worked closely with the wind farm operator, Enel Green Power, to showcase the benefits that can be obtained from the use of a high-performance synthetic hydraulic unit oil versus a mineral oil. Shell Synthetic oil Tellus S4 and a mineral alternative were implemented respectively in two of its turbines, and found that:

- Shell Tellus S4 doubles oil usage life to a duration of 10 years. This reduction in required oil changes can deliver savings of approximately €23,125 over a 10 year period

- With Shell Tellus S4, the hydraulic group was subject to 19% less start-up times meaning reduced component wear, extending their lifetime. For a wind farm of 40 wind turbines over a period of 10 years, this can save approximately €39,000
- An average saving of around 5,000 €/MW can be obtained using synthetic oil instead of mineral oil due lesser requirements of replacement parts and the associated maintenance costs of this



Find out more by visiting

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1. The savings indicated are specific to the calculation date and mentioned site. These calculations may vary from site to site and from time to time, depending on, for example, the application, the operating conditions, the current product being used, the condition of the equipment and the maintenance practices

SHELL'S PORTFOLIO OF PRODUCTS & SERVICES TO OPTIMISE WIND TURBINE PERFORMANCE

PRODUCT GROUP	PRODUCT NAME	APPLICATIONS											
		Main gearbox	Geared pitch drive	Yaw drive	Pitch/blade bearing	Yaw bearing (roller bearing design)	Yaw bearing (plain bearing design)	Generator bearing	Main shaft bearing	Yaw gear	Hydraulic brake and pitch system	Transformer	Transformer (offshore HVDC converter stations)
GEAR OILS	Shell Omala S5 Wind 320	■	■	■									
	Shell Omala S4 GXV range		■	■									
	Shell Omala S4 WE range (PAG)		■	■									
GREASES	Shell Rhodina BBZ				■	■							
	Shell Gadus S5 V110 KP				■	■							
	Shell Gadus S5 V460 KP						■		■				
	Shell Gadus S4 OG range									■			
HYDRAULIC OILS	Shell Tellus S4 VX 32										■		
	Shell Tellus S4 ME 32										■		
	Shell Tellus S2 VX 32										■		
	Shell Naturelle HF-E 32 (biodegradable)										■		
TRANSFORMER	Shell Diala S4 ZX-I											■	■

SERVICES

Shell LubeAnalyst	Oil and equipment monitoring service
Shell LubeCoach	Lubrication training
Shell LubeAdvisor	Expert advice from Shell technical team

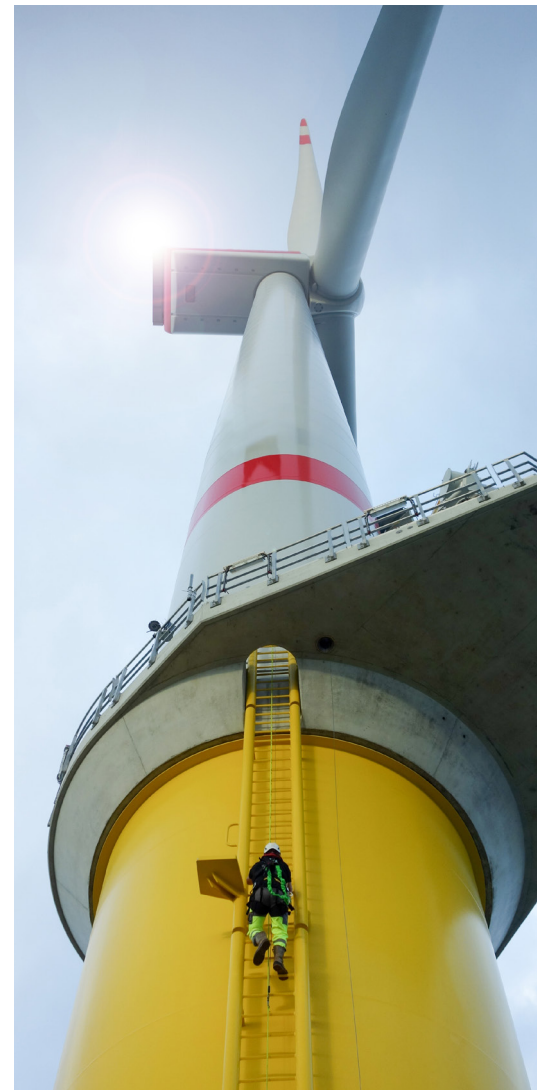
DESIGNED TO DELIVER RELIABILITY AND EFFICIENCY

Keeping wind turbines working efficiently and reducing operating costs can be critical for a profitable business. At Shell Lubricants, we appreciate that turbines operate in tough conditions, and that, to be competitive, you need them to be reliable and have high availability. Your lubricants must protect your equipment to help reduce operating and maintenance costs. Choosing the right lubricants and services for your business needs can help to make a real difference to your power generation operations.

Our advanced technology wind turbine lubricants, which are developed, researched and supported by our international team, are designed to help you to

- extend oil and grease life
- extend your equipment lifetime
- improve your system efficiency and energy yields

thereby supporting your efforts to maximise wind turbine performance and increase uptime.





SHELL OMALA S5 WIND 320 **NOW CARBON NEUTRAL**

- Product lifecycle CO₂ emissions are compensated for through Shell's global portfolio of nature-based solutions projects.
- Nature-based solutions comprise all activities related to the protection, or redevelopment, of natural ecosystems such as forests, grasslands and wetlands.
- Nature-based solutions can help contribute to your businesses' voluntary emissions targets.

For more information please visit
www.shell.com/naturebasedsolutions

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