

Natural Gas Engine Oil & Power Generation



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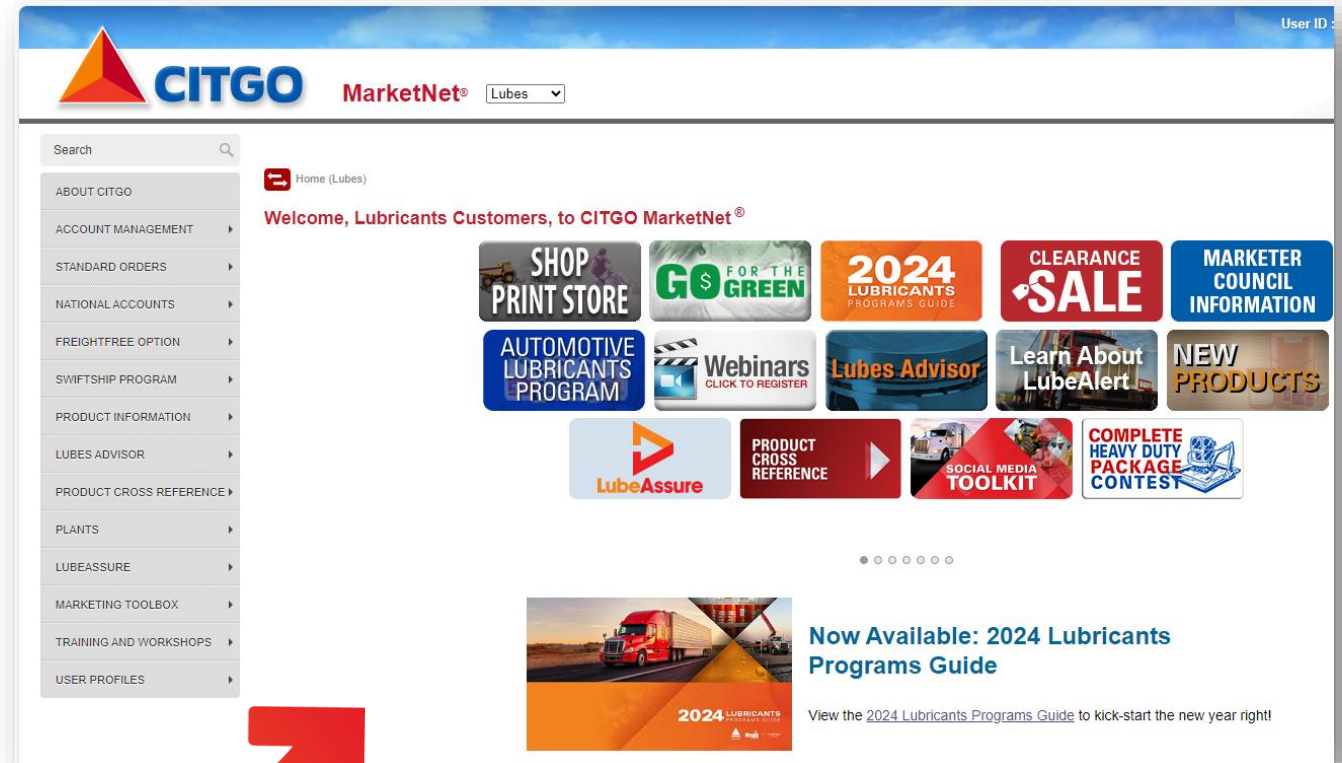
Want Resources?

Support
Literature

Social
Media
Toolkit

Technical
Services

Webinars



Future Webinars

August 23: Agriculture & Forestry Industries

September 20: Industrial Plant Utilities

October 18: Food, Bottling & Pellet Mill Industries



Abdul Maye – STLE OMA-I

- CITGO Sr. Product Specialist
- BS in Chemistry
- 19 Years of Experience in the Lubricants Industry



John Messinger – STLE CLS & OMA-I

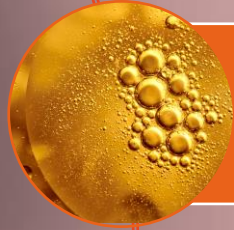
- CITGO Sr. Account Manager
- 28 Years of Selling Experience in the Lubricants Industry



Agenda



Natural Gas Gathering & Transportation



Gas Compression & Compressor Types



Turbine Oils for Power Generation



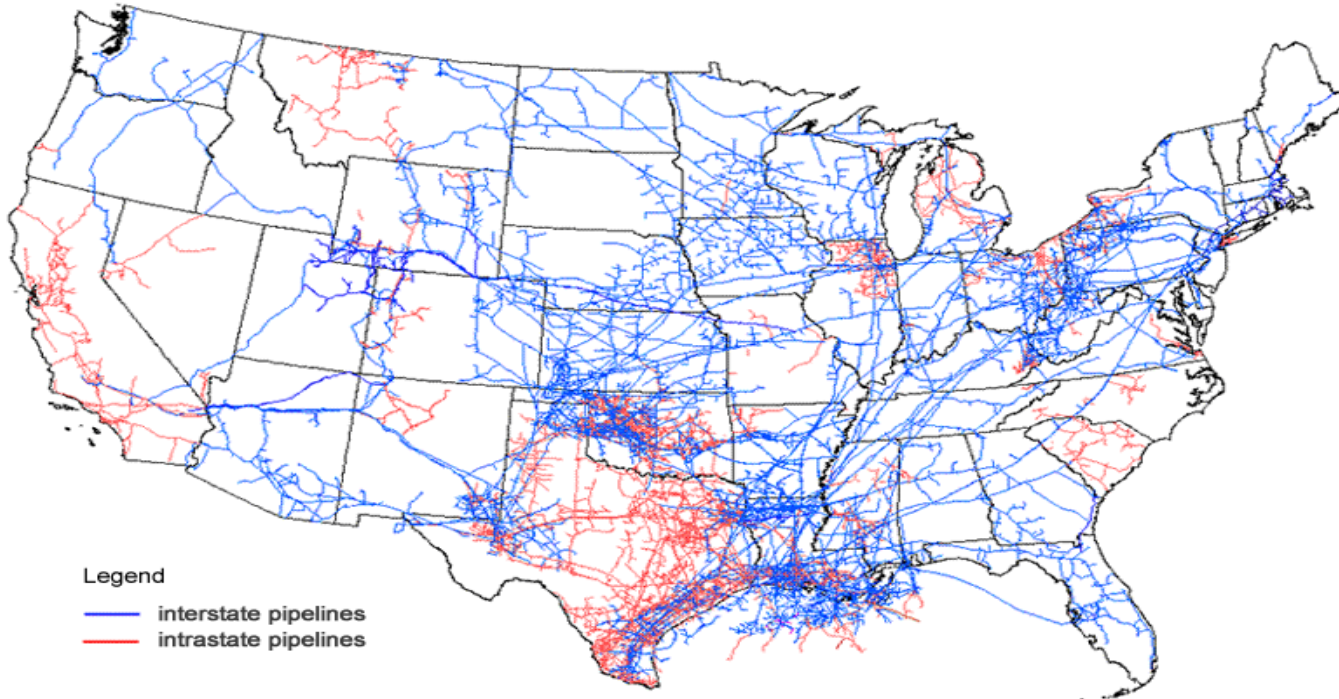
Selling to the Oil & Gas and Gas Transportation Markets

Natural Gas Gathering & Transportation



Where are Gas Gathering & Transportation Customers?

Map of U.S. interstate and intrastate natural gas pipelines



Legend

- interstate pipelines
- intrastate pipelines

Source: U.S. Energy Information Administration, *About U.S. Natural Gas Pipelines*



Natural Gas Engine Users

Oil & Gas Industry 80%

- Natural Gas Transmission & Gathering
- Oil Well Pumping

Agricultural Industry 10%

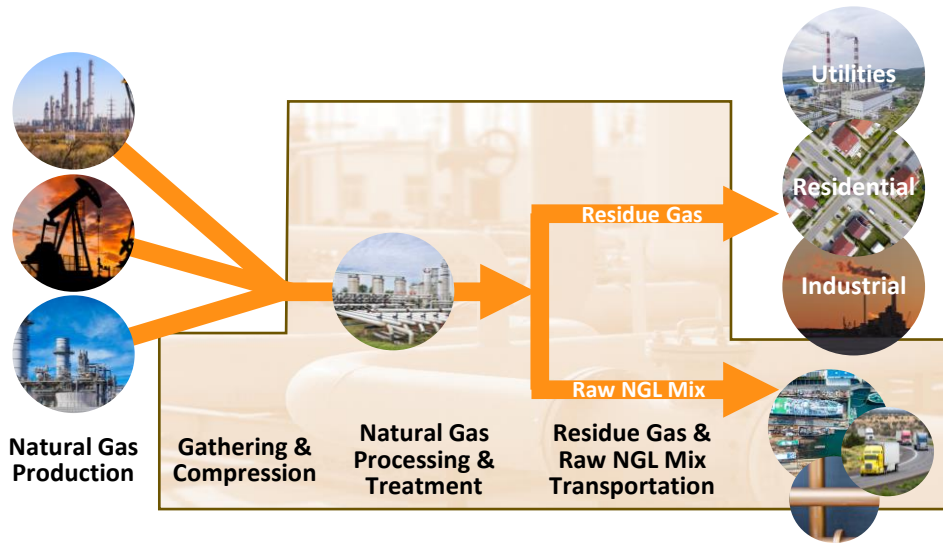
- Irrigation Pumping
- Dairies

Commercial 5%

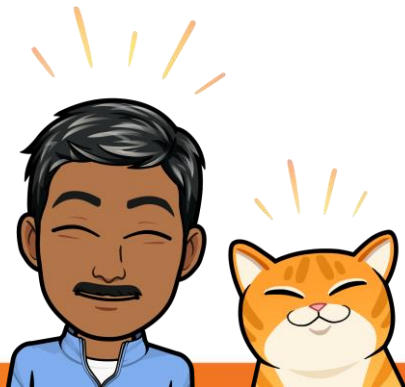
- Power & Heat Generation (airport, hotels, hospitals, paper mills and other industrial facilities)

Municipal 5%

- Water Supply Pumping
- Water Treatment
- Landfills



Natural Gas Compression Applications



Application

Wellhead Gathering

Gas Processing Plants

Pipeline Compressor Stations

Industrial Power Plants

Biogas / Landfill

Natural Gas Engine Types

Small 4-Stroke, Small 2-Stroke

Large 4-Stroke

Large 2-Stroke, Large 4-Stroke

4-Stroke, Some Co-Generation Power

Large 4-Stroke

Wellhead Gas Gathering

Operations

- Variable gas quality
- Higher engine temperature recommended if H₂S is present
- Frequent maintenance
- Frequent oil changes
- Typically requires special gas pre-processing

Common Problems

- High moisture content
- Short oil life
- Remote locations
- Corrosion and detonation-related failures



Field Gathering

Operations

- Run unattended
- Same oil in engine and compressor
- (unless high moisture gas)
- Often exposed to elements
- Primarily 4-stroke
- Field operators may adjust A/F ratio
- Usually overloaded

Common Problems

- Shortened oil life
- Overloading
- Variable fuel quality
- Valve recession
- Valve guttering/burning

Gas Transmission

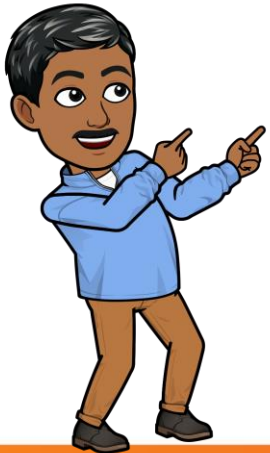
Operations

- Same oil in engine and compressor
- Multiple engines in a building
- Often large 2-stroke engines
- Usually well-maintained

Common Problems

- Combustion chamber and piston deposits due to over-oiling
- Port deposits from over-oiling or using the wrong lubricant
- Use of inferior replacement parts

Landfill Gas to Energy



Operation

- Almost always four stroke
- Usually run unattended
- Usually well maintained
- Usually run at 100% load
- Normally more than one engine in a room
- Often Caterpillar or Jenbacher

Common Problems

- Low gas quality
 - Low energy content
 - Usually contains H₂O
 - May contain CFCs
 - H₂S, Siloxanes
- Frequent maintenance
- Frequent oil changes
- Valve deposit build-up
- Liner lacquering
- Corrosion-related failures

Stationary Natural Gas vs. Diesel Engine Lubes

Natural Gas Engine Oils

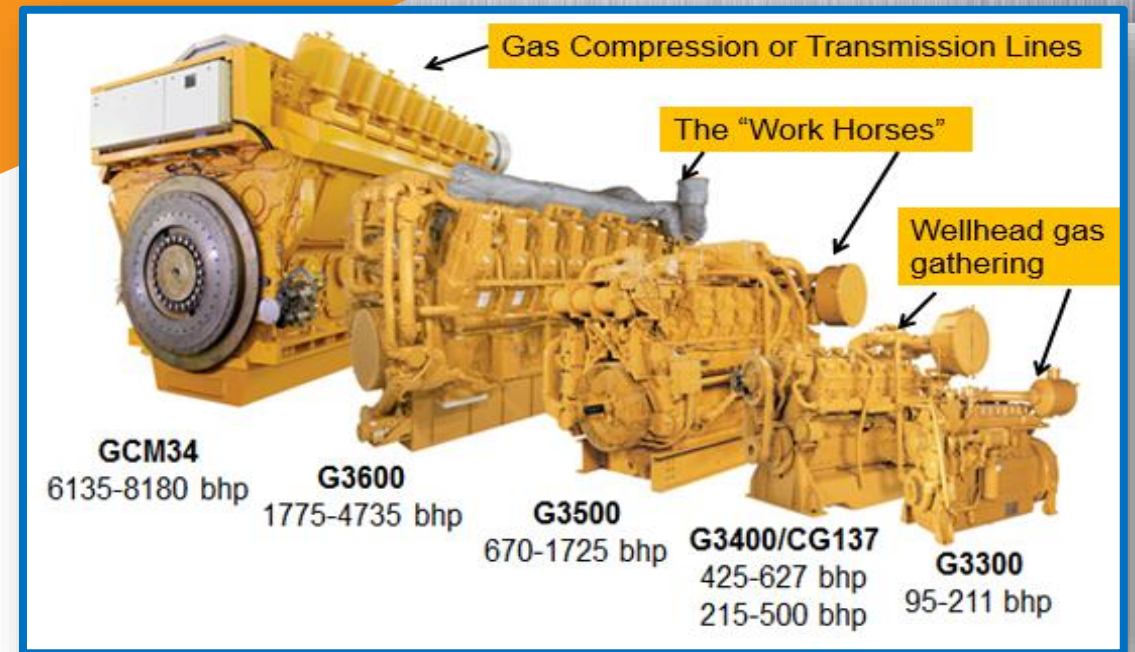
- No industry standard
- Field testing for OEM approval
- Low ash or ashless oils
- SAE 40 preferred by OEMs

Diesel Engine Oils

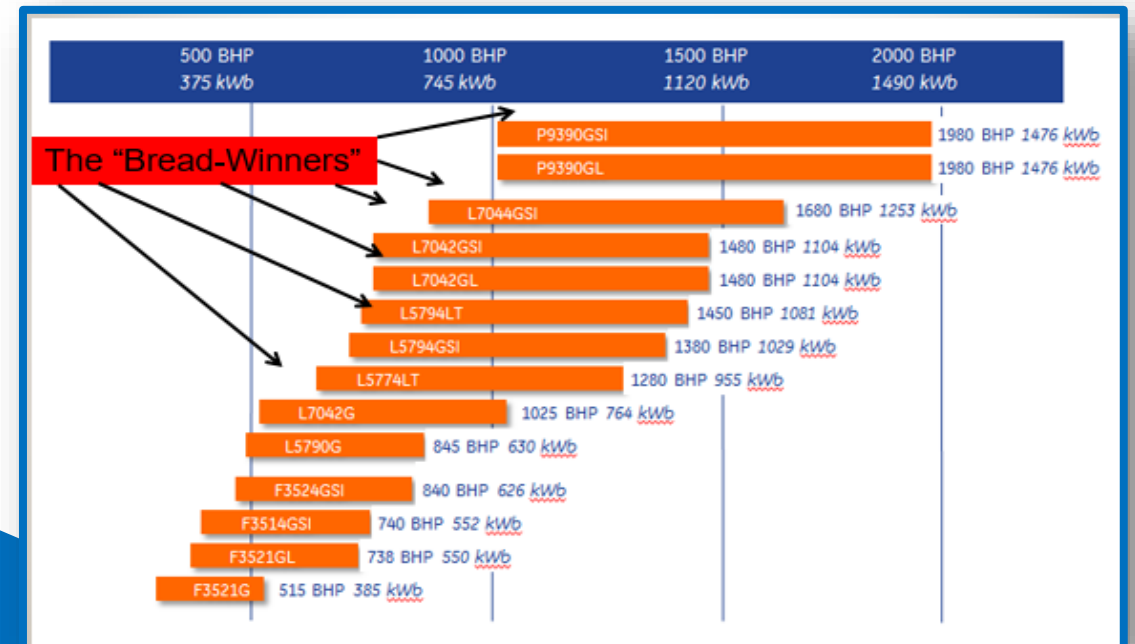
- Industry service classifications
- Field testing not required
- Mid ash oils
- Multi-viscosity oils preferred by OEMs

Major Original Equipment Manufacturers

- Caterpillar (about 50% of NA market)
- GE Power (Waukesha, Jenbacher, Cooper Bessemer, Superior, Ajax) (Waukesha has about 25% of market)
- Cummins
- Others
 - Deutz Power Systems
 - Niigata
 - MDE
 - Rolls Royce
 - Wartsilla
 - Clark

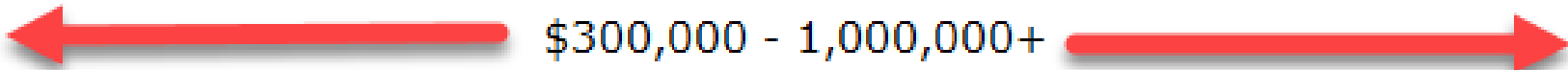


Caterpillar Gas Compression Offerings

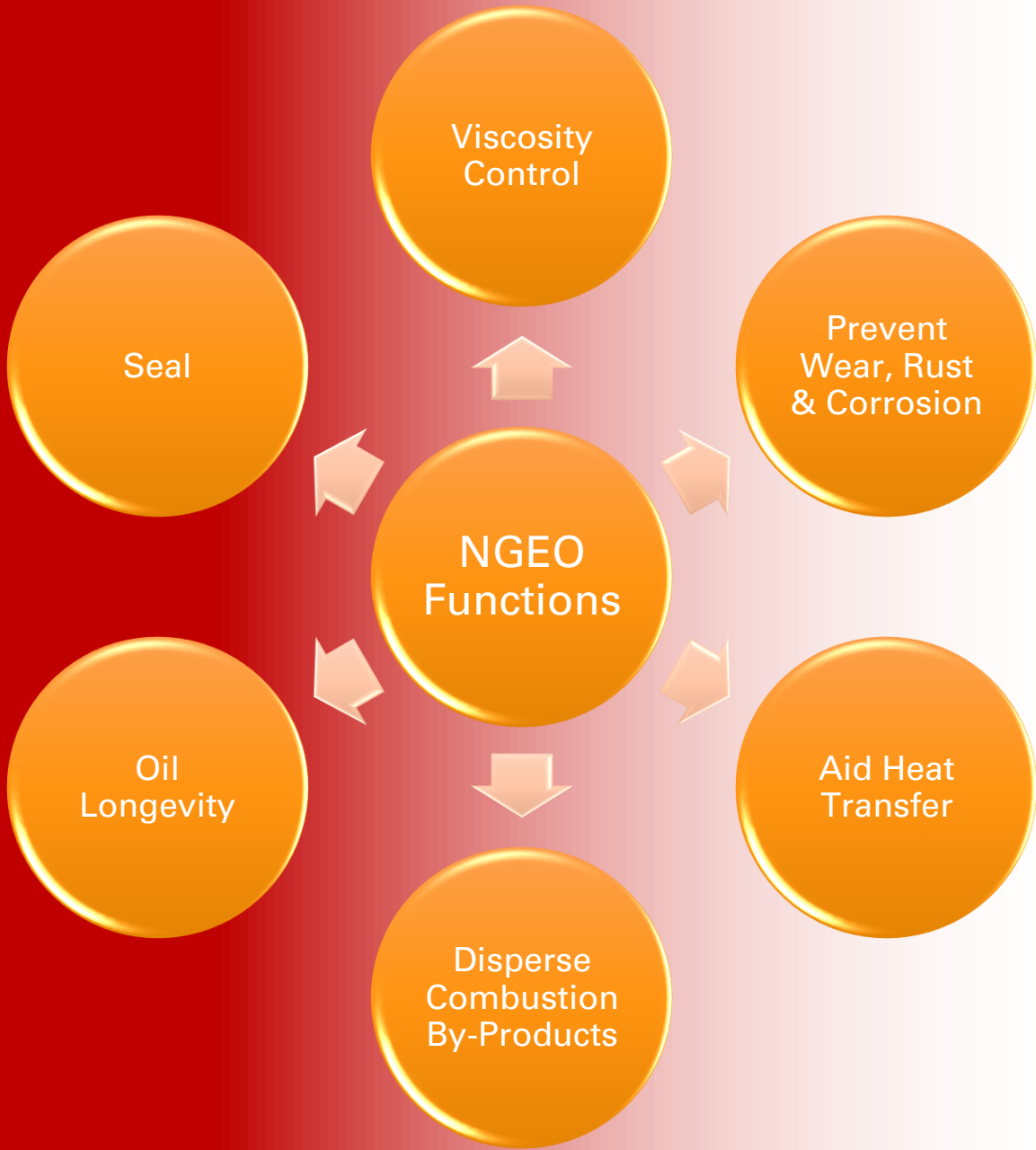


Waukesha Product Portfolio

Typical Gas Engine Parameters

Manufacturer	Caterpillar	Waukesha	Jenbacher	Ingersoll-Rand
Engine Model	G3516	VHP L7044	Type 6	KVR
Cycle	4-T	4-T	4-T	2-T
Ignition	Spark	Spark	Spark	Spark
Breathing	Turbo-	Turbo-	Turbo-	Turbo-
Cylinders	16	12	16	16
Bore, mm (in)	170 (6.7)	238 (9.4)	190 (7.5)	432 (17)
Stroke, mm (in)	190 (7.5)	216 (8.5)	220 (8.7)	559 (22)
Displacement, L (cu in)	69 (4211)	115 (7037)	100 (6090)	1309 (79,897)
Weight, kg (K lbs)	7550 (17)	9525 (21)	23,600 (52)	140,000 (310)
Sump, L (gal)	360 (95)	720 (190)	530 (140)	7740 (2044)
Speed	1400	1200	1500	330
Power, kW (Hp)	1030 (1380)	1250 (1680)	2188 (2934)	4480 (6000)
Torque, N-m (ft-lb)	7020 (5180)	9970 (7350)	13,900 (10,270)	122K (90K)
	 \$300,000 - 1,000,000+			

Key Lubricant Performance Properties



Why Do Natural Gas OEM Manufacturers Prefer SAE Monogrades?

SAE Monograde Preference

Continuous Running

Fuel economy not a typical concern

Multi-viscosity oil performance perception

Monogrades with pour point depressant

Stationary Natural Gas Engine & SAE Grades

Sulfated Ash

Ash Residue Left After Oil is Burned

Detergent dispersant additives contribute to SASH

Dry film lubrication for valves

More is not necessarily better

Just the right amount of ash



Segmentation by Ash (Sulphated **ASH** = **SASH**)

▪ <u>Ashless</u>	< 0.1 SASH	Older 2-stroke
▪ Low ash	0.1 – 0.5 SASH (→ 0.6)	Most common
▪ Medium ash	0.5 – 1.0 SASH	High sulfur gas / some OEM's
▪ High ash	> 1.0 SASH	Very high sulfur gas

4-Stroke Key Lubricant- Performance Properties

Oxidation Control

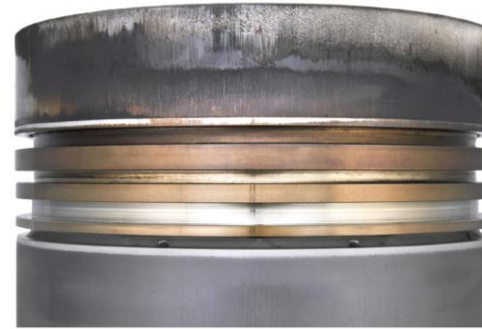
Nitration Control

Minimize Valve
Recession

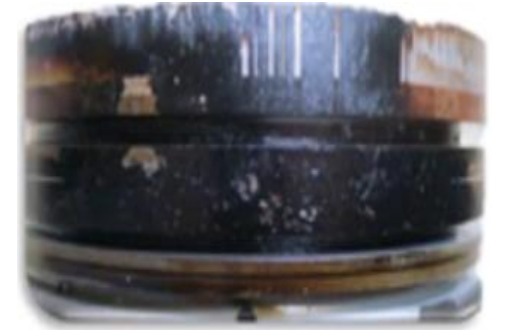
Prevent Rust and
Corrosion

Keep Engine
Parts Clean

Piston



Oxidation



Acid Attack



Burned Valve



Valve Recession



Nitration in Natural Gas Engines

Effects on Lube Oil

TAN Increase

Varnish

Viscosity
Increase

Shortened
Oil Life

2-Stroke Key Lubricant Performance Properties

Minimize port and chamber deposits

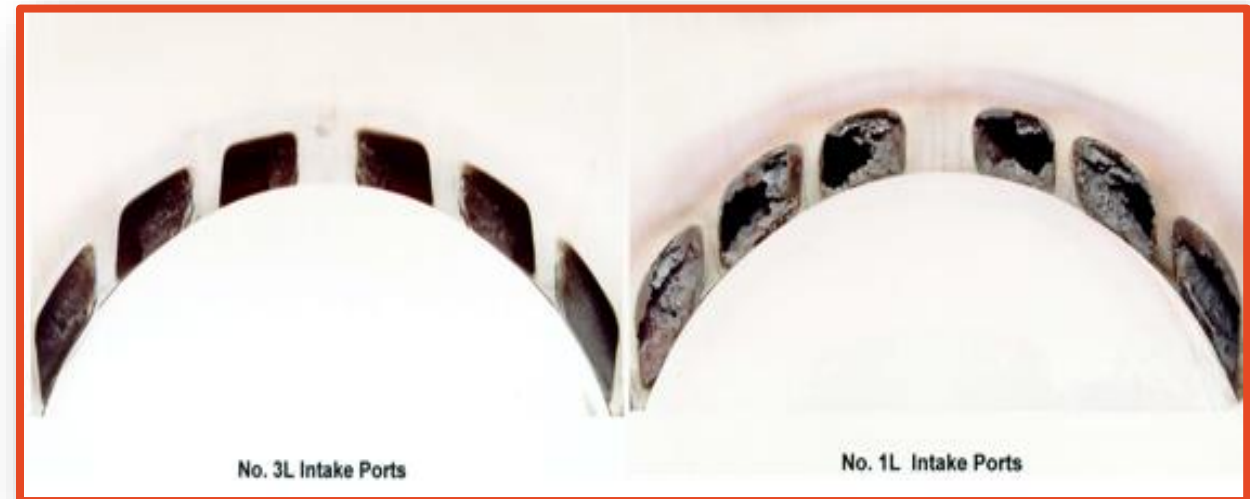
Keep engine parts clean

Reduce wear

Prevent rust and corrosion



Port Plugging



Good

Bad

CITGO Pacemaker GEO Product Line

4-Stroke Low Ash Gas Engine Oil

Pacemaker GEO 1900XL Series

Low ash product designed for use in 4-stroke engines

Unsurpassed performance in severe nitration and oxidation application

Offers enhanced extended drain capability

Available in SAE 30, SAE 40 and SAE 15W-40

GEO 1940XL is an approved oil for use in Caterpillar G16CM34

Pacemaker GEO 1600 Series

Premium low ash oil designed for use in 4-stroke engines

Additional antioxidant provides oxidation and nitration stability

Offers extended drain interval capability

Available in SAE 30, SAE 40 and SAE 15W-40

Suitable for a wide range of engines operating on any variation of natural gas

Pacemaker GEO 1400 Series

Low ash product designed for use in 4-stroke Caterpillar and Waukesha engines

Provides improved oxidation and nitration stability

Extended oil life capable

Available in SAE 30, 40 and 15W-40

Suitable for use in catalytic converter system



CITGO Pacemaker GEO Product Line



4-Stroke Low Ash Gas Engine Oil

Pacemaker LFG LA 40

- Premium low ash product designed for high output 4-stroke natural gas engine operating on landfill and digester gas
- The product is formulated to neutralize combustion acids from landfill and digester gas
- Offers extended drain interval
- Approved by GE Jenbacher for use in Type 2, 3, 4 and 6 engines (fuel class B and C)

4-Stroke Low Ash Gas Engine Oil

Pacemaker GEO 700 Series

- Premium medium ash product designed for use in 4-stroke engines
- Higher TBN to offer greater protection against acid increase and corrosive wear from sour gas
- Contains higher zinc level for anti-wear and recommended for engines converted to natural gas
- NOT RECOMMENDED FOR ENGINES EQUIPPED WITH CATALYTIC CONVERTERS
- Available in SAE 40 and 15W-40

4-Stroke Low Ash Gas Engine Oil

Pacemaker GEO 15SL

- Low ash stationary gas engine oil formulated with synthetic base stock and advanced additive system
- This is a high zinc-containing product and is recommended for use in stationary engines converted to natural gas such as irrigation pump service and LP (liquid propane) applications
- Drastically extends oil service life compared with conventional engine oil

2-Stroke Ashless Gas Engine Oil

Pacemaker GEO 1000 Series

- Premium ashless product designed for use in 2-stroke engines
- GEO 1000 series minimizes port plugging, piston deposit and controls wear
- Offers extended oil life capable
- Available in SAE 30/40, SAE 40 and SAE 15W-40
- Recommended for use in 2-stroke engines such as Ajax, Clark, Dresser-Rand, Cooper-Bessemer, Worthington, and Fairbank-Morse as well as gas engine manufacturers requiring ashless engine oils





OEM

OEM
requirements

No industry
standard

Formula
“Read
across” not
accepted

~8,000-hour
performance
test results

Stationary Natural Gas Engine Oil Performance Field Testing

Natural gas engine OEMs do not
rely on industry specifications

Industry relies on real-
world performance

Formula “Read across” is
not accepted

Performance is
demonstrated by field
testing

Under actual
operating conditions

CITGO Pacemaker GEO 1940XL on CAT G16CM34 Approval

Proof of Oil Performance

- Engine driving Ariel KBB for gas compression
- Test completed in 2019
- Total hours on test 8,588 hours
- **CITGO Pacemaker 1940XL** is the first commercial lubricant in the US to obtain approval
- **CAT engineers endorsed** the use of **CITGO Pacemaker 1940XL** for use in its CAT G16CM34



Pacemaker GEO 1940XL Performance

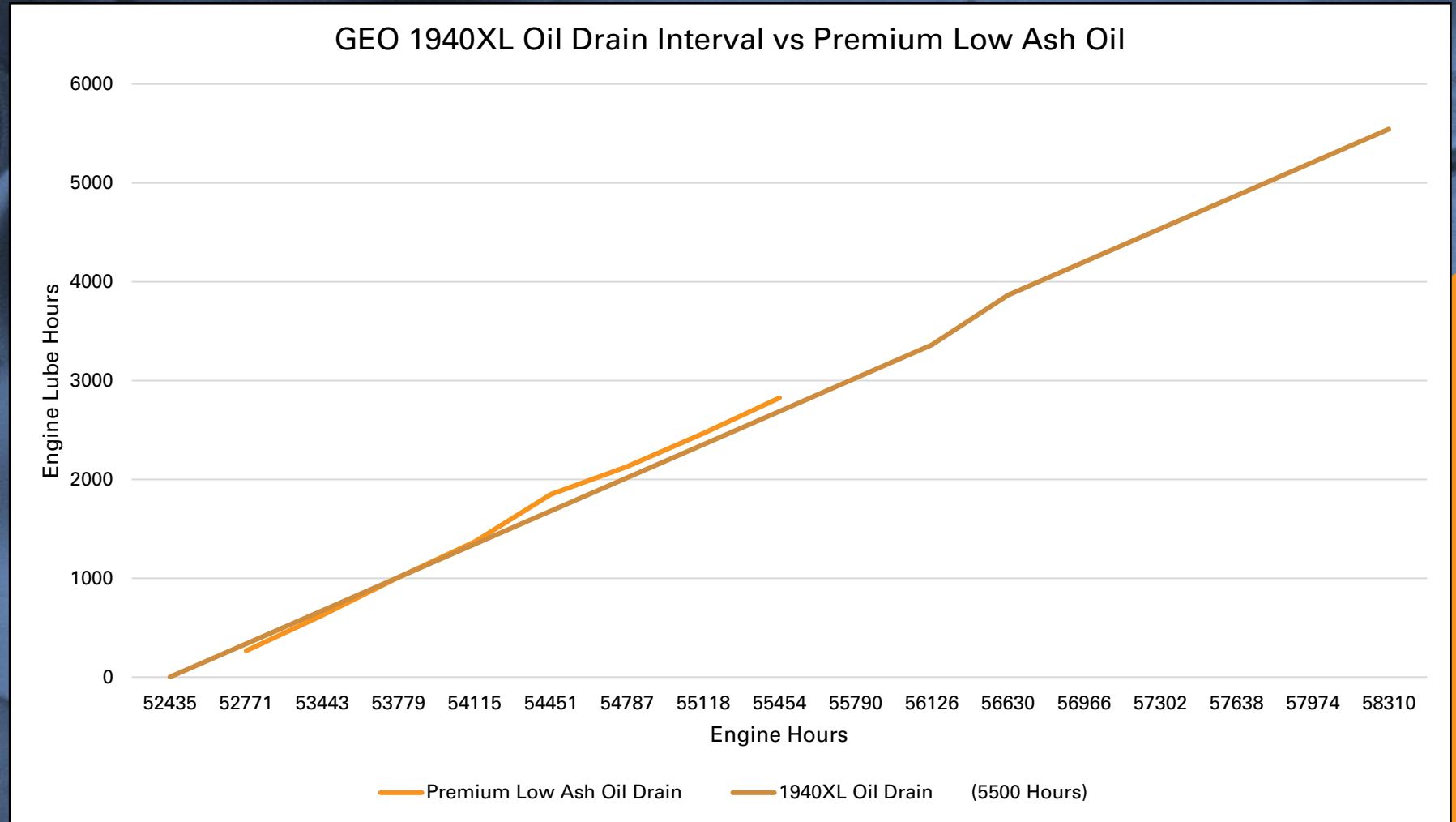
with Premium Low
Ash Oil



- Initiated an evaluation of CITGO Pacemaker GEO 1940XL vs Premium Low Ash Oil
- Evaluation started August of 2023 and the trial ended in April 2024
- The Premium Low Ash Oil gave an average of 3K hours before TAN was flagged
- Pacemaker GEO 1940XL gave 5544 hours before TAN was flagged
- Pacemaker GEO 1940XL gave twice the oil drain interval compared with Premium Low Ash Oil
- Wear was observed in the Premium Low Ash Oil and GEO 1940XL, no wear was observed in the engines through Used Oil Analysis

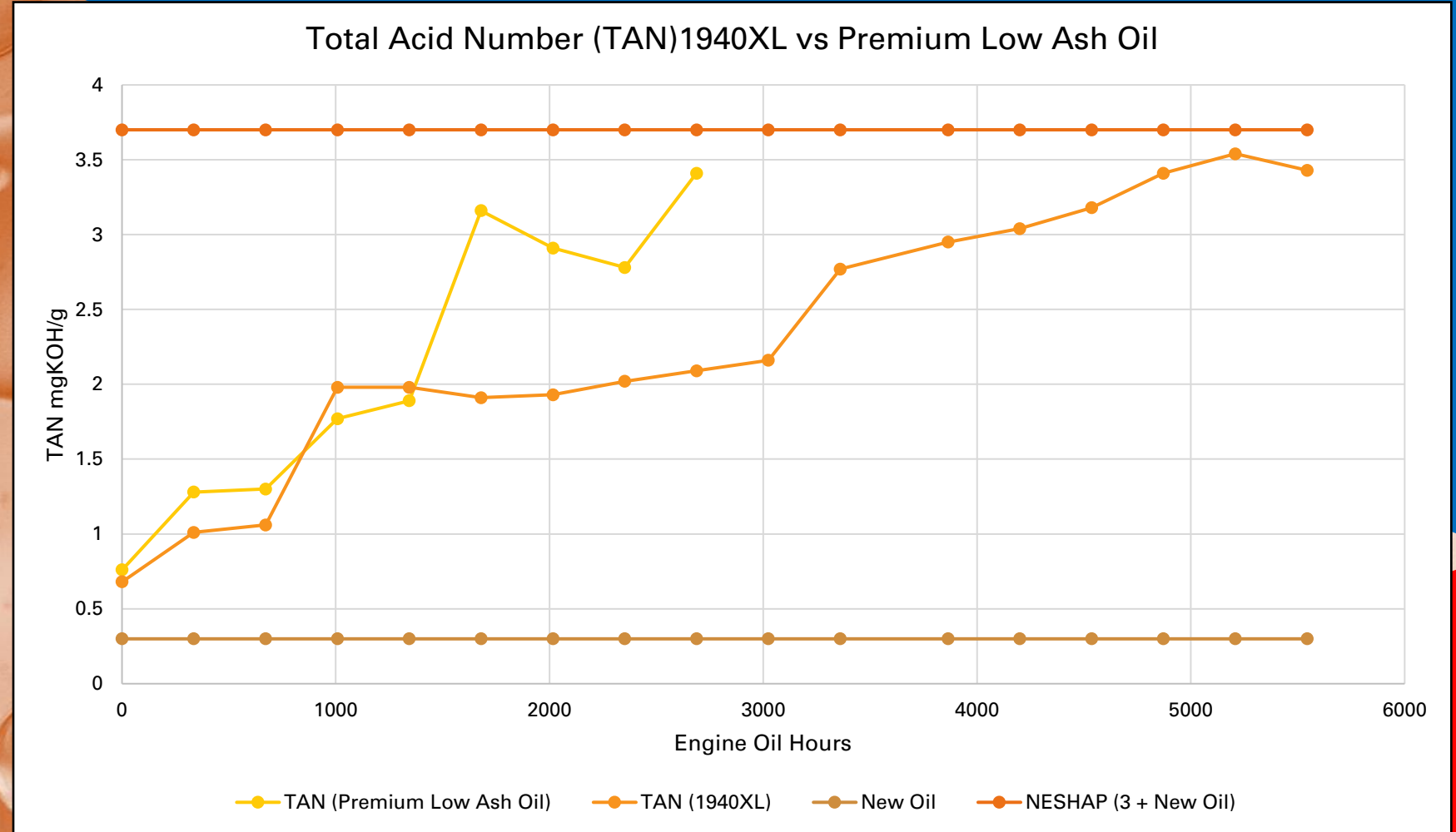
Oil Hours of PM GEO 1940XL Compared to Premium Low Ash Oil

Premium Low Ash Oil Drain	1940XL Oil Drain (5500 Hours)	Engine Hours
	1	52435
264	336	52771
624	672	53443
1008	1008	53779
1368	1344	54115
1848	1680	54451
2128	2016	54787
2464	2352	55118
2824	2688	55454
	3024	55790
	3360	56126
	3864	56630
	4200	56966
	4536	57302
	4872	57638
	5208	57974
	5544	58310



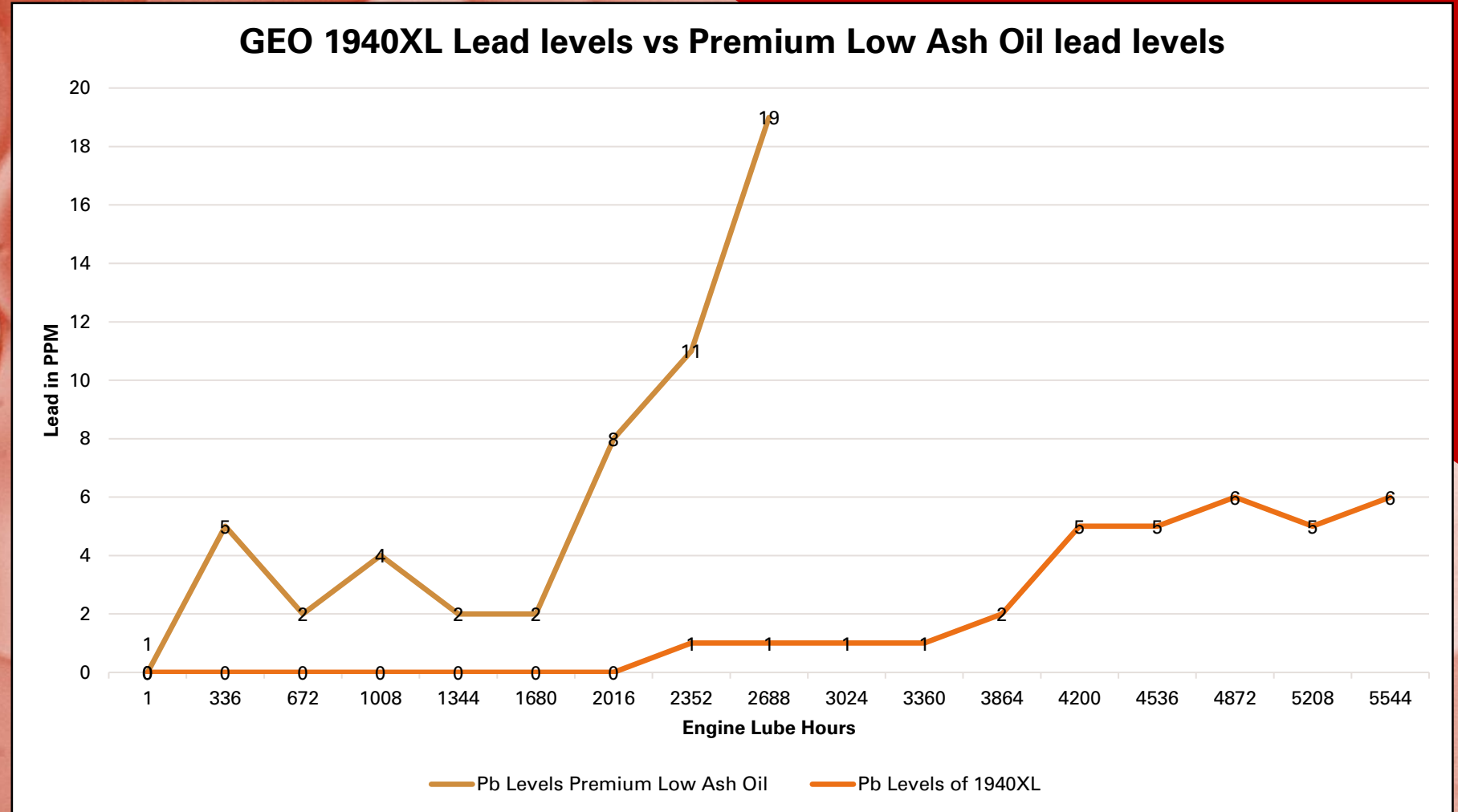
TAN (Total Acid Number) of PM GEO 1940XL Compared to Premium Low Ash Oil

Engine Oil Hours	TAN (Premium Low Ash Oil)	TAN (1940XL)	New Oil	NESHAP (3 + New Oil)
1	0.76	0.68	0.3	3.7
336	1.28	1.01	0.3	3.7
672	1.3	1.06	0.3	3.7
1008	1.77	1.98	0.3	3.7
1344	1.89	1.98	0.3	3.7
1680	3.16	1.91	0.3	3.7
2016	2.91	1.93	0.3	3.7
2352	2.78	2.02	0.3	3.7
2688	3.41	2.09	0.3	3.7
3024		2.16	0.3	3.7
3360		2.77	0.3	3.7
3864		2.95	0.3	3.7
4200		3.04	0.3	3.7
4536		3.18	0.3	3.7
4872		3.41	0.3	3.7
5208		3.54	0.3	3.7
5544		3.43	0.3	3.7



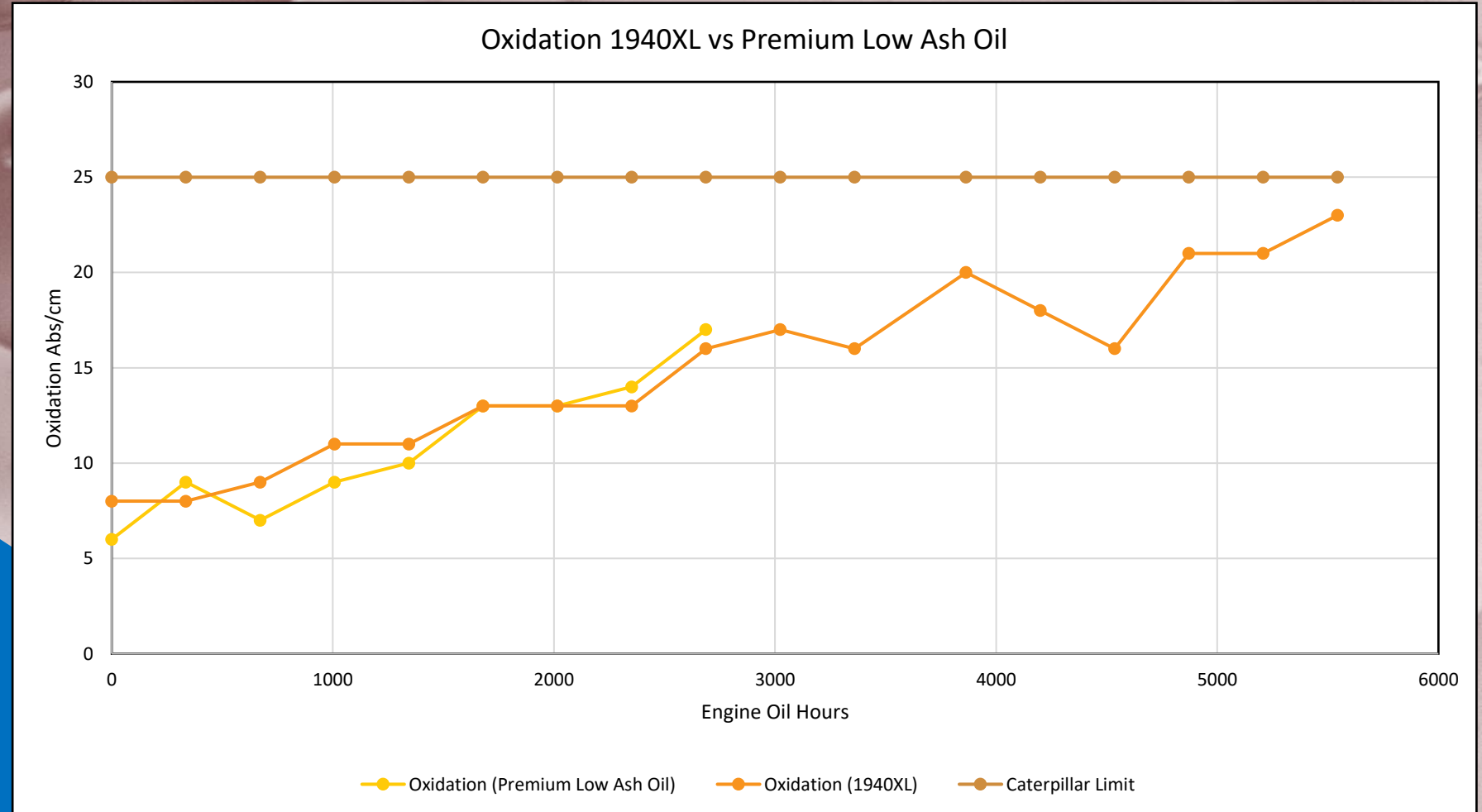
Wear Metals of PM GEO 1940XL Compared to Premium Low Ash Oil

Engine Oil Hours	Pb Levels Premium Low Ash Oil	Pb Levels of 1940XL
1	0	0
336	5	0
672	2	0
1008	4	0
1344	2	0
1680	2	0
2016	8	0
2352	11	1
2688	19	1
3024		1
3360		1
3864		2
4200		5
4536		5
4872		6
5208		5
5544		6



Oxidation of PM GEO 1940XL Compared to Premium Low Ash Oil

Engine Oil Hours	Oxidation (Premium Low Ash Oil)	Oxidation (1940XL)	Caterpillar Limit
1	6	8	25
336	9	8	25
672	7	9	25
1008	9	11	25
1344	10	11	25
1680	13	13	25
2016	13	13	25
2352	14	13	25
2688	17	16	25
3024		17	25
3360		16	25
3864		20	25
4200		18	25
4536		16	25
4872		21	25
5208		21	25
5544		23	25



Gas Compression & Compressor Types



Gas Compression

- Transportation and storage require compression for space.
- Pipeline gas is typically at 1000–1500 psi.
- Compression stations on pipelines usually every 50-70 miles.



Reciprocating Compressors

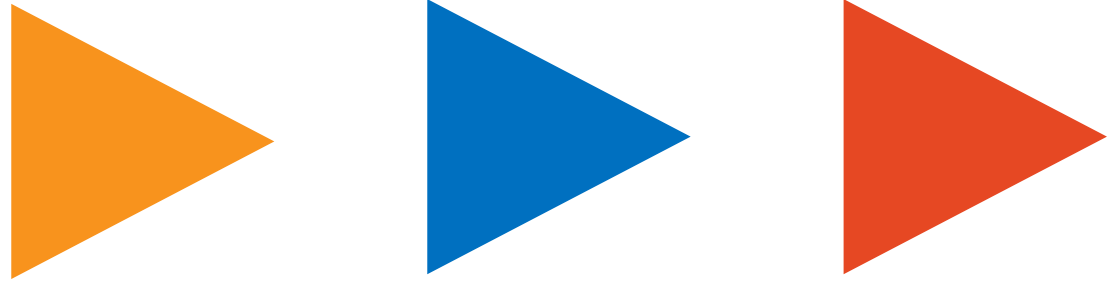
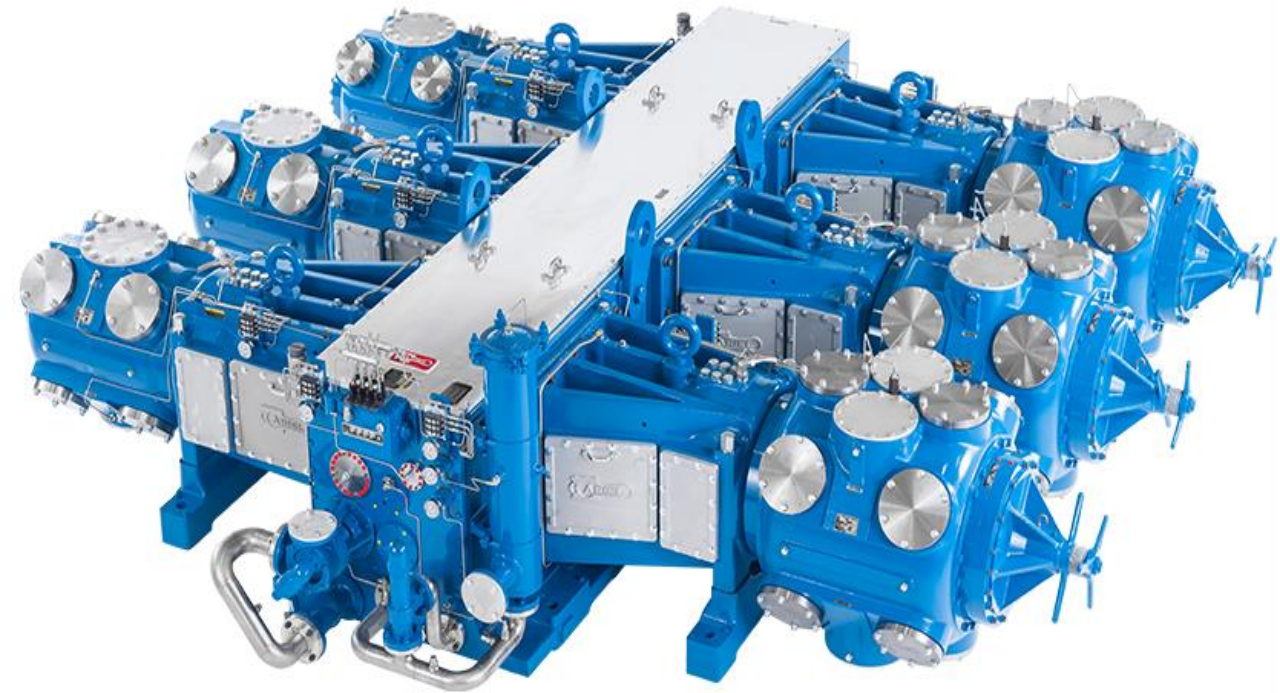
Used when flow rates are low and required pressures are high

Increases pressure by reducing gas volume in a cylinder using a piston (positive displacement)

Compressing gases results in heat generation

End pressure can be achieved in stages

Can be single-acting or double-acting



Natural Gas Compressor Types

Rotary Compressors

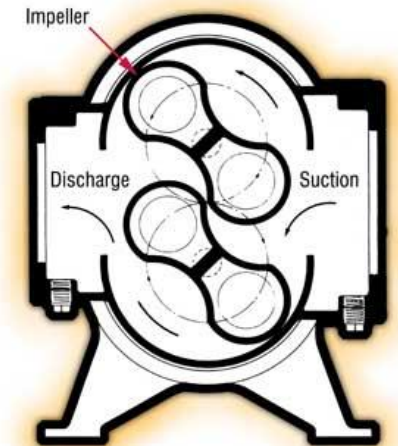
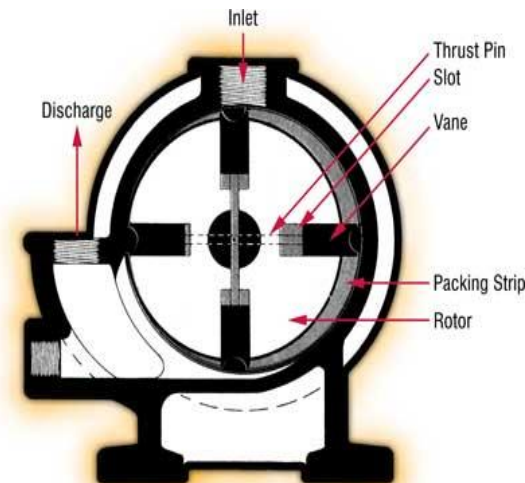
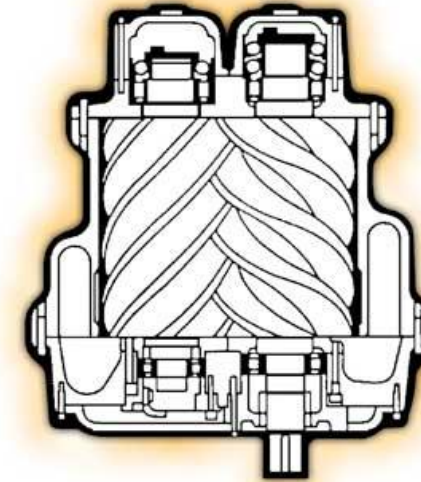
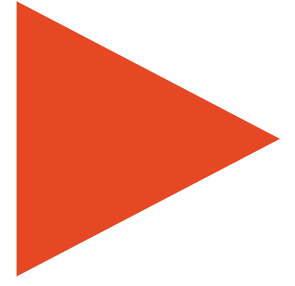
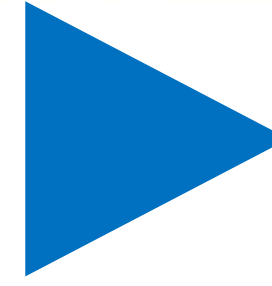
Rotary screw, lobe, vane compressors

Generate lower pressures than reciprocating compressors

In wet (oil flooded) screw types, compressor fluid acts as a coolant, sealant and lubricant

Lubricating fluid is recirculated in screw or lobe rotary compressors

Rotary vane compressors are once through



Reciprocating Compressor Oils

Oil Performance

- Low-temperature pumpability, excellent water separation, wear protection, oxidation stability, foam control, corrosion control, high film strength, good thermal stability

Base Oils

- Mineral Oil
- Compounded Oil for wet and/or contaminated gas
- Polyalphaolefin (PAO) Synthetic for high discharge temperatures
- Polyalkylene Glycol (PAG) is used for rod and cylinder lubrication (not crankcase) in reciprocating compressors at high pressures.

Cylinder Oil Viscosity

- Depends on cylinder discharge pressure and gas composition
- Usually the same as frame oil
- ISO 150 AW R&O, ISO 220 AW R&O, or SAE 40 NGE0
- AW - anti-wear properties (Ariel requirement)

Factors That Can Affect Oil Viscosity/Dilution

- **Discharge gas pressure:** the higher the pressure - the more oil dilution, requires higher viscosity
- **Discharge gas temperature:** the higher the temperature - the less oil dilution, lower viscosity might be acceptable (depends on gas quality)

Rotary Screw Compressor Oils

Oil Performance

- Low temp fluidity, excellent lubricity, excellent water separation, shear stability, high film strength for sealing, corrosion control, good viscosity control, low volatility, high thermal stability with good deposit control, resist lubricant dilution by condensed hydrocarbons or entrained carbon dioxide from process gases.

Base Oils

- Mineral Oil
- Polyalphaolefin (PAO) Synthetic for high temperature operation
- Polyalkylene Glycol (PAG) is Used for applications involving harsh chemical environments and elevated temps. Where resistance to hydrocarbon dilution is required

Screw Compressor Oil Viscosity

- Depends on gas discharge pressure and gas composition
- ISO 100, ISO 150, ISO 220

Factors That Can Affect Oil Viscosity/Dilution

- **Discharge gas pressure:** the higher the pressure - the more oil dilution, requires higher viscosity
- **Discharge gas temperature:** the higher the temperature - the less oil dilution, lower viscosity might be acceptable (depending on gas quality)

CITGO Compressor Lube Choice

1

Pacemaker GEO
1440, 1640,
1940XL

2

Pacemaker R&O
150, 220

Compressor Oil
35LP, 45LP

3

CITGO Cylinder
Oil

CITGO
CompressorGard
XA 200

4

CITGO
CompressorGard
SS 100, 150, 220

5

CITGO
CompressorGard
PAO 100, 150
PAG 150, 220

Increasing severity, pressure, moisture, contaminant gas

CUSTOMIZED SOLUTIONS FOR YOUR EQUIPMENT

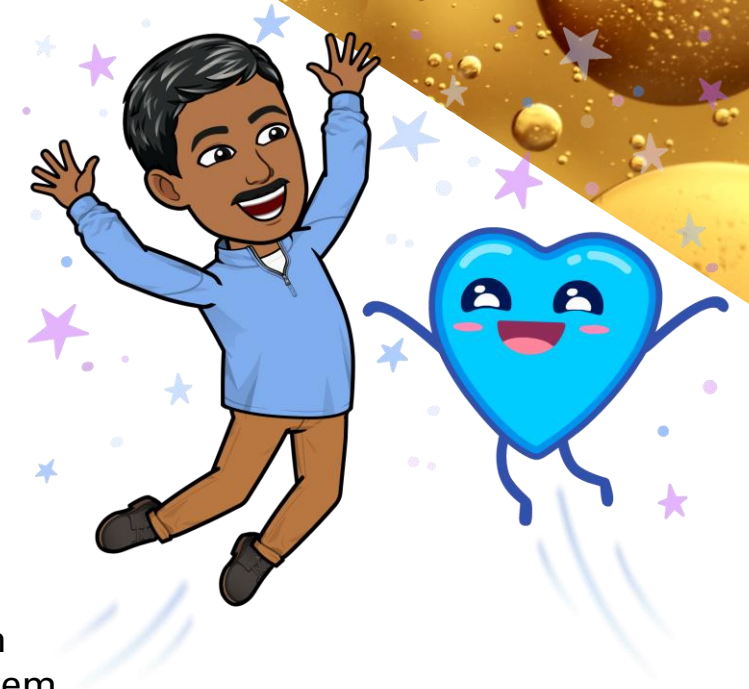
CompressorGard® Synthetic Compressor Lubricants

A full range of CITGO synthetic compressor lubricants deliver effective additive and base oil technologies to extend component life, optimize drain intervals and maximize uptime for some of the most critical operating components in industrial operations today. The extensive line of CITGO CompressorGard synthetics offer exceptional protection for

Fluid Type Compatibility

Type	Compatible With:
Petroleum (mineral)	Petroleum, PAOs, Diesters, Polyolesters
Polyalphaolefin (PAO)	Petroleum, PAOs, Diesters, Polyolesters
Mineral/PAO Synthetic Blends	Petroleum, PAOs, Diesters, Polyolesters
Diesters* and Polyolesters	Petroleum, PAOs, Diesters, Polyolesters
Polyalkylene Glycols (PAG)*	Polyalkylene Glycols (PAG)*
Silicone*	Silicone*

* Diesters can also be used as a flushing oil (for 8 to 12 hours) when converting to and from polyglycol-based oils or silicone-based lubricants to a different base fluid type or when system cleaning is necessary.



Turbine Oils for Power Generation



Types of Power Generation Turbines

Hydroelectric	Large and robust construction, Higher viscosity oil, Efficiency >90%
Steam	High power, Large oil charge, Efficiency 25 – 40%
Gas	High power, Compact, Efficiency up to 35%
Combined Cycle	Combination of gas and steam, Efficiency 50 – 60%



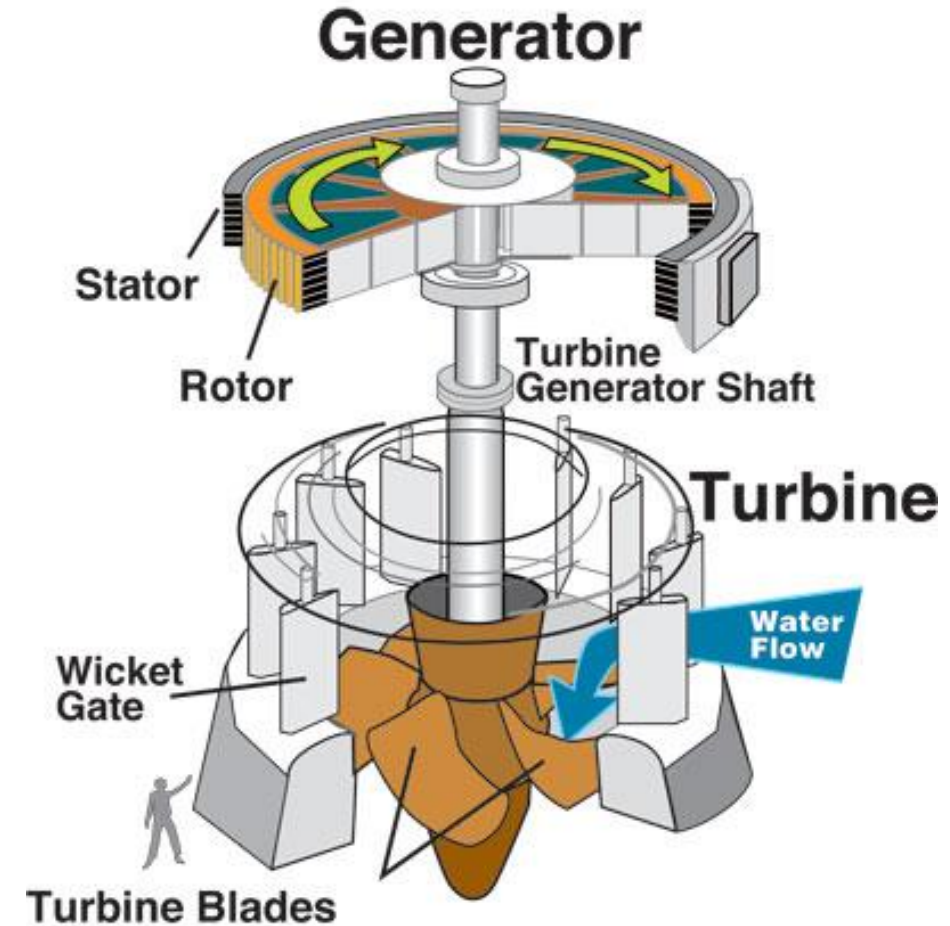
Turbine Basics

Uses the continuous stream of superheated steam or hot gas from combustion

Thermal energy from the fluid is converted into kinetic energy through expansion

The fluid passes through rows of blades attached to a center shaft, forcing the shaft to rotate and in turn causing a drop in temperature and pressure of the fluid and an increase in its volume

The kinetic energy turns a shaft that can drive machinery or a generator to produce electricity



A photograph of a large industrial facility, likely a hydroelectric power plant. In the foreground, a massive blue turbine is visible, featuring a complex design with multiple curved blades and a central shaft. It is surrounded by a metal railing. In the background, several other similar turbines are lined up, receding into the distance. The room has high ceilings and concrete walls, with a bright light source at the far end of the hall.

Hydroelectric Turbine

Several designs:
Francis, Kaplan, Pelton,
Tubular

Efficiency $>90\%$

Very long oil life >25
years

Industrial Steam Turbine



High-pressure steam

- 650 psi typically
- Steam expands progressively through the blades

Water contamination
Oil life 10 – 15 years



Industrial Gas Turbine

Compressor feeds high pressure air into the combustion chamber

Fuel is injected into the **combustion chamber**

High-pressure gases impinge upon the turbine blades,

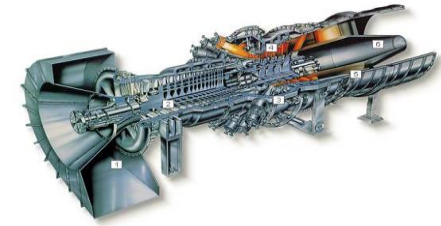
Turbine drives the compressor and the driven machine

Power output ranges 5 MW to >300 MW

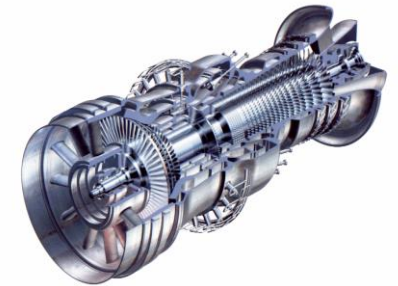
Firing temperature up to 2650°F

Efficiency up to 35%

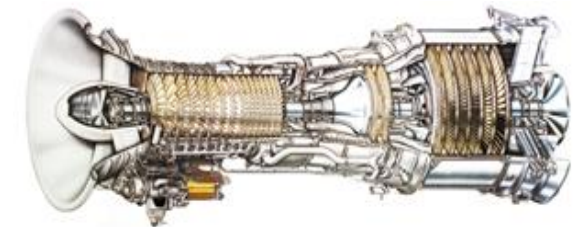
Oil life 5 – 8 years



Siemens SGT6-6000G Gas Turbine
300 MW to 500 MW for Combined Cycle Applications



Alstom GT 24



GE LM 2500

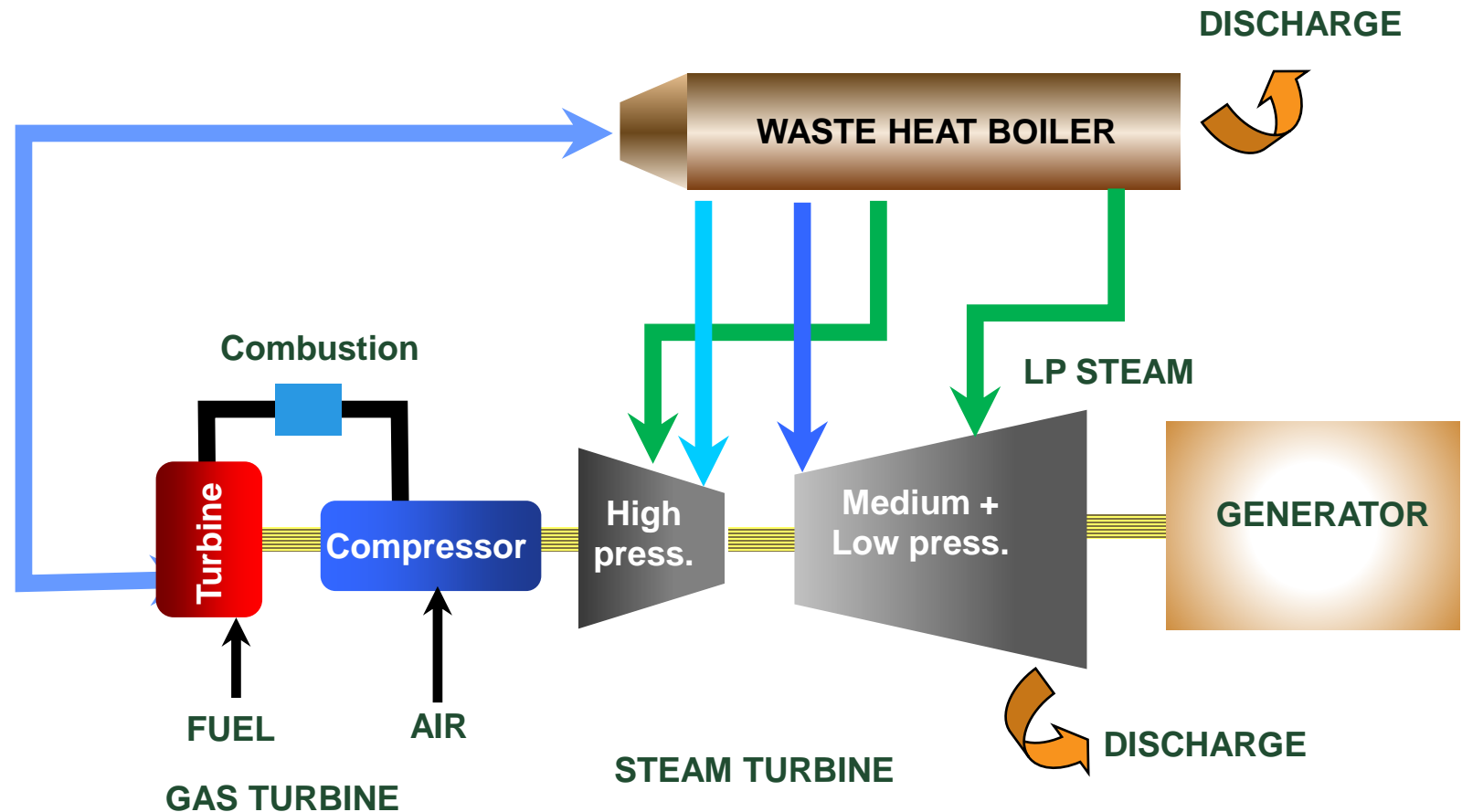
Combined Cycle Turbine Single Shaft

Efficiency
Improvement –
up to 60%

Reduced
footprint and
weight

Common oil
system for both
turbines

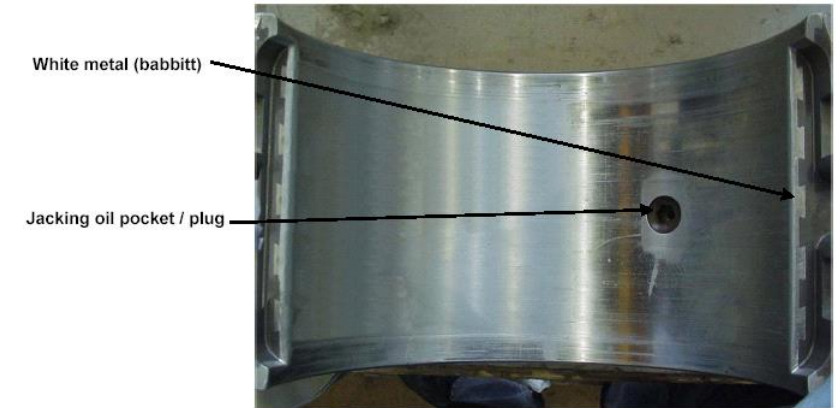
Oil life 5 – 8
years



Turbine Components Requiring Lubrication

Journal Bearings (Hydrodynamic)

- Support the weight of the turbine rotors
- Consists of two half-cylinders that enclose the shaft
- Internally lined with babbitt metal, an alloy usually consisting of tin, copper, and antimony
- Older babbitt metal contained lead



Thrust Bearings (Hydrodynamic)

- Axially locate the turbine rotors
- Consists of a series of babbitt metal lined thrust pads
- Runs against a locating disk attached to the turbine rotor



Source: [Thrust Bearings from Waukesha Bearings \(waukbearing.com\)](http://WaukeshaBearings.com)

Turbine Oil Properties

Viscosity (ASTM D445)

ISO 68 mainly for hydroelectric turbines

Viscosity Index (ASTM D2270)

High VI to maintain viscosity over wide temperature range, start-up and operation

Thermal and Oxidation Stability

Excellent thermal (ASTM D2070) and oxidation stability (ASTM D943) to provide long service life

Corrosion Resistance

Must resist corrosion of steel (ASTM D556) and yellow metal (ASTM D130) parts

Turbine Oil Properties

Air Handling

Must release entrained air (ASTM D3427) and resist foam formation (ASTM D892)

Water Shedding

Must separate water well (ASTM D1401) and resist the formation of oil/water emulsions (ASTM D2711)

Antiwear Properties

Important for geared turbines (ASTM D4172)

Filterability

Especially important for electro-hydraulic control system (ISO 13357-1 (wet) and ISO 13357-2 (dry))

Resistance to Varnish Formation

To prevent sticking of control valves and varnish formation on bearings (ASTM D7843 Membrane Patch Colorimetry)

Key Turbine Oil Specifications

ASTM D4304,
Type I, II, and III

DIN 51515 Part 1
and 2

DIN 51524 Part 1

Fives Cincinnati
P-38

ISO 8068 TSA,
TGA, TGE, and
TSE

British Standard
BS 498

General Electric
GEK 32568H

General Electric
GEK 46506D,
GEK32568F

Alstom HTGD
90117

ISO 11158 HH, HL

Siemens AG TLV
9013 04 Standard
Thermal Stability

Siemens AG TLV
9013 05 High
Thermal Stability

Solar ES9-224L
grades C32 and
C46

Solar ES 9-224W

Pacemaker[®] T Oils

Steam Turbine Oils

Pacemaker T-32, T-46, T-68, and T-115

ISO 32, 46, 68, and 100

ISO 68 primarily for hydroelectric turbines

All grades formulated with API Group II base oils

Excellent oxidation and thermal stability

Excellent rust and corrosion prevention

Excellent water separation

Excellent foam resistance and air release properties

Pacemaker[®] XL-32

Specialty Turbine Oil

ISO 32

Formulated with white mineral base oils

Excellent oxidation and thermal stability

Excellent rust and corrosion prevention

Excellent water separation

Excellent foam resistance and air release properties

Pacemaker[®] ST-32

Gas Turbine Lubricant

ISO 32

Formulated with synthetic PAO fluids

Includes a solvency enhancing additive

High viscosity index

Excellent oxidation and thermal stability

Excellent rust and corrosion prevention

Excellent water separation

Excellent foam resistance and air-release properties

Antiwear properties for use in geared turbines

Not for use in aero-derivative or aviation engines!

Selling to the Oil & Gas and Gas Transportation Markets



Natural Gas Engine Users

Oil & Gas Industry 80%

- Natural Gas Transmission & Gathering
- Oil Well Pumping

Agricultural Industry 10%

- Irrigation Pumping
- Dairies

Commercial 5%

- **AI Data Centers**
- Power & Heat Generation (airport, hotels, hospitals, paper mills and other industrial facilities)

Municipal 5%

- Water Supply Pumping
- Water Treatment
- Landfills

Prospecting Tools

Internet

- US Energy Information Administration
- Google
- LinkedIn

Knock on Doors

Cold Call

Networking

Referrals

Tradeshows & Conferences

- Hart Energy
- State Associations (KIOGA, TXOGA, LMOGA)
- Ag and Farm Shows

Selling Tips

Why Natural Gas Engines

- Large Volume
- Stable Margin
- Service Loyal

Sales

- Find the prospect's pain points
 - Understand operator maintenance philosophy and practices
- Demonstrate tangible savings
- Total Service
- Complete Supplier
 - TEG and Methanol
- Relationship, Relationship, Relationship



Common Operator Concerns

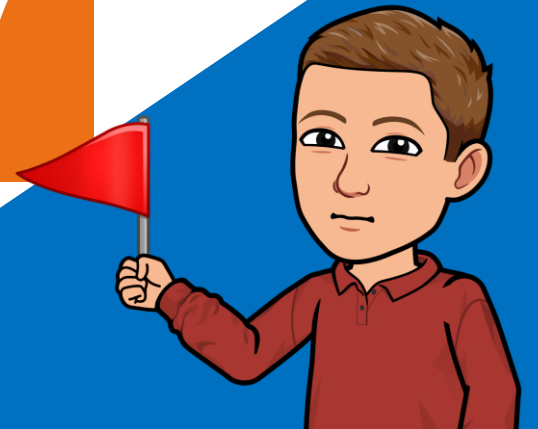
Stationary Natural Gas Engines

Safety

Emissions

Reliability

Durability

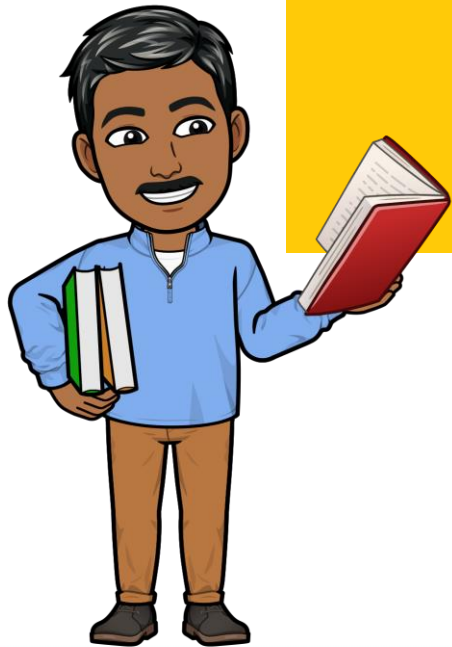


Prospect Expectations

- Marketer reliable service & responsiveness
 - Emergency Service
- Supplied Equipment
- Trustworthy supplier to consistently meet needs
- Some operators prefer multiple suppliers
 - Operators may be interested in adding a supplier
 - Opportunity may exist to displace existing weak suppliers
- LubeAlert used oil condition monitoring program

Questions?

Please post your
questions using the
Q&A function.



For technical inquiries or issues:
Lubes Answer Line 800-248-4684
lubeshelp@citgo.com

Thank You!

See you next time!

