

# POWERING TOMORROW STARTS WITH TODAY

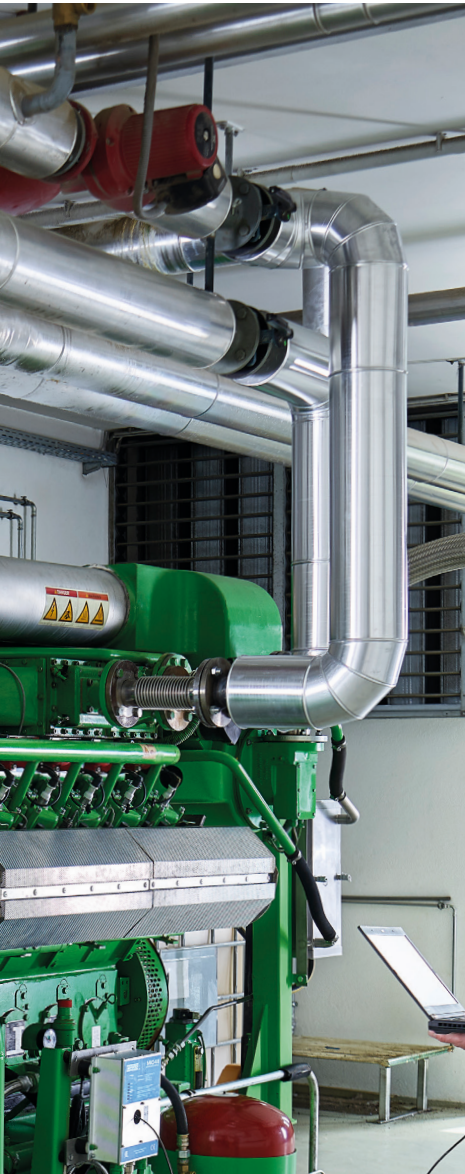
How choosing Shell Mysella  
can help stationary gas  
engine operators boost  
productivity and profits

**SHELL  
LUBRICANT  
SOLUTIONS**





## A SECTOR ON THE RISE



The global market for gas engines used within stationary applications is set for strong growth over the next few years. Today, nine countries make up more than half of the world's gas engine market. Between 2019 and 2023, the global market for stationary gas engines is expected to grow by 7% a year<sup>1</sup>. By 2022, the global market for stationary gas engines is expected to be worth \$4.4 billion<sup>2</sup>.

Europe, including Russia and Turkey, is the leading region with an annual installed capacity addition of approximately 2 GWe in 2017<sup>1</sup>. It is also expected that the East Asia region will almost double in size during the next five years, with most of the growth coming from China<sup>2</sup>.

### WHAT IS DRIVING CHANGE?

The ongoing rise in the global population is leading to an increase in energy demand. Indeed, by 2070, the number of people living on Earth could have grown to as many as 10 billion<sup>3</sup>. That's 2.5 billion more than today - the equivalent of adding the combined populations of China and India, the two most populous countries in the world.

Consequently, global energy demand is predicted to grow by more than 25% between now and 2040<sup>4</sup>. And, with gas increasingly being employed as a fuel source across a diverse range of areas - from industrial and commercial usage to residential applications - stationary gas engines are set to play a pivotal role in society moving forward.

To take just one example, in Germany, energy needed to power data centres alone is projected to grow to 16.4 billion kWh per year by 2025, with countries such as the UK, France and the Netherlands not far behind<sup>5</sup>.



### BUILDING FOR THE FUTURE

The need to reduce emissions and meet rising energy demands is forcing cities to evolve their thinking when it comes to energy supply. As a result, a growing number of projects are being constructed with renewable energy at their core.

## RENEWABLE BUILDINGS

### **Aktiv-Stadthaus (Frankfurt, Germany)<sup>6</sup>**

Municipal housing agency ABG FRANKFURT HOLDING designed an apartment building in Frankfurt that has an electricity-generating shell, powered by highly efficient modules installed on both the roof and the façade, which produce more environmentally friendly energy than tenants are able to consume throughout the year.

### **5, St Pancras Square (London, UK)<sup>8</sup>**

Designed by Bennetts Associates, the office building is rated by world-leading assessment body BREEAM as 'outstanding' due to its combination of renewable design elements and connection to King's Cross's combined heat and power system, which helps reduce CO<sub>2</sub> emissions.

### **Various Locations (Portsmouth, UK)<sup>7</sup>**

Several Portsmouth City Council housing blocks are benefitting from a range of sustainable energy measures, including solar panels, fuel cells, and low energy lighting, cutting their carbon emissions by a total of 100 tonnes a year. A number of the buildings are able to run entirely on renewable energy on some days.

### **Apple Park (Cupertino, USA)<sup>9</sup>**

Though Europe is leading the way when it comes to renewable buildings, Apple's global headquarters in California is perhaps the most impressive example of a commercial building that is powered completely by renewable energy. The location features a 17-megawatt solar formation and the building even provides energy back to the public grid when possible.

## DEMAND FOR CLEANER ENERGY AND THE NEED FOR CONSTANT, RELIABLE POWER

As concerns around climate change, air pollution and resource depletion mount, meeting the energy needs of a growing population cannot simply rely on traditional sources of power. Instead, renewable forms of energy must be – and are being – added to the energy mix.

For instance in 2017, the EU generated 32% of its electricity from renewable sources, an increase from just 20% from 2010<sup>10</sup>. And European demand for electricity is expected to grow by 40% by 2050<sup>11</sup>, driven by the uptick in transport, residential, agricultural, commercial and industrial use of electric power.

Any interruptions in power – even for a short time – can create situations that negatively impact citizens, businesses and public services. This trend has led to a rise in stationary gas applications for reliable power generation. Acting as a complementary power source, gas engines can

be brought online quickly and can respond rapidly to load changes, providing strong performance at peak demand and offering a flexible back up for renewable energy.

## DECENTRALISED POWER GENERATION

Europe has also moved to decentralised power generation – over the last decade and a half, the region has moved from a power-generation system dominated by a relatively small number of coal-fired stations, to a more distributed generation scheme of many smaller, local stations running on natural gas and renewable energy sources. The use of stationary gas engines in decentralised power generation is seen in combined heat and power (CHP) generation.

This is good for the environment, helping to lower emissions associated with power generation. But decentralisation also brings challenges. At a local level, the amount of power which the distribution network must handle can increase significantly. Because of this, power companies must take steps



## STATIONARY GAS ENGINES ON THE RISE

Research by Delta Energy and Environment has identified three key areas that are currently witnessing gas engines securing increased market share<sup>7</sup>.

### **District Heating**

Traditionally, larger commercial and industrial projects have relied on gas turbines or coal. However, volatile electricity prices combined with heating demands means there is growing expectation that countries will seek to utilise combined heat and power (CHP) plants that can operate flexibly to respond to demands.

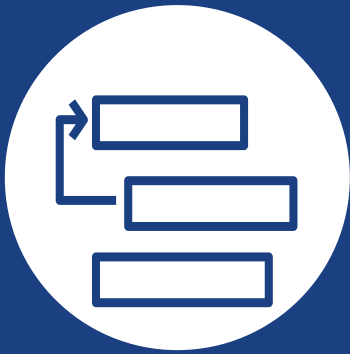
Germany has led the charge, announcing the installation of 100 MWe-scale CHP plants (190 MWe and 100 MWe) using gas engines within DH schemes in 2018<sup>13</sup>.

### **Commercial Buildings**

To reliably and consistently power large commercial buildings, stationary gas engines have made significant in-roads. The market has seen larger sizes and improved performance (>3 MWe) to cater to greater demand for more flexible operations.

### **Peaking Power Plants**

Peaking power plants need to have the ability to operate flexibly. That means being able to quickly ramp up or ramp down as needed, so as to provide electric grid stability. Research shows that the transition to gas engines is already well underway, with the expectation that they will be selected for an increasing number of peaking plant projects in future<sup>7</sup>.



## MAKING MAINTENANCE A PRIORITY

to mitigate against outages caused by overload<sup>12</sup>. Modern stationary gas engines will play a vital role in tomorrow's energy mix. But to do this, they must be engineered and maintained for the highest possible levels of performance and efficiency. And that can only happen if the oils that operators use are of the highest quality and are specifically designed for the task at hand. If a stationary engine is the heart of the power supply, the engine oil is its lifeblood. No matter the condition of the engine, if the oil within it is not of a high enough quality, the whole operation will be unable to perform to its maximum potential.

With stationary gas engines becoming more advanced all the time, the demands placed on oils are also increasing. Because lubrication is so crucial to determining engine performance, the oils selected must be viewed as critical components, rather than simply interchangeable commodities. After all, smart investments should be complemented with smart maintenance.

### BUILDING UNDERSTANDING

The adoption rate for new maintenance technologies varies greatly between countries. In part, this is due to a lack of understanding about what these technologies can provide. There also continues to be some confusion surrounding how their readings or data should be interpreted. In many ways, Europe already leads the world in the maintenance of stationary gas engines. Only 19% of power businesses experience breakdowns due to ineffective lubrication as opposed to 43% worldwide<sup>14</sup>.

But one in five is still too high. So, which piece of the puzzle is still missing? The answer,

surprisingly, is awareness: 60% don't realise that lubrication can lower maintenance costs<sup>14</sup>. Little surprise, then, that one third of power businesses in Europe have difficulty in selecting the correct lubricant for their equipment. To get the failure rate down, that 60% needs to analyse and optimise its lubrication practices.

If European businesses are provided with the support necessary to make these decisions, the health and reliability of their stationary gas engines will improve dramatically. This raises the importance of trusted experts, who can act as collaborative partners throughout the maintenance process, by offering products, services and advice that will allow performance to be optimised.





## CHALLENGES AND SOLUTIONS

**As engine technology continues to evolve to produce higher efficiency and output, it places greater stress on the oil used to keep the engine running.**

To meet the needs of a wide range of gas-engines and applications, Shell has designed a portfolio of gas engine oils that allow you to choose a product to match both the manufacturer's specific technical recommendations and your operational needs.

In particular, our next-generation lubricants, like Shell Mysella, are meticulously engineered through a complex blend of reliable base oil and performance-enhancing additives to ensure equipment is well protected for longer.

Trend	What it means for oil	How Mysella can help
Higher power density engines	An increased engine output places greater demands on oil performance	Provides superior deposit control even when faced with high pressure conditions
Extension of oil-drain interval	The oil needs to be able to resist oxidation and nitration and to cope with components such as acids, in the gas.	Designed to deliver long oil life, even in engines fuelled by sour gases, which can rapidly reduce the oil life of more traditional gas engine lubricants
Lower specific engine oil consumption	With lower oil consumption or replenishment, the lubricant must be more efficient	Designed to deliver longer oil life and reduced oil consumption, reducing labour costs and increasing filter life
Reduced sump capacity	Similar to a lower oil consumption, a smaller sump size will result in oil stress building up at a quicker rate, placing greater demand on oil	Formulated to minimise deposit build-up and keep engines clean, even in the most severe engine conditions
Extend catalyst lifetime required	Catalysts are used to control (or eliminate) engine emissions. However, some additive components of a gas engine oil can accelerate the ageing	Proven not to foul exhaust boilers, catalysts or intercoolers

## NEW CHALLENGES, NEW SOLUTIONS

The challenges presented by modern, high efficiency stationary gas engines can lead to higher total cost of ownership. These include:



### Increased risk of deposit formation

From our experience in the field and our global oil analysis database, Shell engineers know that new-generation engines have a tendency towards increased deposits, especially in ring grooves and on piston tops, which can raise concerns around engine reliability.



### More frequent oil changes

Shell has seen that oil drain intervals are getting shorter in new generation engines due to high oil stress levels, leading to frequent engine stoppages, unplanned downtime and rising costs.



### Increased risk of oxidation and faster Base Number (BN) depletion

When Shell looks at the trends of used-oil analysis reports of various new generation engines, the increase in oil stress levels is quite evident. This can result in increased oil oxidation and faster Base Number (BN) depletion.

In response, Shell has developed a new generation of lubricants that deliver increasingly efficient protection. Shell Mysella S7 N Ultra is a premium-tier product designed to meet the challenges posed by the higher pressures of modern operating environments, as well as the latest high Brake Mean Effective Pressure (BMEP) engines, which regularly operate at 24 bar BMEP. In fact, Shell Mysella S7 N Ultra has the capacity to support engines developed in the future with an even higher BMEP, offering an ultra-extended oil life to help extend maintenance intervals, in addition to excellent engine protection.

It also delivers enhanced deposit control and handling for trouble-free piston running, which helps boost engine efficiency, avoid unplanned downtime and means that predictive maintenance intervals can be followed as determined by the manufacturer.

## SHELL MYSELLA AS A SMART SOLUTION

Shell's technical experts continually improve the Shell Mysella range, which is developed to meet the specific challenges of stationary gas engines and their applications. It is also approved by leading OEMs such as INNIO Jenbacher, MWM, Caterpillar, Waukesha, and many more.



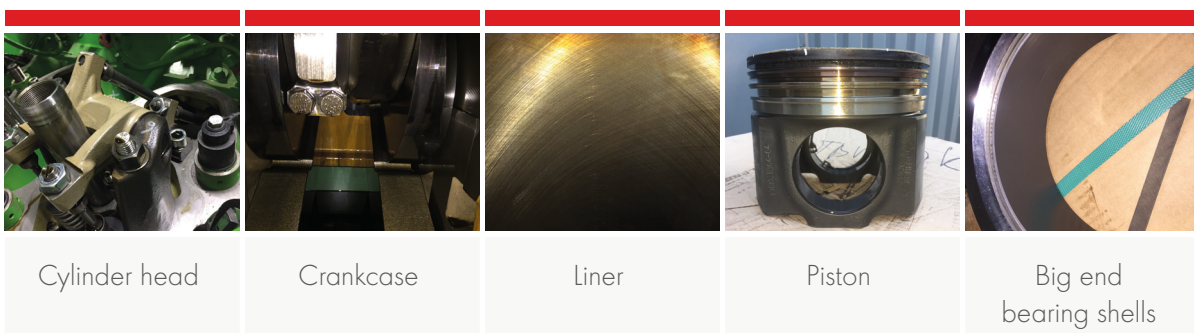
## SHELL MYSELLA PROVIDES:



Wear Protection	Oil Life	System Efficiency
<p>With energy demand at an all-time high, demands on gas engines are greater than ever. This brings greater stress on critical components within the engine itself. Lubricants must therefore be equipped with the necessary protective qualities to safeguard components from the increased possibility of wear.</p> <p>The Shell Mysella range of gas-engine oils is designed to minimise deposit build-up and to keep your engine clean. For instance, Shell Mysella S6 N provides superior deposit control, even in the latest generation of high-output engines that operate in severe conditions with very high piston temperatures and pressures.</p> <p>This helps maintain excellent ring belt cleanliness and cylinder liner protection.</p>	<p>Technological advances have resulted in stationary gas engines that are designed with longer service intervals in mind. As such, engine oil must be specially formulated to enable longer drain intervals, while retaining their reliability and performance.</p> <p>Shell Mysella oils are designed to deliver long oil life to help you maintain your operations efficiently and cost-effectively.</p> <p>For instance, Shell Mysella S7 N Ultra will keep the engine running reliably even with increased residence time of the oil on hot engine parts at lower oil consumption levels.</p> <p>The product's ash level also benefits a lower oil consumption environment, since it works to lubricate valve seats on the cylinder head, preventing valve recession.</p>	<p>Recent industry trends, such as demands for lower emissions and cost reductions, have seen the development of more advanced engine system designs. These high-efficiency engines need similarly effective lubricants, that can deliver high thermal and pressure stability, to ensure performance under testing conditions.</p> <p>The Shell Mysella range of gas-engine oils has been designed to provide high engine efficiency.</p> <p>For instance, Shell Mysella S5 N can provide excellent cleanliness for heat recovery boilers, turbochargers and intercoolers.</p>

## PRESERVES ENGINE CONDITIONS

### SHELL MYSELLA S7 N ULTRA FIELD TEST IN A JENBACHER J616F



Results are supported by 45,000+ hours of field trials in more than 10 Jenbacher Type 6 engines.



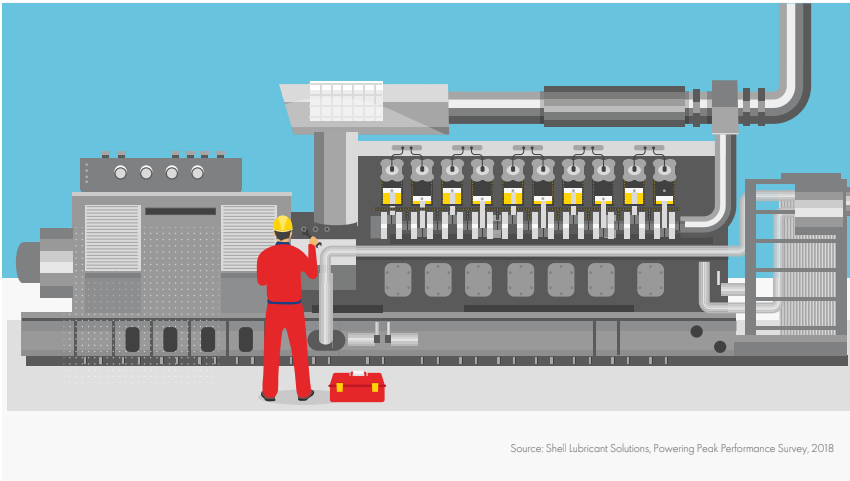
# POWERING NEXT-GENERATION GAS ENGINES WITH SHELL MYSELLA S7 N ULTRA



The rising global demand for power is driving the ongoing evolution of stationary gas engines. However, the more powerful the engine, the more extreme the operating conditions.

Shell developed high-performance oil Shell Mysella S7 N Ultra to help safeguard the efficiency, help ensure the reliability and meet the considerable demands of next-generation stationary gas engines. Helping to generate the power we need to keep the lights on.

## WHY MAINTENANCE AND LUBRICATION MATTER



Source: Shell Lubricant Solutions, Powering Peak Performance Survey, 2018

There is a missed opportunity for power operators to:

- prevent breakdowns
- minimise disruption to operations
- avoid unforeseen costs



PRIORITISE PREDICTIVE MAINTENANCE AND HIGH-QUALITY LUBRICANTS

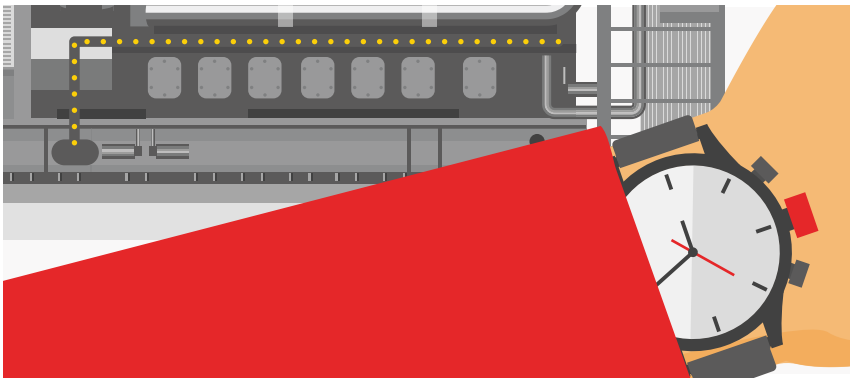
# 40%

of power operators often experience breakdowns due to ineffective lubrication

# 72%

of power operators say unreliable equipment has led to unexpected costs

## ULTRA-EXTENDS OIL LIFE



SHELL MYSELLA S7 N ULTRA

# 2X

OIL LIFE

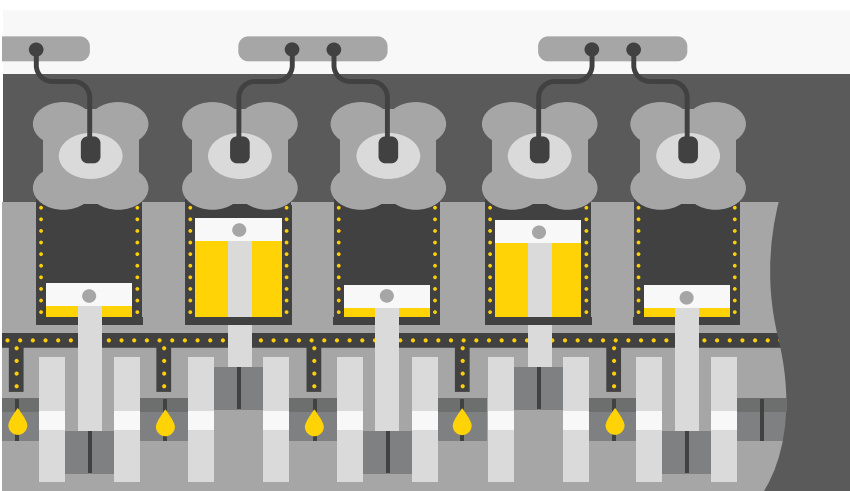
Up to  
**4,000**  
HOURS ODI

**24+**  
BAR BMEP

- Up to double current industry performance for oil life
- Increases oil drain intervals from average 2,000-mark
- Extends oil drain intervals for steel piston engines up to 24 bar BMEP\* with capacity to support future engines with higher BMEP

\* Brake mean effective pressure  
Results are supported by 45,000+ hours of field trials in more than 10 Jenbacher Type G engines

## PROTECTS COMPONENTS



SHELL MYSELLA S7 N ULTRA



Offers excellent deposit handling and piston cleanliness



Handles increased stress caused by engine running conditions



Guards against scuffing

## REDUCES DOWNTIME



SHELL MYSELLA S7 N ULTRA

-  Cuts unplanned maintenance through ongoing protection
-  Lessens need to replace power unit or parts due to wear prevention
-  Helps sustain planned maintenance intervals

## HELPS TO BOOST BOTTOM LINE



SHELL MYSELLA S7 N ULTRA

-  Ensures ongoing operations through greater reliability
-  Protects expensive engine components
-  Helps to lower total cost of ownership

## WHY CHOOSE SHELL MYSELLA S7 N ULTRA?



Safeguards efficiency and withstands higher stress in extreme operating conditions



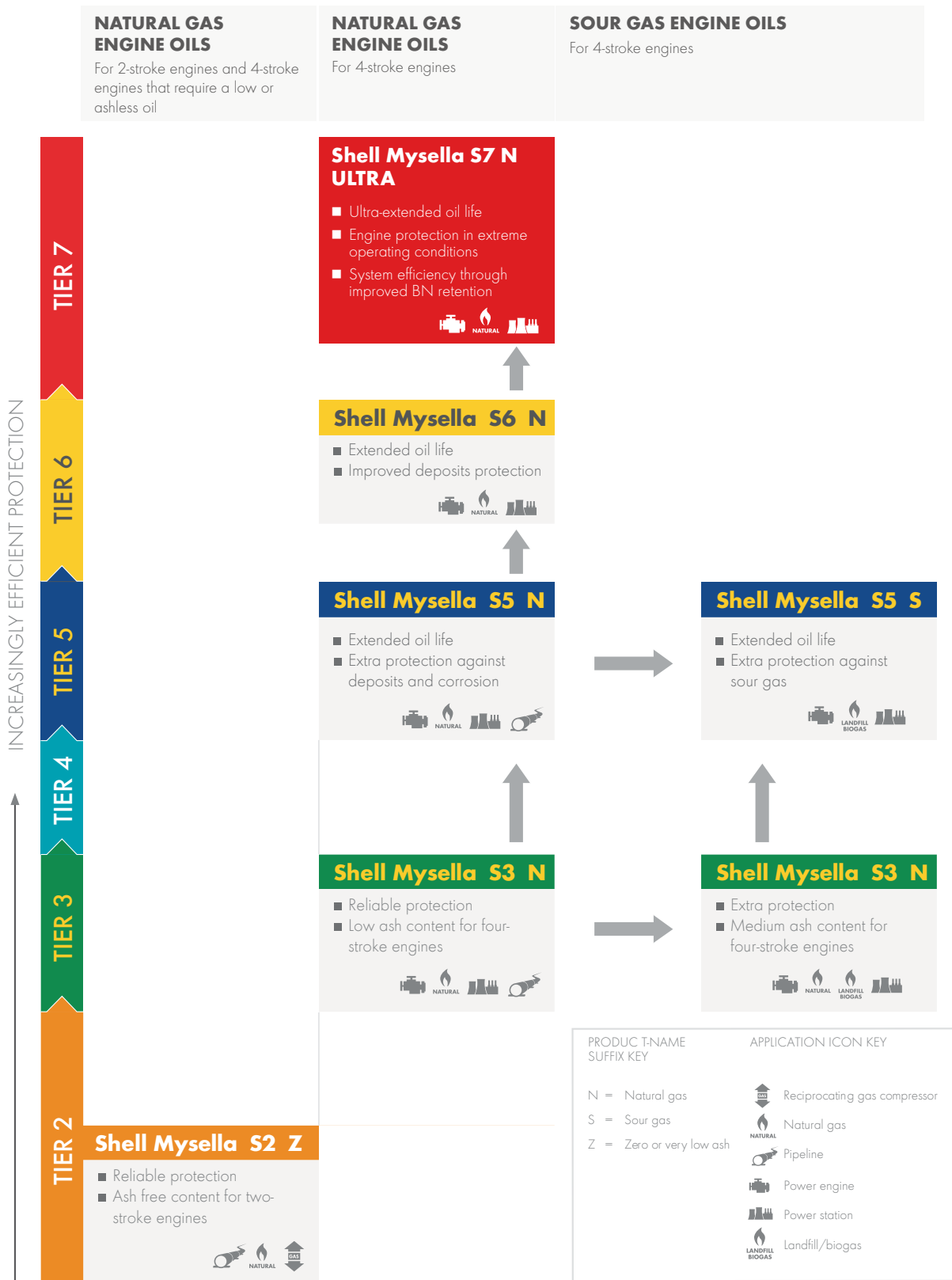
Enables operators to maximise power production to help meet growing customer demand



Helps plant owners to optimise operations and better future-proof their business

# A RANGE OF GAS-ENGINE OILS TO MEET YOUR NEED

To meet the challenges of a wide range of gas engines and applications, Shell has designed a portfolio of fluids that enable you to choose a product to match your technical and operational needs.



THE SHELL MYSELLA RANGE OF GAS-ENGINE OILS HAS BEEN DESIGNED TO MINIMISE DEPOSIT BUILD-UP AND TO KEEP YOUR ENGINE CLEAN.



## DELIVERING PEAK PERFORMANCE

As well as finding the correct lubricant, choosing a supplier that can offer ongoing expertise and guidance around selection, application and management assures you that your machinery is always delivering peak performance. That's why Shell offers a range of support services to customers, all aimed at increasing equipment efficiency and reducing unplanned breakdowns.

### SHELL LUBEANALYST FOR STATIONARY GAS ENGINES

#### Partner, protect, produce and progress

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.

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

#### SHELL LUBEANALYST FOR GAS ENGINES

- Is tailored to the needs of gas engine operators
- Meets the requirements of leading gas engine manufacturers
- Offers simple selection and handling using newly compiled test packages

#### ON-SITE SERVICE PACKAGE

Test	GEST OCM Standard – Gas Engine (Natural Gas)	GEAV OCM Advanced – Gas Engine (Natural Gas)	GEAL OCM Advanced – Gas Engine (Landfill Gas)
Viscosity at 100°C (ASTM D445)	■	■	■
Viscosity at 40°C (ASTM D445)		■	■
TAN (ASTM D664)	■	■	■
TBN (ASTM D2896)	■	■	■
Water content (acc. Karl Fischer)	■	■	■
FTIR (ASTM E2412)	■	■	■
Metals/ICP (ASTM D5185)	■	■	■
IpH (Jenbacher)		■	■
Sulphur content (inhouse)		■	■
Chlorine content (DIN 51 408/2)			■

## OTHER SHELL SERVICES

### Shell Lube Video Check

**60%** of power professionals do not realise effective lubrication can help lower maintenance costs.

Shell LubeVideoCheck performs component analysis that is normally only possible by dismantling equipment. With the support of Shell technical experts, this enables you to fully assess equipment and prepare for the future, without wasting time or money.

### Shell LubeChat

**57%** of power professionals believe third party advice would help improve maintenance practices.

Shell LubeChat is a 24/7 AI-powered online chat service that provides answers to lubricants questions, enabling you to make faster and better-informed decisions that can ultimately help bring down total cost of ownership.

### Shell LubeAdvisor

**30%** of power professionals find convincing management of the benefits of higher quality lubricants, a challenge.

Shell LubeAdvisor is designed to ensure you use the right oil, at the right time, every time through detailed audits, lubrication surveys and technical support. All are tailored to your specific business needs by Shell lubricants specialists.

### Shell LubeCoach

**76%** think their maintenance staff would benefit from additional lubricant training.

Shell LubeCoach is a high-quality training programme specifically designed to empower your staff to deliver the benefits of a well-designed lubrication plan. Delivered by technical experts with substantial field-based experience, courses are workshop-based and offer practical insight into best practice techniques.



## CASE STUDIES

### **Gemmo SRL Niguarda increased oil drain intervals by 228%**

Power company Gemmo SRL Niguarda, operating MWM TCG 2032 V 16 engines on natural gas, was looking for ways to improve efficiency.

#### **CHALLENGE**

It wanted to optimise its maintenance schedule for lubricants in order to improve equipment uptime and reduce costs.

#### **SOLUTION**

The Shell Lubricants team assessed the company's equipment and oil condition using Shell LubeAnalyst and recommended a switch to Shell Mysella S5 N 40 in order to extend the life of the oil and filters.

#### **OUTCOME**

Switching to the new package of products and services led to immediate improvements in product life. In particular, oil drain intervals rose from 3,500 to 8,000 hours, with a corresponding reduction in downtime for scheduled maintenance.

The reduced spend on consumables and maintenance has seen the company reporting estimated annual savings of US\$25,000.

### **Czech power plant cut maintenance costs by 29%**

A Czech power plant was operating a GE Jenbacher 416 gas engine for around 8,500 hours a year. The company needed a way to increase reliability and decrease costs.

#### **CHALLENGE**

In particular, the company wanted to extend its oil drain interval and ensure this coincided with the service interval of its equipment.

#### **SOLUTION**

The Shell Lubricants team recommended Shell Mysella S5 S 40 for its ability to deliver longer oil life in this application. It also recommended that the company use Shell LubeAnalyst for oil condition monitoring.

#### **OUTCOME**

The extended oil drain interval has helped the company save significant time on oil changes and top-ups. This has, in turn, reduced consumables and maintenance costs by around 29%.

Reduced maintenance and consumables costs have delivered estimated annual savings of US\$6,000 for an engine.

## Rostenice A.S. cuts running costs by a third with Shell Mysella

This power company was operating a GE Jenbacher 416 gas engine for around 8,500 hours a year. To reduce costs, it needed to use less oil without undermining its maintenance record.

### CHALLENGE

Key to this objective was the power operator's ability to improve its oil drain interval and align this with the equipment's service interval.

### SOLUTION

The Shell Lubricants team recommended Shell Mysella S5 S 40 as being ideally suited to the application. Shell LubeAnalyst was offered to monitor oil condition and confirm the optimum oil drain interval.

### OUTCOME

After the switch to Shell Mysella, tests showed that the oil drain interval could be safely extended to match the service interval, exactly as planned. This saved on maintenance and consumables, with costs reduced by around 34%. The economies associated with longer oil life have delivered estimated annual savings of US\$8,000, for an engine.

## POWERING THE FUTURE

Stationary gas engines are energy efficient, cost effective and reliable. Or, more accurately, they can be, if they are maintained and run according to best practice and kept in peak condition. When you work with Shell, our consultants can help you find exactly the right lubricants for your equipment and its operating environment, helping it spend less time out of action and more time driving profits for your business. Meanwhile our engineers and consultants work with you to establish a maintenance regime that is fully optimised to your organisation's goals and your customers' needs.

Most importantly of all, by helping maximise the performance, reliability and value of your stationary gas engines today, Shell can ensure that both your equipment and your business are ready to play a key role in powering the world of tomorrow.

To find out how the Shell Mysella team can help you get more from your stationary gas engines, get in touch today.



## SOURCES

1. <https://www.reuters.com/brandfeatures/venture-capital/article?id=97335>
2. <https://www.globenewswire.com/news-release/2017/12/08/1250256/0/en/Global-Gas-Engine-Market-Will-Reach-USD-4.4-billion-by-2022-Zion-Market-Research.html>
3. <https://www.un.org/en/development/desa/news/population/2015-report.html>
4. <https://webstore.iea.org/download/summary/190?fileName=English-WEO-2018-ES.pdf>
5. <https://www.opencompute.org/documents/the-current-state-of-data-center-energy-efficiency-in-europe-ocp-white-paper>
6. <https://www.frankfurt-greencity.de/en/status-and-trends/planning-and-construction/the-house-as-power-plant/>
7. <https://www.portsmouth.gov.uk/ext/news/portsmouth-city-council-housing-blocks-benefit-from-green-energy>
8. <https://www.theguardian.com/sustainable-business/2015/apr/30/camdens-local-government-services-hub-goes-green>
9. <https://www.engineering.com/BIM/ArticleID/16804/Apples-Global-Facilities-Are-Now-Powered-Sustainably.aspx>
10. <https://sandbag.org.uk/wp-content/uploads/2019/01/The-European-Power-Sector-in-2018-1.pdf>
11. [https://www.mckinsey.com/~ /media/mckinsey/dotcom/client\\_service/epng/pdfs/transformation\\_of\\_europes\\_power\\_system.ashx](https://www.mckinsey.com/~ /media/mckinsey/dotcom/client_service/epng/pdfs/transformation_of_europes_power_system.ashx)
12. [http://www.vernimmen.be/ftp/An\\_introduction\\_to\\_distributed\\_generation.pdf](http://www.vernimmen.be/ftp/An_introduction_to_distributed_generation.pdf)
13. <https://www.modernpowersystems.com/features/featurewhy-stationary-power-is-a-growth-market-for-gas-engines-6140544/>
14. Power: European Report: Powering Peak Performance, Shell January 2019
15. <https://www.machinerylubrication.com/Read/524/natural-gas-engine-oil-analysis>