



FROM PROTECTING YOUR ASSETS TO POWERING CITIES

TOGETHER IT'S POSSIBLE

Work with us to find lubrication solutions for your power generation or transmission business.

Whether you operate turbines, transformers or stationary engines in the distribution and transmission business, lubricants can make a significant difference to your total cost of equipment ownership. Our partners work with us to increase their productivity and reliability, and reduce their maintenance costs, in some cases by up to 30%.

shell.com/lubricants

SHELL LUBRICANTS
TOGETHER ANYTHING IS POSSIBLE



PRODUCTIVITY, RELIABILITY AND LUBRICANT STRATEGIES

OUR PLANET IS BUSIER AND HUNGRIER FOR POWER.

The electricity network is one of the world's largest and most complex machines and an essential part of most people's daily lives. It is easy to take access to affordable electricity for granted, but keeping the lights on means overcoming serious challenges today and in the future.

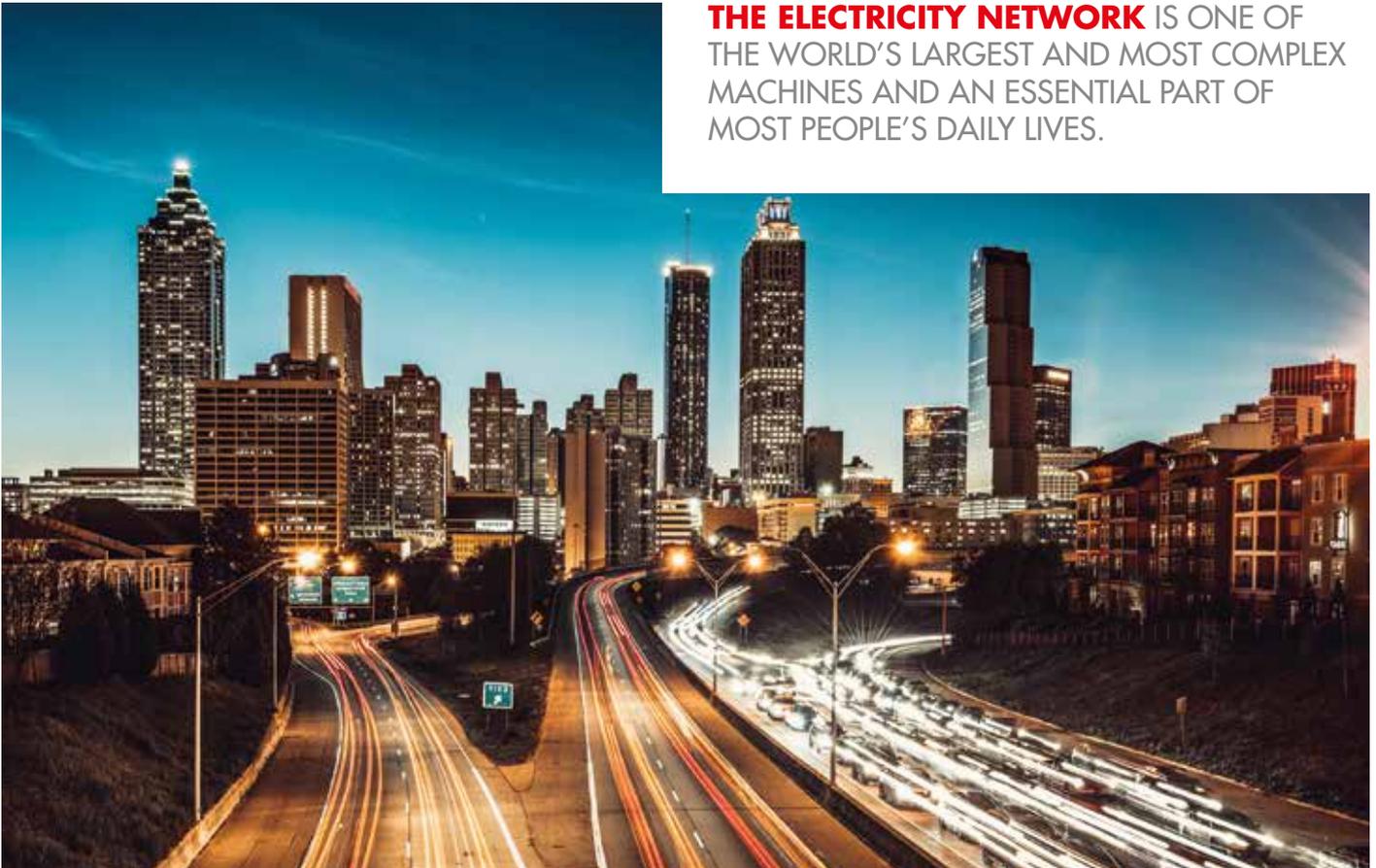
We understand that, as power producers or distributors, you are committed to delivering greater productivity and reliability, while meeting stricter environmental targets, and face severe penalties for supply interruptions. The right lubricants and lubrication management can help you to meet these commitments by better protecting your equipment to minimise downtime and extend its operational life.

The role of lubricants in daily operations may appear unimportant. They typically account for less than 5% of a power company's operational expenditure. Consequently, lubricants are often seen as non-strategic purchases and any product meeting the minimum specification set by the equipment manufacturer may be perceived as acceptable. However, this is not always the case, and simply meeting the minimum standards will not necessarily offer the same level of performance and protection.

The right lubricants, not necessarily the cheapest, used in the right way can significantly reduce the total cost of ownership (TCO) of your equipment. Our power-industry customers have reported TCO-driven lubricant strategies helping to maximise the value of equipment investments by lowering operational costs, enhancing equipment availability and productivity, and extending component life.

In some instances our partners have achieved maintenance savings of up to 30% by selecting high-performance products and applying effective lubricant management practices.

THE ELECTRICITY NETWORK IS ONE OF THE WORLD'S LARGEST AND MOST COMPLEX MACHINES AND AN ESSENTIAL PART OF MOST PEOPLE'S DAILY LIVES.



TURBINE OILS NEED TO COPE WITH INCREASED STRESS AND HELP TO ENHANCE SYSTEM RELIABILITY AND EFFICIENCY BY PREVENTING METAL-TO-METAL CONTACT AND CONTROLLING VALVE STICKING DURING START UPS AND SHUTDOWNS.

KEEPING TURBINES WORKING FOR LONGER

Today's power generation turbines work under demanding conditions, including 24/7 running and stop-start operations to support fluctuating renewable power capacity. Power outputs are greater, while lubricant reservoirs are the same size or smaller, which is leading to higher operating temperatures and loads.

Turbine oils need to cope with increased stress and help to enhance system reliability and efficiency by preventing metal-to-metal contact and controlling valve sticking during start ups and shutdowns. They must also cool equipment quickly to prevent oil degradation and bearing deposit formation, and protect against corrosion.

Working with you, our technical experts can support you through such challenges offering guidance on current operations, enhancing your lubricant management practices and selecting the right products to deliver value.

From high-temperature gas turbine systems to combined-cycle gas and steam turbine systems with integral gearing, the Shell Turbo range of turbine oils is designed to protect your equipment, extend the life of your oil and offer system efficiency benefits to maintain optimal operating conditions. For example, in tests Shell Turbo S4 X far exceeds industry standards for resistance to degradation and offers exceptional performance compared with other oils in the market.



CUTTING OPERATING COSTS BY 37%¹

After suffering a series of operational issues, a turbine operator switched to a Shell Turbo oil. This reduced journal bearing failures, extended the bearing life and improved plant reliability. In total, the customer reported that this cut operating costs by 37%.¹

¹Savings reported by individual customers. Actual savings may vary, depending on the application, the current oil used, the maintenance procedures and the conditions of the equipment.

ENHANCING WIND TURBINE RELIABILITY

Wind power is a growing part of today's global energy mix. In 2014, new installed capacity increased by 44%. The Global Wind Energy Council suggests that the existing installed capacity may double by the end of 2019.¹

Reliability is a major issue. For example, GCube Renewable Energy Insurance reports more than 900 gearbox bearing failures a year resulting in insurance claims of \$200,000–300,000 each. This means that helping to protect bearings against wear and premature failure has the potential to deliver considerable savings.

Wind turbines are often remotely located and are getting larger. Over the last decade, the average offshore wind turbine capacity has increased to 3.6 MW. The siting and size of wind turbines

present operational and maintenance challenges, including increased loads and vibration, which can accelerate bearing wear; extreme hot or cold climates; sandstorms; seawater spray and water ingress; and corrosion.

As a trusted technical partner, Shell can work with you to select the right products and lubrication management processes for all your wind-turbine components to keep them working in the face of these operational challenges. For example, Shell Gadus S5 V460KP can help to avoid unplanned maintenance and limit planned maintenance. Industry tests show that it offers superior all-round performance compared with its rivals, which are good in some areas but heavily compromised in others.

¹Global Wind Energy Council, Global Wind Report, Annual Market Update 2014

WIND POWER IS A GROWING PART OF TODAY'S GLOBAL ENERGY MIX.
IN 2014, NEW INSTALLED CAPACITY INCREASED BY 44%.

REDUCING OPERATING COSTS

Power company Eskom wanted to improve operating efficiency by switching to a synthetic oil for its gearboxes. Shell recommended Shell Omala S4 GX, an advanced, synthetic industrial gear oil, and the Shell LubeExpert service. Shell Omala S4 GX, in combination with improved lubrication practices, provided energy savings and reduced operational downtime and maintenance costs through extended oil-drain intervals, lower lubricant consumption and longer component life, with a reported total annual saving of US\$170,000.²



STATIONARY ENGINE

REDUCING STATIONARY ENGINE OPERATING COSTS

Manufacturers are focusing on developing more efficient engines with higher power densities and brake mean effective pressures. This results in increasingly demanding high-oil-stress conditions, including elevated operating temperatures. These conditions can lead to an increase in efficiency-robbing deposits, rapid oil degradation and the need for more frequent oil changes. To ensure they protect components from wear, control deposits to maintain engine operating efficiency and provide optimum oil life, engine oils must perform well in these challenging conditions.

A good understanding of fuels is important for oil selection, as fuel type and quality can detrimentally affect oil performance. For dual- or tri-fuel engines, oil selection during the operating cycle is even more critical. Non-conventional fuels, such as landfill, bio or sewage gas, present additional challenges such as increasing the risk of corrosion and ash deposits build-up in the combustion chamber.

For engines operating with heavy fuel oil, lubricants have to manage fuel contamination, protect the engine from the sulphur-related corrosion and offer optimum oil life through total-base-number retention and viscosity control. Where gas is used, a balance between ash level and performance is needed to ensure that system efficiency is not compromised.

EXTENDING OIL-DRAIN INTERVALS BY 68%

Indraprastha Gas Ltd wanted to reduce costs by extending the oil-drain intervals in 130 gas engines. Our technical team suggested a Shell Mysella S5 N trial supported by the Shell LubeAnalyst and Shell VideoCheck services.

The company increased its oil-drain intervals by 68% with the new product. This helped it to reduce oil consumption, and increase filter life and equipment availability, **saving a reported US\$84,333 a year.²**

Working in partnership, and including our best-in-class Shell LubeAnalyst oil condition monitoring programme, our experts can help you to reduce costs by extending the life of our high-performance Shell Mysella and Shell Argina oils. These product ranges include lubricants specifically designed to meet today's challenges. For example, Shell Mysella S5 N is formulated to reduce costs in natural-gas engines by extending oil-drain intervals and reducing deposit-related maintenance.

TRANSFORMER

INCREASING TRANSFORMER LIFETIME AND EFFICIENCY

In many countries, the average age of transformers is 30–40 years or more. As the capital cost of replacing transformers is high, many are operating close to or beyond their recommended lifespans. They also frequently operate under overload, with larger voltages to improve transmission efficiencies and higher power-to-weight or power-to-volume ratios to reduce manufacturing and installation costs.

This means that transformer oils must work effectively for extended periods and at higher temperatures while protecting against copper corrosion, paper degradation and premature oil ageing.

Our experts can work with you to select the most appropriate products from the Shell Diala range of transformer oils. These products help to protect your transformer and ensure efficient operation throughout its life. For example, Shell Diala S4 ZX-I, a new gas-to-liquids-based product engineered for optimum performance in the latest generation of transformers, offers enhanced protection, longer oil life and greater cooling performance.³ It helps to meet the specific demands of today's transformers such as reduced sizes, increased loads, higher voltages and longer operational lifetimes.

²The 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 products being used, the condition of the equipment and the maintenance practices. More details are available on request.

³Based on tests comparing Shell and competitors' products



INCREASED TRANSFORMER FILLING EFFICIENCY

L&Z Transformatoren offers an oil reconditioning service. Waiting for foam to dissipate delayed the refilling process. The company contacted Shell for advice. Working with our local expert, it introduced Shell Diala S4 ZX-I, an oil based on gas-to-liquids technology, with a lower foaming tendency than conventional transformer oils. With the new oil, the company has cut refilling times by 10%, giving **a reported maintenance saving of \$24,000 a year.²**



BUILDING TRUSTED PARTNERSHIPS

Selecting the right product for a particular component and set of operational challenges is only one part of the key to unlocking potential TCO savings. It is also important to ensure that the correct amount of product reaches the right surfaces, at the right time and without being contaminated. That means adopting effective lubricant management practices.

Working together, our technical teams can help to embed these practices in your organisation, and advise on the best products and technical services for your needs. They can also help if you have a lubrication issue, as they have the experience and expertise, backed by a global research and development team, to find a solution.

We invest significant resources in developing new power-industry lubricant solutions. Our lubricant research and development teams in our Shanghai, China, Hamburg, Germany, and Houston, USA, technology centres collaborate with a network of experts such as:

- technical partnerships with equipment manufacturers to help ensure that our products are optimised for the latest equipment technologies
- field trials with customers to validate real-life product performance and to steer the development of future lubricant products
- research with academic institutions, such as the University of Manchester, UK, as part of a major European consortium, investigating transformer design and operation, and the influence of oil on ageing and reliability characteristics that could potentially help to revolutionise transformers' lifespans.

ADDING VALUE THROUGH TECHNICAL SERVICES

To get the most value from our lubricants and as part of a lubrication management programme, we often recommend our technical services.

Shell LubeAnalyst is an oil and equipment monitoring service available in 95 countries and 28 languages. Through it, we can monitor your equipment without interrupting operations and help you to interpret the results. The service provides a health check for your lubricants and machinery, benchmarking equipment performance against a large global dataset. It helps to keep your business running smoothly by helping to identify potential oil or equipment failures before they become critical.

As part of the **Shell LubeAdvisor** service, our specialised Shell lubricant technical advisors conduct site surveys to help

you identify quantifiable areas for lubrication improvement. They can then help you to implement value improvement projects that aim to seize the opportunities identified.

Shell LubeMatch, our easy-to-use online service, recommends lubricants for specific industrial applications. It provides jargon-free guidance on the benefits of different lubrication products and is available in 138 countries and 21 languages, which makes it the most comprehensive and integrated lubricant selection tool available.

Our **Shell LubeCoach** service can help to upskill your employees. It is a customised training programme led by our technical experts and designed to develop understanding of lubrication.

A SELECTION OF OUR **PREMIUM** PRODUCTS

TURBINE	WIND	TRANSFORMER	STATIONARY ENGINE
<p>Turbine oils Shell Turbo T Shell Turbo S4 X Shell Turbo S4 GX Shell Turbo DR</p>	<p>Bearing greases Shell Gadus S5 V460KP Shell Gadus S5 V110KP</p> <p>Gear oil Shell Omala S4 GX</p> <p>Hydraulic fluids Shell Tellus S2 V Shell Tellus S4 VX</p>	<p>Electrical oils Shell Diala S4 ZX-I Shell Diala S4 ZX-IG</p> <p>Hydraulic fluid Shell Naturelle S4-I</p>	<p>Cylinder lubricants Shell Alexia S4 Shell Alexia S5 Shell Alexia S6</p> <p>Engine oils Shell Argina Shell Gadinia Shell Melina S</p> <p>Gas-engine oils Shell Mysella S2 Z Shell Mysella S3 Z Shell Mysella S3 N Shell Mysella S3 S Shell Mysella S5 N Shell Mysella S5 S</p>

Manufacturer approved: Our lubricants meet or exceed the specifications of many equipment manufacturers.

THE RIGHT LUBRICANTS USED IN THE RIGHT WAY CAN SIGNIFICANTLY REDUCE THE TOTAL COST OF OWNERSHIP OF YOUR EQUIPMENT.



Find out more by visiting
www.shell.com/lubricants