

ADDINOL[®]

THE ART OF OIL • SINCE 1936

High-performance lubricants for

GAS ENGINES



www.addinol.de





Solutions for all lubrication-related challenges

ADDINOL is one of the few companies in the German mineral oil industry acting independently of any large business group and has distributor partners on all continents and in more than 100 countries. Our high-performance lubricants are design

elements reflecting the highest level of modern technology. In symbiosis with engines, drives, chains, bearings and hydraulic systems they reveal their full performance.



Development and production at the company site in Leuna, one of the most modern lubricant-factories in Europe



Decades of experience and close cooperation with internationally leading OEM and institutes. State-of-the-art instrumental analytics and selected machine test benches in our own laboratory



Competent partner network in more than 100 countries and on all continents



More than 650 different products, filled, packed, stored and dispatched in line with highest standards



Extended operating lives, increased energy efficiency, reliable protection of components, extended lifetime and resource-conserving – added value in the long run



Our service for you: application-technical support, comprehensive analyses service, trainings at the ADDINOL Academy



Quality and environmental management certified according to DIN EN ISO 9001:2015 and 14001:2015 by TÜV Süd Management Service GmbH



Listed as »World Market Leader Champion« for biogas engine oils as well as specific high-performance and high-temperature lubricants



ADDINOL Gas engine oils Maximum efficiency & reliable operation

ADDINOL Gas engine oils are state-of-the-art. They have been developed in close co-operation with leading additive manufacturers and OEM, tailored to the complex and versatile requirements of demanding gas engines.

ADDINOL offers the perfectly fitting product for each application and all operating conditions. Whether plants are operated with natural or special gases – the advantages of our gas engine oils speak for themselves.

Your benefits at a glance



maximum oil operating life, perfectly tailored



highest safety of operation



highest engine cleanliness, minor deposits



maximum stability at high combustion temperatures



reliable protection against corrosion and wear



comprehensive analyses service



stable operation and long engine lifetimes



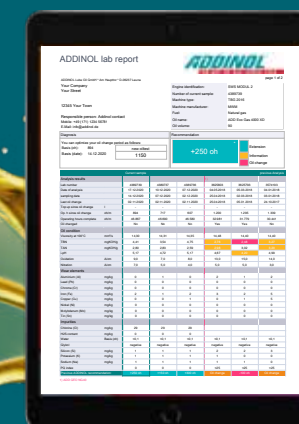
approved by internationally leading engine manufacturers

ADDINOL Power Pack

Engine oil + cooler protection + analysis

...all at one stop

ADDINOL Lab report
reliable analysis



ADDINOL Antifreeze
proven cooler protection



ADDINOL Gas engine oils
for natural and special gases

ADDINOL Gas engine oils

Tried and tested in practice many a time

Clean gases

Natural gas is converted into electricity and heat via a combustion engine and is used primarily in public facilities, in the municipal sector, but also in industrial plants. Compared to other fossil fuels, natural gas and cleaned special gases burn more cleanly. Natural gas is not contaminated with acidic components and therefore requires a lower alkaline reserve of the engine oil. Accordingly, manufacturers of gas engines for operation with natural gas demand the use of a low-ash engine oil. At the same time, the use of natural gas and cleaned special gases is accompanied by high combustion temperatures. The oils used must therefore have a high temperature stability.

In the application with natural gas and cleaned special gases the **ADDINOL Gas engine oils MG-40 Extra LA** and the **Eco Gas XD series** have already proven themselves many times. They are characterised by a low tendency to

deposit and high thermal-oxidative stability. Thus, they withstand the high combustion temperatures of natural gas, ensure a clean engine and reliably protect against corrosive and mechanical wear.

Both the continuous operation of the plants under full load for base load supply and the flexible, electricity-led use of CHPs, e.g. as regenerative storage power plants to cushion electricity fluctuations or peaks, mean maximum loads for the oil used. ADDINOL gas engine oils are successfully applied in both areas.



GREENHOUSE COMPLEX KRUGLYI GOD LLC

Generation of electricity and heat

Location
Pikalyovo, Leningrad Oblast, Russia

Technical details
power-driven plant, 3,354 kW

Type of engine
Jenbacher JMS620GS-N.L

Oil volume
800 litres

Type of gas
natural gas

Applied oil
ADDINOL Eco Gas 4000 XD

Application since
20.03.2019

Results
With ADDINOL Eco Gas 4000 XD clearly extended operating lives are reached at a stable running of the plant.



CHP-PLANT RUDOLF-VIRCHOW HOSPITAL

Generation of electricity and heat for own use, cooling supply

Location
Glauchau, Germany

Technical details
electrical output: 99 kW
thermal output: 167 kW

Type of engine
MAN E 2876 E302

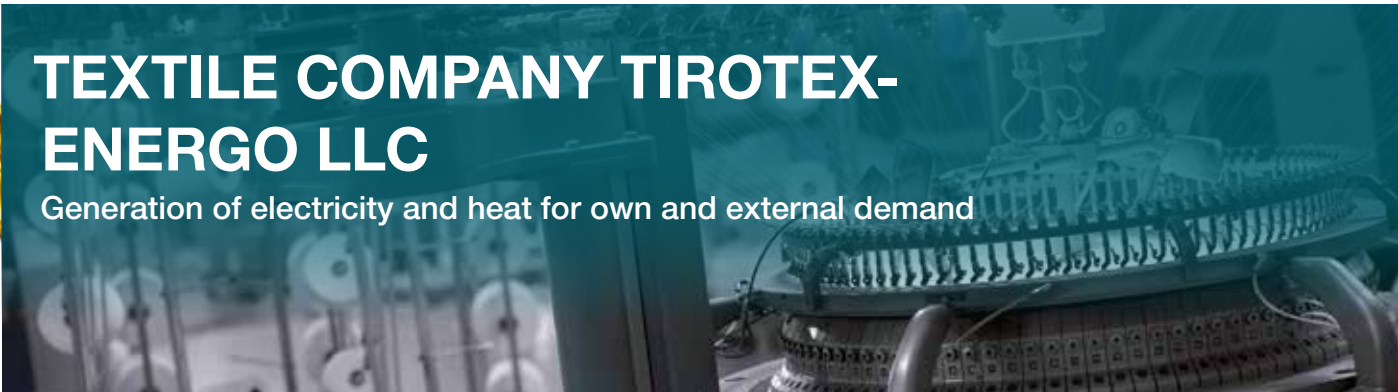
Oil volume
35 litres

Type of gas
natural gas

Applied oil
ADDINOL Eco Gas 4000 XD

Application since
2017

Results
With the use of ADDINOL Eco Gas 4000 XD, a high level of operational safety is achieved, which is important for the reliable supply of the hospital. Maintenance requirement is low. Thanks to the CHP plant, approx. 250 tons of CO₂ are saved per year.



TEXTILE COMPANY TIROTEX- ENERGO LLC

Generation of electricity and heat for own and external demand

Location
Tiraspol, Moldova

Technical details
power-driven plant, 31 MW

Type of engine
8 x MWM TCG 2032 V16

Oil volume
2,200 litres each

Type of gas
natural gas

Applied oil
ADDINOL Gas engine oil MG 40-Extra LA

Application since
2014

Results
Extended service life and plannable maintenance intervals are achieved through accompanying analyses despite continuous operation under full load.

Special gases

Many CHP units for the generation of electrical energy and heat are operated with special gases such as biogas, mine gas, landfill gas or sewage gas. Against the background of global warming and the scarcity of fossil fuels, the utilisation of climate-damaging gases from landfills, mines and sewage treatment plants has decisive advantages.

In operation, however, these gases bring challenges due to individual, varying gas qualities. They are usually characterised by a load of strong acid-forming substances such as chlorine or sulphur compounds. To ensure reliable lubrication at the highest level, the gas engine oil used must reliably neutralise the acids produced. If it fails at this point it can lead to a total failure of the entire system.

The **ADDINOL Gas engine oils MG-40 Extra Plus** and **Eco Gas 4000 XD** with high alkaline reserve are specifically tailored to these difficult conditions, reliably protect against corrosion and abrasive wear and are successfully used in a large number of plants worldwide. Depending on manufacturer demands **ADDINOL Gas engine oil MG 40-Extra LA** is also applied here.



ČSM HARD COAL MINE

Generation of electricity and heat for own use and network supply

Location

Eastern part of Karvina (Stonava),
Czech Republic

Technical details

1,200/1,410 kW

Engine type

MWM TCG 2020 V12

Oil volume

205 litres

Type of gas

cleaned mine gas

Applied oil

ADDINOL Gas engine oil MG-40
Extra LA

Application since

start of operation in 2013

Results

Stable operation with operating lives
above average, satisfied operator.

AGRICULTURAL COOPERATIVE
BANZKOW/MIROW EG

Generation of electricity and heat for own use and district heating



Location

Banzkow, Germany

Technical details

power-driven plant, 400 kW, farm with
crop cultivation and dairy farming:
utilisation of grass silage and maize
as well as liquid manure

Type of engine

MWM TCG 2016 C V8

Oil volume

350 litres

Type of gas

biogas

Applied oil

ADDINOL Eco Gas 4000 XD

Application since

August 2020

Results

With ADDINOL Eco Gas 4000 XD
above-average service lives
are achieved. This allows maximum
flexibility when planning maintenance
work. At the same time, the opera-
tors have the certainty that ADDINOL
Eco Gas 4000 XD has sufficient re-
serves for sudden changes in operat-
ing conditions.

LARGEST LANDFILL GAS PLANT
IN SCANDINAVIA

Generation of heat and electricity



Location

Espoo, Finland

Technical details

3,850 kW/ 1,560 kW

Type of engine

2× MWM TCG-2032 V16 and
3× MWM TCG-2020 V16

Oil volume

865 and 2,200 litres respectively

Type of gas

landfill gas, cleaned since 2019

Applied oil

ADDINOL Gas engine oil MG-40 Extra LA
and MG-40 Extra Plus depending on
gas quality

Application since

2010

Results

Engines have been running safely and
trouble-free for many years, long oil
change intervals are achieved.
The demanding operating conditions
are optimally mastered.

ADDINOL Cooler Protection

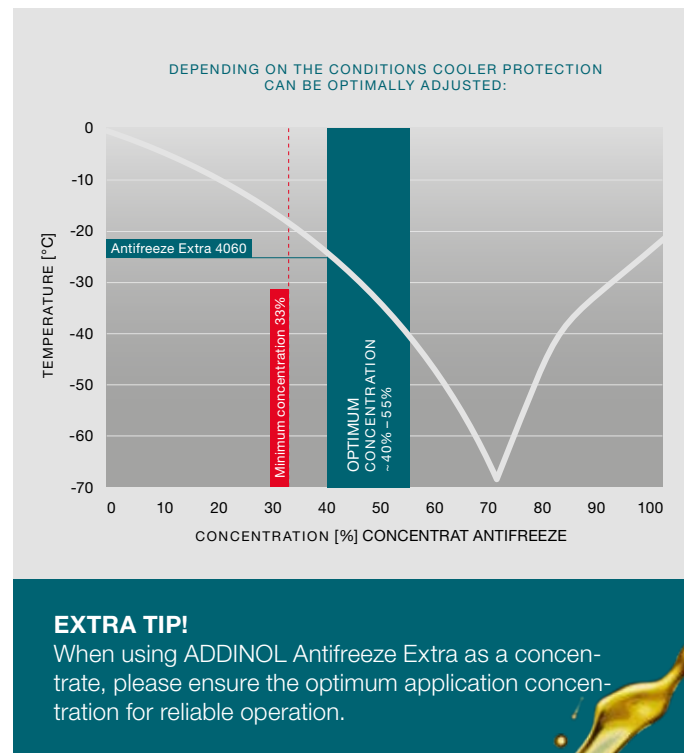
Extra tip for service

ADDINOL Antifreeze Extra 4060

In addition to the reliable lubrication of the engine, optimum heat exchange is of particular importance for safe operation. The use of a high-quality cooler protection agent guarantees optimum heat exchange and also reliably protects against frost, cavitation and corrosion.

The cooler protection agent **ADDINOL Antifreeze Extra 4060** is already premixed with special mixing water – this way it can be used immediately without great effort or preparation and at stable quality. Therefore, it is also particularly suitable for service companies servicing various plants with different water qualities. The use of Antifreeze Extra 4060 is of particular benefit in case of unfavourable water qualities on site (e.g. very hard water).

The combination of carefully selected additives and special mixing water reduces the formation of deposits and achieves maximum cleanliness both in the entire cooling system and in the heating circuit – this way Antifreeze Extra 4060 ensures good heat transfer. The formation of foam is effectively prevented. Even in most modern, thermally highly loaded engines ADDINOL Antifreeze Extra 4060 reliably dissipates heat and has already proven its capability many a time.



Long operating lives

Thanks to its high technical stability ADDINOL Antifreeze Extra 4060 achieves long service lives even under high loads.



High efficiency

Optimally adjusted cooler protection reduces oil ageing and prevents overheating damage to engine components for efficient operation.



Approved and proven

ADDINOL Antifreeze Extra 4060 is approved by leading manufacturers and has been tried and tested many a time in practice:

- INNIO Jenbacher TA 1000-0200
- MWM 0199-99-2091



Ready-to-use

Pre-mixed with special mixing water at an optimum ratio, ADDINOL Antifreeze Extra 4060 is ready for use and can be applied immediately with stable quality.



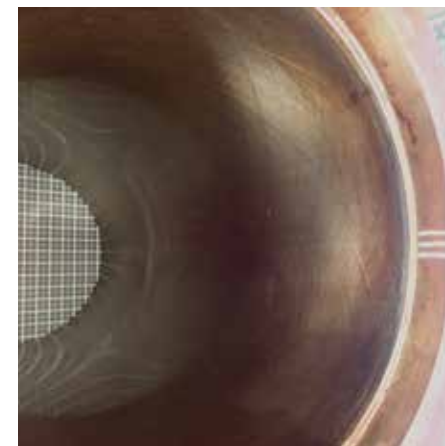
Less deposits

ADDINOL Antifreeze Extra 4060 is based on high-quality components and is free of silicate, nitrite, amine, borate and phosphate. It does not form deposits impairing heat dissipation.

Highest engine cleanliness, reliable wear protection

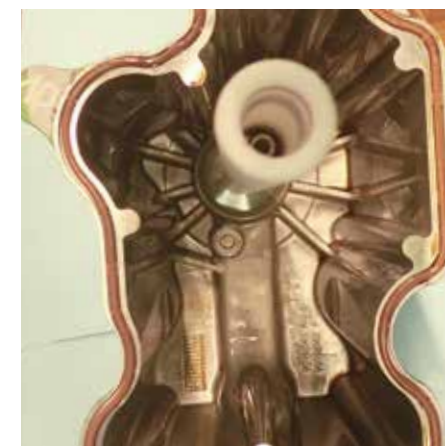
The exact state of engine cleanliness and possible wear can only be determined by an examination with a borescope or by disassembling the engine components. The cleanliness of the engine is particularly important for the stable and safe operation of a plant. The full performance of the components and long operating lives can only be achieved if the engine is clean and has few deposits and minor wear only. In the long

run, deposits lead to grinding marks and wear on piston skirts, valve train, bearings, cylinder liners and other components. These deposits impair the function of the components and thus of the engine as a whole. They lead to power loss and ultimately to failure of the system.



Cylinder liner
INNIO Jenbacher J416 GS-B02

After 6,000 hrs no signs of wear or varnish, honing structure intact



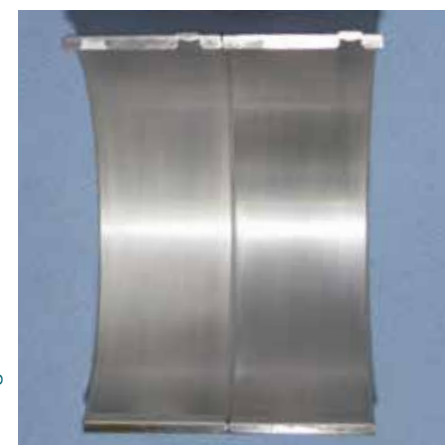
Valve cover
INNIO Jenbacher J416 GS-B02

After 6,000 hrs free of contamination and oil sludge



Cylinder head with valve train
INNIO Jenbacher J416 GS-B02

After 6,000 hrs free of deposits and oil sludge



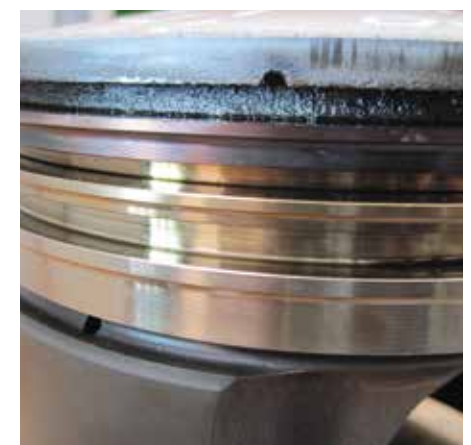
Bearing shells
INNIO Jenbacher J412

After 8,000 hrs no signs of wear, uniform wear pattern in contact surface



Aluminium piston with ring grooves
MWM TCG 2016 V12

After 10,000 hrs no wear or coking on fire land or ring lands | Cleanliness of ring grooves (usual tendency to coking after this running time)



Steel piston with ring grooves
INNIO Jenbacher J612 GS-F02

After 6,000 hrs no wear or coking on fire land or ring lands | Cleanliness of ring grooves (usual tendency to coking after this running time)

hrs = operating hours

ADDINOL Analyses Service

Reliable operation and optimally tailored oil change intervals

Oil parameters in view

The precondition for the stable and economical operation of a CHP unit is not only the use of an approved gas engine oil, but also the continuous monitoring of the oil condition at regular intervals and the implementation of oil changes. In their guidelines and instructions, gas engine manufacturers define exactly which oil parameters are to be monitored and specify limit values and sampling intervals. Compliance with these is essential to ensure stable operation and not to lose warranty claims in the event of damage. Proof of proper monitoring and compliance with the specified maintenance measures is also indispensable when dealing with insurers.

The monitoring focuses on the following important oil parameters, among others, which have a direct influence on the condition of the engine and the service life of individual components:

- Alkaline Reserve (TBN) → Engine cleanliness
- Thermal-oxidative stability (oxidation) → Deposition behaviour
- Wear elements → Component wear

The ADDINOL analyses service is specifically tailored to the requirements of the OEM. Based on our special matrix, which is based on limit values of the manufacturers as well as on characteristic values from field tests and practical applications, we determine the oil change interval for each plant individually, tailored to the respective conditions on site and the condition of oil and engine.



Benefits

- Continuous monitoring of oil and engine
- Individually tailored, maximum oil change intervals taking into account OEM specifications
- Risk minimisation → efficient operations management
- Optimised cost control
- Better planning of maintenance and oil changes
- Compliance with OEM warranty conditions and machine breakdown insurance conditions
- Maximum engine lifetimes
- Competent advice by ADDINOL Application Technology

The oil samples are analysed by an independent laboratory and evaluated by our Application Technology experts at the company's headquarters in Leuna, Germany. The effort for operators is minimal.

- 1 Sampling with the prepared set
- 2 Dispatch of sample bottle and sample form to one of the independent partner laboratories of ADDINOL
- 3 As soon as the values of the independent laboratory are available, the operators promptly receive an individual operating time recommendation plus a recommendation for the next analysis date from ADDINOL. In case of irregularities, the report contains an additional comment on the condition of oil and/or plant.

ADDINOL Lab report All information on the condition of oil & plant

ADDINOL lab report

ADDINOL Lube Oil GmbH • Am Haupttor • D-06237 Leuna
Your Company
Your Street
12345 Your Town
Responsible person: Addinol contact
Mobile: +49 (171) 1234 56781
E-Mail: info@addinol.de

Engine identification: SWS MODUL 2
Number of current sample: 4389739
Machine type: TBG 2016
Machine manufacturer: MWM
Fuel: Natural gas
Oil name: ADD Eco Gas 4000 XD
Oil volume: 90

Diagnosis
You can optimize your oil change period as follows:
Basis (oh): 894
Basis (date): 14.12.2020
new oiltest
1150

Recommendation
+250 oh
Extension
Information
Oil change

	Current sample	previous Analysis
Analysis results		
Lab number	4389739	4389737
Date of analysis	17.12.2020	10.12.2020
Sampling date	14.12.2020	07.12.2020
Last oil change	02.11.2020	02.11.2020
Top up since oil change	l	-
Op. h since oil change	oh/m	894
Operating hours complete	oh/m	46.867
Oil changed	No	No
Oil condition		
Viscosity at 100°C	mm²/s	14.30
TBN	mgKOH/g	4.41
TAN	mgKOH/g	2.80
pH		5.17
Oxidation	A/cm	9.0
Nitration	A/cm	7.0
Wear elements		
Aluminium (Al)	mg/kg	0
Lead (Pb)	mg/kg	0
Chromium (Cr)	mg/kg	0
Iron (Fe)	mg/kg	2
Copper (Cu)	mg/kg	0
Nickel (Ni)	mg/kg	0
Molybdenum (Mo)	mg/kg	0
Titanium (Ti)	mg/kg	0
Impurities		
Chlorine (Cl)	mg/kg	29
H2S content	mg/kg	0
Water	Basis (oh)	<0.1
Glycol	negative	negative
Silicon (Si)	mg/kg	1
Potassium (K)	mg/kg	1
Sodium (Na)	mg/kg	1
PQ index		0

Previous ADDINOL recommendation: +250 oh +150 oh +300 oh Oil change +100 oh Oil change

1) ADD GEO NG40



Benefits

- Clear**
Traffic light system for recommended oil change intervals
- Clearly structured**
Individual oil application time in focus
- Concise**
Analytical values at a glance and highlighted in case of irregularities
- Individual**
Comments tailored to the respective plant

- A Engine parameters**
Thorough data collection for optimal evaluation in the ADDINOL Analyses Service
- B Oil change interval recommendation**
The oil change interval is not a fixed parameter, but is subject to influencing factors such as gas quality, operating conditions, oil quality and oil volume. With our recommendation, which is based on the limit values of the respective OEM, the specific operating conditions and the history of the engine, we provide precise information on how to proceed. This way, oil changes can be carried out depending on the condition.
- C Trend analyses**
By showing the last up to five results, you will get a comprehensive overview of the condition of oil and engine and reliably detect changes.
- D Alkalinity stability**
Statement on the neutralisation capacity of acidic components → Protection against corrosion
- E Oil condition**
Monitoring of oil ageing → Avoidance of deposits and varnish
- F Wear elements**
Statement on engine condition → Early indication of wear processes or damage to engine components
- G Contamination**
Indication of foreign substances that have been introduced into the oil → Monitoring minimises risk of power loss, wear and engine damage

Please note: the illustration shows a complete laboratory report. The recommendation applies solely to the given unit under the specified operating conditions. The values determined are not transferable to other units, not even to units of the same type.

ADDINOL Gas engine oils
Approved by leading engine manufacturers

ADDINOL Gas Engine Oils		MG 40-Extra Plus	MG 40-Extra LA	Eco Gas 500 XD	Eco Gas 4000 XD	Eco Gas 4010 XD	Eco Gas 4205 XD	Gas Engine Oil LG 40	Gas Engine Oil NG 40
Ash Content		high ash	low ash	low ash	low ash	low ash	low ash	low ash	low ash
Natural Gas			✓	✓	✓	✓	✓		✓
Special Gases*		✓	✓		✓			✓	✓
Special Gases* in natural gas quality with and without catalytic converter			✓	✓	✓	✓	✓	✓	✓
2G Energy	agenitor Series 4				natural gas, cleaned biogas				
	patruus Series	biogas	natural gas		natural gas				
	aura Series				natural gas, cleaned biogas				
	avus 500plus				natural gas, cleaned biogas				
Bergen Engines	B35:40 & B36:45 & K-Type Natural Gas						+		
Burkhardt Energie- und Gebäudetechnik	Engine group – wood gas 12-cylinder (ECO 330/340 HG, ECO 495)				+				
Caterpillar CG Series (TR 0199-99-12105)	Natural Gas		+ without CG132B / CG170B / CG260(4.5)		+				+
	Special Gas	+	+ without CG132B / CG170B / CG260(4.5)		+				+
	Cleaned Special Gas		+ without CG132B / CG170B / CG260(4.5)		+				+
Deutz AG (TR 0199-99-01213)	Series 913 / 914 / 2015 Natural Gas		+		+				
INNIO Jenbacher (TA 1000-1109)	Series 2 + 3	Fuel Gas Class B, C	Fuel Gas Class A, B, S, Cat		Fuel Gas Class A, S, Cat	Fuel Gas Class A, S, Ca		Fuel Gas Class B, C	Fuel Gas Class A, B**, Cat
	Series 3 Version F				Fuel Gas Class A, S, Cat				
	Series 4 Version A + B + D		Fuel Gas Class A, B, S, Cat			Fuel Gas Class A, S, Cat		Fuel Gas Class B, C	Fuel Gas Class A, B**, Cat
	Series 4 Version C + E				Fuel Gas Class A, S, Cat	Fuel Gas Class A, S, Cat			
	Series 6 Version C + E		Fuel Gas Class A, B, S, Cat		Fuel Gas Class A, S, Cat	Fuel Gas Class A, S, Cat		Fuel Gas Class B, C	Fuel Gas Class A, B**, Cat
	Series 6 Version F + J				Fuel Gas Class A, S, Cat	Fuel Gas Class A, S, Cat			
	Type 624 Version G + H + K				Fuel Gas Class A**, S, Cat	Fuel Gas Class A, S, Cat			
Mamotec (TR 20-03)	Natural Gas		+		+				
	Special Gas	+							

ADDINOL Gas Engine Oils		MG 40-Extra Plus	MG 40-Extra LA	Eco Gas 500 XD	Eco Gas 4000 XD	Eco Gas 4010 XD	Eco Gas 4205 XD	Gas Engine Oil LG 40	Gas Engine Oil NG 40
Ash Content		high ash	low ash	low ash	low ash	low ash	low ash	low ash	low ash
Natural Gas			✓	✓	✓	✓	✓		✓
Special Gases*		✓	✓		✓			✓	✓
Special Gases* in natural gas quality with and without catalytic converter			✓	✓	✓	✓	✓	✓	✓
MAN Truck & Bus	M 3271-2 Natural Gas		+		+				
	M 3271-4 Special Gas	+							
	M 3271-5 Natural and Special Gas with Catalytic Converter				+				
	M 3271-5 including steel pistons				+				
MAN Energy Solutions	Natural Gas			+	+				
MWM (TR 0199-99-2105)	Natural Gas		+ without TCG3016 / TCG3020 / TCG2032B		+				+
	Special Gas	+	+ without TCG3016 / TCG3020 / TCG2032B		+				+
	Cleaned Special Gas		+ without TCG3016 / TCG3020 / TCG2032B		+				+
Perkins	Natural Gas				+				
	Special Gas	4000 Series							
Rolls-Royce Solutions (MTU) Series 400	Natural Gas		+		+				
	Special Gas	+							
	Special Gas SCR Cat.				+				
Rolls-Royce Solutions (MTU) Series 500	Natural Gas				+				
	Cleaned Biogas				+				
	Special Gas								
Rolls-Royce Solutions (MTU) Series 4000	Natural Gas						L61 / L62 / L63 / L64 / L64FNER / T24N / Mx5xN		
	Special Gas	L62 FB	+						
R Schmitt Enertec	Natural Gas				+				
	Cleaned Biogas				+				
	Special Gas	+							
Tedom	Natural Gas				+				
	Special Gas	+							
Wärtsilä	Natural Gas								+
Also recommended for		Caterpillar Series 35xx / 36xx; Liebherr; Waukesha; Dual Fuel Engines							

The individual application depends on the respective OEM specifications. Please contact our technical service for detailed information!

* Special Gases = Biogas, Mining Gas, Landfill Gas, Sewage Gas

** Eco Gas 4000 XD - Engines built before Feb. 28, 2020

** Gas Engine Oil NG 40 - Engines built before Nov. 26, 2020

+ = approved

ADDINOL Gas engine oils More than 20 years of experience and success

Research and development is one of the core competences of our company. In the development of gas engine oils we have been working closely with leading OEMs for many years. After all, the engine oil has long been a design element and only the application of the right lubricants will lead to stable operation.

MILESTONES in energy generation with gas engines

Further development of engines and exhaust aftertreatment technologies

against the background of performance increase:
new materials, optimised designs

2009: Amendment to Act on Combined Heat and Power Generation (KWKG)

Extension of support | law for the maintenance,
modernisation and expansion of combined
heat and power generation

Development of **exhaust gas after-
treatment technologies**

2002: Act on Combined Heat and Power Generation (KWK) in Germany

Feed-in and remuneration of electricity from CHP plants

In the following years, **mine gas, sewage and landfill
gas as well as natural gas** are increasingly used
to generate energy.

Energy generation through biomass

The use of biomass to generate electricity and heat
begins as early as the 1990s. More and more plants with
the characteristic domed roofs spring up in Germany.
At first, it is mainly agricultural businesses that take advan-
tage of the opportunity to use their waste in this way.

High-performance lubricants for gas engines

TODAY

Extension of the Eco Gas XD range with Eco Gas 500
XD especially for high heat recovery rates and Eco Gas
4010 XD for highest demands | 3.5 million analytical
values | approx. 100,000 used oil analyses to date |
more than 15,000 engines serviced | 1.5 % market share
worldwide

2019

»World Market Leader Champion« of the University of
St. Gallen for biogas engine oils

2014

Eco Gas 4000 XD for natural gas and cleaned special
gases | Gas Engine Oils NG 40 for natural gas and
LG 40 for landfill gas applications

2010

With the increased use of catalytic converters the ap-
plication of ADDINOL Gas engine oil MG-40 Extra LA is
extended to further OEM

from 2009

Worldwide increasing use of ADDINOL gas engine
oils | Addition of coolants Antifreeze Extra and Anti-
freeze Extra 4060 to the package

2008

Widening of customer support by the ADDINOL
Analyses Service

2003-2005

ADDINOL Gas engine oil MG-40 Extra LA for low ash
applications especially in MWM engines | Expansion of
the cooperation with OEM, e.g. GE Jenbacher, MTU,
MWM, Tedom, Perkins

2000-2004

Cornerstone for the targeted development of gas en-
gine oils in close cooperation with MAN and a leading
additive manufacturer: launch of ADDINOL Gas Engine
Oil MG-40 Extra Plus for biogas applications