

Chevron Group II Performance In Automotive Lubricants

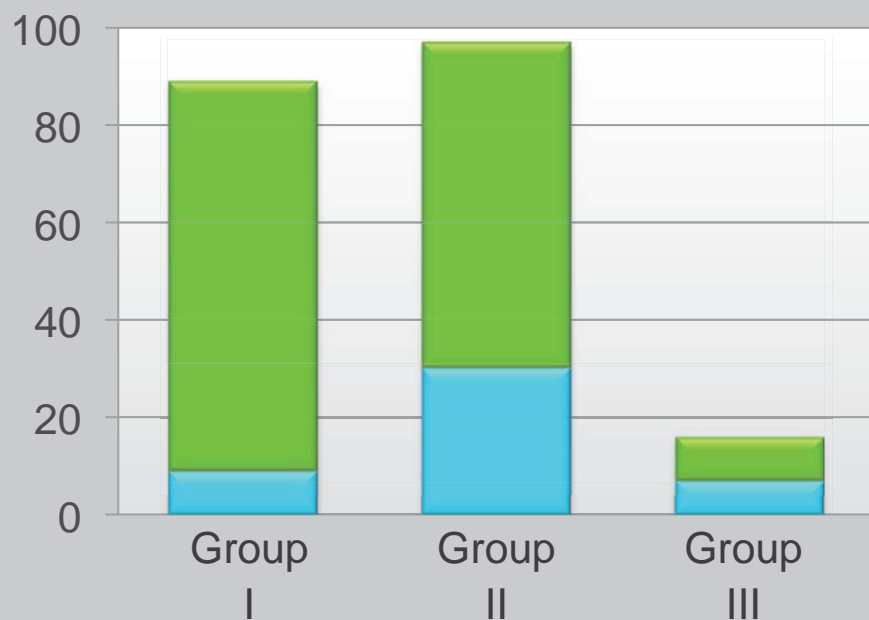


The Benefits Of Group II Base Oils
In Formulating Automotive Lubricants



Globally Chevron Group II Can Be Used In >93% Of All Lubricant Volume

Percent of Applications That Can Be Formulated With Each Base Oil Grade



* Based on Volume

- Technically capable to meet viscometrics
- Some use is likely/possible
- Minimal or no use likely/possible

	Market %	Group I	Group II	Group III
INDUSTRIAL LUBRICANTS				
Industrial engine oils	45.6%			
Marine	7.0%			
Railroad	4.6%			
Piston-aircraft	0.9%			
Natural gas	0.2%			
Other	0.8%			
Hydraulic fluids	0.5%			
AW32	9.4%			
AW46	2.0%			
AW68	1.2%			
Other mineral	4.5%			
Fire resistant	0.9%			
Compressor oil	0.9%			
Refrigeration oil	0.7%			
Turbine & circulating	0.8%			
ISO32	2.3%			
ISO46	0.7%			
ISO68	0.8%			
Synthetic	0.7%			
Industrial gear oil	0.1%			
ISO68	2.1%			
ISO150	0.2%			
ISO220	0.5%			
ISO320	0.4%			
ISO460	0.4%			
Other	0.4%			
Industrial grease	0.4%			
Metalworking fluids	1.7%			
Process Oils	6.3%			
Electrical	13.0%			
White oil	2.0%			
Rubber	3.0%			
Aromatic	2.9%			
Other paraffinic	1.7%			
Other naphthenic	1.9%			
Synthetic	1.2%			
Other industrial	0.2%			
CONSUMER LUBRICANTS	24.9%			
PCMO	21.3%			
0W-XX/SW40/SW50	0.7%			
5W20/SW30	4.2%			
10W30/10W40	6.9%			
Other multigrade	5.2%			
Monograde	2.0%			
2T	2.3%			
ATF	2.2%			
Dexron III/ Mercon	1.4%			
Mopar	0.4%			
PS/SA	0.0%			
Other	0.4%			
Gear Oil - Conventional	1.1%			
Gear Oil - Synthetic	0.0%			
Grease	0.3%			
COMMERCIAL LUBRICANTS				
HDMO	29.6%			
5W30 / 5W40	23.2%			
10W30/10W40	0.1%			
15W40	2.0%			
Other multigrade	10.6%			
Monograde	2.1%			
THF/HTF/ATF/Other	8.3%			
HD Gear Oil - Conventional	3.6%			
HD Gear Oil - Synthetic	1.7%			
Grease	0.1%			
Other	0.9%			

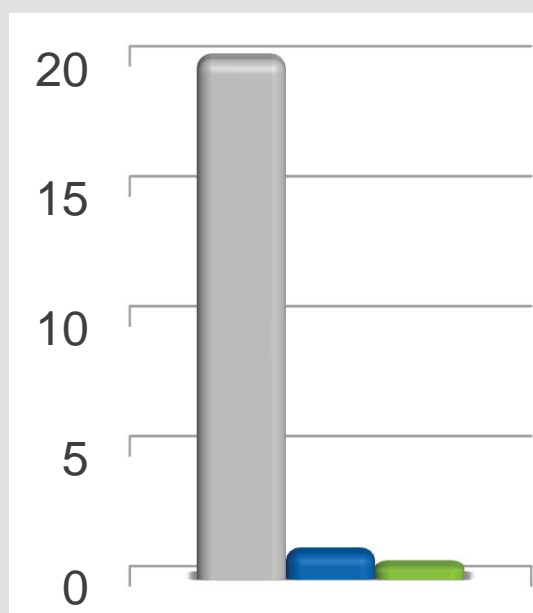
Source: Kline & Co.



Group II & Group III – Practically zero sulphur, and high oxidative stability

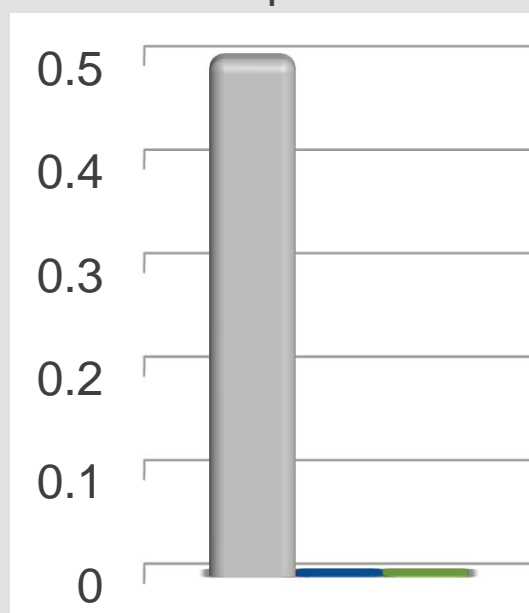
Group I – High level of impurities compromise lubricant performance

% wt Aromatics



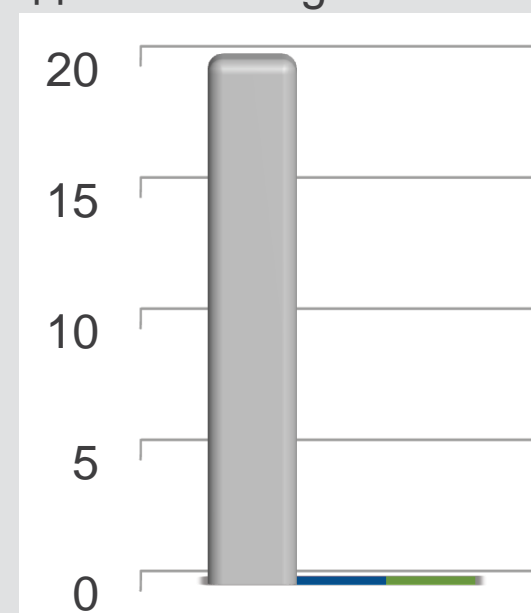
Increase oxidation and degradation

% wt Sulphur



- Natural antioxidant performance
- Form acids and sludge

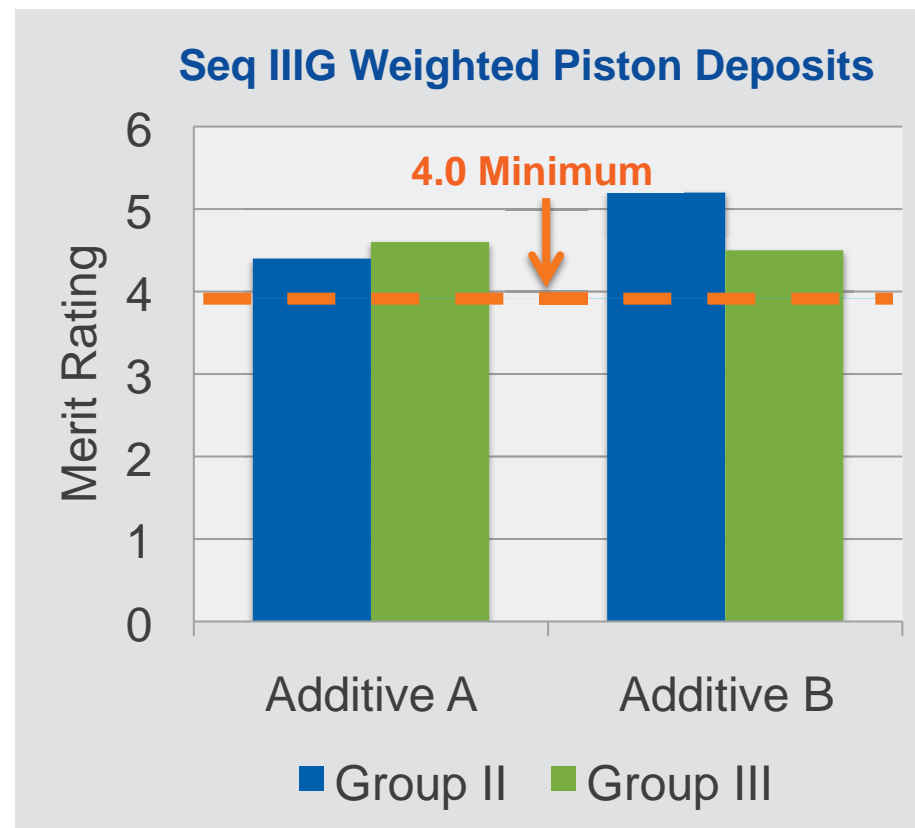
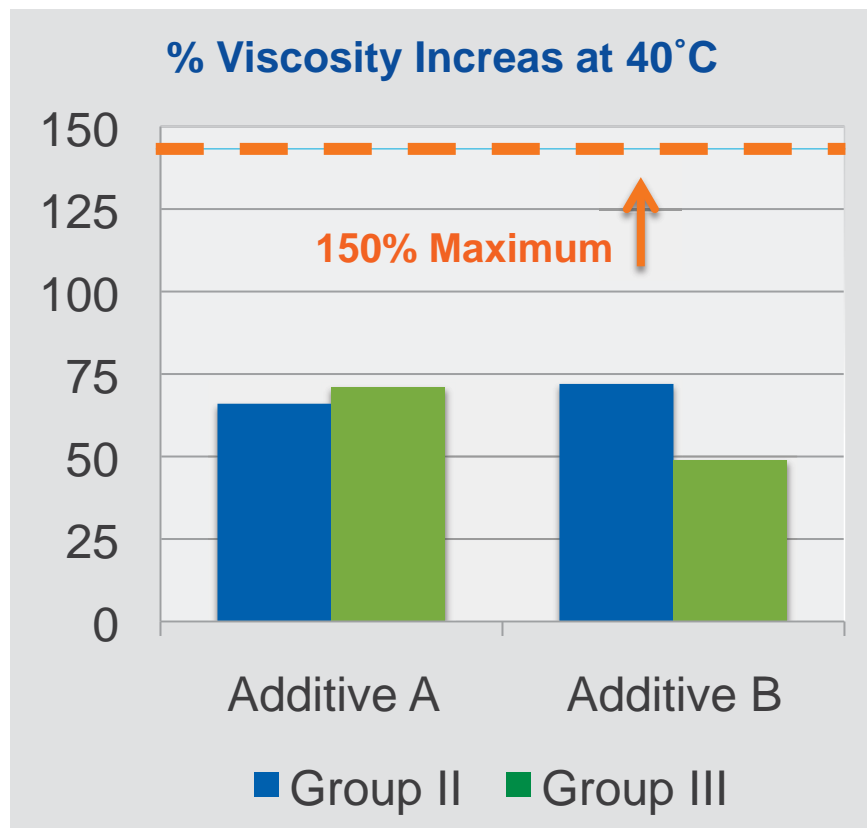
ppm Nitrogen



- Poor oxidation stability
- Promotes formation of lacquer and varnish

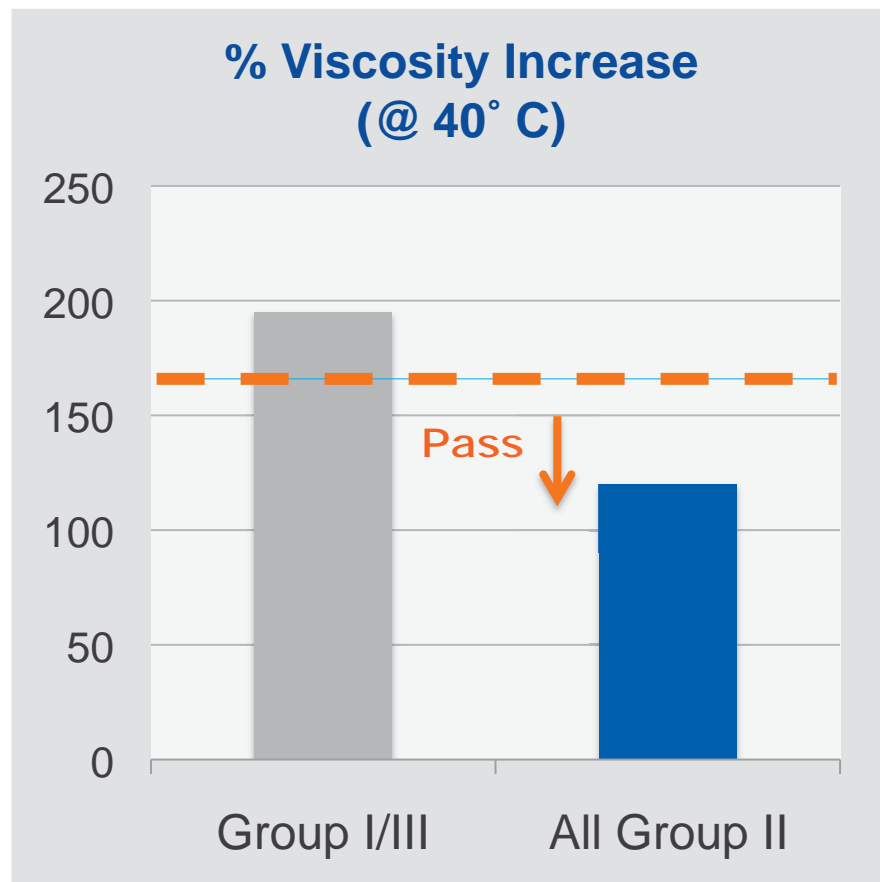


Additive Technology Closes The Gap Between Group II And Group III Performance In The Sequence IIIG

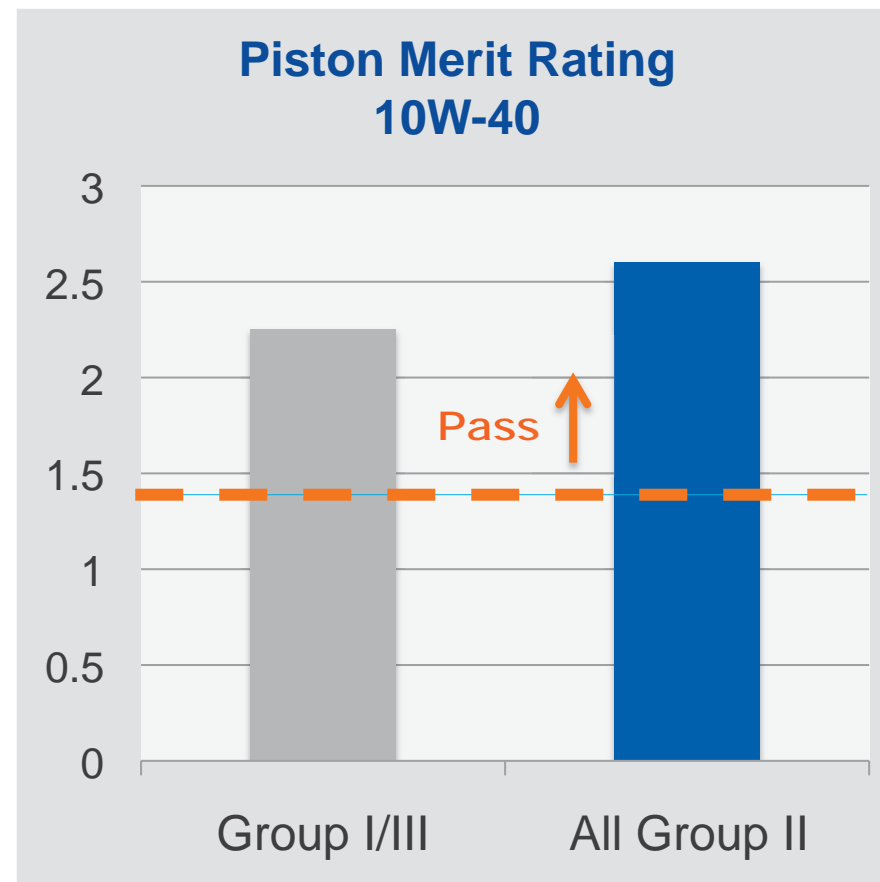


All oils 5W-30 PCMO

Group II-only 10W-40 formula passes all criteria for stringent VW T-4 performance



Group I/III base oil blend has less oxidation stability

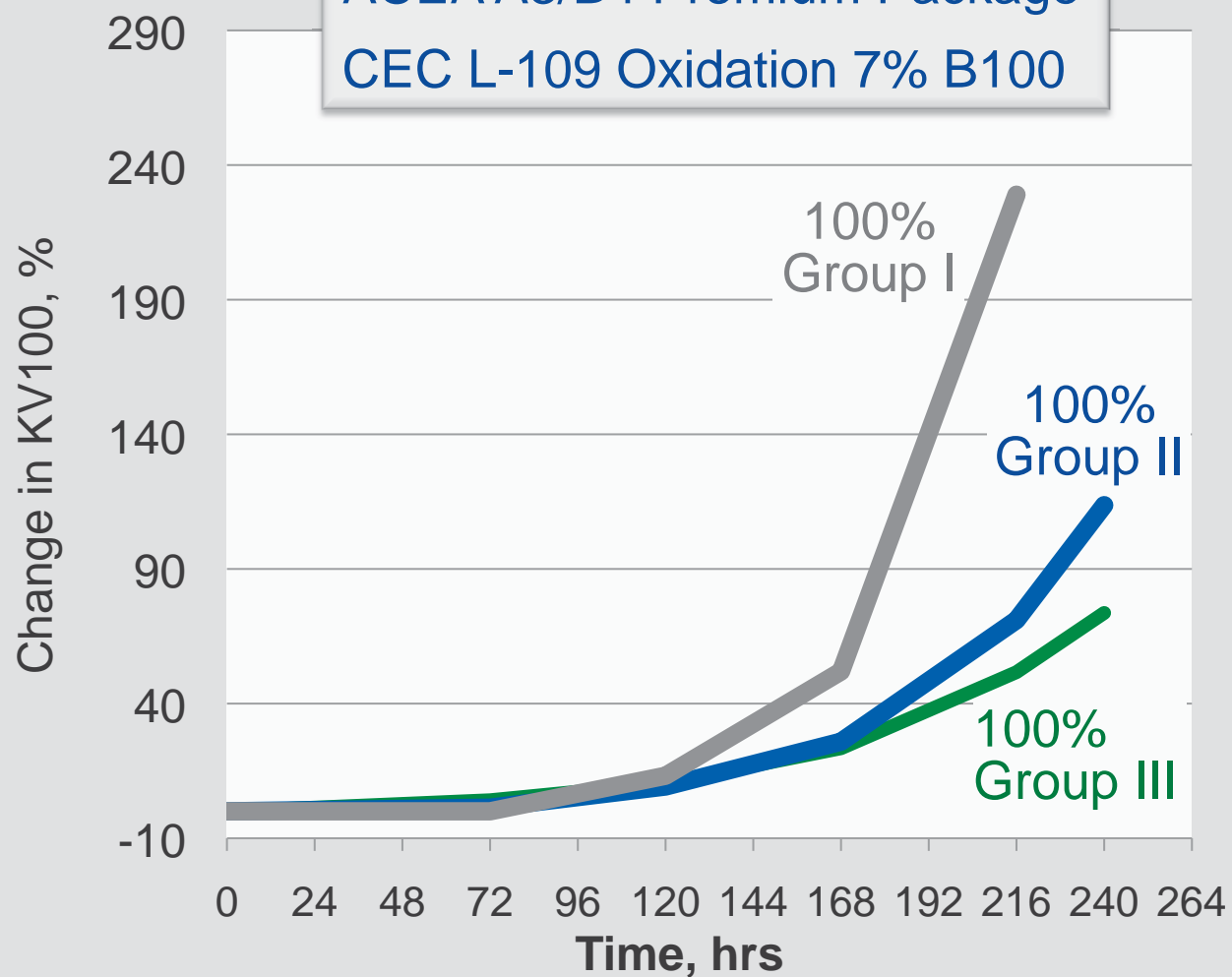


Piston merit is 248-hour test under various loads and cycles

Base oil type has major influence on new CEC oxidation bench test



ACEA A3/B4 Premium Package
CEC L-109 Oxidation 7% B100



Same pattern in both Daimler (bio and non-bio tests) and CEC oxidation tests

Source:
Afton
CHEMICAL

In demanding engine tests of critical performance attributes Group II outperforms Group I



Engine Oil Performance	ACEA	API	Group II
Fewer High Temperature Deposits	PSA TU-5	Sequence IIIG	+
Less Engine Sludge	Sequence VG	Sequence VG	+
High Oxidation Stability	Daimler Oxidation Test	Sequence IIIG / EOAT	+
Low Valve Train Wear	PSA TU-3 / OM646LA	Sequence IVA / Cummins ISB	=
Low Liner / Bearing Wear	Mack T-12	Mack T-12	+
Soot Handling	Mack T-11	Mack T-11	+
Piston Cleanliness	VW TDi / OM501LA	Caterpillar 1N / Sequence IIIG	+