



ADVANCEMENTS IN OEM EQUIPMENT FOR INDUSTRIAL GAS ENGINES RESULTS IN NEW PRODUCT OFFERINGS

Gas Engine Background

Stationary gas engines discussed in this article are engines that use a gaseous fuel such as natural gas, liquefied petroleum gas, landfill gas or biogas. They are spark-ignited engines that operate similarly to gasoline engines. The fuel, methane, burns hot and can cause severe oxidation and nitration of the engine oil in use. Gas engines do not produce soot like diesel engines, and there is no liquid fuel to help lubricate the intake and exhaust valves. It is the oil's ash that actually helps protect the hot valve face-seat interface.

Valve wear resistance is important to the durability of the engine. Valve recession is wear that occurs at the valve seat interface and is the most common form of valve wear in gas-fired engines. It can be caused by metal abrasion, high-temperature corrosion, frictional sliding, and adhesion mechanisms. The valve pounds back into the cylinder head, or recedes, by the repeated closing action of the valve. When the valve is prevented from seating properly, it can cause engine roughness, poor fuel economy, power loss, and excessive emissions. It requires a cylinder head overhaul to correct. And, if it is not corrected, it can lead to the valve and the insert seat becoming damaged or other mechanical problems. Consequently, ash content and composition of gas engine oils have a significant effect on engine head life.

Gas engine installations can be operated under quite a variety of conditions where they are found in gas transmission, power generation, landfill, and many other applications. There are gas engine oils designed for each of them. If the lubricant isn't properly

matched to its intended service, an engine may experience non-optimal performance. The oil may have inadequate oxidation and nitration resistance, resulting in engines that have reduced oil drain intervals and filter life, as well as higher piston and engine sludge deposits. Reduced oil drain intervals can result in engine downtime along with increased engine maintenance.

OEMs are developing new 4-stroke engine designs in order to increase the specific power output, improve efficiency and reduce emissions. Sometimes these changes have unexpected adverse effects.

Some hardware changes have resulted in lower oil consumption and higher thermal and mechanical stress on the lubricant. These issues lead to more rapid thermal and oxidative breakdown of the lubricant, resulting in shorter oil drain intervals and/or increased deposit formation.

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Sales and Marketing – Extra Eyes and Ears for Technology

Extensive field tests are done years before commercializing a product designed for gas transmission and power generation or landfill gas. And, while a variety of test sites, operating conditions, and fuel qualities are tested, they may not address all engines and operational conditions. Also, as previously explained, OEMs are making hardware changes at the same time; it's clearly a moving target. Field tests play an extremely important role in the final commercialization of a Chevron lubricant.

It is important for sales and marketing to obtain as much information as possible regarding lubricant performance and engine operation when "out in the field" and feed that information back to product development and technology.

Performance and Used Oil Analysis

Chevron formulates gas engine oils using premium Group II base oils and by doing so, its products are much more oxidatively stable. Group II base oils have greater chemical homogeneity and greater stability, resulting in a longer service life and generating fewer deposits. Group II base oils have greater chemical homogeneity and greater stability, resulting in product formulations that provide longer service life and generating fewer deposits than products using Group I based formulations.

Many believe that the reduced aromatic content in Group II base oils reduces the solubility and the ability of the base oil to dissolve the oil decomposition products that deposit as sludge and varnish. They may not appreciate that gas engine oils (GEOs) are fully formulated oils that also contain dispersants and detergents to assist in keeping insolubles in solution. Antioxidants are also added to extend operating life of the oil.

Base number (BN) is an indication of the reserve alkalinity in engine oil available to neutralize acids of combustion. For in-service oils, used oil analysis reports showing a low BN in itself is not necessarily a problem, unless it is also accompanied by increased viscosity, acid number, oxidation, nitration and/or wear metals.

Simply choosing oil with a higher BN does not necessarily mean the oil will have better base retention. The formulation may use a "soft" base using dispersants and amine type inhibitors that tend to show a rapid depletion in use.

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Product Development

Chevron has responded to today's industry challenges by developing two new gas engine oils:

HDAX® 9200 LOW ASH GAS ENGINE OIL SAE 40

It was developed as a 0.5% ash product with increased thermo-oxidative stability to address higher amounts of crankcase blow-by, which are characteristic of modern high brake mean effective pressure (BMEP) engines.

The improved BN retention for natural gas/sweet biogas applications, even for low oil consuming engines, provides extended oil drain ability by controlling oxidation. It provides resistance to deposit formation in highly loaded modern engines and provides drain intervals to meet and exceed OEM and operator requirements.

This product has proven performance in Caterpillar 3500 and 3600 series engines including its severe G3516E+ engine. It also has proven performance in Waukesha L7044 and MWM engines. Field testing continues in other engines.



HDAX 6500 LFG GAS ENGINE OIL SAE 40

It was developed as a 0.5% ash solution with improved detergency and contaminant handling capability for biogas/landfill gas applications, providing excellent BN retention and long drain intervals.

The main issues with biogas/LFG are the relatively high sulphur content allied to H₂S (hydrogen sulphide). If the sulphur is not neutralized, sulphuric acid will accumulate in the engine oil, resulting in accelerated corrosion and premature wear of the engine components.

Siloxane levels in the gas contribute significantly to decreased component life (cylinder liners, pistons, valves, etc.).

The anti-wear additives contained within HDAX 6500 have demonstrated that increased component life can be achieved, even in the presence of high siloxane levels.

Conventionally, the approach has been that oils were formulated using increased amounts of detergents to provide excess base reserve to sufficiently neutralize the acids being formed during the combustion process. Unfortunately, this approach increases the sulphated ash of the lubricant, which lends itself to increased ash deposits and negatively impacts the combustion dynamics of these engines. This also dramatically impacts a variety of associated engine factors, such as increased oil consumption, increased exhaust emissions and tendency for engine to detonate.

HDAX 6500 LFG, however, has a unique low Sulphated Ash, Phosphorous Sulphur (SAPS) technology in combination with Group II base oils to provide increased protection while minimizing the contribution of ash to deposits in the combustion chamber, at spark plugs, at valves and other components. Landfill gas can also give high silicon levels creating higher wear levels. HDAX 6500 disperses the silicon to help prevent deposits and provides good liner wear protection.

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Caltex Reliability — The RBL™ Program is our commitment of business support and reliability: Caltex's lubrication expertise combined with superior products and a tailored service program work together to help your business Run Better Longer.