TITAN / MAINTAIN

# Lubricants for stationary gas engines

LUBRICANTS.
TECHNOLOGY.
PEOPLE.

FUCHS

# LUBRICANTS. TECHNOLOGY. PEOPLE.

We focus consistently on high-quality lubricants and related specialties.

We develop innovative and holistic solutions for a wide variety of applications.

We value the high level of commitment of our employees and their trusting interaction with one another.

## Facts and figures

**Company:** FUCHS SCHMIERSTOFFE GMBH, a company of the FUCHS Group
**Headquarters:** Mannheim
**Product range:** A full range of more than 2,000 products and 6,000 articles
**Certifications:** ISO/TS 16949, DIN EN ISO 14001, BS OHSAS 18001, ISO 50001, KTA 1401
**References:** One of the leading lubricants OEM for the German automotive industry

FUCHS has developed, produced and sold high-quality lubricants and related specialties for more than 85 years – for virtually all areas of application and sectors. With over 100,000 customers and 57 companies worldwide, the FUCHS Group is the leading independent supplier of lubricants.

A team of more than 800 specialists across Germany works to guarantee the satisfaction of our customers. Whatever their requirements, we have the ideal lubricant for their specific applications and processes. In our technology center we link interdisciplinary expertise in a quick and efficient way – and work on innovative lubricant solutions to meet the demands of today and tomorrow every single day.

FUCHS lubricants stand for performance and sustainability, for safety and reliability, for efficiency and cost savings. They represent a promise: technology that pays off.

# IT'S ALL ABOUT THE RIGHT LUBRICANT

FUCHS has a profound understanding of engine oil technology. As the world's largest independent lubricant manufacturer, we concentrate exclusively on the manufacturing and development of lubricants. Continuous investments in our worldwide development centers and cooperation with the German automotive industry have helped make us what we are today: a lubricant specialist with a comprehensive product portfolio and a large number of custom solutions.

# The specialist for gas engine oils

Particularly in the field of stationary gas engines, choosing the right engine oil and being able to call on competent support for continuous operation are critically important for reliable operation, high availability and efficiency, as well as a long service life.

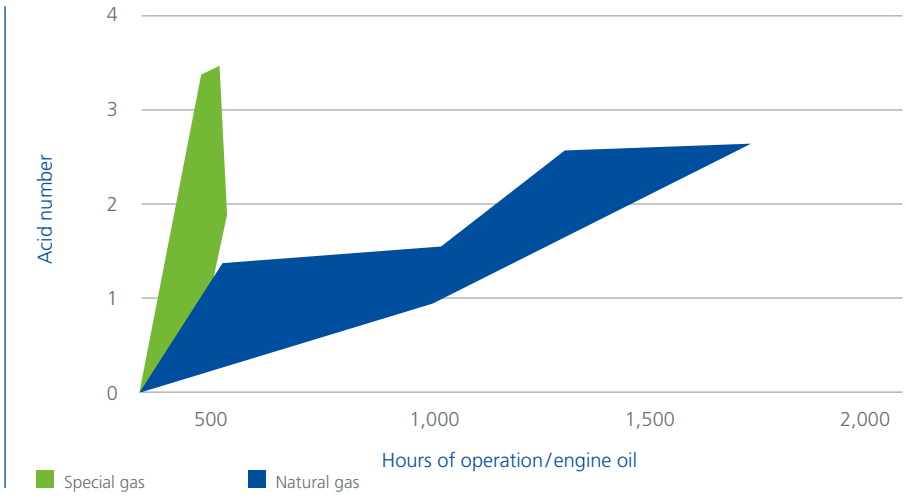
### Gases and their composition

In different applications of cogeneration units, different fuel gases can be used. Fuel gas is defined as an appropriate gas mixture for gas engines, which vary in composition, fuel value and knock resistance. The methane number of natural gas is for example 70 – 90 and decreases the knock resistance in comparison to gases like biogas, sewage or landfill gas with a methane number of 100 – 160. The gas quality and composition can vary during operation which can be compensated by using an adjusted facility and engine management. If the characteristcs of the gas quality change or if dangerous substances increase, the lifetime, the reliability and the efficiency of the engine can be shortened. Fuel gases consist of components which provide the needed energy for the combustion process and impurities which influence reliable operation.

The main components define the most important fuel characteristics (e.g. knock resistance, fuel value, combustion temperature, flame propagation speed and ignition properties) involved in the engine operation and combustion process. The main important components are methane, the main contributor to the fuel value and energy content of the combustion gas, hydrogen and chained hydrocarbons such as propane and butane as well as inert gases like nitrogen and carbon dioxide.

The most usual impurities found in the different gas types are sulphur compounds or hydrogen sulphide, chlorine, fluoride, silicon compounds or dust. The effects of these impurities are proportional to the amount present in the engine during operation. The lower the fuel value of the combustion gas, the higher the amount of gas being used in the combustion process. With more gas being used there is a higher amount of impurities. In order to be able to evaluate and compare different gases even with identical concentrations of pollutant elements but with different energy content, the concentration of trace elements must be referenced to the fuel value of the combustion gases. Impurities such as sulphur compounds occur primarily on special gases so that the oxidation and the acidification proceed faster. Another difficulty of these gases is the varying composition and quality which can change continuously during operation. The engine and engine oils therefore have to meet different challenges depending on the gas type.

### Change of the acidification of different fuel gas types – the same oil, same engine model



# Overview of fuel gas types

| Fuel gas | Methane number (MN)* | Impurities / pollutants | Effects on engine operating / lubricating oil |
|---|---|---|---|
| **Natural gas** Natural gas | MN: 70 – 90 | Non-existent<br>Very clean | Danger of knocking with MN < 75.<br>It leads to damages of engine components and reduces the oil service life |
| **Biogas** Special gas | MN: ≥ 100 | Sulfur and silicone compounds | Reduction of the alkaline oil reserve (abrasive wear) |
| **Landfill gas** Special gas | MN: 100 – 160 | Chlorine, fluorine, sulfur and silicon compounds | Corrosive wear<br>Reduction of the alkaline oil reserve<br>Silicon in the combustion chamber and deposits on the exhaust valve<br>Abrasive wear |
| **Sewer gas** Special gas | MN: 100 – 150 | Sulfur and silicon compounds | Corrosive wear<br>Reduction of the alkaline oil reserve<br>Silicon in the combustion chamber and deposits on the exhaust valve<br>Abrasive wear |
| **Mine gas (CMM)**** Special gas | MN: 95 – 100 | Sulfur and silicon compounds | Corrosive wear<br>Silicon in the combustion chamber<br>Abrasive wear |
| **Wood gas** Special gas | MN: 120 – 140 | Tar, pyroligneous acid | Gas is cleaned before entering the combustion chamber, thereby preventing any impurities from coming into contact with the lubricant. |

* MZ >100, by inert gases which do not participate in combustion
**Gas from active mines (CMM – Coal Mine Methane)

# Requirements for gas engine oils

Gas engines used in power stations, landfill sites, sewage plants and biogas plants are characterised by continuous operation at full load. The good anti-knock properties of fuel gas causes high effective pressures in gas engines which again lead to very high combustion temperatures.

The result is an increased formation of NOX which reacts with the used engine oil and causes oxidation and nitration along with an increase in viscosity. The formation of acids (organic and inorganic) pose the danger of oil acidification and corrosive wear in the oil circuit.

Consequently, gas engine oils have to meet the following demands:

- High thermal stability
- High resistance to aging
- Good neutralisation properties

Depending on the application, the characteristics of engine oils have to be customized. It can be differentiated for example between applications with natural gas or cleaned biogas (reduced sulphur content) and applications with special gases.

### The high performance engine oils of the TITAN GANYMET range

TITAN GANYMET engine oils from FUCHS were specially developed for stationary Otto and pilot injection gas engines and offer a broad spectrum of applications.

Special high-performance additives with a high resistance to oxidation and nitration guarantee reliability even under extreme operating conditions. Our special formulations offer a maximum degree of wear protection and work against the formation of sludge, deposits, acids and corrosion.

# GAS ENGINE OILS

When operating engines using fuel gases with low contaminant levels, low-ash engine oils are generally recommended by the engine manufacturers, as a high level of engine cleanliness is favored over a high neutralization capacity.

When using fuel gases with increased contaminant levels, engine oils with a higher sulfated ash content are typically allowed as a way of increasing the neutralization capacity and achieving longer oil change intervals.

# Technical background

In an engine oil, the sulphated ash (SA) is formed from certain additive (functional metallic) components in the oil. These ash-forming agents affect engine cleanliness, neutralisation capacity, ageing resistance and the anti-wear properties of the oil. The element zinc is one of these ash-forming agents and is usually found in conventional engine oils as a metalorganic compound in the form of ZnDTP (zinc dialkyldithiophosphates). This compound offers high protection against wear and corrosion as well as good antioxidation properties. However, this additive gets into the combustion chamber of the engine by passing the piston rings. When burnt, ash components are formed and build deposits on the pistons, cylinder head, valves and catalytic converter. These deposits cause wear of engine components and lead to a drop in performance and premature engine failure.

**The following applies: The higher the proportion of ZnDTP, the greater the wear protection and antioxidation characteristics – but also the amount of sulphated ash.**

Additives which contain calcium compounds are the principal constituent of socalled detergents. These play a significant role in avoiding coking deposits on the piston crown, rings and ring grooves. The deposits again have a grinding effect on the cylinder liners and lead to polished surfaces. The detergents are also responsible for the neutralisation capacity and alkaline reserve (expressed as the Total Base Number, TBN) of an engine oil and thus reduces acidity increase and thereby protects against corrosion.

**The following applies: The higher the proportion of detergents and calcium compounds, the greater the engine cleanliness and the TBN – but also the proportion of sulphated ash formed.**

Therefore carefully balanced formulations are required to enable the use of these additives: A higher proportion of detergents and ZnDTP in the oil results in greater neutralisation capacity, better wear protection and improved ageing resistance but also causes increased formation of sulphated ash. It is hence impossible to develop a universal product for all gas engines. As engine manufacturers recommend or prescribe various sulphated ash limits for different types of fuel gas, the possibilities of optimising single character istics of an oil are limited. Therefore it is important to select the most suitable gas engine oil for the specific application. Engine manufacturers generally recommend low-ash (SA <0.5 % wt) oils for engines running on relatively clean gases (e.g. natural gas) because they allocate greater importance to engine cleanliness than to high neutralisation capacity. Engine oils with a higher sulphated ash content (max. 1 % wt) however, are usually accepted when using gases with a higher degree of noxious components such as sulphur, chlorine and fluorine as an increased neutralisation capacity is required to achieve longer oil change intervals.

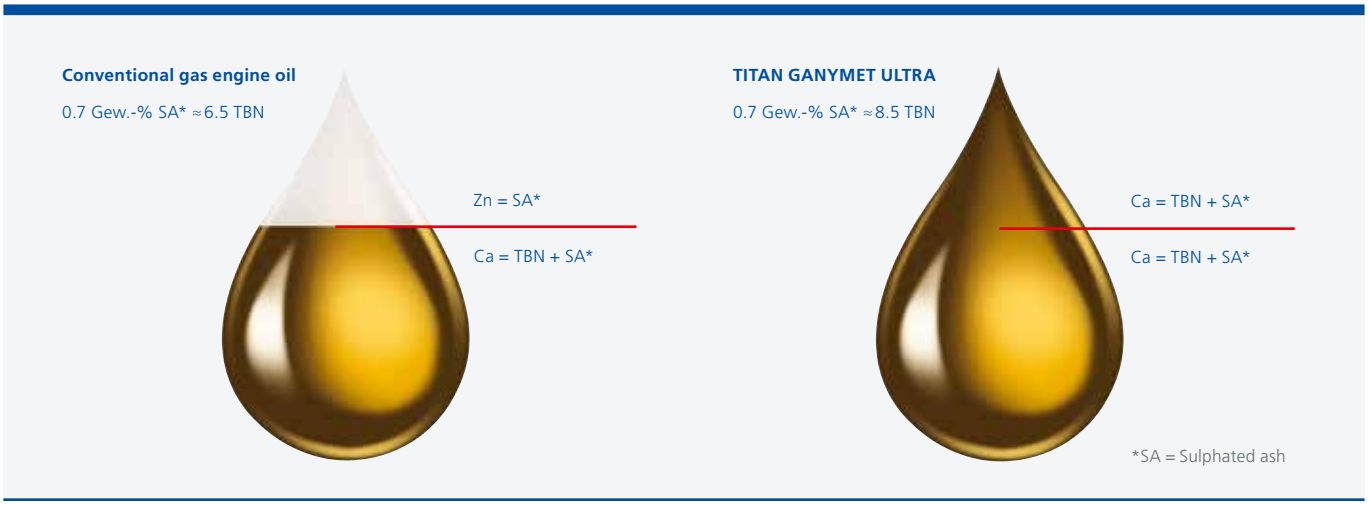
# Clear advantage for zinc-free technology

### Why zinc-free?

Two different formulation technologies are illustrated in the highly-simplified drop diagram on the right. The left drop represents the conventional formulation technology where as the right drop shows the zinc free Low SAPS technology developed by FUCHS – both in relation to ashforming components and TBN. The volume of each drop demonstrates the sulphated ash potential of each formulation. To enable a comparison between the two formulation technologies, the ash forming potential is defined with wt.-0.7 % for both technologies and thus the volume of both drops is the same.

The principal difference between the two additive technologies is that in the zinc-free formulation the zinc has been replaced by specially-adapted calcium compounds. The amount though, was only increased as long as the desired sulphated ash content did not exceed 0.7 wt.- %. In addition, the increase in calcium components has a positive effect on the oil's neutralisation capacity which could be enhanced about 25 %.

To give the new formulation the necessary anti-wear, anti-corrosion and anti-oxidation properties which were previously provided by zinc, completely new, ash-free additives were used. The major advantage of these new additives is that they do not influence the formation of sulphated ash and can thus be used in almost unlimited quantities. As a result, the anti-wear and anti-oxidation properties of the new formulation were not just maintained but significantly improved.




## Advantages of zinc-free sulfated ash deposits

Experiences have shown that there are significant differences in the morphology (structure) of the ash compounds. Ash deposits formed by the combustion of calcium are noticeably softer than those formed by the combustion of both calcium and zinc. Zinc-free sulphated ash deposits lead to considerably less abrasive wear and are less tenacious, a factor which ultimately influences the cleanliness of the combustion chamber.

## Minimal losses of phosphorus

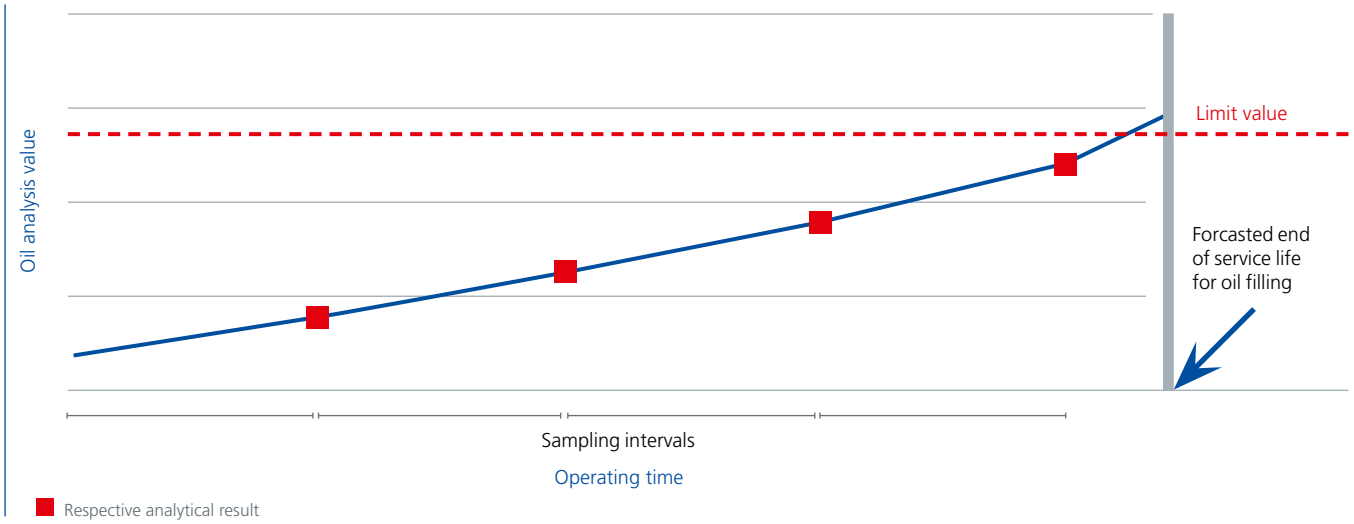
Phosphorus is an important component in the oil's anti-wear additive system. During combustion, small amounts from the oil on the cylinder walls are burnt and reach the catalytic converter where the catalytic surfaces can be poisoned. The performance and life time of the catalytic converter is thus influenced by the amount of phosphorus in the exhaust gases.

Various tests have shown that there are significantly smaller losses of phosphorus in zinc-free technologies than in formulations containing zinc. Consequently the lubricant retains the desired wear protection and contributes in addition to maintain the performance and life time of the catalytic converter.

## All advantages at a glance

- Due to the higher neutralisation capacity (approx. 30 % higher TBN) at constant sulphated ash content, significantly longer oil change intervals can be implemented.
- Conversely, if the TBN value remains constant, the sulphated ash content falls and engine cleanliness visibly improves.
- Improved wear protection and higher oxidation stability due to novel additives which do not form sulphated ash and can thus be used in greater concentrations.
- Noticeably less abrasive wear and greater engine cleanliness due to zinc-free sulphated ash deposits.
- Due to minimal losses of phosphorus, not only does the wear protection of the oil remain, but the longevity of the catalytic converters are not affected.

## Condition monitoring of the engine oil




## Monitoring and laboratory analysis

When a gas engine is commissioned, the oil change intervals are initially determined by the recommendations of the engine manufacturer.

It is therefore necessary to monitor the condition of the engine oil with routine oil analyses (see chart) and then to set individual oil change intervals for every engine.

The lubricant's life and the optimum oil change intervals are however dependent on:

- Gas quality
- Lubricating oil quality
- Environmental conditions
- Modes of engine operation

Regular analyses of used oil show the rate of degradation in all the measured parameters. So deviations in gas quality or different operating modes can be compensated quickly. This avoids potential engine damage and corresponding repair costs.

Make use of our fast, professional and complete service for oil analysis. Your engine will benefit.

# Lubricants for stationary gas engines

| Brand name | Description | Approvals | FUCHS Recommendations |
|---|---|---|---|
| | | **Premium-Quality** | |
| **TITAN GANYMET ULTRA**<br>Natural gas<br>Special gas<br>TBN: 8.5 mg KOH/g<br>SA: 0.7 % | Premium Synthetic Zinc-free High Performance Engine Oil for stationary Otto and pilot injection gas engines. The highest corrosion protection together with the optimized zinc-free wear protection, excellent acid neutralisation properties and oxidation stability allow a safe and extended oil service in natural gas and especially aggressive gas operations (sewage gas, landfill gas and biogas) also with formaldehyde catalysts. | 2G TA-003 agenitor series 2, 3<br>AGROGEN<br>CAT CG132, CG170, CG260<br>CAT / MWM TR 0199-99-02105<br>GE JENBACHER TA 1000-1109<br>- A,CAT: series 2, 3, 4 (Version B), 6 (Version C, E)<br>- B, CAT: series 2, 3<br>MAN M 3271-2<br>MAN M 3271-4<br>MTU Onsite Energy DK-BS-0001 (E, P, B)<br>MTU Onsite Energy DK-BS-0002 (B)<br>SEVA TRS-07<br>SPANNER RE²<br>TEDOM 61-0-0281.1/L, B, S | – |
| | | **High-Quality** | |
| **TITAN GANYMET PLUS**<br>Special gas<br>TBN: 9.2 mg KOH/g<br>SA: 0.8 % | Zinc-free High Performance Engine Oil for stationary Otto and pilot injection gas engines. The highest corrosion prevention together with the optimized zinc-free wear protection and excellent acid neutralisation properties allow a safe and extended oil service in special aggressive gas operations (sewage gas, landfill gas and biogas). | CAT CG132, CG170, CG260<br>CAT / MWM TR 0199-99-02105<br>DREYER & BOSSE<br>GE JENBACHER TA 1000-1109<br>- B: series 2, 3<br>MTU Onsite Energy DK-BS-0001 (B)<br>SEVA TRS-07 | – |
| **TITAN GANYMET PLUS LA**<br>Natural gas<br>TBN: 6.6 mg KOH/g<br>SA: 0.5 % | Zinc-free, „Low Ash" High Performance Engine Oil for stationary gas engines. The highest corrosion prevention together with the excellent zinc-free wear protection and acid neutralisation properties allow a safe and extended oil service. Specially for gas engines fitted with exhaust catalyst and heat exchangers that specify an sulphate ash content of less than 0.5 weight %. | CAT CG132, CG170, CG260<br>CAT / MWM TR 0199-99-02105<br>DEUTZ TR 0199-99-01213<br>SEVA TRS-07<br>TEDOM 61-0-0281.1/G, P | CATERPILLAR<br>CUMMINS<br>WAUKESHA |

# Lubricants for stationary gas engines

| Brand name | Description | Approvals | FUCHS Recommendations |
|---|---|---|---|
| | | **Basic-Quality** | |
| **TITAN GANYMET PRO MA**<br>Special gas<br>TBN: 4.73 mg KOH/g<br>SA: 0.56 % | High Performance Engine Oil for stationary gas engines running on digester gases such as sewage gas, landfill gas and biogas (e.g. GE Jenbacher gas classes B and C). Reduced sulphated ash content for less deposits. | GE JENBACHER TA 1000-1109<br>- B, C: series 2, 3, 4 (Version B),<br>6 (Version C, E)<br>MAN M 3271-4 | CATERPILLAR<br>(Special gas) |
| **TITAN GANYMET PRO LA**<br>Natural gas<br>TBN: 5.54 mg KOH/g<br>SA: 0.5 % | „Low Ash" High Performance Engine Oil for stationary gas engines. Specially for gas engines with oxidation or formaldehyd catalysts and heat exchangers that specify a sulphated ash content of less than 0.5 weight %. | CAT CG132, CG170, CG260<br>CAT/ MWM TR 0199-99-02105<br>GE JENBACHER TA 1000-1109<br>- A, - B: series 2, 3, 4 (Version B),<br>6 (Version C, E) | CATERPILLAR<br>CUMMINS<br>WAUKESHA<br>WÄRTSILÄ |
| **TITAN GANYMET**<br>Special gas<br>TBN: 8.1 mg KOH/g<br>SA: 0.99 % | High Performance Engine Oil for stationary gas engines which run on all types of digester gases such as sewage gas, landfill gas and biogas. | ASJA AMBIENTE ITALIA<br>GE JENBACHER TA 1000-1109-C: series 2, 3<br>MAN M 3271-4<br>MTU Onsite Energy DK-BS-0001 (B, K)<br>SEVA TRS-07 | – |
| **TITAN GANYMET LA**<br>Natural gas<br>TBN: 5.5 mg KOH/g<br>SA: 0.45 % | „Low Ash" High Performance Engine Oil for stationary gas engines. Good corrosion prevention. Specially for gas engines fitted with exhaust catalyst and heat exchangers that specify a sulphate ash content of less than 0.5 weight %. | CAT CG132, CG170, CG260<br>CAT / MWM TR 0199-99-02105<br>DEUTZ TR 0199-99-01213<br>GE JENBACHER TA 1000-1109<br>- A, CAT: series 2, 3, 4 (Version B),<br>6 (Version C, E)<br>MAN M 3271-2<br>MTU Onsite Energy DK-BS-0001 (E, P, K)<br>SEVA TRS-07 | CATERPILLAR<br>CUMMINS<br>WAUKESHA |

# Oil Chooser

| | Clean gas | | Contaminated gas | |
|---|---|---|---|---|
| **MANUFACTURER** | **Natural gas** | **Cleaned special gas** | **Biogas / Sewer gas** | **Landfill gas** |
| **Approvals** | | | | |
| **2G AGENITOR** | TITAN GANYMET ULTRA (series 2 & 3) | | TITAN GANYMET ULTRA (series 2 & 3) | |
| **CATERPILLAR MWM** | TITAN GANYMET PLUS LA<br>TITAN GANYMET PRO LA<br>TITAN GANYMET LA | | TITAN GANYMET ULTRA<br>TITAN GANYMET PLUS<br>(only in agreement with service partner) | |
| **GE JENBACHER** | TITAN GANYMET ULTRA (BR 2, 3, 4 A-B & 6 C-E)*<br>TITAN GANYMET PRO LA (BR 2, 3, 4 A-B & 6 C-E)<br>TITAN GANYMET LA (BR 2 & 3)* | | TITAN GANYMET ULTRA (BR 2&3)<br>TITAN GANYMET PRO LA<br>(BR 2, 3, 4 A-B & 6 C-E)<br>TITAN GANYMET PRO MA<br>(BR 2, 3, 4 A-B & 6 C-E)<br>TITAN GANYMET PLUS (BR 2&3) | TITAN GANYMET PRO MA<br>(BR 2, 3, 4 A-B & 6 C-E)<br>TITAN GANYMET |
| **MAN** | TITAN GANYMET LA | TITAN GANYMET ULTRA<br>TITAN GANYMET<br>TITAN GANYMET LA* | TITAN GANYMET ULTRA<br>TITAN GANYMET<br>TITAN GANYMET PRO MA | |
| **MTU ONSITE ENERGY (MDE)** | TITAN GANYMET ULTRA (BR 400)<br>TITAN GANYMET LA (BR 400)* | | TITAN GANYMET ULTRA (BR 400 & 4000 L32FB / L62 FB)<br>TITAN GANYMET PLUS (BR 400)<br>TITAN GANYMET (BR 400)* | |
| **AGROGEN** | TITAN GANYMET ULTRA | | TITAN GANYMET ULTRA | |
| **SPANNER RE²** | – | | TITAN GANYMET ULTRA (wood gas operation) | |
| **TEDOM** | TITAN GANYMET PLUS LA | | TITAN GANYMET ULTRA | |
| **Recommendations** | | | | |
| **CATERPILLAR** | TITAN GANYMET PLUS LA<br>TITAN GANYET PRO LA<br>TITAN GANYMET LA | | TITAN GANYMET PLUS LA<br>TITAN GANYMET PRO MA<br>TITAN GANYMET LA | |
| **CUMMINS** | TITAN GANYMET PLUS LA<br>TITAN GANYMET PRO LA<br>TITAN GANYMET LA | | TITAN GANYMET PLUS LA<br>TITAN GANYMET PRO LA<br>TITAN GANYMET LA | |
| **WAUKESHA** | TITAN GANYMET PLUS LA<br>TITAN GANYMET PRO LA<br>TITAN GANYMET LA | | TITAN GANYMET ULTRA<br>TITAN GANYMET PLUS LA<br>TITAN GANYMET PRO LA**<br>TITAN GANYMET LA | |
| **WÄRTSILÄ** | TITAN GANYMET PRO LA | | TITAN GANYMET PRO LA | |

*also for applications with formaldehyd catalyst; **some engines require SA < 0.5 %; ***approval process ongoing

# MAINTAIN antifreeze coolants for gas engines

Gas engines create large amounts of heat during the combustion process. As the engine and its components can only release heat slowly, additional coolants are necessary, so that the engine does not break down due to overheating.

Our "ready-mixed" anti-freeze coolants are especially easy to use on stationary engines. No on-site mixing is needed.

| Brand name | Description | Specifications | Approvals | FUCHS Recommendations |
|---|---|---|---|---|
| **MAINTAIN FRICOFIN LL concentrate** | Premium Performance Coolant Additive based on monoethylene glycol. Free from nitrite, amine, phosphate and silicates. Product dyeing: orange | ASTM D 3306 TYPE I<br>BS 6580:2010<br>SAE J814<br>FORD WSS-M97-B44-D<br>JAGUAR LAND ROVER STJLR.651.5003<br>FVV Heft R443<br>KSM 2142<br>UNE 26-361-88/1 | Bez. Reg. Arnsbg. E62.12.22.64-2011-1<br>CAT / MWM TR 0199-99-2091<br>DAF 74002<br>DEUTZ DQC CB-14<br>MAN 324 TYPE SNF<br>MB-APPROVAL 325.3 | AFNOR NFR 15-601 TYPE I<br>ASTM D 4985, SAE J1034<br>ADE (ATLANTIS DIESEL ENGINES)<br>BAIC GROUP FOTON Q-FPT 2313005-2013<br>CATERPILLAR MAK A4.05.09.01<br>CHRYSLER MS 12106<br>CNH MAT 3624<br>CUMMINS (ISBe engines at DAF and Leyland)<br>CUMMINS CES 14603<br>CES 14439<br>DETROIT DIESEL 93K217<br>FIAT 9.55523<br>GM GMW 3420 (6277M)<br>HYUNDAI MS 591-08<br>JASO M325, JIS K2234<br>JOHN DEERE JDM H5<br>KOMATSU AF-NAC (ready-mix) (07.892 (2009)<br>LIEBHERR MD 1-36-130<br>MACK 014 GS 17009<br>MAZDA MEZ MN 121 D, PSA B 71 5110<br>RENAULT 41-01-001/- -S TYPE D<br>SAAB B 040 1065, SKODA 61-0-0257<br>TOYOTA TSK 2601G-8A<br>VAUXHALL GME L1301<br>VW TL 774-D/F (G12+/different colour)<br>VOLVO 128 6083/002 (= VOLVO LKW, VOLVO CE, from MY 2005, VOLVO PENTA from MY 05/2010) |
| **MAINTAIN FRICOFIN concentrate** | Super High Performance Coolant Additive based on monoethylene glycol. Free from nitrite, amine and phosphate. Product dyeing: blue-green. | AFNOR NF R 15-601 TYPE 1<br>ASTM D 3306 TYPE I<br>ASTM D 4985<br>BS 6580:2010<br>CUNA NC 956-16<br>SAE J814; SAE J1034 | BMW GS 94000 (BMW N 600 69.0)<br>CAT / MWM TR 0199-99-2091<br>DEUTZ DQC CA-14<br>GE JENBACHER TA 1000-0201<br>MAN 324 TYPE NF; - PRITARDER<br>MB-APPROVAL 325.0<br>MTU MTL 5048<br>PN-C 40007:2000<br>VOITH TURBO 172.00225010 | DAF 74001<br>LIEBHERR TLV 035/TLV 23009 A<br>OPEL/GM B 040 0240<br>VW TL 774-C (G11) |
| **MAINTAIN FRICOFIN -35 Ready-to-use Mix** | Super High Performance Coolant Ready-mix based on monoethylene glycol. Offers frost protection down to -35°C. Free from nitrite, amine and phosphate. Product dyeing: blue-green. | AFNOR NF R 15-601 TYPE 3<br>ASTM D 3306 TYPE III<br>ASTM D 4985<br>BS 6580:2010<br>SAE J814 | DEUTZ DQC CA-14<br>MB-APPROVAL 326.0 | BMW GS 94000 (BMW N 600 69.0)<br>DAF 74001<br>JENBACHER TA 1000-0201<br>LIEBHERR TLV 035/TLV 23009 A<br>MAN 324 TYPE NF; -PRITARDER<br>MTU MTL5048<br>CAT/MWM TR 0199-99-2091<br>OPEL/GM B 040 0240<br>PN-C 40007:2000<br>VOITH TURBO 172.00225010<br>VW TL 774-C (G11) |

# Save your benefit

This questionnaire will enable us to determine the most suitable lubricant for your gas engine.

Please fill in and fax to: + 49 621 3701-7302

or via mail to: anwendungstechnik.automotive@fuchs-schmierstoffe.de

*Necessary information

## Your details

Company*

Telephone*

Address*

Fax

Contact Person/Title*

E-mail*

Customer ID

## Engine Details

Manufacturer*

Running hours

Type*

Engine power (kW)*

Year of manufacturer*

Current power output (%)*

Year of operating hours*

Oil volume*

Catalytic converter* Yes ☐ No ☐

Oil temperature*

## Gas details

Fuel gas type*

Gas analysis available* Yes ☐ No ☐
(If possible, please attach copy)

Gas purification* Yes ☐ No ☐

## Details of current oil in use

Product name*

Required volume per month

Price/litre

Manufacturer*

Oil drain interval* (If possible, please attach oil analysis)

Do you have any problems with your current oil?
If yes, please specify.

Would you like an appointment for further information? Yes ☐ No ☐

Date

Signature

# Notes

# Notes

**Note**
The information contained in this brochure is based on the experience and expertise of FUCHS SCHMIERSTOFFE GMBH in the development and manufacture of lubricants and represents the current state of the art. The performance of our products can be influenced by a series of factors, especially the specific use, the method of application, the operational environment, component pretreatment, possible external contamination, etc. For this reason, it is not possible to make universally valid statements about the function of our products. Our products must not be used in aircraft/spacecraft or parts thereof. This does not apply insofar as the products can be removed again before components are fitted in an aircraft/spacecraft. The information given in this product information represents general, non-binding guidelines. No warranty expressed or implied is given concerning the properties of the product or its suitability for any given application. We therefore recommend that you consult a FUCHS SCHMIERSTOFFE GMBH application engineer to discuss application conditions and the performance criteria of the products before the products are used.

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FUCHS lubricants

# Innovative lubricants need experienced application engineers

Every lubricant change should be preceded by expert consultation on the application in question. Only then can the best lubricant system be selected. Experienced FUCHS engineers will be happy to advise on products for the application in question and also on our full range of lubricants.

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