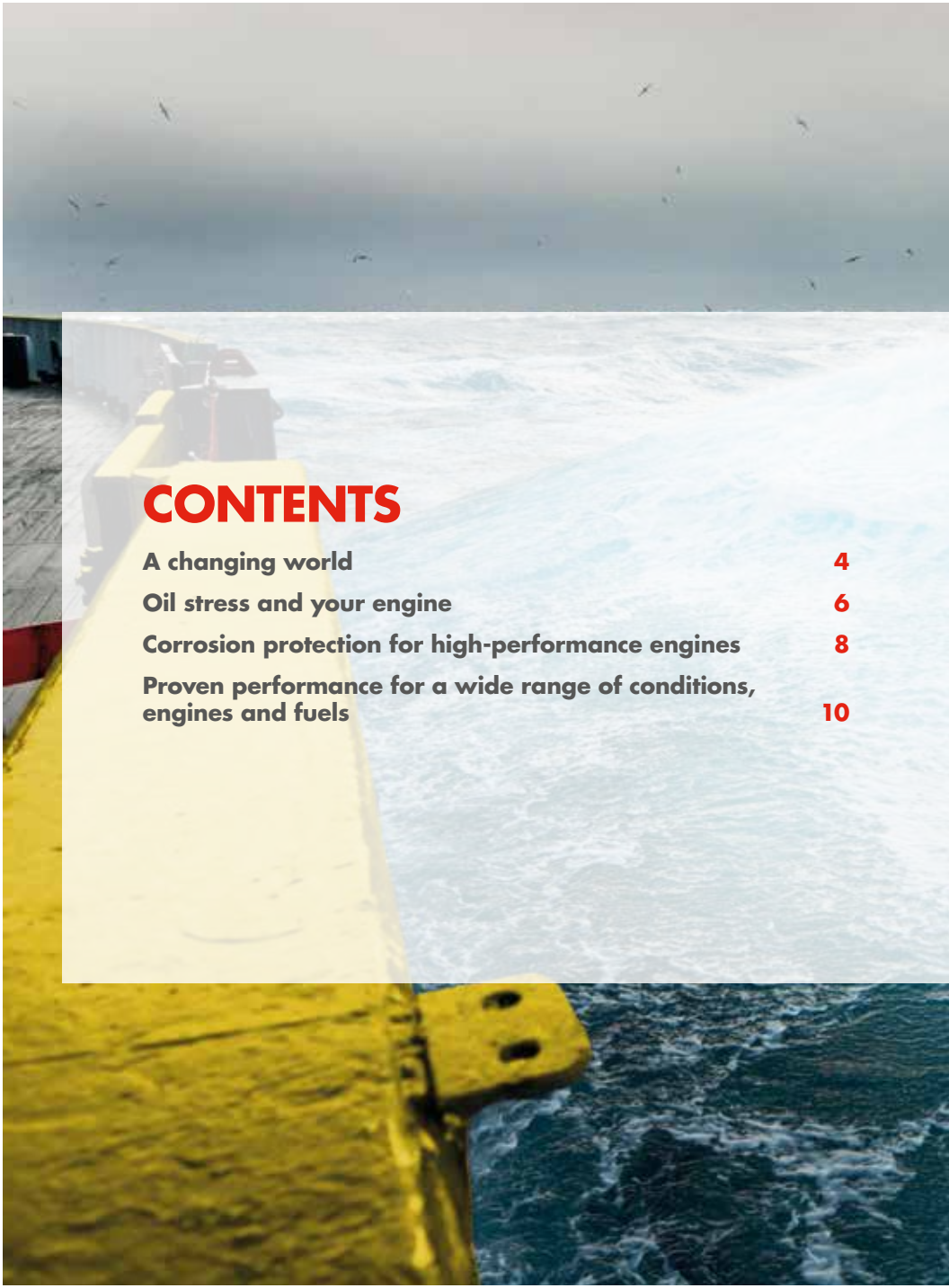
ADVANCED TRIPLE-ACTION TECHNOLOGY FOR THE LATEST NEW AND MODIFIED ENGINES

Shell Alexia

Shell Marine Products



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YOU CAN RELY ON SHELL ALEXIA IN A CHANGING WORLD

The marine industry is changing rapidly. In just 16 years, the drive to reduce fuel costs and improve environmental performance has seen maximum container-ship capacity increase from about 7,000 twenty-foot equivalent units (TEU) to 18,000 TEU. These new vessels are powered, at slow steaming speeds, by super-long-stroke engines that present a new set of cylinder oil challenges, including cold corrosion.

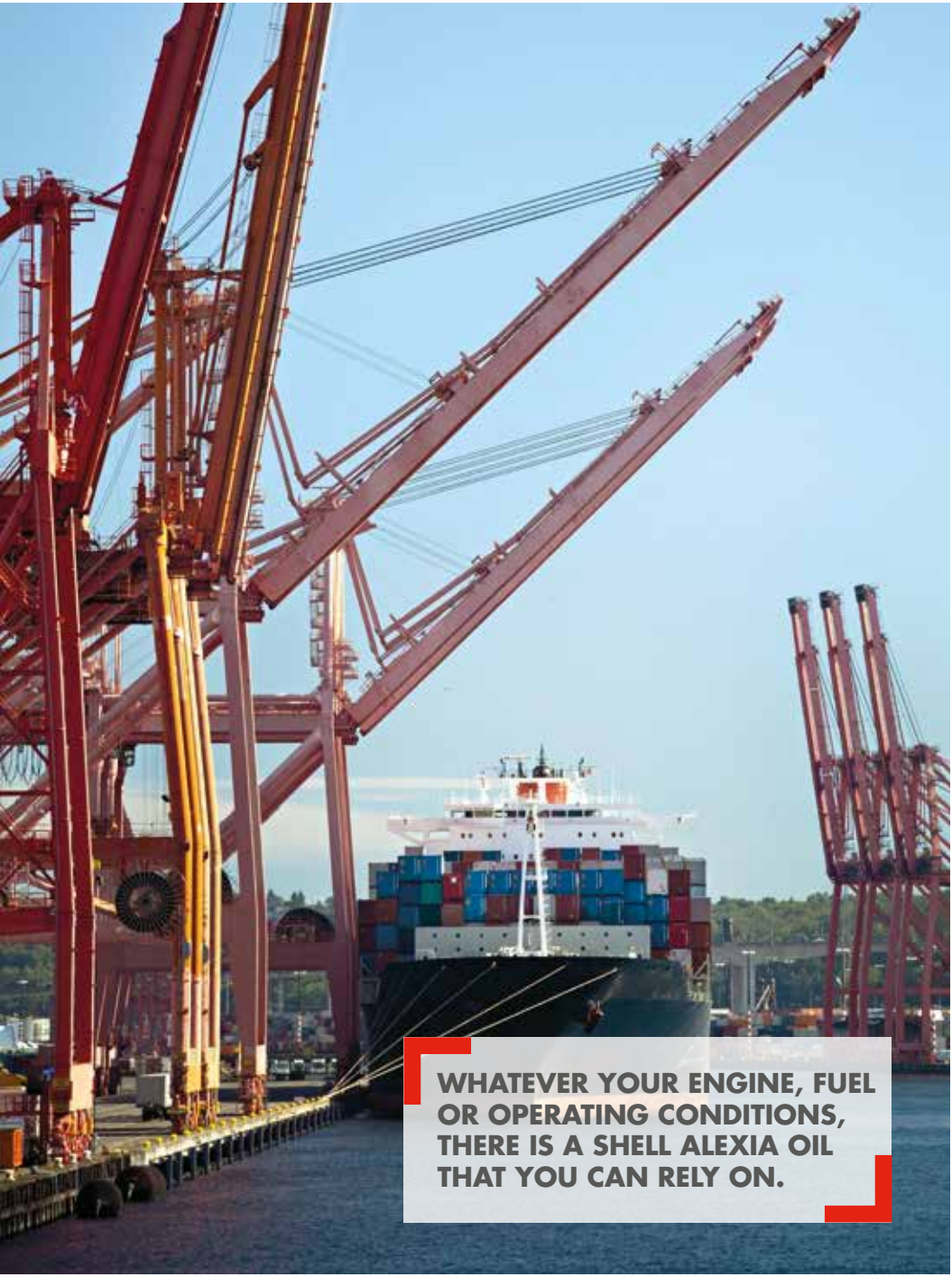
At the same time, tough environmentally driven legislation is increasing operational complexity.

Anticipating these challenges has led to the development of three Shell Alexia cylinder oils, which are designed to meet your changing needs. These oils are underpinned by a rigorous scientific understanding of oil stress and their proven performance in engines.

- **Shell Alexia S5** and **Shell Alexia S6** cylinder oils use advanced Triple-Action Technology to help protect the latest new and modified high-performance engines against cold corrosion.
- **Shell Alexia S4** is designed to improve performance across a wide range of operating conditions, non-critical engines and fuel sulphur contents.[1] It has over 18 million hours in operation, helps to simplify operations and gives customers the confidence to reduce cylinder oil feed rates and extend cylinder overhaul intervals.

[1]Within the guidelines stipulated by the major engine manufacturers.

Shell's Advanced Triple-Action Technology				
	BN	Acid blocking	Acid neutralization	Smart detergency
Shell Alexia S4	60	✓	✓	✓
Shell Alexia S5	80	✓	✓	✓
Shell Alexia S6	100	✓	✓	✓



WHATEVER YOUR ENGINE, FUEL OR OPERATING CONDITIONS, THERE IS A SHELL ALEXIA OIL THAT YOU CAN RELY ON.

OIL STRESS AND YOUR ENGINE

Oil stress in a lubricant can cause the product to degrade and become less effective. Over 20 years ago, we realised that if we were to improve engine oil performance radically we needed to understand all the stresses acting on the oil.

We now understand that two-stroke engine cylinder oil is exposed to four oil-stress factors:

- thermal stress
- insolubles stress
- acid stress
- humidity stress.

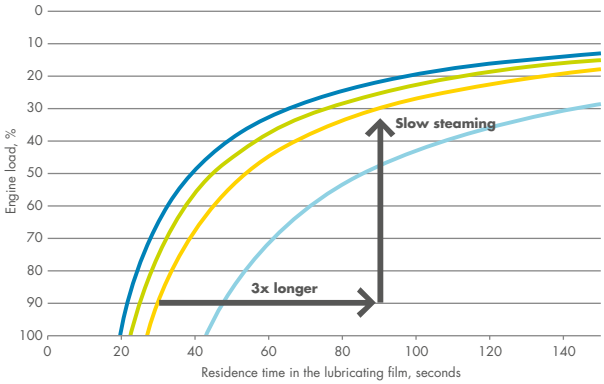
These stresses increase significantly under slow-steaming conditions because of the longer oil residence time in the cylinder. In fact, a reduction in engine load from 90% to 30% was found to cause a threefold increase in lubricant residence time. A slightly longer oil residence time could cause a rapid deterioration in lubricant performance, thereby affecting your engine performance.

The breakthrough in our understanding of oil stress led to the development of **Shell Alexia S4**, an innovative formulation, intended as mainstream grade for non-critical engines and flexible fuel use.

MORE ACID IN NEW ENGINE DESIGNS

Continuing cost and environmental pressures make investing in new and modified engine designs an attractive option. These changes, combined with slow-steaming practices, can increase acid in the cylinders by up to 300%, thereby exposing your new and modified engine to increased risk of corrosive wear and high maintenance costs.

Conventional cylinder oils that focus only on neutralising acids can lead to deposit build-up, dirty engines and high maintenance costs. We have used our insight into oil stress to develop an approach that helps to protect against acid stress and deposit build-up in three ways. This breakthrough Triple-Action Technology is at the core of **Shell Alexia S5** and **Shell Alexia S6**, and helps them to protect your new and modified engines from corrosive wear.



Three times longer:
Plotting oil residence time against engine load for a fixed oil feed rate shows that slow steaming may force the oil to work for three times longer than at normal steaming speeds.

Feed rate
- 1.1 g/kWh
- 0.95 g/kWh
- 0.8 g/kWh
- 0.5 g/kWh

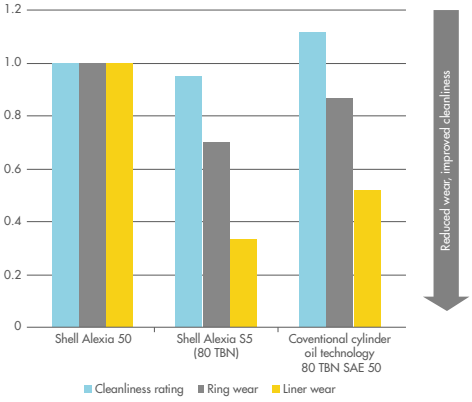
SLOW STEAMING AND NEW ENGINE DESIGNS CAN SIGNIFICANTLY INCREASE OIL STRESS.

CORROSION PROTECTION

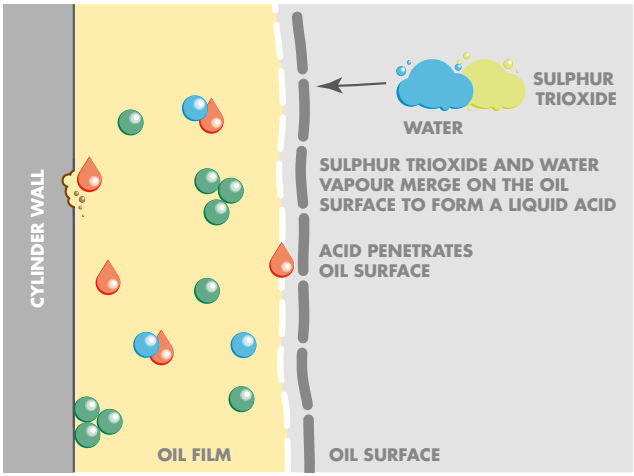
for high-performance engines – Shell Alexia S5 and Shell Alexia S6

Shell Alexia S5 and Shell Alexia S6 have been developed to help reduce the cost of maintaining new and modified engines. The latest super-long-stroke engines and older engines that are modified with low-load turbocharger cut-outs can suffer from excessive acid stress and severe corrosive wear, especially under slow-steaming operations. This, in turn, can lead to high maintenance costs.

Shell Alexia S5 (BN 80) and Shell Alexia S6 (BN 100) use Triple-Action Technology to help boost acid protection beyond the level suggested by the oils' base number (BN). Both oils complement recent recommendations from MAN Turbo & Diesel (MDT) and Wärtsilä to use BN80 and BN100 products in new and modified engines.

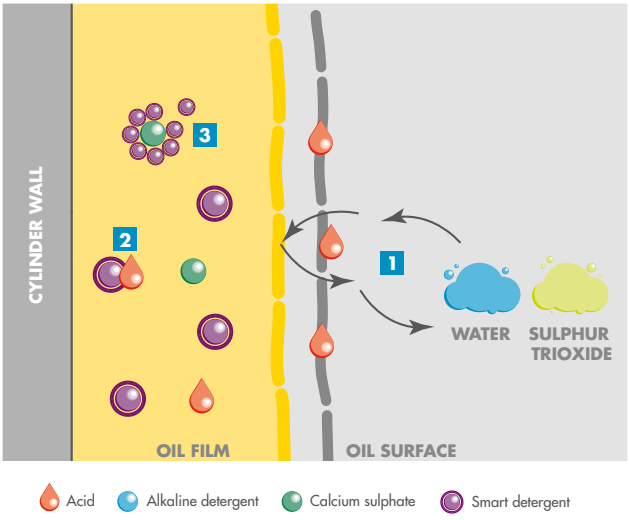


Proven in engine tests: In engine tests that simulated high-acid-stress conditions, Shell Alexia S5 outperforms Shell Alexia 50 and a competitor's conventional-technology BN80 oil.



Conventional cylinder oils

Acid penetrates the oil surface and causes corrosive wear on the liner. Conventional cylinder oils focus on neutralising the acid to form calcium sulphate. Too much calcium sulphate can lead to deposit build-up on the piston ring assembly, and, ultimately, increased maintenance levels.



Shell Alexia S5 and Shell Alexia S6

Triple-Action Technology works in three ways. **(1)** Acid blocking helps to reduce the acid penetrating the oil's surface; **(2)** acid neutralisation uses calcium carbonate to form calcium sulphate; and **(3)** smart detergency helps to stabilise the calcium sulphate molecules and prevent deposit build-up.

TRIPLE-ACTION TECHNOLOGY HELPS TO:

- **Prevent corrosive wear**
- **Reduce deposit build-up**
- **Prolong engine life.**

PROVEN PERFORMANCE FOR A WIDE RANGE OF CONDITIONS, ENGINES AND FUELS[1] – **SHELL ALEXIA S4**

We believe that new Shell Alexia S5 and Shell Alexia S6 oils are the best solutions for customers operating new and modified engines, while Shell Alexia S4 remains the right choice for most of today's non-critical engines. It is designed to simplify operations for use under a wide range of operating conditions, fuel specifications, engine and vessel types.

OPERATIONAL SIMPLICITY

Shell Alexia S4 helps to simplify operations by eliminating the need to carry a separate product for use with low-sulphur fuels.

- It can be used with residual fuel oil containing sulphur levels from 0.5% to 3.5% under a wide range of engine loads and climate conditions: polar to tropical.
- It offers easier product supply, procurement and forecasting, and a simple product storage and handling option, which reduces the need for intermediate bulk containers or drums.
- It reduces the requirement for a more expensive cylinder oil when using low-sulphur fuel.
- It helps to avoid the need for a lubricant change when moving in and out of emission control areas.
- It is fully miscible with all other cylinder oils, which means an easy changeover process.

[1]Within the guidelines stipulated by the major engine manufacturers.

PROVEN PERFORMANCE

Since its 2012 launch, Shell Alexia S4 has clocked up over 18,000,000 operating hours in our customers' engines and is used in more than 3,400 vessels. Our customers have told us that switching to Shell Alexia S4 and using Shell's technical support have helped them to reduce costs:

- Oldendorff Carriers saved over US$320,000[2,3] a year in cylinder oil costs for a capesize-designated iron ore carrier.
- HOSCO Group reduced the cylinder oil feed rate by 20%[3] in a bulk carrier.

[2]Based on list price of Shell Alexia S4 in IPL 88.

[3]These calculations may vary from vessel to vessel, depending on, for example, the application, the operating conditions, the current products being used, the condition of the equipment and the maintenance practices.

SINCE ITS 2012 LAUNCH, SHELL ALEXIA S4 HAS CLOCKED UP OVER 18,000,000 OPERATING HOURS IN OUR CUSTOMERS' ENGINES AND IS USED IN MORE THAN 3,400 VESSELS.

NOW AVAILABLE FOR ORDERS

Shell Alexia S5 and Shell Alexia S6 for the latest new and modified engines

For more information, email **smp-marketing@shell.com**

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