



FROM PROTECTING TURBINE SYSTEMS TO POWERING PROGRESS

Shell Turbo makes it possible

The Shell Turbo range of oils helps to protect your equipment
and to ensure efficient operation throughout its lifetime.

www.shell.com/lubricants

**SHELL
LUBRICANT
SOLUTIONS**

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Every part of your machine or process has been meticulously engineered, so you want to choose a supplier that can provide a combination of high-quality turbine oils designed to protect your equipment with value-added services that give you peace of mind and help to reduce equipment downtime.

Shell's range of turbine oils and lubricant analysis services enable users such as power companies and process plant operators to select the oil that will deliver optimum value to their operations through enhanced protection, long oil life and high system efficiency.

SYSTEM PROTECTION

From high-temperature gas turbine systems to combined-cycle systems with integral gearing, the Shell Turbo range of turbine oils is designed to protect your equipment from the effects of corrosion and to minimise the build-up of deposits and lacquer in turbine bearings and control valves. It includes Shell Turbo S4 GX, which is specifically formulated to provide additional protection for gearboxes in turbine systems that require enhanced anti-wear performance from oil.

OIL LIFE

Because Shell understands the costs that downtime can incur in a capital-intensive plant, its lubricants are designed for exceptional oil life under continuous operating conditions. The products are designed to have outstanding oxidative stability and to resist the effects of water contamination. Shell's manufacturing processes are tightly controlled to ensure that customers receive only the highest-quality lubricants.

SYSTEM EFFICIENCY

To help your turbines to perform to their full operating potential, the Shell Turbo range of turbine oils is designed to have rapid air release and excellent filterability characteristics.

A RANGE OF TURBINE OILS TO MEET YOUR NEEDS

INDUSTRIAL STEAM, LIGHT- AND HEAVY DUTY GAS AND COMBINED-CYCLE TURBINE SYSTEMS AND TURBOCOMPRESSORS

INDUSTRIAL STEAM, LIGHT- AND HEAVY-DUTY GAS AND COMBINED-CYCLE TURBINE SYSTEMS, INCLUDING GEARED TURBINES WITH LOAD REQUIREMENTS

INDUSTRIAL STEAM AND LIGHT-DUTY GAS TURBINES AND TURBOCOMPRESSORS

INCREASINGLY EFFICIENT PROTECTION

TIER 4

Shell Turbo S4 X

- Extended oil life¹
- Enhanced efficiency¹
- Available in ISO 32 viscosity



Shell Turbo S4 GX

- Extended oil life¹
- Enhanced wear protection¹
- Available in ISO 32 and 46 viscosities



SPECIALIST APPLICATION

- Excellent fire resistance
- Available in ISO 46 viscosity



Shell Turbo S5 DR

APPLICATION ICON KEY

- | | |
|------------------|-----------------|
| Turbine | Enclosed gear |
| Power station | Long life |
| High temperature | Flame retardant |
| Turbocompressor | |

Shell Turbo T

- Reliable performance
- Reliable protection
- Available in ISO 32, 46, 68 and 100 viscosities



Shell Turbo J

- Satisfies requirements of MHPS steam and gas turbines
- Available in ISO 32 viscosity



¹Compared with market representative products

SHELL LUBEANALYST

Monitor, benchmark, improve and save

Shell LubeAnalyst is a health check for your lubricants and machinery. It is an oil condition monitoring service that helps you to keep your business running smoothly by identifying potential oil or equipment failures before they become critical. Shell LubeAnalyst will help your business to save money and time on maintenance and potential lost production caused by equipment failures.

It is an early-warning system that aims to give you peace of mind knowing that both your equipment and your lubricants are in optimum working order. A global platform, Shell LubeAnalyst is available in 95 countries and 27 languages, and has more than 75 million data points.

Shell provides four individual test suites (see Table 1) designed for your specific turbine application.

A comprehensive range of additional tests is available. Please consult your local Shell technical representative for further details.

ON-SITE SERVICE PACKAGE

The Shell offer extends beyond oil products and oil analysis. It also includes services such as contamination control and support with commissioning, flushing, filling and filtration.

SHELL LUBEANALYST TURBINE OIL CONDITIONING MONITORING PACKAGES

TEST	INDUSTRIAL STEAM, LIGHT- AND HEAVY-DUTY GAS, COMBINED-CYCLE TURBINE SYSTEMS AND TURBOCOMPRESSORS			INDUSTRIAL STEAM TURBINES WITH ELECTROHYDRAULIC CONTROL SYSTEMS
	OCM Turbine Suite - Advanced Quarterly ²	OCM Turbine Suite - Advanced Semi-annual ³	OCM Turbine Suite - Advanced Annual ⁴	OCM Turbine Suite - Advanced Control Fluids Three-monthly ⁵
Appearance (visual)	■	■	■	■
Colour (ASTM D1500)	■	■	■	■
Kinematic viscosity at 40 °C (ASTM D445)	■	■	■	■
Density at 15 °C (ASTM D4052)				■
Total acid number (ASTM D664)	■	■	■	■
Water (Karl Fischer) (ASTM D6304)	■	■	■	■
Wear metals/additive elements by ICP (ASTM D5185)	■	■	■	■
Particle count - cleanliness (ISO 4406-99)	■	■	■	■
Millipore sludge (0.8µ ISO 4405)	■	■	■	
Water separability at 54 °C (ASTM D1401)			■	
Rust test (ASTM D665-A)			■	
Foaming (Sequence I, II, III) (ASTM D892)		■	■	
Air release (ASTM D3427)		■	■	■
RPVOT (ASTM D2272)			■	
Varnish potential MPC (ASTM D7843)	■	■	■	
Oxidation by FTIR (ASTM E2412)	■	■	■	
Anti-oxidant trending RULER™ (ASTM D6810, D6971)	■	■	■	
Chlorine content (ISO 15597)				■
Volume resistivity (IEC 60247/ASTM D1169)				■
Voltammetry antioxidant trending RULER (ASTM D6810, D6971)	■	■	■	
Demulsibility (ASTM D1401, ml-ml-ml (min))			■	

Table 1: Test kits and test methodologies (tests may vary by region).

²Shell recommends OCM Turbine Suite - Advanced Quarterly turbine oil test suite for all turbines

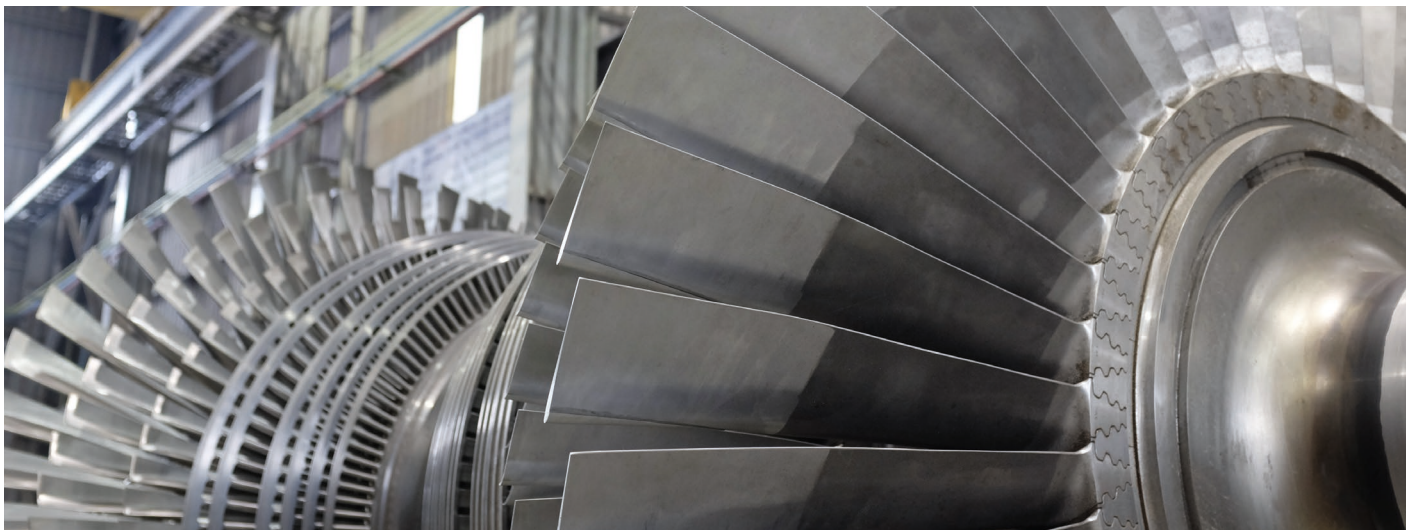
³Shell recommends OCM Turbine Suite - Advanced Semi-Annual turbine oil test suite for steam turbines and combined cycle systems every six months

⁴Shell recommends OCM Turbine Suite - Advanced Annual turbine oil test suite for all turbines at first fill, for three-yearly major overhaul activities and for steam and gas turbine systems on an annual basis

⁵Shell recommends OCM Turbine Suite - Advanced Control Fluids Three-monthly or maximum on an annual basis

PRODUCT	CATEGORY DESCRIPTOR	BENEFITS	TECHNOLOGY	ISO VISCOSITY GRADES	SPECIFICATIONS AND APPROVALS (Full details of approvals for all products can be obtained from your Shell representative; approvals and claims will vary by viscosity grade.)
Shell Turbo S4 GX	Industrial steam, light- and heavy-duty gas and combined-cycle turbine systems, including geared turbines with load requirements	<ul style="list-style-type: none"> ■ Extended oil life⁶ ■ Enhanced wear protection⁶ 	Shell GTL (gas-to-liquids) technology	32, 46	Approved by or meets Alstom HTGD 90 117 V0001 Y; ASTM 4304-13 Type I, II and III; Dresser Rand 003-406-001 Type I and III; GB 11120-2011, LTSE, LTGE and LTGSE; General Electric GEK 32568j, GEK 46506e, GEK 28143b, GEK 101941a, GEK 107395a and GEK 120498; Siemens Power Generation TLV 9013 04 and 05, Ruston report 65/0027 and Turbo-machinery 1CW0047915; Solar ES 9-224W Class II; MAN D&T SE TED 10000494596; ISO 8068 LTSE, LTGE and LTGSE; JIS K-2213 Type 2; DIN 51515 Part 1 L-TD and Part 2 L-TG
Shell Turbo S4 X	Industrial steam, light- and heavy-duty gas and combined-cycle turbine systems	<ul style="list-style-type: none"> ■ Extended oil life⁶ ■ Enhanced efficiency⁶ 	Shell GTL technology	32	Approved by or meets Alstom HTGD 90 117 V0001 Y; Dresser Rand 003-406-001 Type I and III; General Electric GEK 32568j, GEK 46506e, GEK 28143b Type I and VII, GEK 107395a and GEK 120498; Siemens Power Generation TLV 9013 04 and 05, Ruston report 65/0027 and Turbo-machinery 1CW0047915 (non-EP); Westinghouse 21 TO591 and 55125Z3 and Eng Spec_DP21T-00000443; Solar ES 9-224W Class II; MAN D&T SE TED 10000494596; ASTM 4304-13 Type I and III; GB (China) 11120-2011, LTGA, LTSA and LTGSB; DIN 51515 Part 1 L-TD and Part 2 L-TG
Shell Turbo T	Industrial steam, light- and heavy-duty gas and combined-cycle turbine systems and turbocompressors	<ul style="list-style-type: none"> ■ Reliable performance ■ Reliable protection 	Mineral oil	32, 46, 68, 100	Approved by or meets Siemens TLV 9013 04; Alstom HTGD 90-117 V; MAN Turbo SPD 10000494596; MAG Cincinnati P-38, P-55 and P-54 (appropriate viscosity grade); GEK 27070, 28143A, 46506E, 32568f and 107395a; Siemens Westinghouse 55125Z3; GEC Alstom NBA 50001A; Solar ES 9-224W Class II; DIN 51515 Parts 1 (L-TD) and 2 (L-TG); ISO 8068; JIS K-2213 Type 2; ASTM D4304-06a Type I and III; and BS 489:1999
Shell Turbo J	Industrial steam, light- and heavy-duty gas and combined-cycle turbine systems and turbocompressors	<ul style="list-style-type: none"> ■ Reliable performance ■ Reliable protection 	Mineral oil	32	Meets the following MHI specifications: Turbine Oil Type 2 (additive); MSO4-MACLO01 (R-1); MSO4-MA-CL002 (R-1)
Shell Turbo S5 DR	Industrial steam turbines with electrohydraulic control systems	<ul style="list-style-type: none"> ■ Excellent fire resistance 	Phosphate ester	46	Meets and exceeds the requirements of major original equipment manufacturers such as General Electric, Mitsubishi Hitachi Power Systems and Siemens. Approved by Factory Mutual Global against Standard 6930 for "Less flammable hydraulic fluids". Meets the requirements of ISO Standard 12922 and ASTM 4293 for HFDR-type fire-resistant hydraulic fluids.

⁶Compared with market representative products





SHELL'S RANGE OF TURBINE OILS AND LUBRICANT ANALYSIS SERVICES ENABLE USERS TO SELECT THE OIL THAT WILL DELIVER OPTIMUM VALUE TO THEIR OPERATIONS.

REAL-WORLD VALUE DELIVERING EXTENDED OIL AND EQUIPMENT LIFE

Enhanced system efficiency

By switching from a competitor's product to a Shell Turbo oil, one customer reported that it

- increased the oil-drain interval
- reduced lubricant and maintenance costs
- enhanced production capacity.

In total, the customer stated that this was worth about **\$90,000⁷** a year.

Enhanced system efficiency

After suffering a series of operational issues, one turbine operator switched to a Shell Turbo oil. This

- reduced journal bearing failures
- extended the bearing life
- improved plant reliability.

In total, the customer reported that this cut operating costs by **37%.⁷**

⁷Savings 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

FULL PRODUCT AND SERVICE PORTFOLIO

Shell Lubricants is the market leader in lubricants and has more than 70 years of innovation. We are constantly investing to develop better lubrication solutions, as demonstrated by

- Shell Diala S4 ZX-I - a premium, inhibited transformer oil
- Shell Turbo S5 DR - a fire-resistant, synthetic turbine oil.

Whatever your needs or application, Shell can provide a full range of oils and greases, including synthetic, high-performance products and additional services.

Lubricant	Application
Shell Corena	Compressor oils
Shell Diala	Transformer oils
Shell Gadus	Greases
Shell Gas Compressor Oil	Gas compressor oils
Shell Morlina	Bearing and circulating oils
Shell Omala	Gear oils
Shell Rimula	Heavy-duty diesel engine oils
Shell Spirax	Axle and transmission oils
Shell Tellus	Hydraulic fluids



Find out more by visiting
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