



SENTRON™ NATURAL GAS ENGINE OILS

Introduction

Petro-Canada SENTRON™ natural gas engine oils (NGEO) are premium performance, long life engine oils specially formulated to lubricate natural gas engines and compressors. SENTRON's extended drain intervals can mean lower maintenance costs, less used oil to dispose of and a more efficient and profitable operation.

SENTRON's exceptional performance is especially important in the severe service conditions common in compression, power generation and combined heat and power applications. Its outstanding anti-wear protection helps to minimize polish and wear of cylinder liners and wear of piston rings, while helping to reduce carbon build-up.

That can mean:

- Longer service intervals
- Cleaner engines with less wear
- Less downtime
- Less backfiring
- Fewer service calls

SENTRON natural gas engine oils are formulated with Petro-Canada's ultra pure HT Severely Hydrocracked base oils and highly advanced additive technology to help deliver a combination of extended oil life, extended drain intervals and excellent control of engine deposits. Offering exceptional protection against wear and corrosion, SENTRON helps provide worry-free operation, increased engine durability and engine life, which can lead to a reduction in overall operating costs.

SENTRON natural gas engine oils span the typical levels of sulphated ash and SAE viscosity grades required by gas engine manufacturers. Moreover, they have a proven track record of successful use under a wide range of operating conditions.

Features and Benefits

- **Longer oil life provides long-lasting equipment protection**
 - Exceptional resistance to breakdown caused by oxidation and nitration.
 - Helps extend engine life by reducing varnish, sludge and carbon deposits.
 - Helps improve engine performance.
- **Extended drain interval can reduce maintenance and provide savings**
 - SENTRON LD 5000 has extended oil change intervals in Caterpillar engines by providing up to 200%* increase in oil life when compared to leading competitive NGEOs. The extended drain interval helps to:
 - Reduce downtime and maximizes production availability.
 - Lower operating costs by reducing maintenance costs.
- **Outstanding anti-wear/anti-scuff protection helps to:**
 - Control and minimize valve recession.
 - Reduce wear on piston rings, cylinder liners and bearings, prolonging engine life.
 - Reduce operating and maintenance costs.
- **Keeps engine parts clean by:**
 - Minimizing ring zone and valve stem deposits.
 - Minimizing port blockage in 2-cycle gas engines.
 - Improving engine lubrication by maintaining clean oil-ways.
 - Maximizing the time between major engine overhauls.
 - Preventing corrosion.
- **Extremely low oil volatility helps to:**
 - Improve work environment through absence of oil odor.
 - Minimize oil consumption.

What is the HT difference?

Petro-Canada starts with the patented HT purity process to produce water-white, 99.9% pure base oils. The result is a range of lubricants, specialty fluids and greases that deliver maximum performance for our customers.



*Performance results may vary due to factors such as, but not limited to, engine optimization, load, fuel gas quality, proper maintenance, type of engine and application.

Applications

Petro-Canada SENTRON natural gas engine oils are premium performance engine oils specially formulated to lubricate industrial and mobile internal combustion engines running on natural gas. Specific SENTRON oils also meet the more severe operational needs of cogeneration, biogas, sewage gas, coal bed methane and low halogen landfill gas operations. SENTRON NGEOs can be used in reciprocating compressor crankcases where an OEM allows 40 SAE oil. SENTRON can also be used in compressor lubricators.

| Industry Classification | | Petro-Canada SENTRON Natural Gas Engine Oils |
|-------------------------|------------------------|---|
| Ash Category | Ash Content (wt % ash) | |
| Ashless | 0.04 | SENTRON 541C |
| Low Ash | 0.1-0.6 | SENTRON LD 5000 SENTRON LD SYNTHETIC BLEND SENTRON 470 SENTRON 445 SENTRON MG 440 SENTRON 590 SENTRON FLEET 10W-40 SENTRON FLEET 0W-30 |
| Medium Ash | 0.6-1.0 | SENTRON CG 40 SENTRON 840 |

- May reduce downtime by maximizing the time between major engine overhauls

SENTRON natural gas engine oils cover the three main levels of sulphated ash required by natural gas engine manufacturers:

Medium Ash

SENTRON CG 40 (0.92% wt ash) is designed specifically for 4-stroke cycle gas engines running in severe service such as co-generation, sewage or sour gas or low halogen landfill gas operations. SENTRON CG 40 gives exceptional performance in turbocharged, naturally aspirated rich and lean burn gas engines as well. Containing low levels of phosphorus and zinc, it is suitable for use in engines fitted with catalytic converters.

SENTRON 840 (0.73% wt ash) is recommended for use in high performance, 4-stroke cycle gas engines requiring a medium ash content.

Low Ash

SENTRON LD SYNTHETIC BLEND (0.51% wt ash) is a 15W-40 multigrade extension of the Sentron LD 5000 line, formulated as a synthetic blend to extend drains by up to 200% or longer in all temperatures. SENTRON LD SYNTHETIC BLEND has low temperature starting capabilities down to -25°C. Field trial results have shown outstanding piston cleanliness which may result in longer equipment life and less downtime.

SENTRON LD 5000 (0.57% wt ash) provides revolutionary performance for up to 200%* longer drain intervals and exceptional overall engine protection for maximum reliability and savings. Petro-Canada recommends for use in Caterpillar, Superior, Waukesha and other turbocharged or naturally aspirated, stoichiometric or lean burn engines that require a low ash natural gas engine oil. SENTRON LD 5000 helps provide reduced valve recession and

controls wear of piston rings, cylinder liners and bearings for prolonged engine life vs. competitive oils.

SENTRON 470 (0.51% wt ash) is designed for use where there is a need for added high temperature deposit control. It is suitable for use in engines fitted with catalytic converters. Using the proven chemistry in SENTRON 445 as a base, SENTRON 470 incorporates an additive boost for the extra performance required for severe service applications, including high output, turbocharged engines that encounter high exhaust gas temperatures. The result can be significantly less valve sticking for reduced backfiring in these severe applications.

SENTRON 445 (0.45% wt ash) is recommended for most 4-stroke and some 2-stroke gas engines. It is suitable for use in engines fitted with catalytic converters. SENTRON 445 helps provide a high level of performance in high output turbocharged engines that prefer a low ash oil. Provides excellent control of engine deposits.

SENTRON MG 440 (0.45% wt ash) is a multigrade (SAE 15W-40) version of SENTRON 445. The multigrade feature permits faster engine starting and improved lubricant flow at low ambient temperatures. SENTRON MG 440 helps provide extended oil life versus competitive products and excellent control of engine deposits during all seasons. It is ideal for cold starts. SENTRON MG 440 is suitable for use in engines fitted with catalytic converters. SENTRON MG 440 may also be used in several models of natural gas engines found in automotive service. These include Cummins L10 and M11 engines and Detroit Diesel 50G and 60G engines.

SENTRON 590 (0.59% wt ash) is recommended for most 4-stroke and some 2-stroke gas engines. It is suitable for use in engines fitted with catalytic converters. SENTRON 590 provides a high level of performance in high output turbocharged engines that prefer a low ash oil. It helps provide excellent control of engine deposits, and is specially formulated for engines that operate in severe nitrating conditions. Combined with Petro-Canada's engine optimization recommendations, and in severe nitrating conditions, SENTRON 590 can deliver up to 200%* longer drain intervals.

SENTRON FLEET 10W-40 (0.54% wt ash) is formulated specially to meet the demands of natural gas engines (stationary and mobile) for exceptional cleanliness of the engine through all seasons. It is recommended for use in natural gas fuelled engines that require high zinc for improved valve train wear. Excellent cold start capability. SENTRON FLEET 10W-40 is CES 20074 approved

SENTRON FLEET 0W-30 (0.54% wt ash) is a low ash, synthetic blend NGEo formulated specifically as an all season solution for small to mid-sized engines that are difficult to start in severe winter conditions. With a Pour Point of -48°C SENTRON FLEET 0W-30 helps provide exceptional performance in extreme winter conditions, presenting opportunities for inventory consolidation. Its excellent cleanliness and control of valve stem deposits offer potential for less downtime and longer service life.

Ashless

SENTRON 541C (0.04% wt ash) is recommended primarily for 2-stroke cycle gas engines but may be used in certain 4-stroke cycle gas engines. SENTRON 541C minimizes combustion chamber and spark plug deposits.

*Performance results may vary due to factors such as, but not limited to, engine optimization, load, fuel gas quality, proper maintenance, type of engine and application.

Petro-Canada Gas Engine Oils Selection Table*

| MANUFACTURER | ENGINE TYPE | FUEL GAS | ENGINE Model | MANUFACTURER'S ASH LEVEL REQUIREMENTS | RECOMMENDATION |
|--|----------------|------------------------|--|---------------------------------------|--|
| Ajax (Cooper Energy Service) | 2-stroke cycle | natural | All - Ashless preferred | <0.1% | Sentron 541C |
| Cooper Bessemer (Cooper Energy Service) | 2-stroke cycle | natural | All - Ashless preferred | <0.1% | Sentron 541C |
| Caterpillar | 4-stroke cycle | natural | All | Low Ash Acceptable | Sentron 445, 470, 590, LD 5000 |
| | | natural | G3300, G3400, G3500, G3600 | 0.4% min - 0.6% max | Sentron 445, MG 440, 470 LD 5000, 590, LD Synthetic Blend |
| | | biogas | G3600 field trial proven | | Sentron LD 5000 |
| Superior (Cooper Energy Service) | 4-stroke cycle | natural | All except 1700 & 2400 | 0.4% - 1.0% | Sentron 445, MG 440, CG 40, 470, LD 5000,590 |
| | 4-stroke cycle | natural | 1700 & 2400 Series | 0.4% - 0.6% | Sentron 445, MG 440, 470, LD 5000, 590, LD Synthetic Blend |
| Superior (White) | 4-Stroke cycle | natural | G825 | 0.4% - 1% | Sentron 445, 470, LD 5000, Sentron 840 |
| | 4-Stroke cycle | natural | GT825 | 0.4% - 1% | Sentron 840 |
| Clark Brothers (Dresser Rand) | 2-stroke cycle | natural | All | Ashless | Sentron 541C |
| Cummins | 4-stroke cycle | natural | L10G, QSK19G, K19G, | <0.5% | Sentron MG440, LD Synthetic Blend |
| | 4-stroke cycle | natural | G19, G38, G50, G28, G855, G14 | | |
| | 4-stroke cycle | natural | B, C, G5.9, G8.3 | CES 20074 Approved | Sentron Fleet 10W-40 |
| | 4-stroke cycle | natural | All QSV, QSK except 19G | Premium grade long change interval | Sentron 445, 470 Sentron LD 5000 |
| Detroit Diesel | 4-stroke cycle | natural | 50G and 60G | <0.8% | SENTRON™ MG440 |
| MWM (former Deutz) | 4-stroke cycle | natural | All | 0.5% max | Sentron LD 5000, 470,445 |
| | 4-stroke cycle | biogas | All | 0.5% - 1.0% | Sentron CG 40 |
| Guascor | 4-stroke cycle | natural | All | 0.9% max | Sentron 445, 840, LD 5000 MG 440, 470, 590, LD Synthetic Blend |
| Iveco | 4-stroke cycle | natural | All | 0.45% max | Sentron 445, MG 440 |
| Ingersoll-Rand (Dresser Ind.) | 4-stroke cycle | natural | Category I | Approval based on field performance | Sentron 541C, Sentron 445, MG 440, 470, LD 5000, LD Synthetic Blend |
| | 4-stroke cycle | natural | Category II - III | Approval based on field performance | Sentron 445, MG 440, 470, LD 5000, LD Synthetic Blend |
| GE Jenbacher | 4-stroke cycle | Class A | 2&3 | | Sentron LD 5000, 445, 470 |
| | | Class A | 4&6 | | Sentron LD 5000, 445, 470 |
| | | Class B | 2&3 | | Sentron CG 40 |
| | | Class B | 4&6 | | Sentron LD 5000, 445, 470 |
| | | Class C | 2&3 | | Sentron CG 40 |
| | | Class C | 4&6 | | none |
| M.E.P., Fairbanks Morse | 2-stroke cycle | natural | All | 0.2 % - 0.5% | Sentron 445, MG 440 |
| | 4-stroke cycle | natural | All | | |
| MAN | 4-stroke cycle | natural | All | 0.4% - 0.7% | Sentron 445, MG 440, 470, LD 5000, 590, LD Synthetic Blend |
| | 4-stroke cycle | biogas | All | 0.4% - 1.0% | Sentron CG 40 |
| Perkins | 4-stroke cycle | natural | All | 0.5% min - 1.0% max | Sentron 840, 470, LD 5000, 590 |
| RRMEB | 4-stroke cycle | natural | All | | Sentron 445, LD 5000 |
| Wärtsilä | 4-stroke cycle | natural & periodic LFO | 150SG, 175SG, 220SG, 25SG, 28SG, 34SG, 32DF,34DF, 50DF | 0.6% max | Sentron 445, 470, LD 5000, 590 |
| Waukesha Engine Div. (Dresser Ind.) | 4-stroke cycle | natural | VSG F11, G, GSI, GSID | 0.35% - 1.0% | Primary - Sentron 445, CG 40, LD 5000, MG 440, 470, 590, LD Synthetic Blend, Secondary - Sentron 840 |
| | 4-stroke cycle | natural | F817, F1197 | 0.35% - 1.0% | Primary - Sentron 445, CG 40, LD Synthetic Blend, LD 5000, MG 440, 470, 590, Secondary - Sentron 840 |
| | 4-stroke cycle | natural | Clinton G2476, L3711, F1850, H884 | Ashless preferred | Sentron 541C |
| | 4-stroke cycle | natural | VHP F2895, F3521, L5108, L5790, L7042, P9390, G, GSI | 0.35% - 1.0% ¹ | Primary - Sentron 445, CG 40, LD 5000, MG 440, 470, 590, LD Synthetic Blend, Secondary - Sentron 840 |
| | 4-stroke cycle | natural | VHP GL | 0.35% - 1.0% | Sentron LD Synthetic Blend |
| | 4-stroke cycle | natural | VGf, F-18, H-24, L-36, P-48, GSI, GSID | 0.35% -0.5% ¹ | Sentron 445, MG 440 |
| | 4-stroke cycle | natural | VGf, F-18, H-24, L-36, P-48, G, GL, GLD | 0.45% - 0.75% ¹ | Sentron 445, MG 440, 470, LD 5000, 590, LD Synthetic Blend |
| | 4-stroke cycle | natural | AT 25/27GL Series | 0.35% -1.0% ¹ | Primary - Sentron 445, CG 40, LD 5000, MG 440, 470, 590, LD Synthetic Blend Secondary - Sentron 840 |
| | 4-stroke cycle | natural | VHP F3524, L5794, L7044 GSI, L5774 LT | 0.45% - 0.75% ¹ | Primary - Sentron 445, MG 440, 470, LD 5000, 590, LD Synthetic Blend Secondary - Sentron 840 |
| | 4-stroke cycle | natural | 16V150LTD, 220GL | 0.40% - 0.55% | Sentron 445, LD 5000 |
| MTU | 4-stroke cycle | natural | 28XX & 30XX | | Sentron LD 5000 |
| | 4-stroke cycle | biogas | 28XX & 30XX | | Sentron CG 40 |
| GM | 4-stroke cycle | natural | 350 | | Sentron Fleet 10W-40, 0W-30 |
| BU Drive | 4-stroke cycle | natural | All | | Sentron LD 5000 |
| | | biogas | All | | Sentron LD 5000 |
| Schnell | 4-stroke cycle | biogas | All | | Sentron LD 5000 |

¹0.1% Zn max. is recommended.

*The above table can be used as a guideline for product selection. Each natural gas engine can be with unique characteristics and variations in operating parameters, and therefore, it is recommended to consult with a Technical Representative to ensure the most appropriate lubricant selection is made.

Operational Considerations

SETRON natural gas engine oil with extended drain interval and oil life as well as excellent control of engine deposits and wear help provide worry-free operation and reduced cost to customers under normal recommended conditions. However, actual oil life is dependent upon system design and operating practices, and should be established by used oil analysis, according to engine manufacturers' recommendations. Petro-Canada's No-Nonsense Lubricants Warranty applies.

Typical Performance Data

| PROPERTY | ASTM TEST METHOD | PETRO-CANADA NATURAL GAS ENGINE OILS SETRON | | | | | | | | | | |
|--|------------------|---|--------------------|--------------------|--------------------|----------------------|-----------------------|--------------------|----------------------------|--------------------|--------------------|--------------------|
| | | SENTRON 541C | SENTRON 445 | SENTRON MG440 | SENTRON 470 | SENTRON FLEET 10W-40 | SENTRON FLEET 0W-30 | SENTRON LD 5000 | SENTRON LD SYNTHETIC BLEND | SENTRON 590 | SENTRON 840 | SENTRON CG40 |
| Ash Type | - | Ashless | Low Ash | Low Ash | Low Ash | Low Ash | Low Ash | Low Ash | Low Ash | Low Ash | Medium Ash | Medium Ash |
| Sulphated Ash, % wt | D874 | 0.04 | 0.45 | 0.45 | 0.51 | 0.54 | 0.54 | 0.57 | 0.51 | 0.59 | 0.73 | 0.92 |
| SAE Grade | - | 40 | 40 | 15W-40 | 40 | 10W-40 | 0W-30 | 40 | 15W-40 | 40 | 40 | 40 |
| Flash Point, COC, °C / °F | D92 | 279/534 | 230/446 | 209/408 | 230/446 | 235/455 | 185/365 | 272/522 | 247/477 | 277/534 | 244/471 | 231/448 |
| Kinematic Viscosity cSt @ 40°C/SUS @ 100°F cSt @ 100°C/SUS @ 210°F | D445 | 118.4/614 13.4/73 | 126/570 13.4/71 | 105/505 14.2/75 | 124/575 13.3/71 | 111/514 16.0/81.9 | 61.7/286 11.1/63.1 | 124/575 13.4/71 | 106.0/545 15.2/77.9 | 121/249 13.5/72 | 120/556 13.1/71 | 128/593 13.3/71 |
| Pour Point, °C / °F | D5950 | -21/-6 | -24/-11 | -33/-27 | -24/-11 | -33/-27 | -48/-54 | -30/-22 | -42/-44 | -30/-22 | -24/71 | -24/-11 |
| Total Acid Number | D664 | 0.7 | 0.6 | 0.9 | 1.6 | 1.4 | 1.6 | 1.1 | 1.02 | 0.98 | 2.0 | 0.7 |
| Total Base Number | D2896 | 1.6 | 5.0 | 5.0 | 5.7 | 5.3 | 5.1 | 4.9 | 4.7 | 6.0 | 5.3 | 8.5 |

The values quoted above are typical of normal production. They do not constitute a specification.

Health and Safety

To obtain Material Safety Data Sheets (MSDS), contact one of our TechData Info Lines.

TechData Info Lines

If you would like to know more about SETRON natural gas engine oils, or any other product in our complete line of quality lubricants, please contact us at:

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