Global Perspective on Base Oil Quality and How it Affects Lubricants Specifications

Global Perspective on Lubricant Specifications and How it Affects Base Oil Quality

Detroit Advisory Panel Forum

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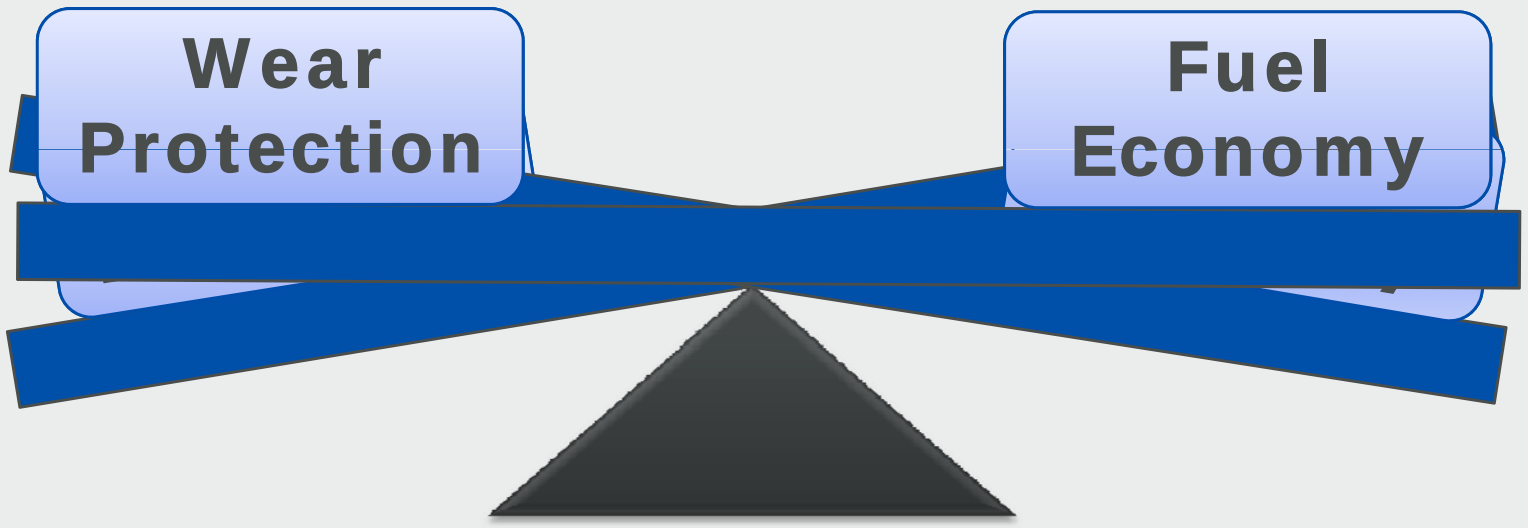
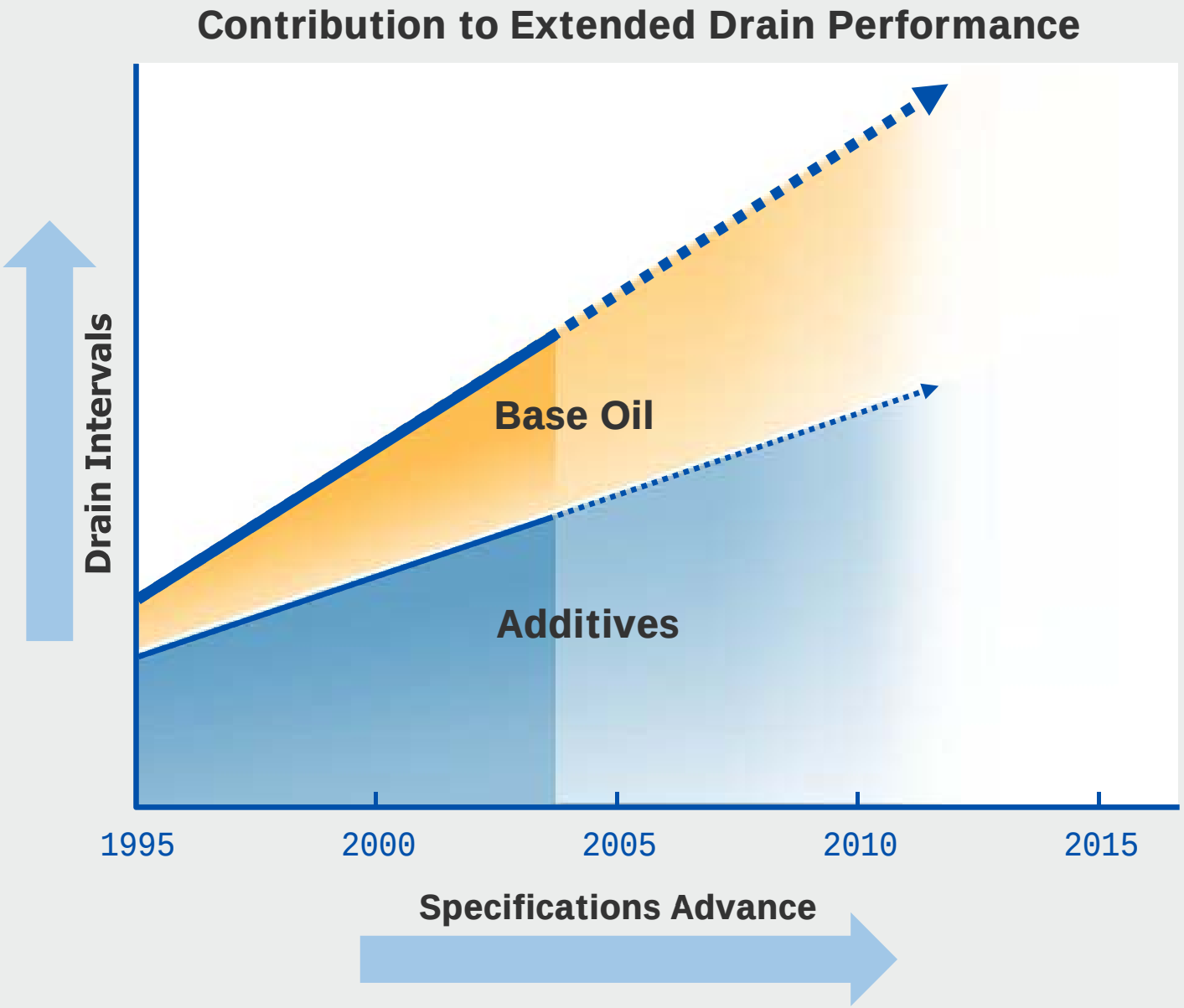
Chevron Global Base Oils

Global Drivers for the Future



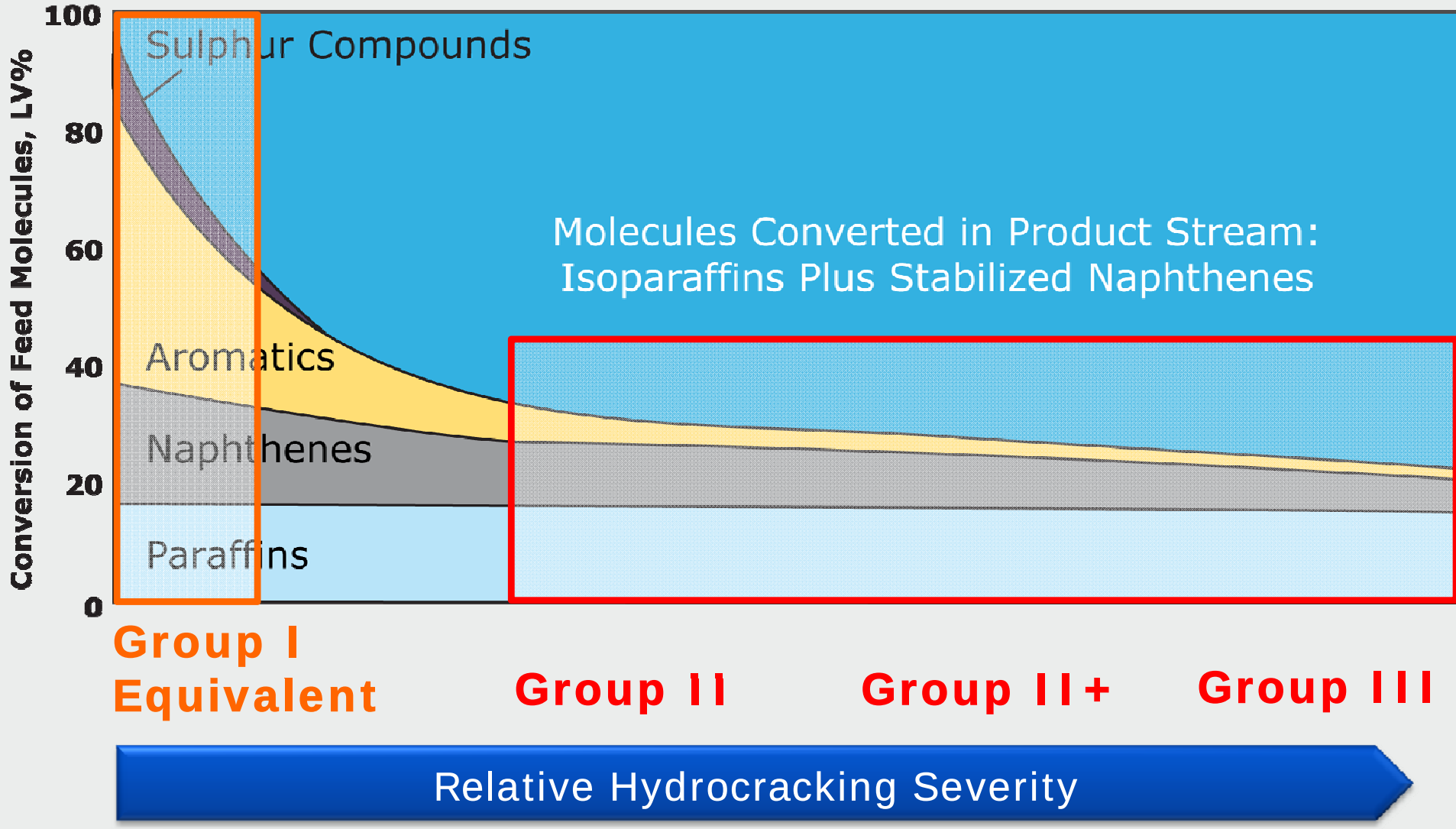
Complexity Reduction

As Base Oil Quality Improved; So Did Its Contribution to Lubricant Performance

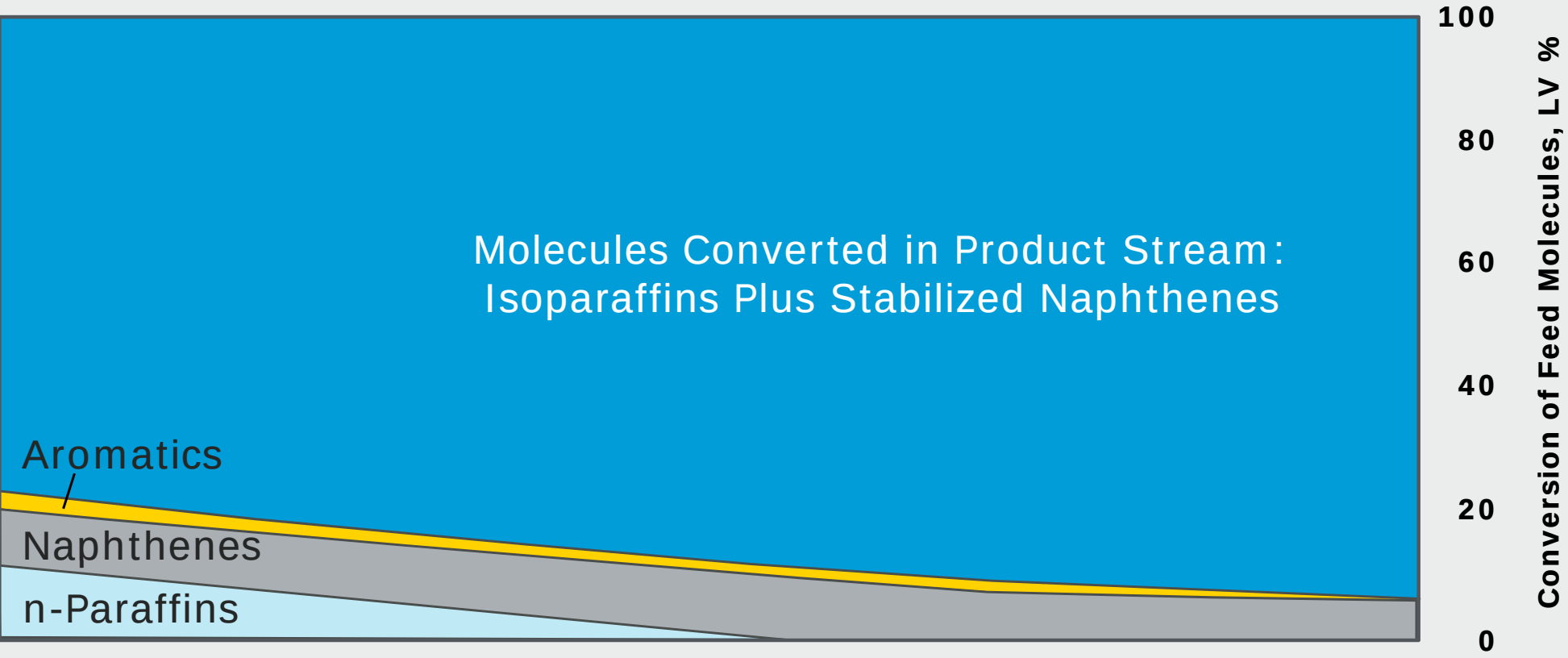


- Stable
- Inert
- Sets minimum viscosity for finished lubricants

Hydrocracking Produces A Continuum of Highly Pure Base Oils



Isodewaxing and Hydrofinishing Improve Purity Further

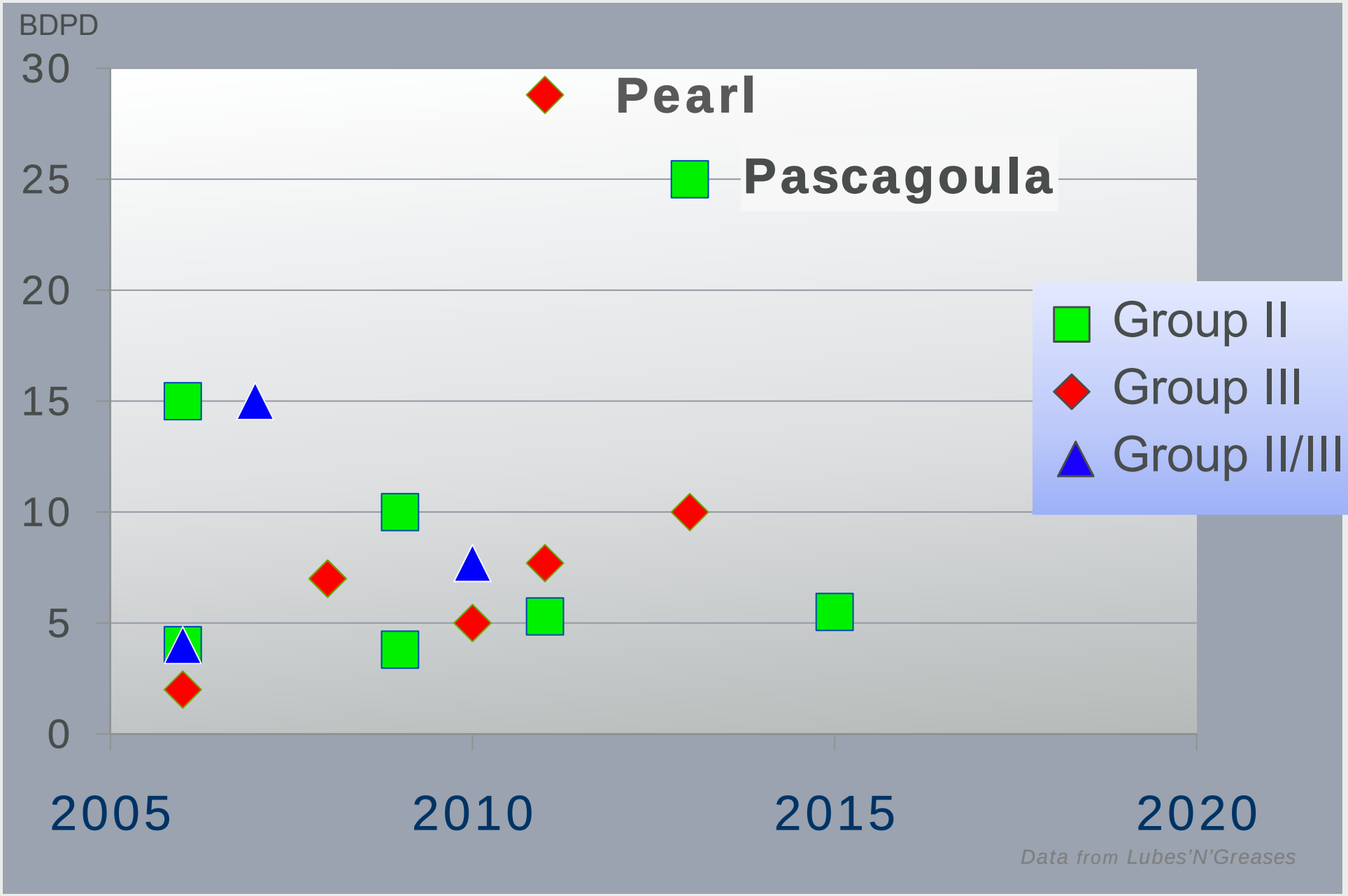


ISODEWAXING
Paraffins ➔ Iso-paraffins

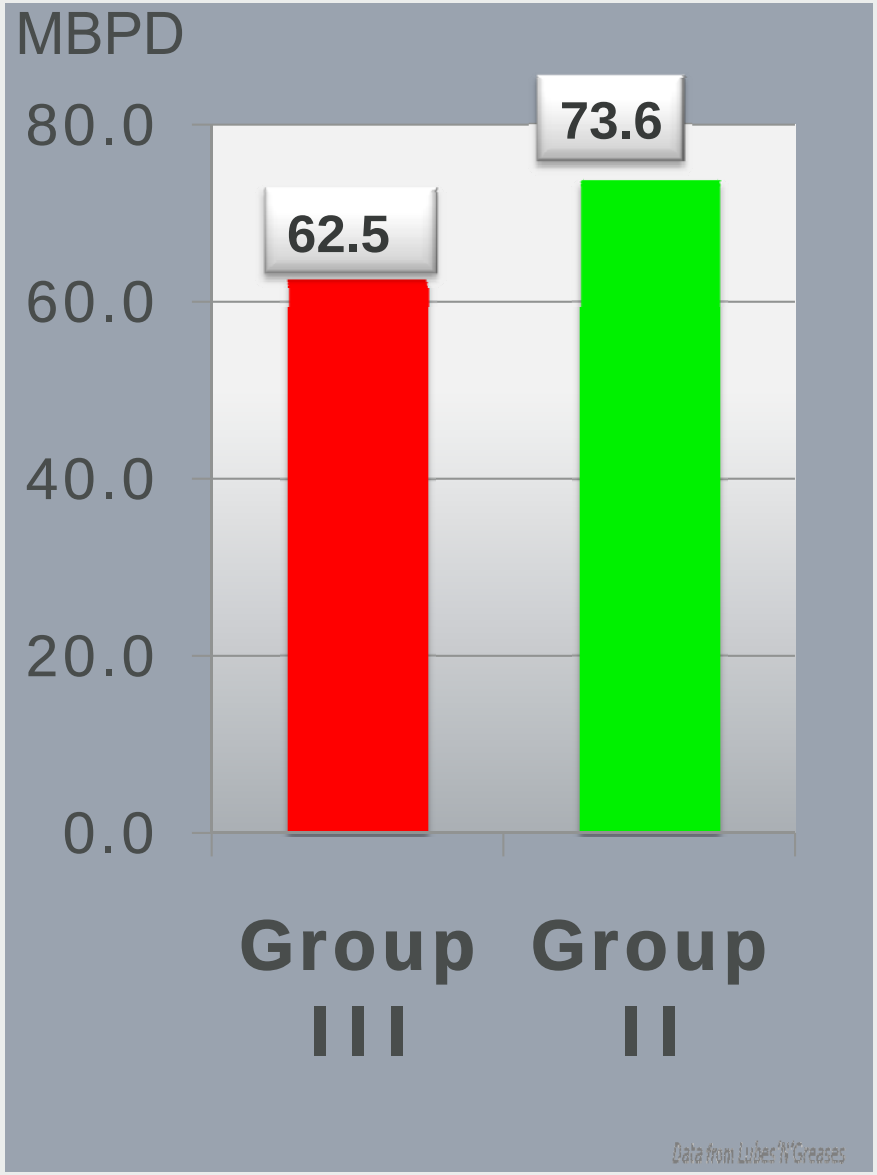
HYDROFINISHING
Aromatics ➔ Iso-naphthenes

Source: Chevron

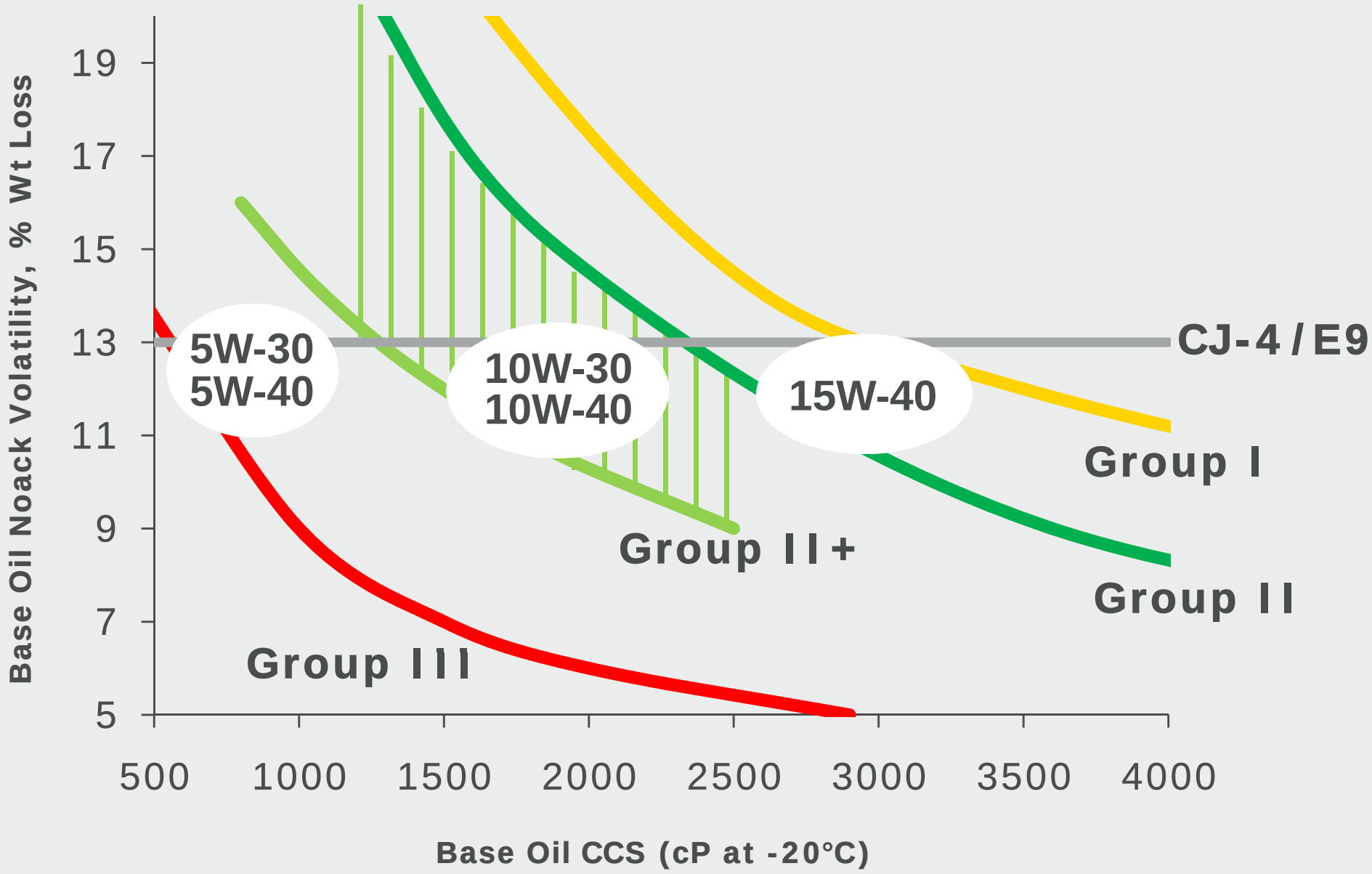
New Specifications Influenced by Supply
New Group III Plants Dominate News



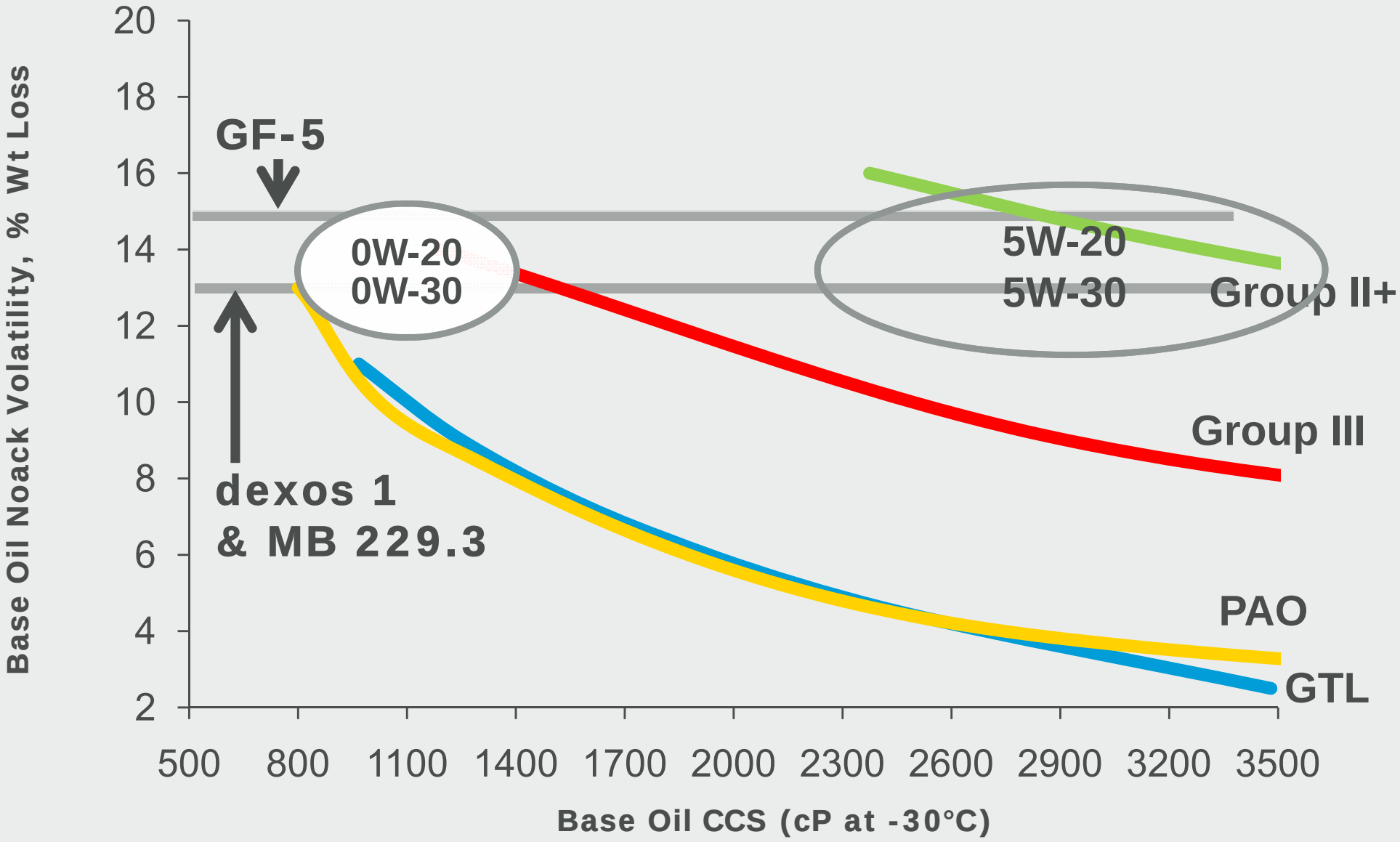
Group II Capacity Growth is Larger



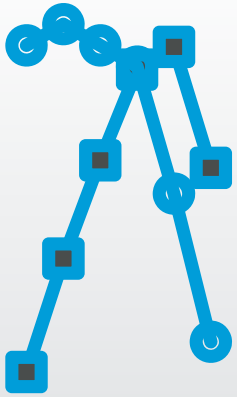
HDMO Low SAPS Requirements Covered By Group II/II+ Base Oils



Fuel Economy Driving PCMO to Light Viscosity Synthetic Base Oils



PCMO vs HDMO – Torque vs Power
Fuel Economy vs Engine Protection



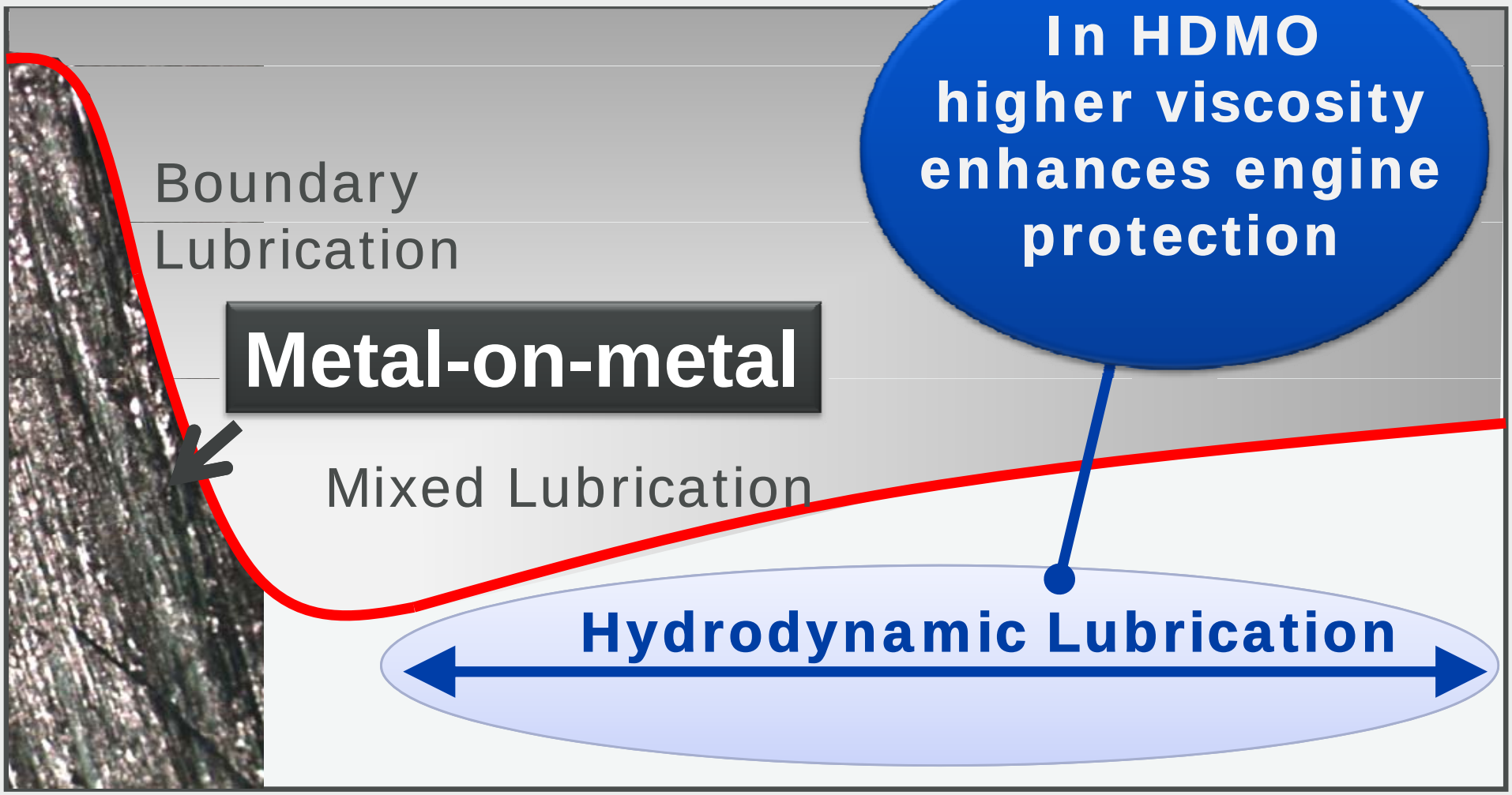
PCMO GF-5
Requires Better Fuel Economy than GF-4

Viscosity Grade	GF-4 Equivalent FEI[1] Sum[2] / FEI 2	ILSAC GF-5 Limit FEI Sum / FEI 2
XW-20	2.1 / 0.9	2.6 / 1.2
XW-30	1.7 / 0.7	1.9 / 0.9
10W-30	1.6 / 0.6	1.5 / 0.6

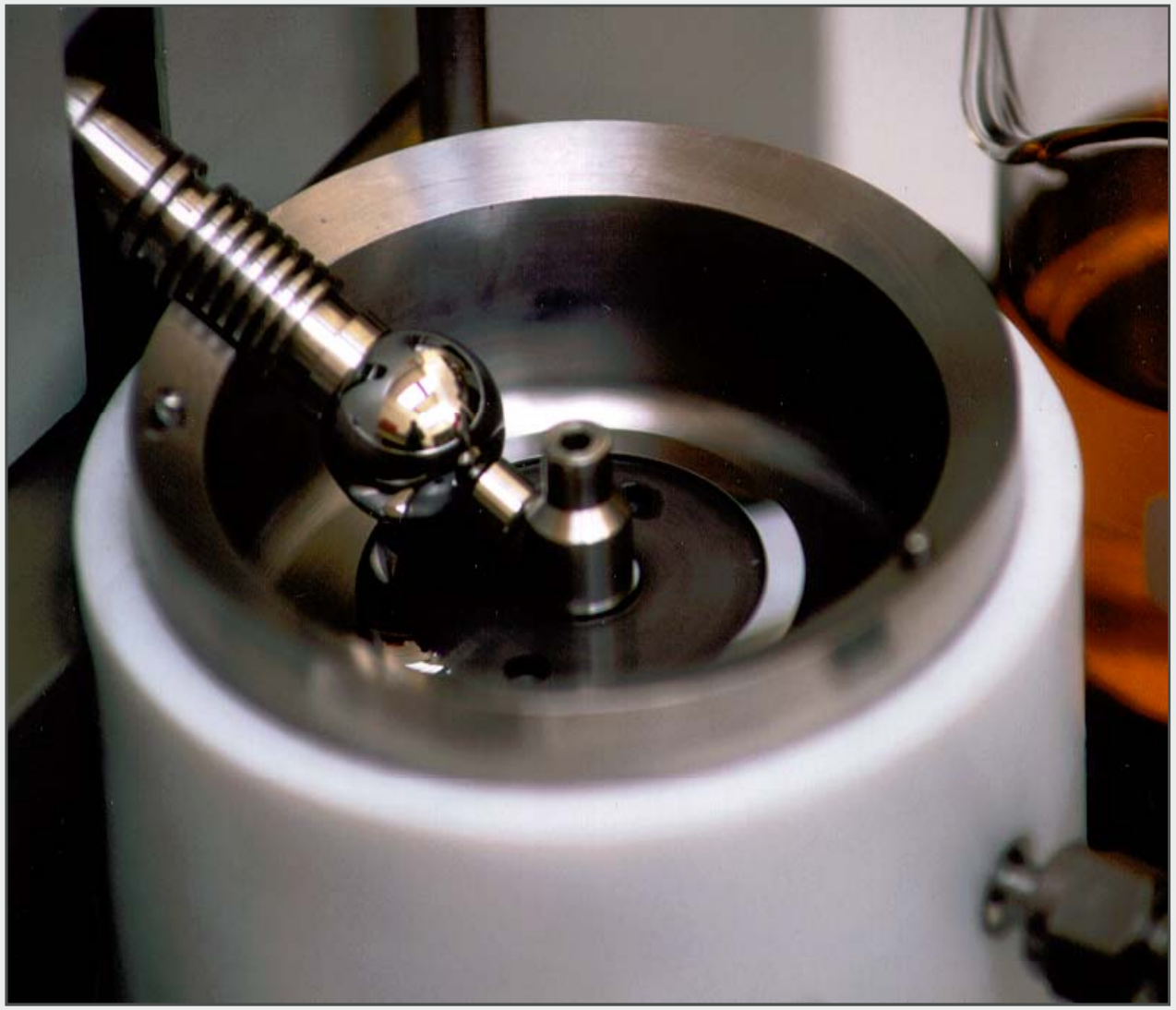
[1] FEI = Fuel Economy Improvement

[2] FEI Sum = FEI 1 (Eq. 1,000 mi) + FEI 2 (Eq. 6,500 mi)

HDMO: High Load + Low Speed = Lubrication Film Breakdown

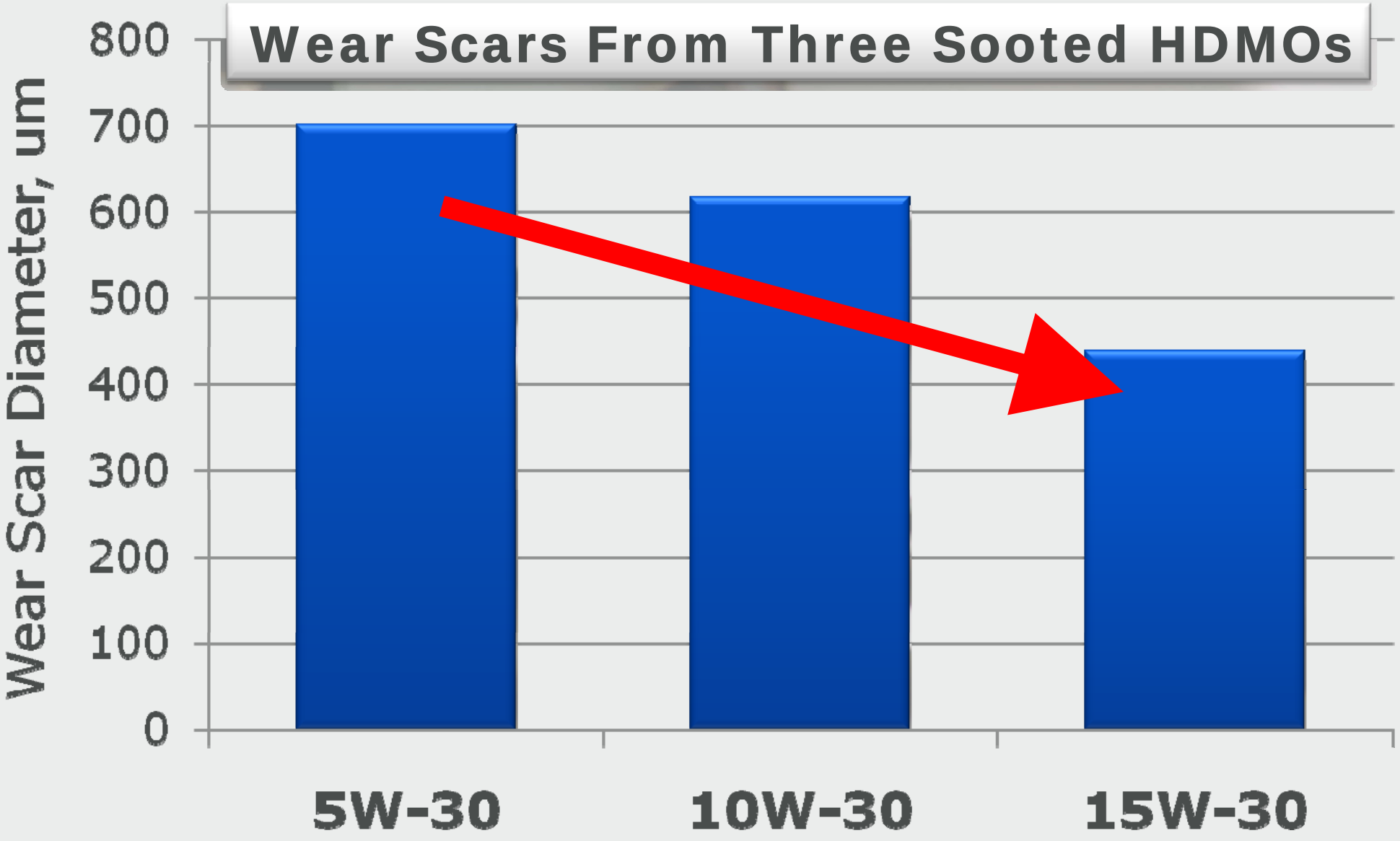


Mini-Traction Machine Rig Measures Wear Scar Diameter

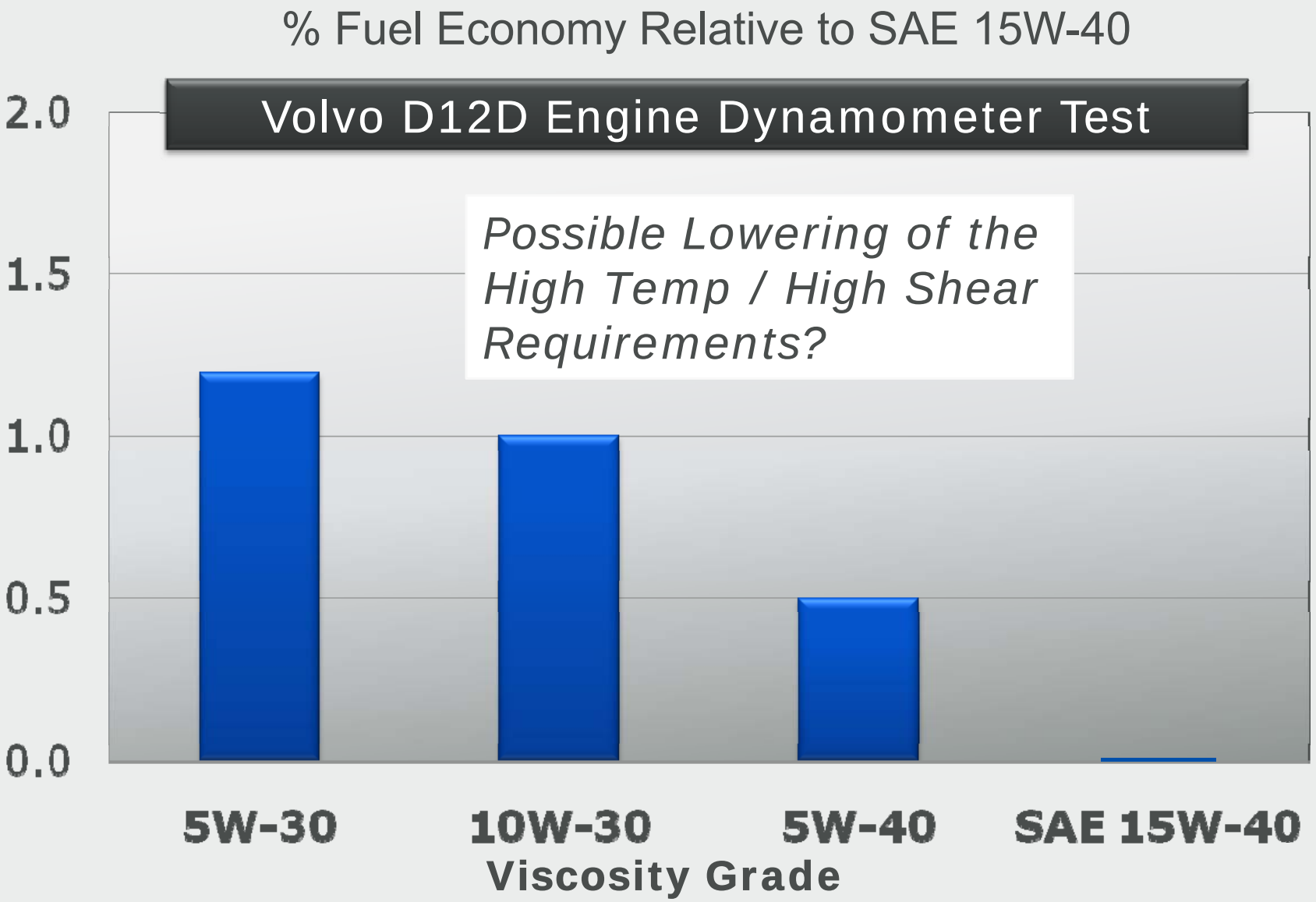


- Control load, speed & temperature (viscosity)
- Measure coefficient of friction
- Characterize Stribeck curve

5W-30 HDMO: Doable but Complicated

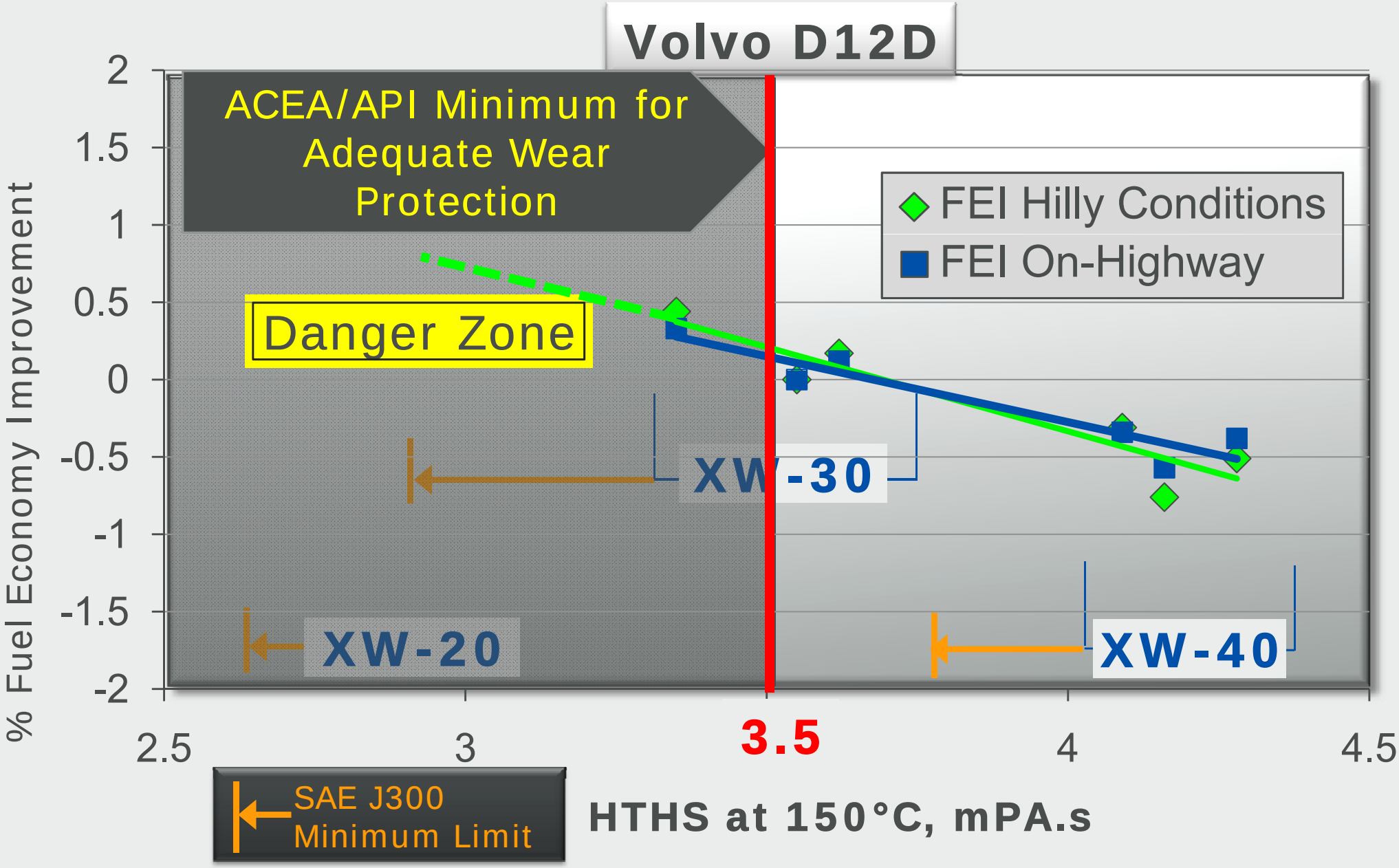


HDEO Fuel Economy Improvement: Modest, But Measurable



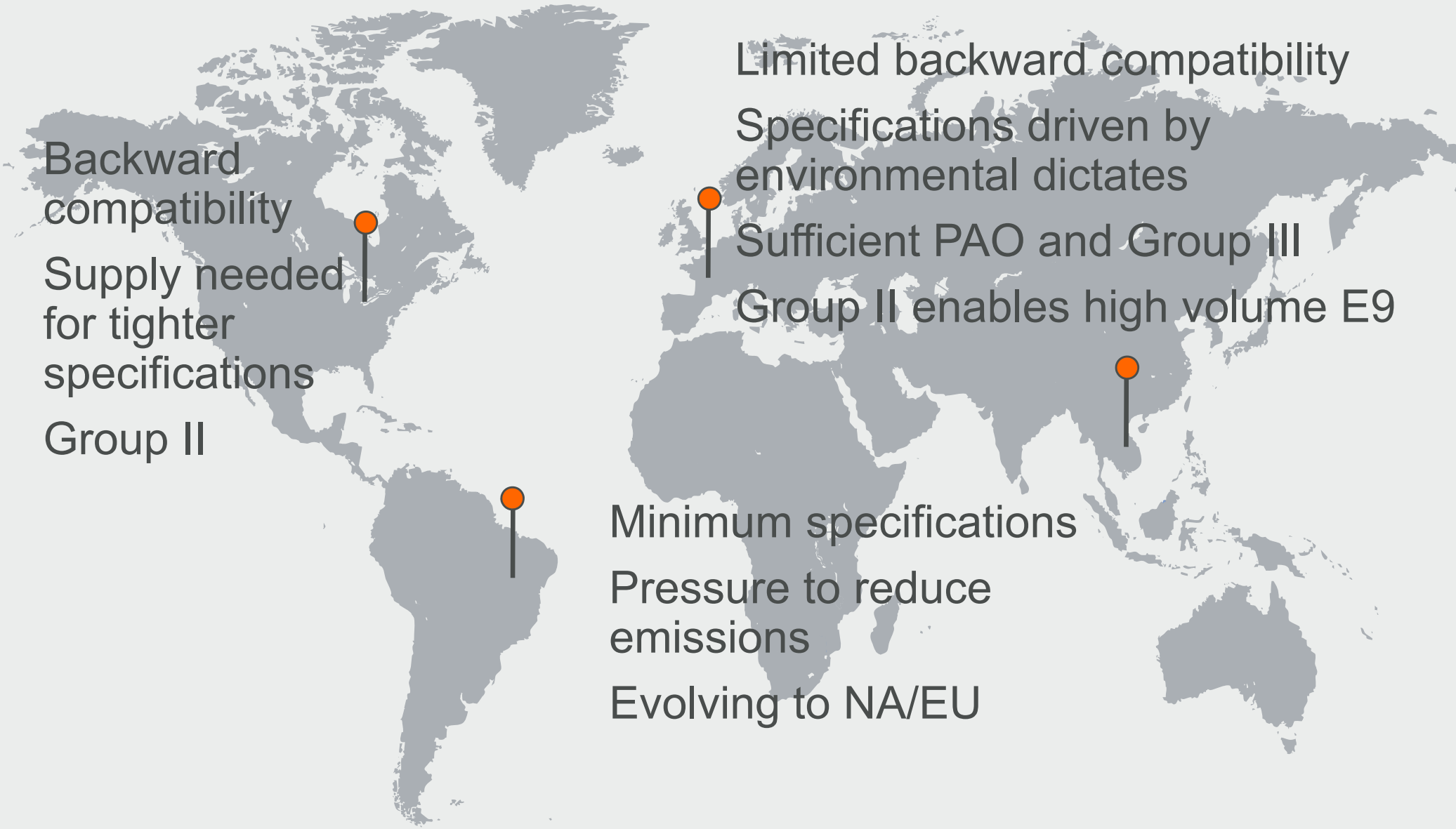
Courtesy of Chevron Oronite

For HDMO OEMs Insist on Minimum 3.5 HTHS for Wear Protection



Data Courtesy of Chevron Oronite Company, LLC

Regional Differences Add Complexity



OEM's Consolidating

- Mack
- Renault
- UD (Nissan Diesel)
- Volvo

- Daimler
- Detroit Diesel
- Mitsubishi Fuso

- General Motors
- Vauxhall
- Opel

Specifications Consolidating

Volvo, VDS-4
Renault, RLD 3
Mack, EO-OPP
JASO-DH-2*

Daimler, 228.31,.51
Detroit Diesel,
DD93K218
JASO DH-2*

dexos 1
dexos 2
DEXRON-VI

Same

- Engines
- Chemistry
- Specifications

Low SAPS:
Require Low-sulfur base oil

Low Noack
High VI

*Allows higher sulfur and Noack

Industry Converging

Global

- Emission Standards
- Engine Platforms
- Specifications

Global Low-Sulfur Base Oils → Global Lubricant Formulations → Cost Complexity Duplication

Summary:

- Continuum of high purity base oils enables optimized lubricant formulations
- Fuel economy continues to drive lubricants to lighter and higher VI base oils
- Trade-Off with wear requires advanced formulation work
- Industry globalizing to reduce cost and complexity

Thank You!

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