POWERING PROGRESS IN WIND

SHELL OFFERS ADVANCED LUBRICANTS FOR WIND TURBINES.

The purpose of Shell is to power progress together with more and cleaner energy solutions. Shell is actively building an advanced portfolio of renewable energy and has a target to achieve net zero emissions by 2050 in step with society. With over 20 years of experience in onshore and offshore wind development, Shell is a strategic partner in wind.

Shell offers a complete lubricant portfolio for wind turbines, including gear oils, greases, hydraulic oils, transformer oils, and coolants. Shell is committed to improving wind operations and maintenance.

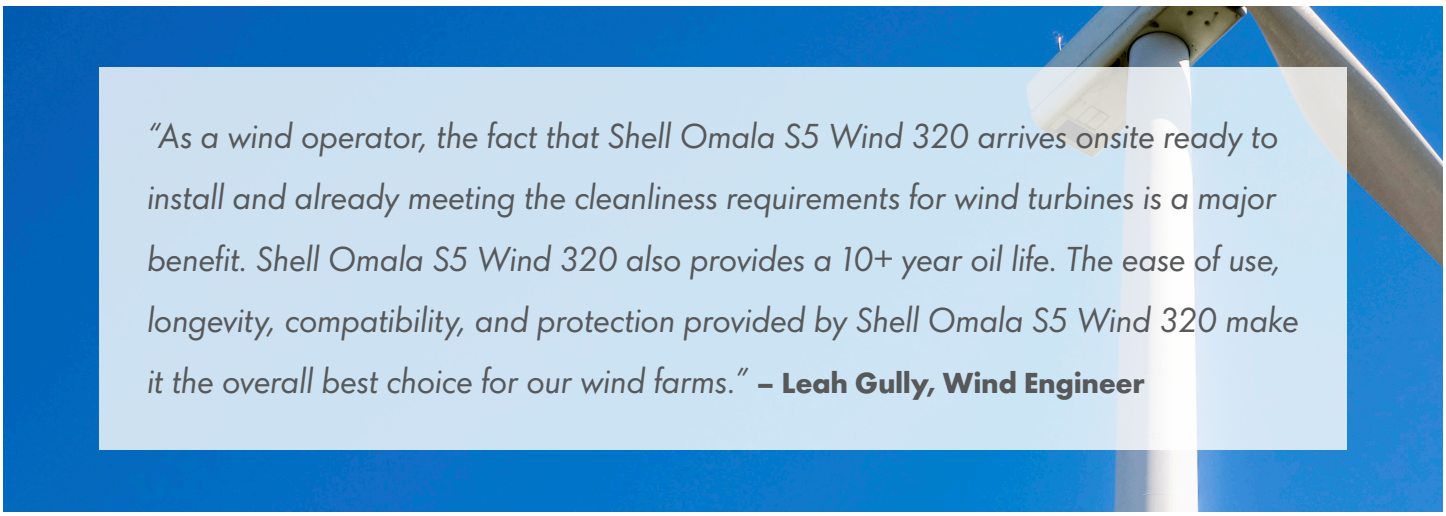
shell.com/lubricants

SHELL
LUBRICANT
SOLUTIONS

SHELL OFFERS COMPLETE LUBRICANT PORTFOLIO FOR WIND TURBINES

		APPLICATIONS										
PRODUCT GROUP	PRODUCT NAME	Main gearbox	Geared pitch drive	Yaw drive (geared)	Generator	Pitch/blade bearing	Hydraulic brake and pitch system	Main shaft bearing	Yaw bearing (roller bearing design)	Yaw bearing (plain bearing design)	Yaw & Blade Open Gear	Transformer
GEAR OILS	Shell Omala S5 Wind 320	■	■	■								
	Shell Omala S3 Wind 320	■										
	Shell Omala S4 GXV oils		■	■								
	Shell Omala S4 WE oils		■	■								
GREASES	Shell Rhodina BBZ					■			■			
	Shell Gadus S5 T460 1.5									■		
	Shell Gadus S5 V110 KP 1				■	■			■			
	Shell Gadus S5 V100 2				■							
	Shell Gadus S5 V460 KP 1.5							■				
	Shell Gadus S4 OG Multi-Season										■	
	Shell Gadus S4 OGXK										■	
HYDRAULIC OILS	Shell Tellus S4 VE 32						■					
	Shell Tellus S4 VX 32						■					
	Shell Tellus S2 VX 32						■					
TRANSFORMER OILS	Shell Diala S4 ZX-IG											■
	Shell Diala S5 BD											■
COOLANTS	Shell Rotella ELC Nitrite Free				■							
	Shell Longlife Coolant				■							

Shell demonstrates dedication to product cleanliness and quality assurance through investing to meet APQP4Wind requirements. Shell is committed to the needs of our Wind customers, including advanced cleanliness requirements for gear oil and hydraulic oil and specialized grease accordion pack sizes for easy maintenance.



"As a wind operator, the fact that Shell Omala S5 Wind 320 arrives onsite ready to install and already meeting the cleanliness requirements for wind turbines is a major benefit. Shell Omala S5 Wind 320 also provides a 10+ year oil life. The ease of use, longevity, compatibility, and protection provided by Shell Omala S5 Wind 320 make it the overall best choice for our wind farms." **– Leah Gully, Wind Engineer**

LUBRICANT APPLICATION BY WIND TURBINE OEM

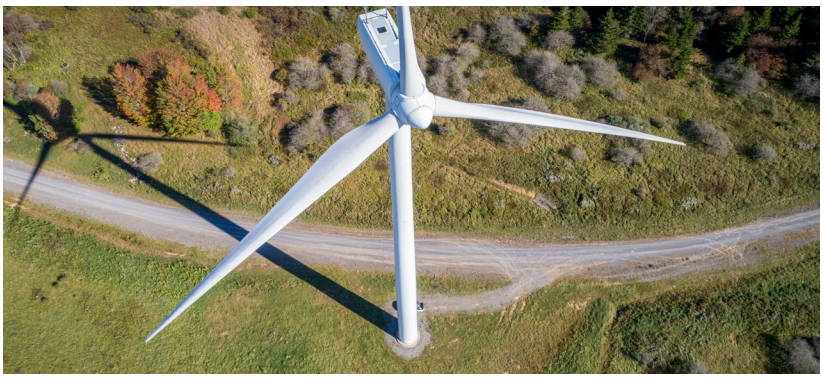
Shell supplies a variety of factory fill and service fill lubricants to wind turbine OEMs around the world.

OEM Platform	Main Gearbox	Pitch & Yaw Gearbox	Hydraulic System	Blade bearing	Yaw bearing	Main Shaft Bearing	Generator	Open Gear
GE	Shell Omala S5 Wind 320	Shell Omala S4 GXV oils	Shell Tellus S4 VX 32	Shell Rhodina BBZ Shell Gadus S5 V110KP 1	Shell Gadus S5 T460 1.5	Shell Gadus S5 V460KP 1.5	Shell Gadus S5 V100 2	Shell Gadus S4 OG Multi-Season
Mitsubishi	Shell Omala S5 Wind 320	Shell Omala S4 GXV oils Shell Omala S4 WE oils	Shell Tellus S4 VX 32 Shell Tellus S2 VX 32	Shell Rhodina BBZ Shell Gadus S5 V110KP 1	Shell Gadus S5 T460 1.5 Shell Gadus S5 V110KP 1	Shell Gadus S5 V460KP 1.5	Shell Gadus S5 V100 2	Shell Gadus S4 OG Multi-Season
Vestas	Shell Omala S5 Wind 320	Shell Omala S4 WE oils	Shell Tellus S4 VE 32	Shell Rhodina BBZ (≤ V90) Shell Gadus S5 V110KP 1 (>V90)	Shell Gadus S5 T460 1.5 Shell Gadus S5 V110KP 1	Shell Gadus S5 V460KP 1.5	Shell Gadus S5 V100 2	Shell Gadus S4 OG Multi-Season Shell Spirax ATE 75W-90
Siemens	Shell Omala S5 Wind 320	Shell Omala S5 Wind 320	Shell Tellus S4 VX 32 Shell Tellus S2 VX 32	Shell Rhodina BBZ Shell Gadus S5 V110KP 1	Shell Gadus S4 OG Multi-Season	Shell Gadus S5 V460KP 1.5	Shell Gadus S5 V100 2	Shell Gadus S4 OG Multi-Season
Gamesa	Shell Omala S5 Wind 320 Shell Omala S3 Wind 320	Shell Omala S4 WE 320	Shell Tellus S4 VX 32 Shell Tellus S2 VX 32	Shell Rhodina BBZ Shell Gadus S5 V110KP 1	Shell Gadus S5 T460 1.5 Shell Gadus S5 V110KP 1	Shell Gadus S5 V460KP 1.5	Shell Gadus S5 V100 2	Shell Gadus S4 OG Multi-Season
Nordex	Shell Omala S5 Wind 320	Shell Omala S4 GXV 150	Shell Tellus S4 VX 32	Shell Rhodina BBZ Shell Gadus S5 V110KP 1	Shell Gadus S5 V110KP 1	Shell Gadus S5 V460KP 1.5	Shell Gadus S5 V100 2	Shell Gadus S4 OG Multi-Season
Acciona	Shell Omala S5 Wind 320	Shell Omala S4 GXV oils Shell Omala S4 WE oils	Shell Tellus S4 VX 32 Shell Tellus S2 VX 32	Shell Rhodina BBZ Shell Gadus S5 V110KP 1	Shell Gadus S5 T460 1.5	Shell Gadus S5 V460KP 1.5	Shell Gadus S5 V100 2	Shell Gadus S4 OG Multi-Season
Senvion	Shell Omala S5 Wind 320	Shell Omala S4 GXV 320	Shell Tellus S2 VX 32	Shell Rhodina BBZ	Shell Gadus S5 V110KP 1	Shell Gadus S5 V460KP 1.5	Shell Gadus S5 V100 2	Shell Gadus S4 OG Multi-Season
Enercon	N/A	Shell Omala S4 GXV 220	N/A	Shell Gadus S5 V110KP 1	Shell Gadus S5 V110KP 1	Shell Gadus S5 V460KP 1.5	N/A	Shell Gadus S4 OG Multi-Season
Suzlon	Shell Omala S5 Wind 320	Shell Omala S4 GXV oils	Shell Tellus S2 VX 32	Shell Rhodina BBZ	Shell Gadus S5 V110KP 1	Shell Gadus S5 V460KP 1.5	Shell Gadus S5 V100 2	Shell Gadus S4 OG Multi-Season
Goldwind	N/A	Shell Omala S4 GXV 150	Shell Tellus S4 ME 32	Shell Gadus S5 V110KP 1	Shell Gadus S5 V110KP 1	Shell Gadus S5 V460KP 1.5	Shell Gadus S5 V100 2	Shell Gadus S4 OG Multi-Season
Envision	Shell Omala S5 Wind 320	Shell Omala S4 GXV 150	Shell Tellus S4 VX 32	Shell Gadus S5 V110KP 1	Shell Gadus S5 V110KP 1	Shell Gadus S5 V460KP 1.5	Shell Gadus S5 V100 2	Shell Gadus S4 OG Multi-Season

Please consult your Shell Technical Advisor to confirm suitability for use.

Shell Omala S5 Wind 320 is approved by all major gearbox manufacturers.

NGC	DHI
ZF	Sany
Moventas	Teek
Eickhoff	TYHI
Winergy	Bonfiglioli



SHELL LUBRICANT SOLUTIONS FOR WIND TURBINES: INTRODUCING NEXT-GENERATION GEAR OIL, GREASE, AND HYDRAULIC OIL

SHELL OMALA S5 WIND 320

OUR MOST TECHNOLOGICALLY ADVANCED GEAR OIL

Shell Omala S5 Wind 320 gear oil offers superior filterability[1] and industry-leading corrosion protection[2], especially against yellow metal corrosion[3]. Ask your Shell representative about the Shell Omala S5 Wind 320 10-Year Oil Life Warranty[4].

LOWER LIFE CYCLE COSTS WITH SHELL OMALA S5 WIND 320

TECHNICAL BENEFIT	LIFE CYCLE VALUE
Superior oxidation and thermal degradation resistance	Extended oil drain intervals of 10+ years and a 10 year warranty
Robust wear and yellow metal corrosion protection	Extends gearbox component life and oil life
Enhanced low temperature flow	Improved speed to grid and improved efficiency in cold climates
Advanced foam control and superior filterability	Prevents gear and bearing failure, false oil level alarms, and spillage
Approved by all major gearbox manufacturers	Trusted by gearbox OEMs in the wind industry; reputation benefit
Multiple equipment approvals and compatible with mineral oils	Opportunity to consolidate and simplify gear oil inventory management
Suitable and approved for yaw and pitch gearboxes	Cost savings from easier logistics and additional oil drain extensions

ONE OIL CHANGE GIVES YOU 20+ YEARS OF PERFORMANCE WHEN FACTORY-FILLED WITH SHELL OMALA S5 WIND 320.

Over the **25-year life** of a wind turbine, Shell Omala S5 Wind 320 may reduce life cycle costs by more than **50%** with a 10+ year oil drain interval.

Current gear oil supplier
3-year oil drain interval = 8 oil changes
5-year oil drain interval = 5 oil changes
8-year oil drain interval = 3 oil changes

Shell Omala S5 Wind 320
10+ year oil drain interval = 2 oil changes

[1] Shell Omala S5 Wind 320 gear oil was tested for 50,000 cycles in a Hydac multi-pass test-rig using 3µm filter material and retained anti-foam performance, longer than every competitor oil, which all failed after 5,000 cycles.
[2] Based on industry standard corrosion testing.
[3] Based on ASTM D2893 testing.
[4] warranty conditions apply

SHELL GADUS S5 V110KP 1

NEXT-GENERATION SYNTHETIC BLADE BEARING GREASE WITH OUTSTANDING PERFORMANCE

- Formulated for long grease life and system efficiency
- Effective film thickness through wide temperature range down to -55° C
- Outstanding protection from false brinelling, wear, and fretting corrosion
- In-depth field trials and laboratory tests confirm this grease provides exceptional protection against challenges, including load, vibration, low speed, high torque, lew temperatures, pumpability, and corrosion.

SHELL GADUS S5 V460KP 1.5

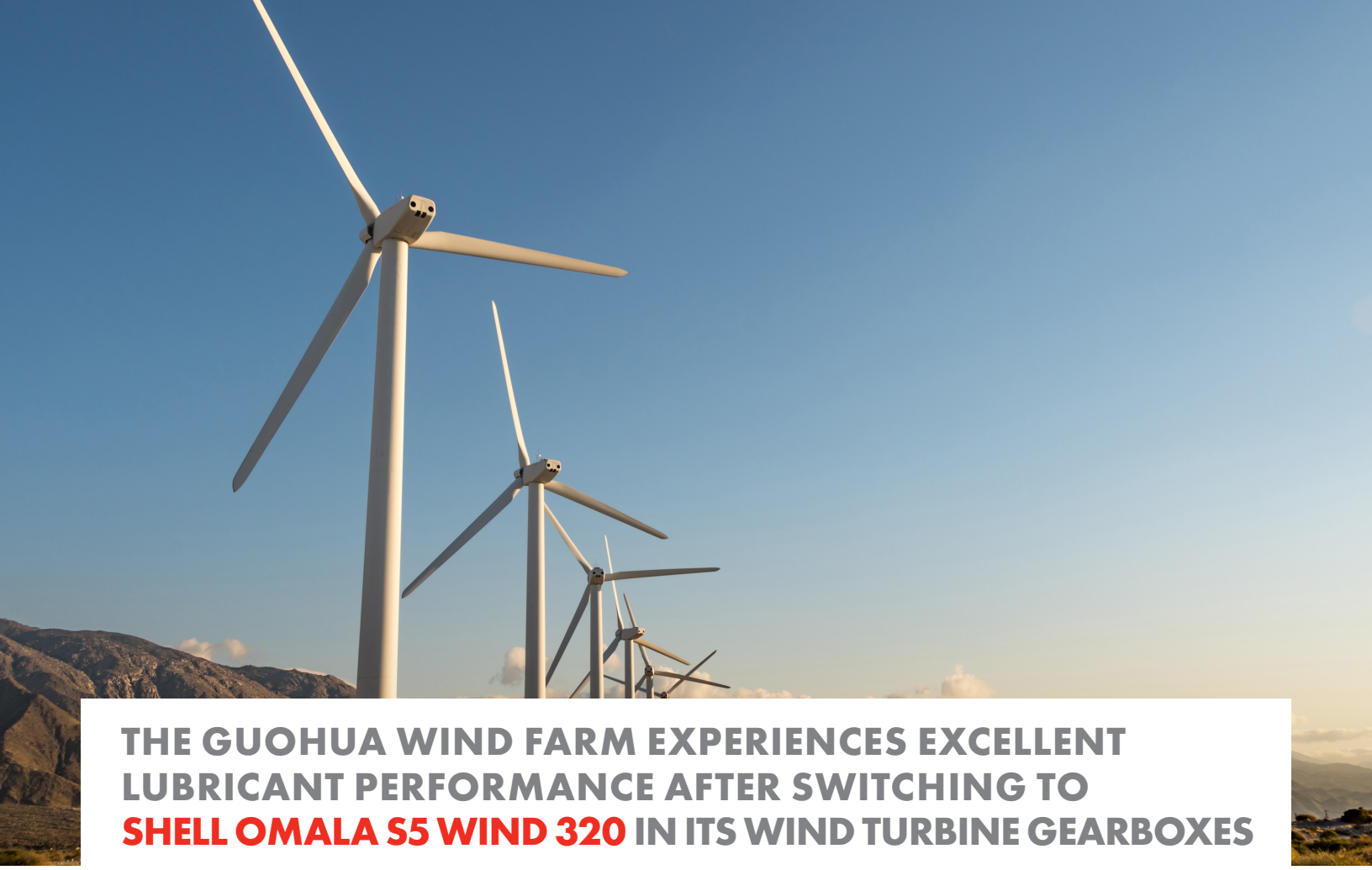
NEXT-GENERATION SYNTHETIC GREASE FOR MAIN BEARINGS AND PITCH & YAW BEARINGS

- Designed to reduce main bearing failures, extend bearing life, and reduce downtime
- Long grease life and system efficiency due to the unique thickener in combination with synthetic oil
- Tailored film thickness throughout the whole temperature range
- Outstanding protection from wear, corrosion and fretting even at low temperatures

SHELL TELLUS S4 VE 32

HIGH PERFORMANCE HYDRAULIC FLUID CAN HELP REDUCE DOWNTIME AND MAINTENANCE COSTS

- Productivity savings through excellent air release and shear stability
- Synthetic base oil with gas-to-liquids (GTL) technology
- Proven wear protection through extensive field testing and OEM approvals
- Provides 10-year oil life in wind turbines; extended oil drain capable to increase uptime
- 15 times lower sludge than Mobil DTE 10 Excel, based on high-temperature ISOT JISK2514
- Operates in subarctic temperatures to extreme desert heat



THE GUOHUA WIND FARM EXPERIENCES EXCELLENT LUBRICANT PERFORMANCE AFTER SWITCHING TO SHELL OMALA S5 WIND 320 IN ITS WIND TURBINE GEARBOXES

ENHANCING PERFORMANCE

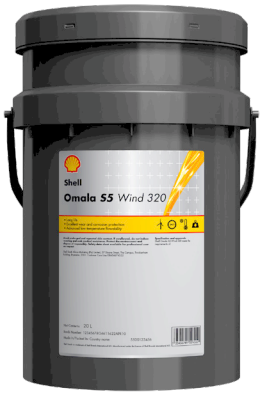
Guohua wind farm in Dailiji, Inner Mongolia, China, operates 33 1.5-MW turbines from Dongfang Electric New Energy Equipment that began productive operation in late 2009. The wind farm is in an area that experiences a yearly temperature range of –30.5 to +38.9 °C.

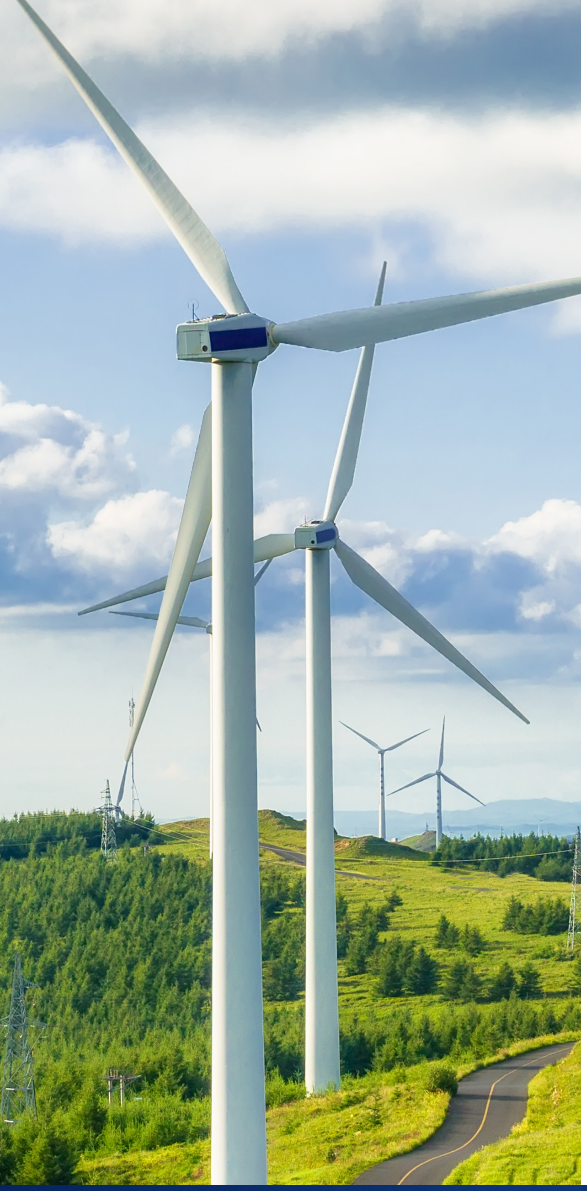
The wind farm operator, Guohua (Tongliao) wind Power Co., Ltd, wanted to ensure maximum uptime and availability for the wind turbines by using a high-performance lubricant. Although wind turbine gearboxes are not prone to frequent faults, a failure would result in a long period of downtime for the affected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

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

- the runtime of the wind turbines was significantly longer
- the foaming problem in the gearboxes had been alleviated
- the cold startup time of the wind 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





INTRODUCING CARBON NEUTRAL LUBRICANTS FOR WIND

CARBON NEUTRAL LUBRICANTS

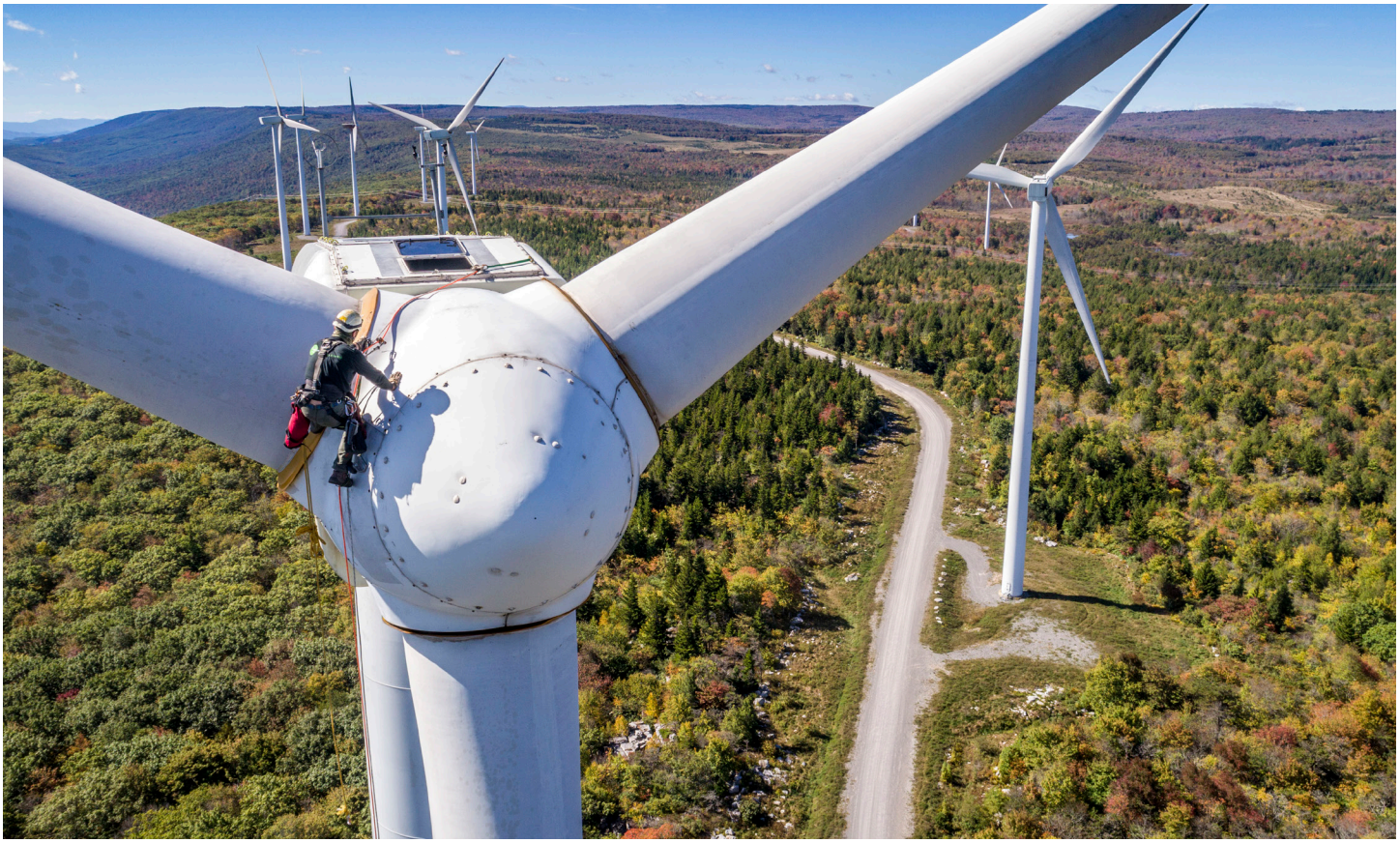
Discover our range of carbon neutral wind lubricants and make sustainability an even stronger part of your business strategy. Shell offers a variety of carbon neutral lubricants including gear oils, greases, and hydraulic oils with full transparency on certificates.

Shell uses Nature-Based Solutions certificates to off-set the product lifecycle carbon footprint of our lubricants portfolio.

- Nature-Based Solutions are projects which protect, transform or restore land. In this way, nature absorbs CO_2 emissions from the atmosphere.
- Independent verification and review by Lloyd's Register, an external, accredited verification body.

SERVICE TO OFFSET EMISSIONS

Shell can provide access to its Nature-Based Solutions portfolio as a service to offset CO_2 emissions from customer value chains, products, and services that are unrelated to Shell.



TECHNICAL SUPPORT AND TRAINING

Shell is committed to working with each customer on specific lubricant applications to meet the needs of each wind site. By partnering with Shell, this gives customers the competitive advantage of better asset protection, tailored oil drain intervals, and less intensive maintenance procedures – creating a unique value proposition for your wind operations.

Shell LubeCoach

Training Program

Shell technical experts can coach your team to deliver better performance through both in-person and online lubrication training programs.

Shell LubeAdvisor

Technical Advisors

Our technical experts can advise you on which lubricants to use to help improve efficiency and reduce operating costs, including maintenance and lubricant portfolio consolidation.

Shell LubeAnalyst

App Based Oil Analysis

An oil condition monitoring offer with equipment-based diagnosis based on lubricant expertise enabling strong limit profiles and recommendations for preventive maintenance to optimize asset performance.

Find out more by visiting

WWW.SHELL.COM/LUBRICANTS-POWER

'Shell Lubricants' refers to the various Shell companies engaged in the lubricant business.