



SUPREME 9000

**THE NEXT GENERATION
IN SYNTHETIC ENGINE OIL**

BASE OIL TECHNOLOGY FOR THE FUTURE

- ❖ **Supreme 9000 is formulated from the next generation in synthetic technology.**
- ❖ **Supreme 9000 is blended from a unique combination of extremely high quality Group III and PAO (Group IV) synthetic base stocks.**
- ❖ **Unlike other synthetic oils that are formulated from only Group III base fluids, the combination of the type of Group III base stocks and PAO provides the Supreme 9000 excellent low temperature characteristics, superior oxidation and thermal stability, and very low volatility characteristics.**

WHY DID SCHAEFFER DECIDE TO USE GROUP III BASE STOCKS

- ❖ **Approximately 5 years ago we told the sales force that we would not be using Group III base stocks because they had not proven themselves in the field. There were issues with additive solubility, oxidation stability, and fluidity.**
- ❖ **We chose not to use the Group III base stocks were available at that time because they were unable to add value to our existing product line.**
- ❖ **After 5 years of additional development in the refining process and enhancements to their quality, Schaeffer Mfg. has found a Group III base oil supplier that will provide value added performance in our engine oils and to our customer base.**

API Base Oil Groups

Group	VI	Saturate Level	Sulfur %	Max Viscosity
I	80-120	<90%	And/or >0.03	>1500
II	80-120	≥90%	≤0.03	100
III	≥120	≥90%	≤0.03	68
IV	PAO	Only		>1500
V	All Other			>1500

BASE OIL TECHNOLOGY FOR THE FUTURE

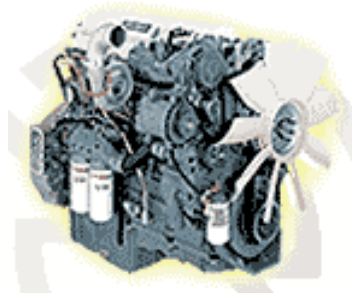
- ❖ **The type of Group III base fluids used in the formulation of Supreme 9000, unlike other Group III base stocks, are derived from a single feedstock and are produced through the use of a unique patented process.**
- ❖ **This process produces a highly saturated (99%) feedstock that has many highly desirable characteristics such as a high viscosity index (~126 to 135), high temperature viscometrics, low volatility, thermal and oxidation stability, purity and a uniform molecular structure.**
- ❖ **The PAOs used in the formulation of Supreme 9000 are derived from a clearly defined patented proprietary processing technology.**

BASE OIL TECHNOLOGY FOR THE FUTURE

- ❖ **These polyalphaolefins have a very uniform, comb-like molecular structure that provides Supreme 9000 with a variety of enhancements in the areas of wear protection, energy efficiency, high temperature performance and low temperature fluidity.**
- ❖ **This uniform molecular structure derived from Group III and PAO Synthetic base stocks results in a more stable and consistent structure that does not contain any weak molecular links.**
- ❖ **This base stock combination is conditions is highly resistant to break down under extreme conditions.**

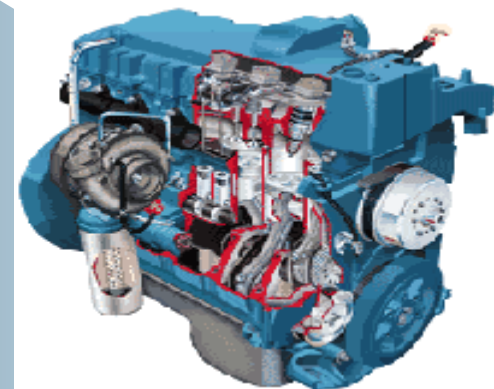
BASE OIL TECHNOLOGY FOR THE FUTURE

- ❖ **The extremely high saturate content of the Group III/PAO Synthetic mix provides excellent additive miscibility and response.**
- ❖ **The base oil combination used in the formulation of Supreme 9000 is extremely low in sulfur (<1ppm) and aromatic content (<0.5%) and already meets and exceeds the proposed base oil sulfur content of <0.1% (1000ppm) for the proposed PC-10 heavy duty diesel engine oil classification.**
- ❖ **The high saturate content of Supreme 9000's base stock has been found to enhance the friction reducing performance of friction modifiers such as Micron Moly® and Penetro®. This is especially true under high operating temperatures up to 392°F. (SAE Paper 932779)**

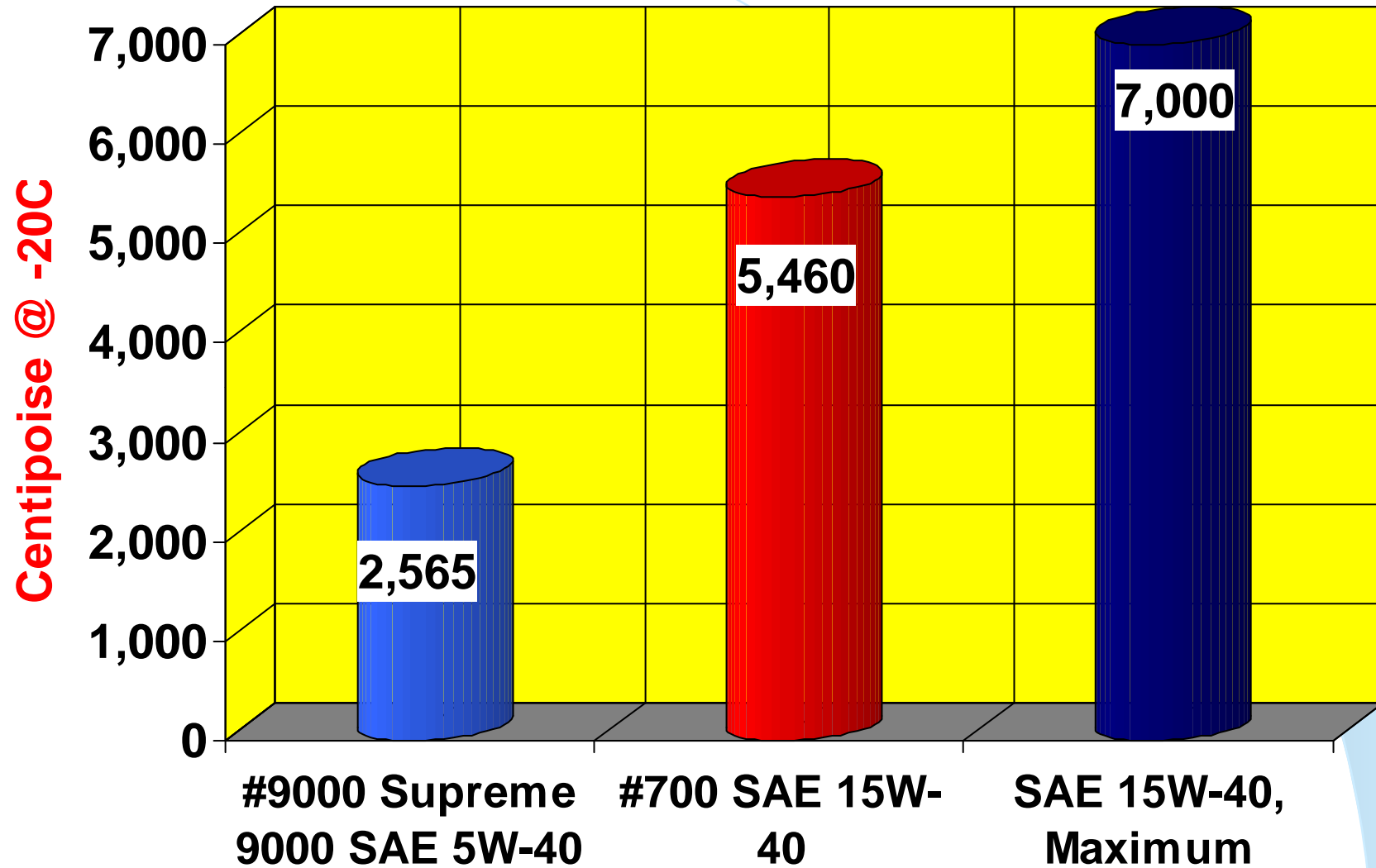


THE SUPREME CHALLENGE

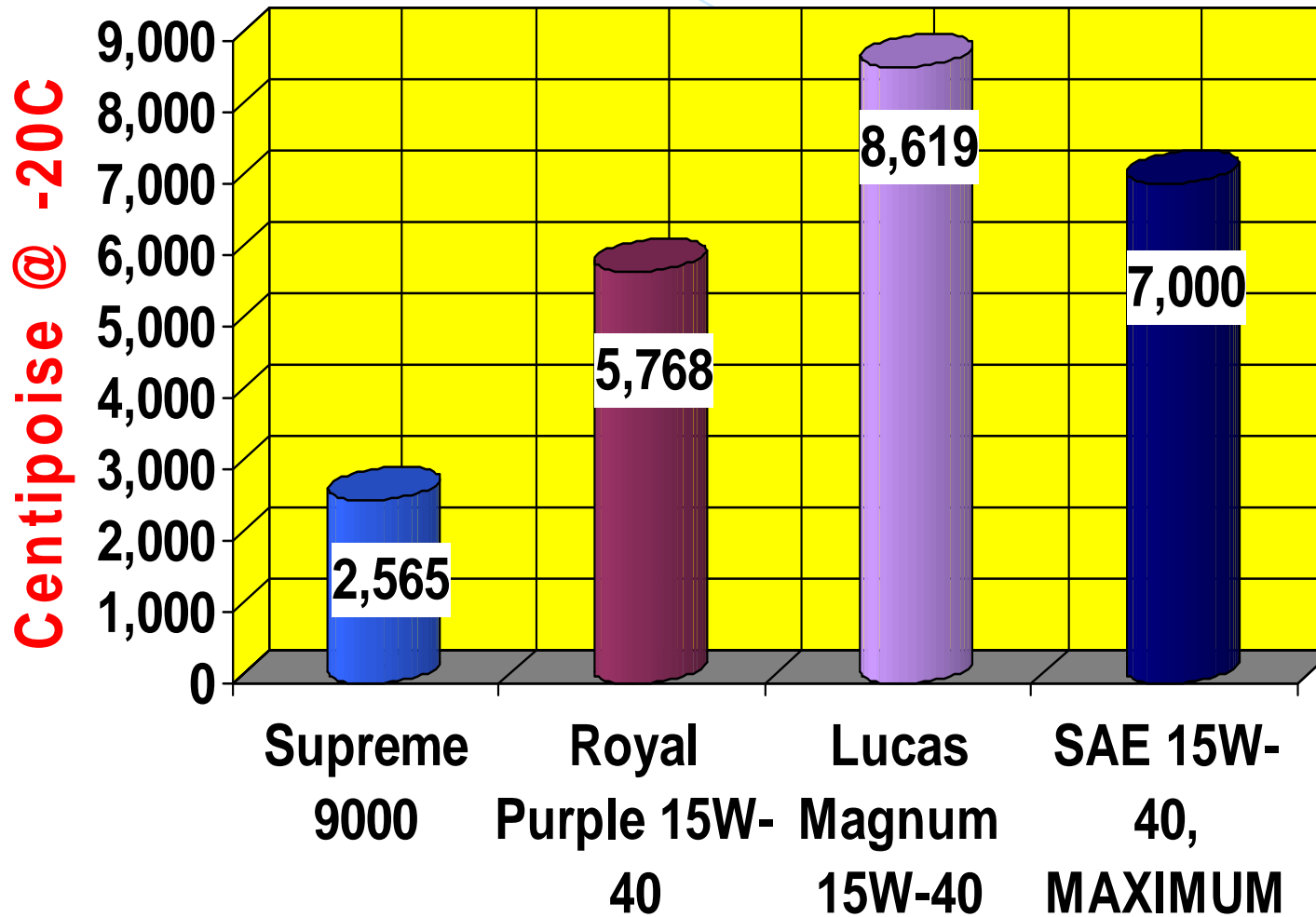
SUPREME 9000 VS. THE COMPETITION COMPARATIVE PRODUCT TESTING



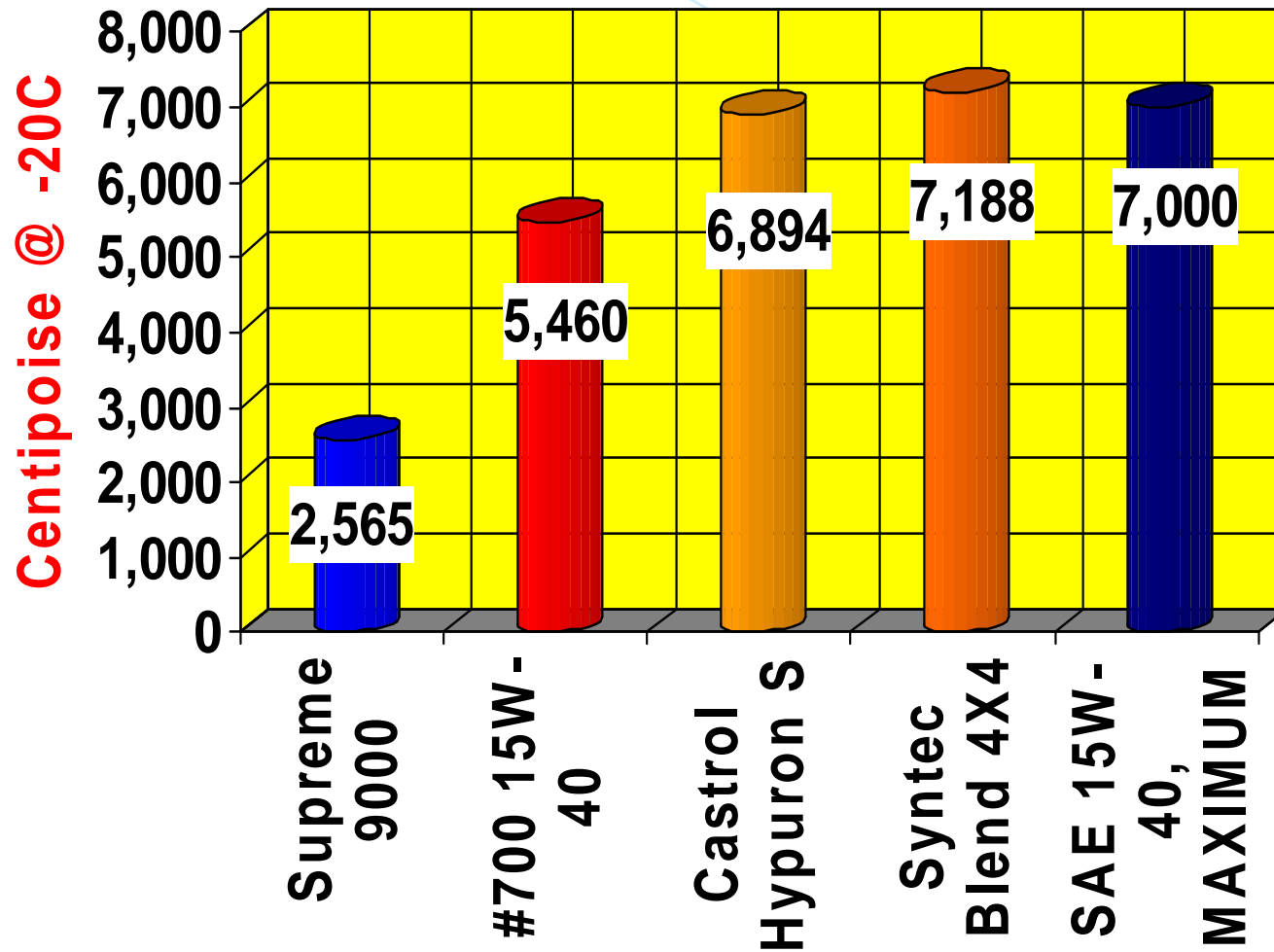
COLD CRANKING VISCOSITY @ -20°C



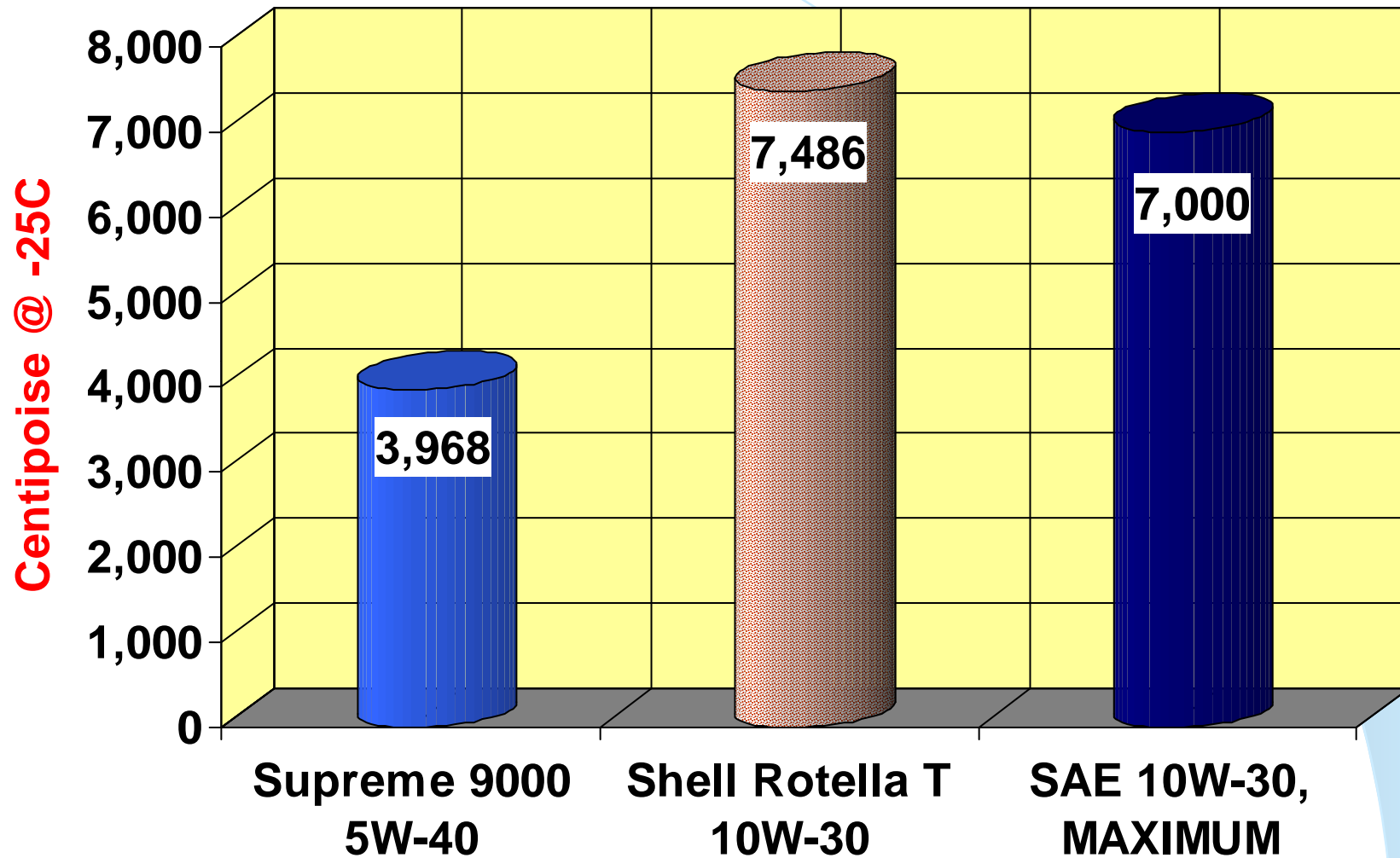
COLD CRANKING VISCOSITY @ -20°C



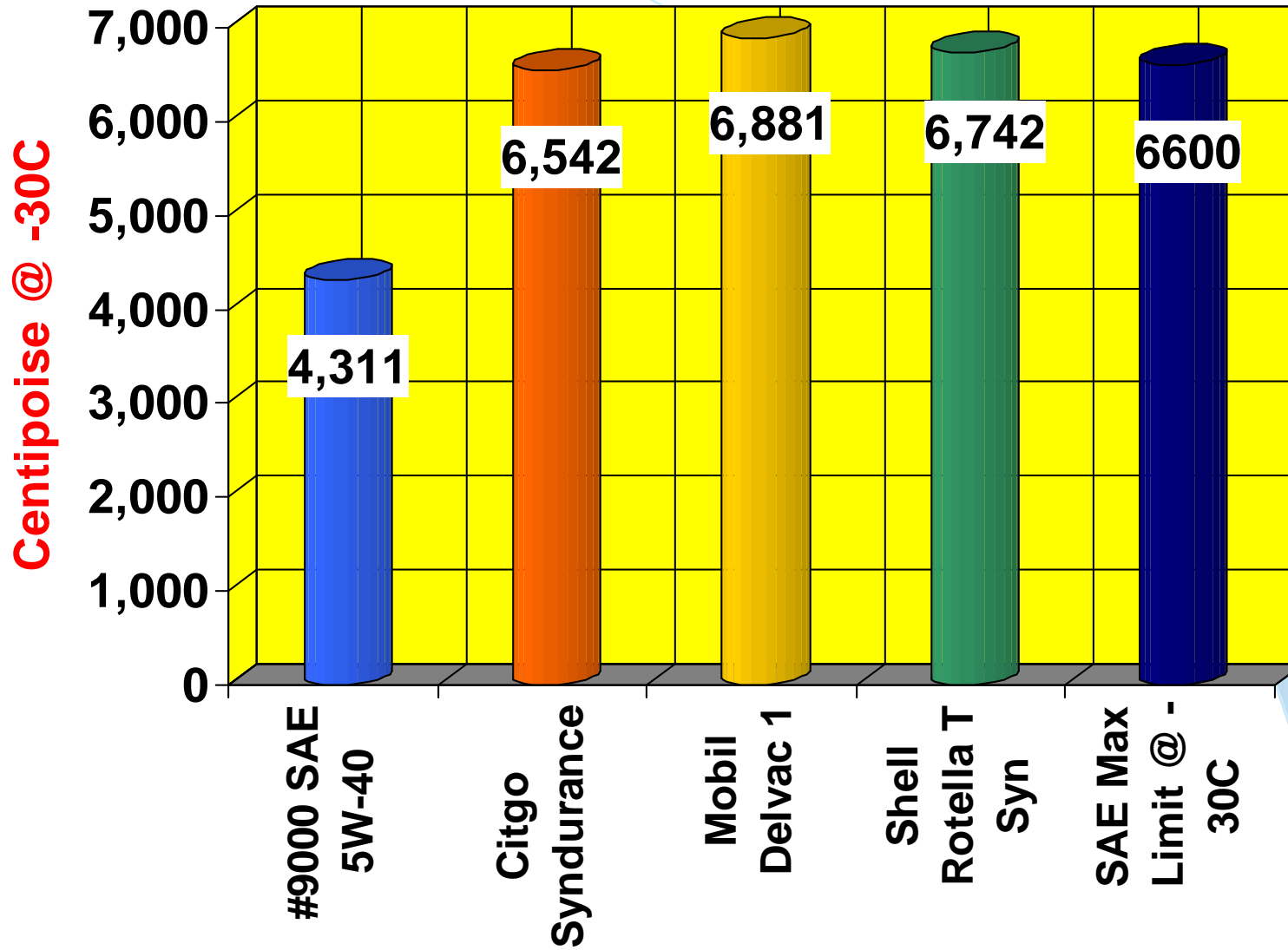
COLD CRANKING VISCOSITY @ -20°C

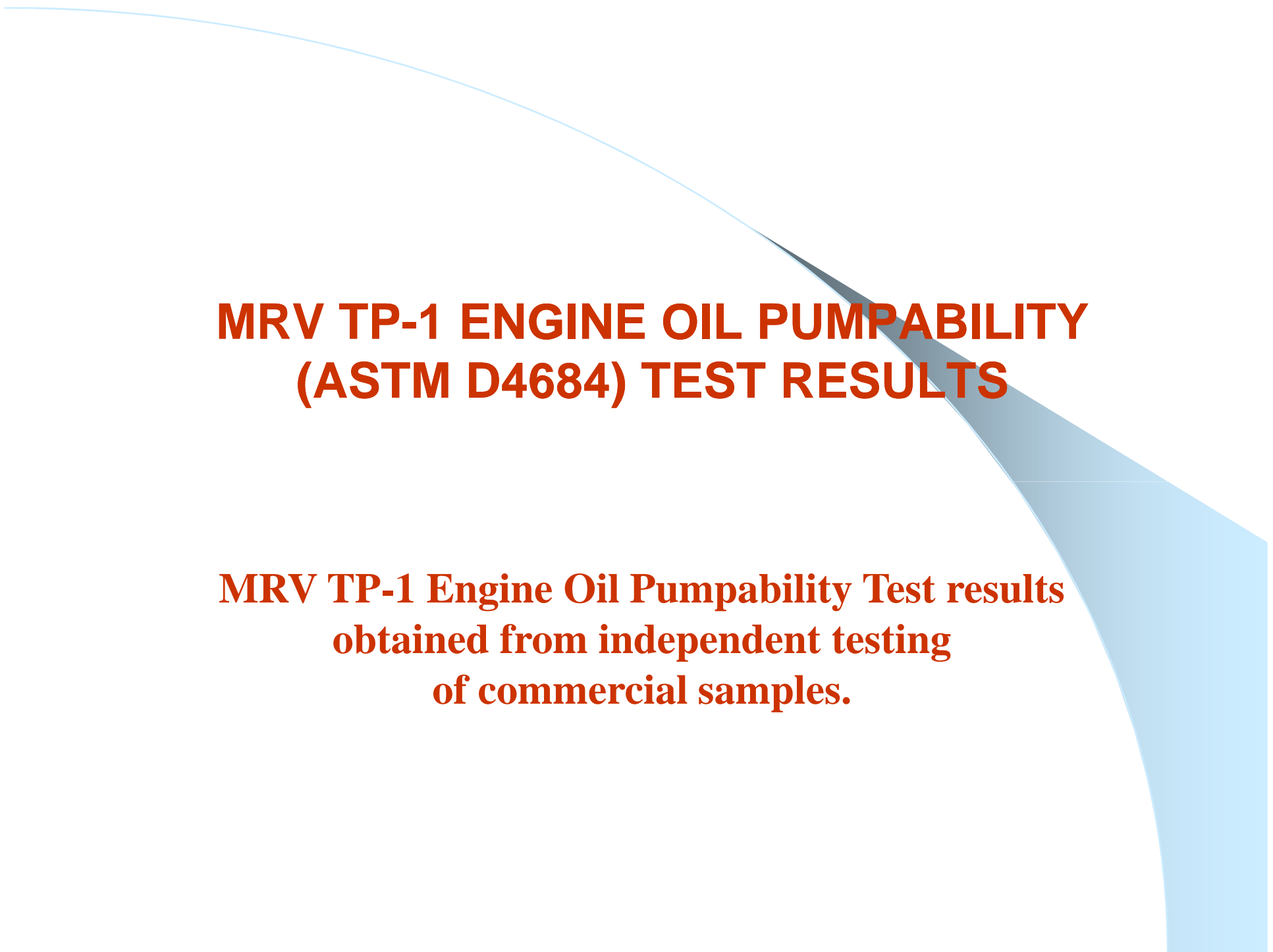


COLD CRANKING VISCOSITY @ -25°C



COLD CRANKING VISCOSITY @ -30°C

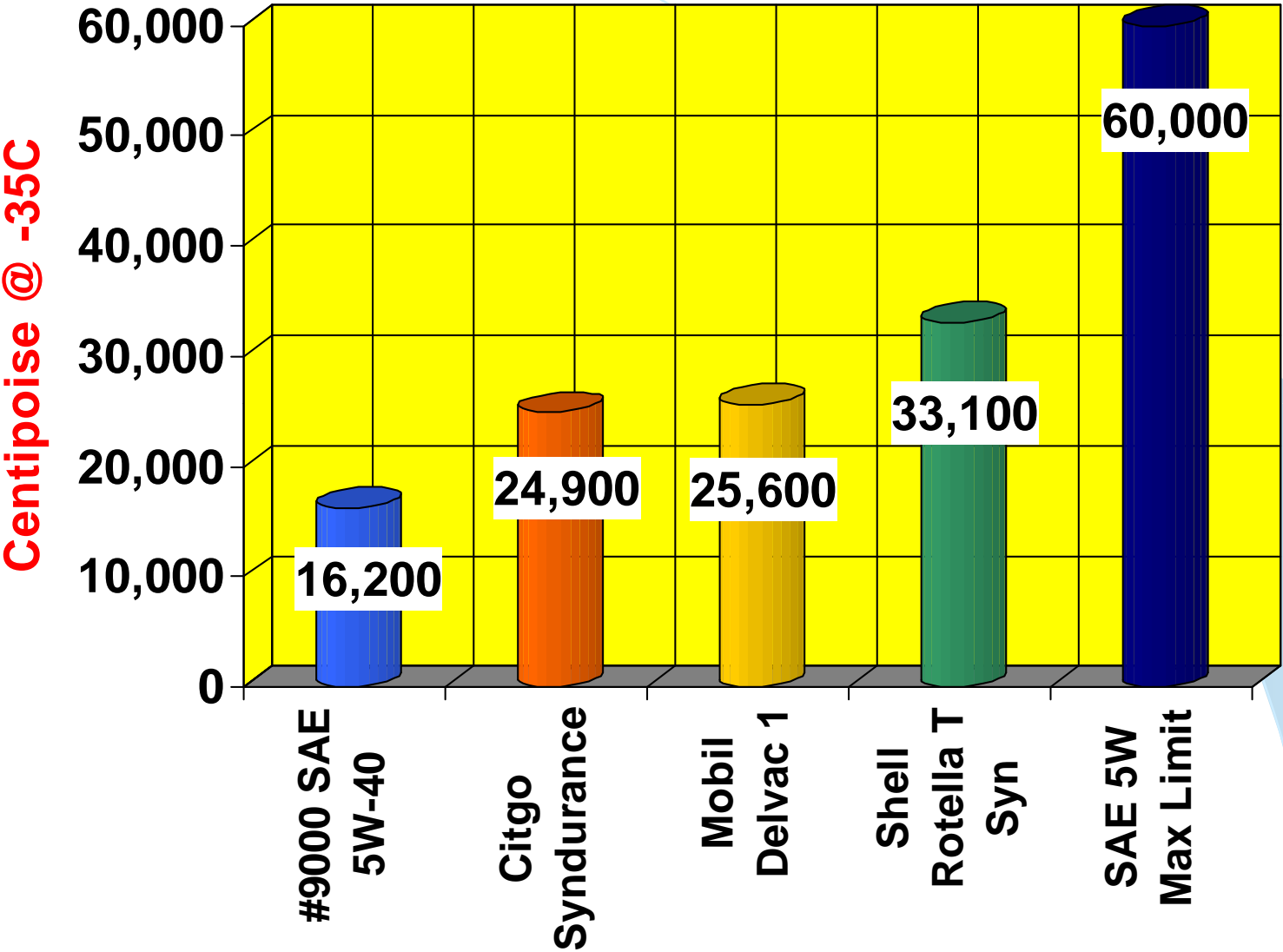




MRV TP-1 ENGINE OIL PUMPABILITY (ASTM D4684) TEST RESULTS

**MRV TP-1 Engine Oil Pumpability Test results
obtained from independent testing
of commercial samples.**

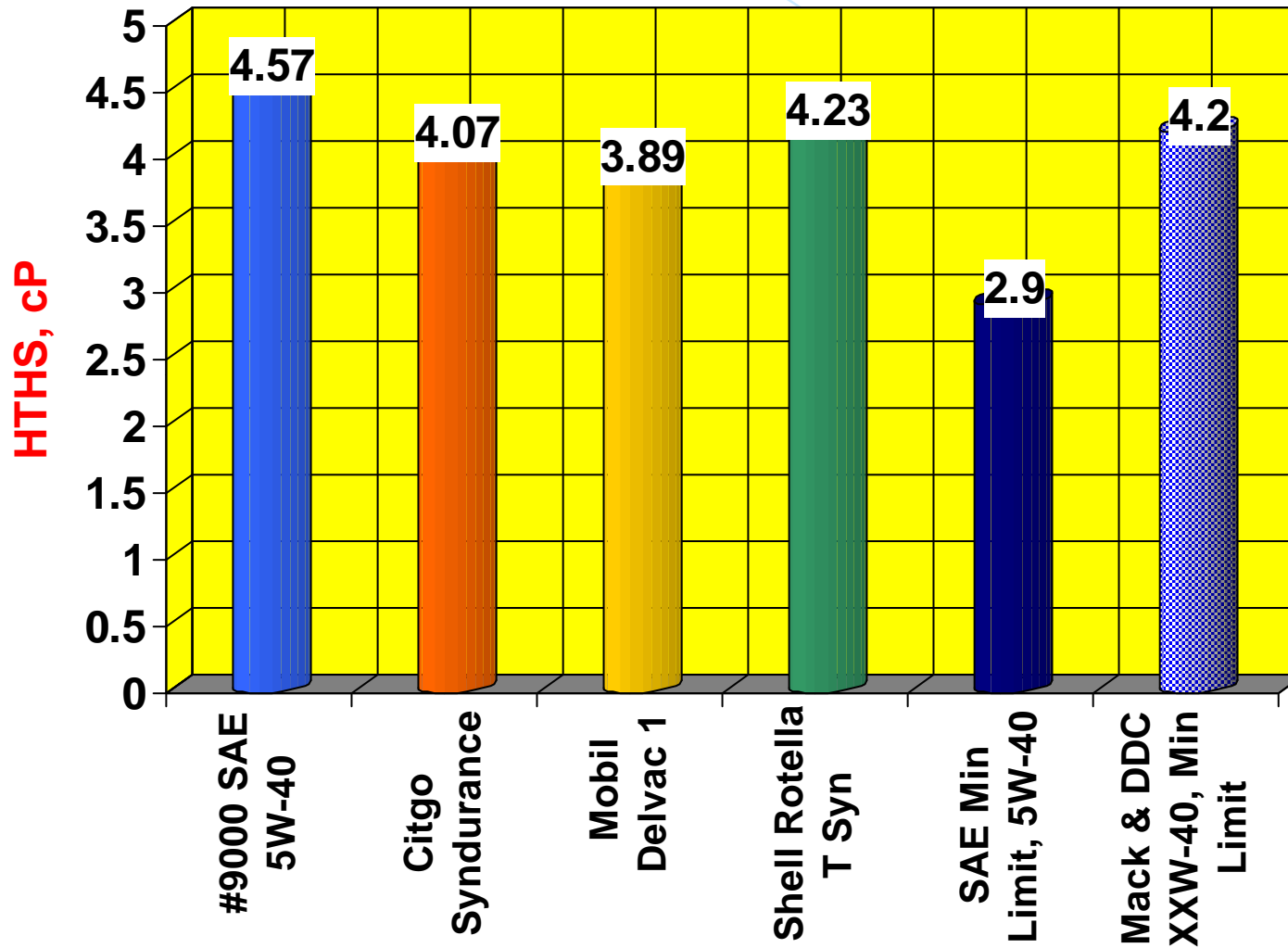
MRV VISCOSITY @ -35°C



A decorative graphic consisting of a thin light blue curved line starting from the top left and curving downwards towards the right. Below this line, a shaded area in a darker blue color follows the curve, widening as it moves to the right, ending in a vertical rectangular shape at the bottom right corner.

**HIGH TEMPERATURE HIGH SHEAR VISCOSITY
ASTM D-4683**

INCREASED HIGH TEMPERATURE HIGH SHEAR PROTECTION



#9000 SUPREME 9000 SAE 5W-40 EXHIBITS IMPROVED SHEAR STABILITY VS. THE COMPETITION

Orbahn Shear Test results obtained from
independent testing of commercial samples.

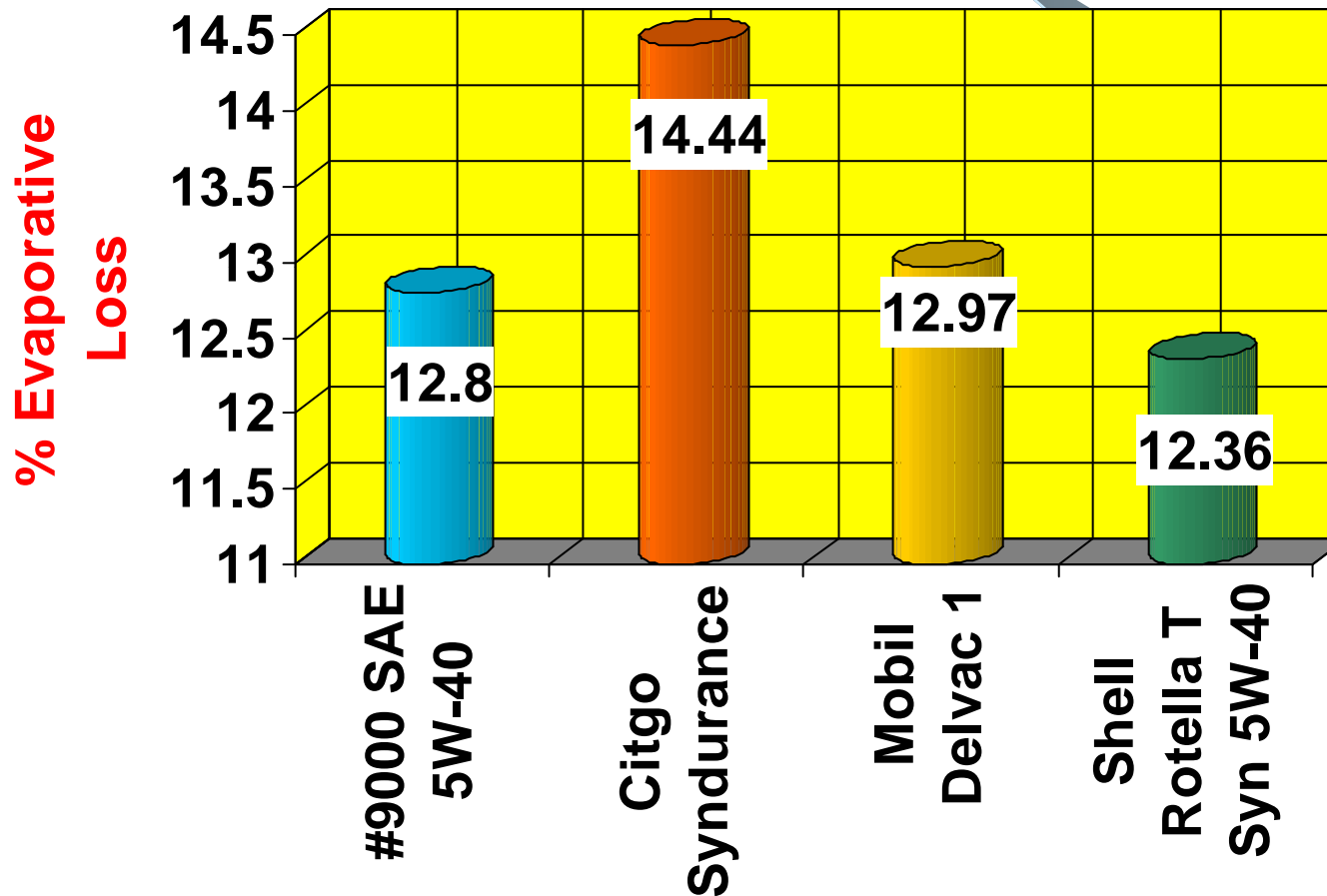
PRODUCT	cSt @ 100°C Unsheared	cSt @ 100°C Sheared 90 Pass	Viscosity Loss %
#9000 Supreme 9000 SAE 5W-40	15.09	13.63	9.67%
Citgo Syndurance	14.75	12.79	13.29%
Mobil Delvac 1	14.46	13.03	9.89%
Shell Rotella T Synthetic 5W-40	14.98	13.12	12.18%



**NOACK VOLATILITY CHARACTERISTICS
ASTM D-5800**

UP TO 13% LESS VOLATILITY THAN COMPETITIVE ENGINE OILS

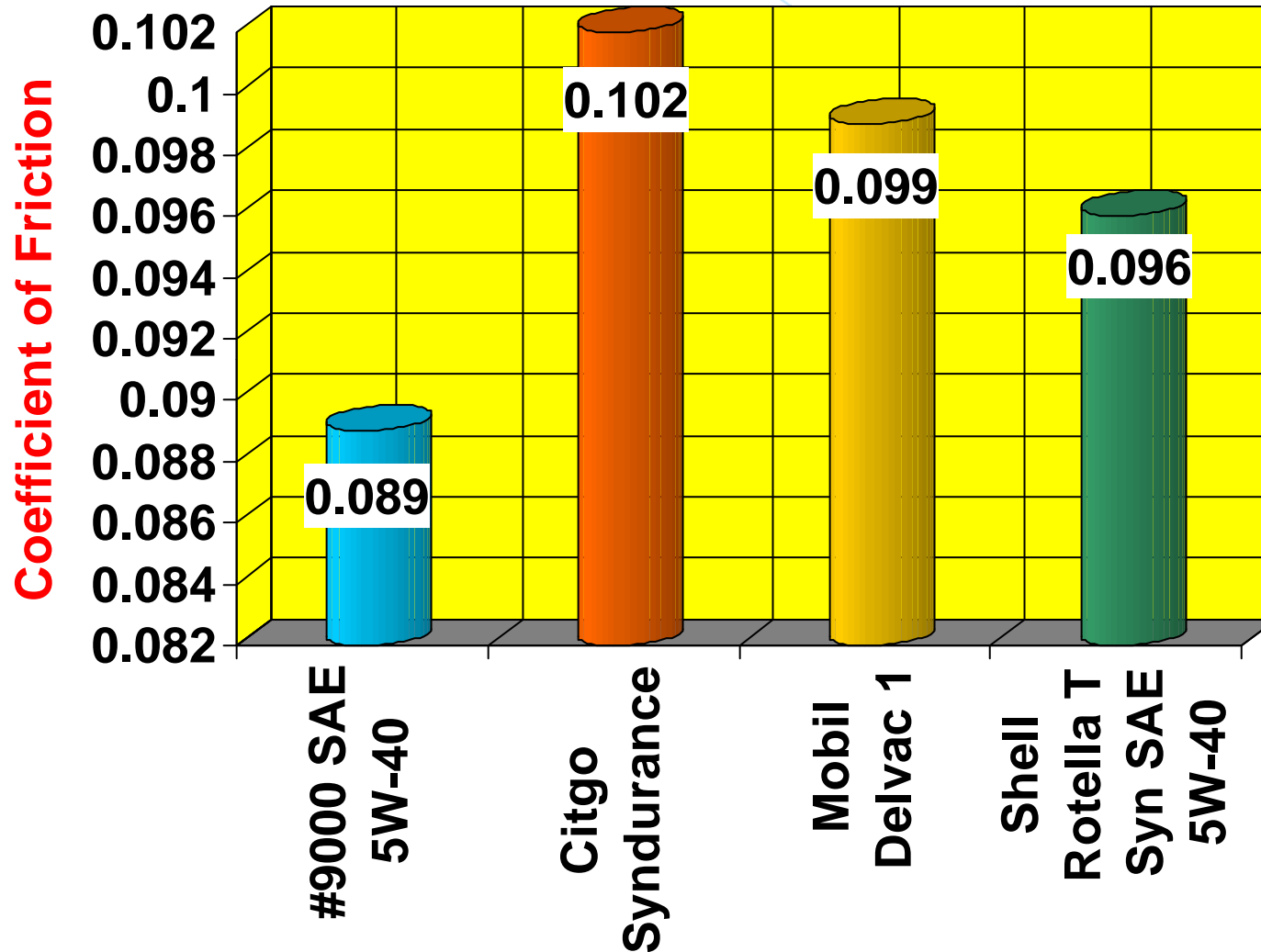
Noack Test results obtained from
independent testing of commercially obtained samples.

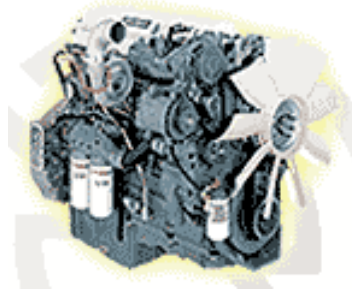


INCREASED WEAR PROTECTION WITH MICRON MOLY® AND PENETRO®

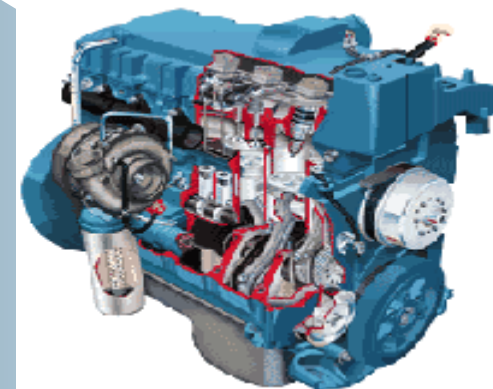
- ❖ **Micron Moly® and Penetro® are proven friction modifiers that once plated to the metal surfaces of the engine prevent metal to metal contact and damaging frictional wear.**
- ❖ **This reduction in friction and the subsequent reduction in wear results in:**
 - * Increased Fuel Economy.**
 - * Significantly Less Bearing, Ring, Piston, Cylinder and Valve-Train wear.**
 - * Increased Engine Durability.**
 - * Increased Engine Life.**
 - * Less Downtime.**
 - * Reduced Maintenance Costs.**

UP TO 12% GREATER PROTECTION AGAINST FRICTIONAL DRAG AND WEAR





SUPREME 7000 VS. THE COMPETITION COMPARATIVE PRODUCT TESTING

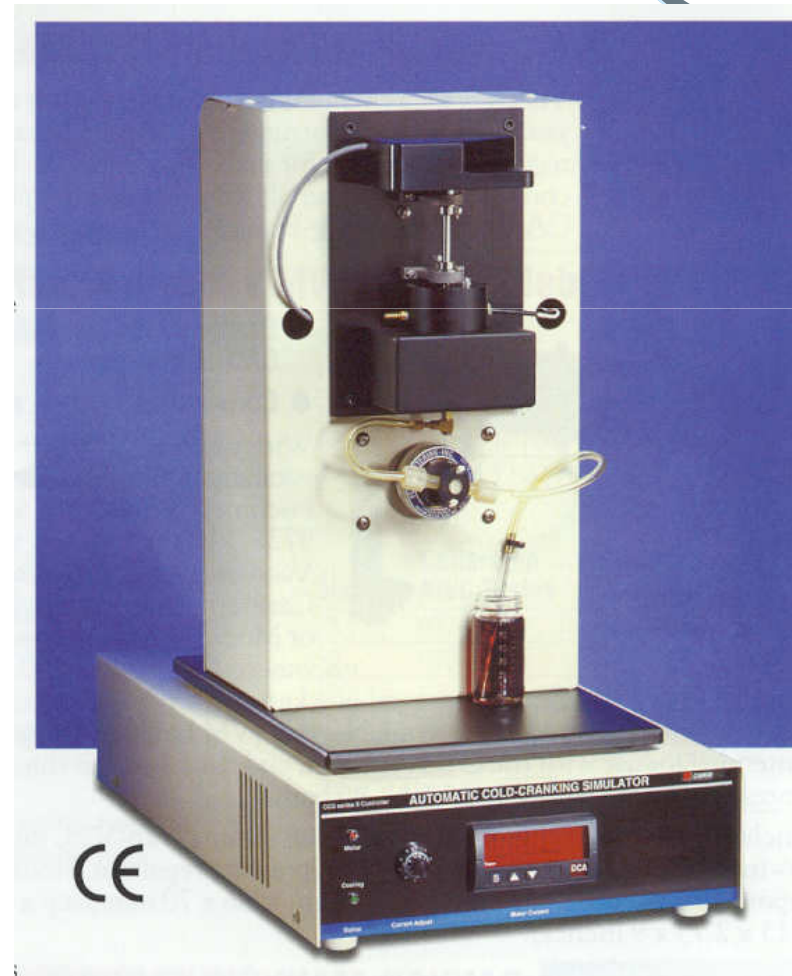


OBJECTIVES

- ❖ **To differentiate Schaeffer's Supreme 7000 SAE 15W-40 Engine Oil from the competition in the areas of:**
 - **Low Temperature Performance**
 - **High Temperature High Shear Protection**
 - **Shear Stability**
 - **Volatility Characteristics**
 - **Protection Against Friction and Wear.**

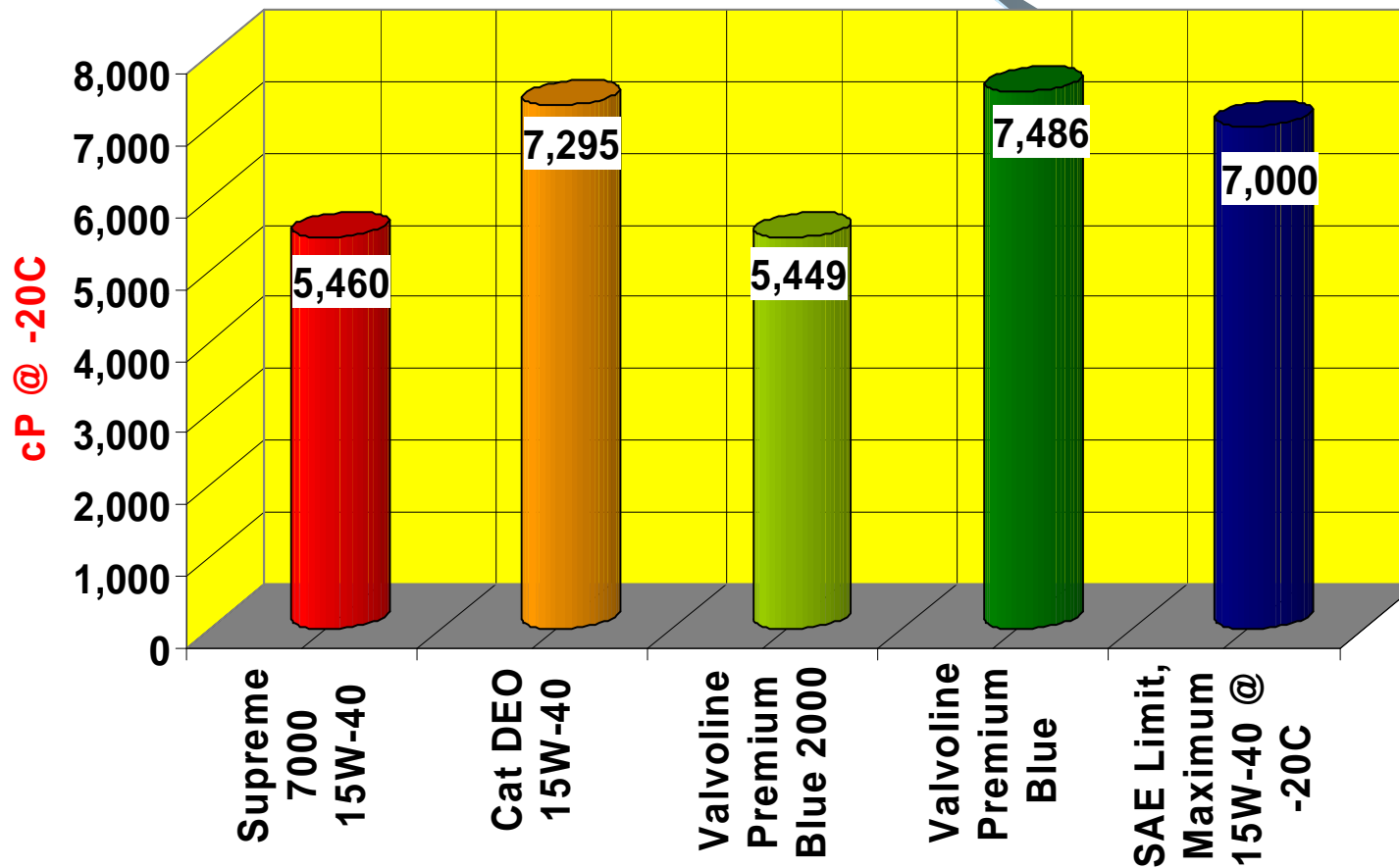
- ❖ **To establish that Schaeffer's Supreme 7000 Series exceeds the API Service Classifications CI-4 Plus and the OEM specifications for heavy duty diesel engines.**

COMPARATIVE COLD CRANKING SIMULATOR TEST RESULTS

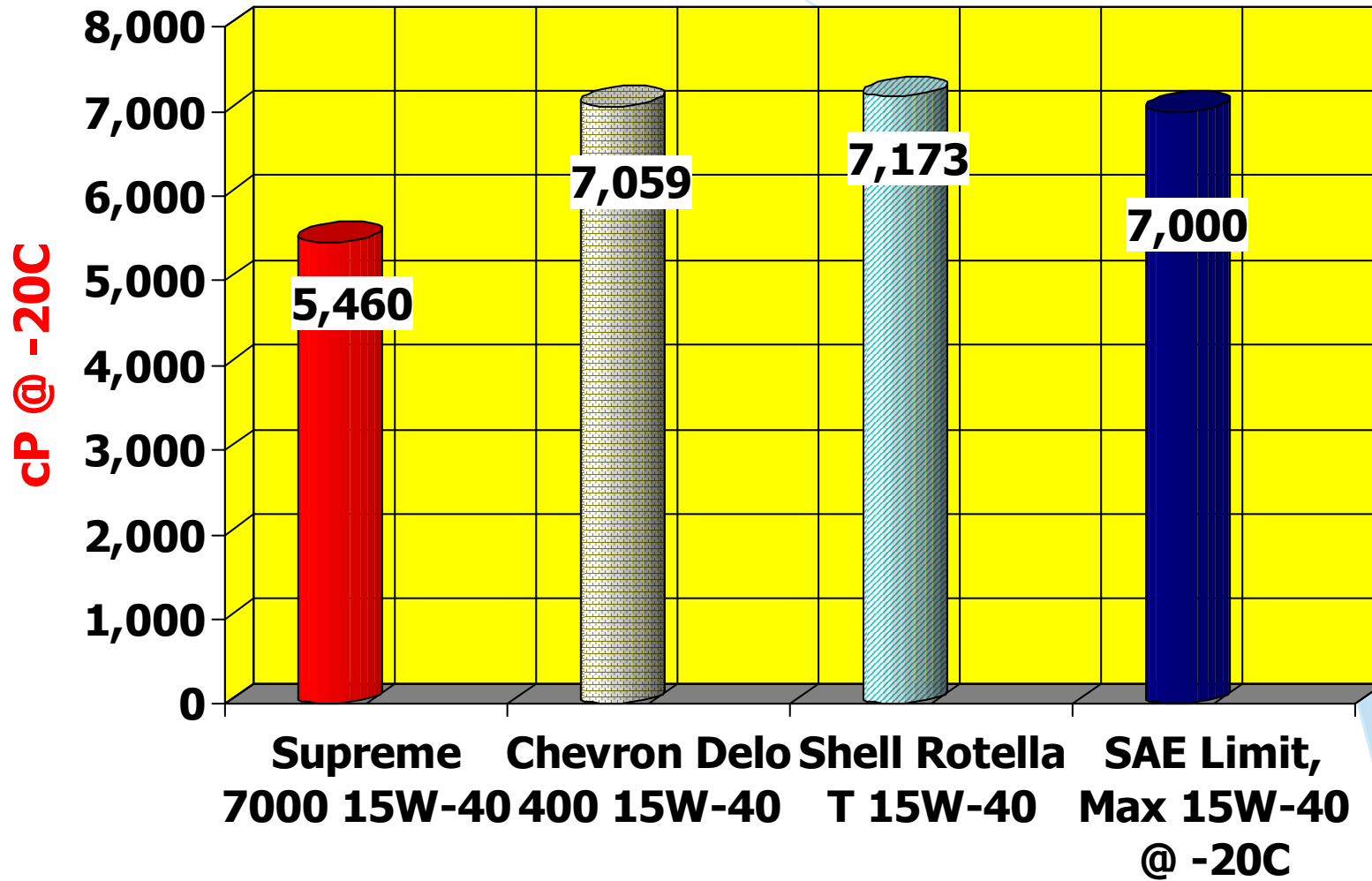


Cold Cranking Viscosities obtained from independent testing of commercially obtained samples.

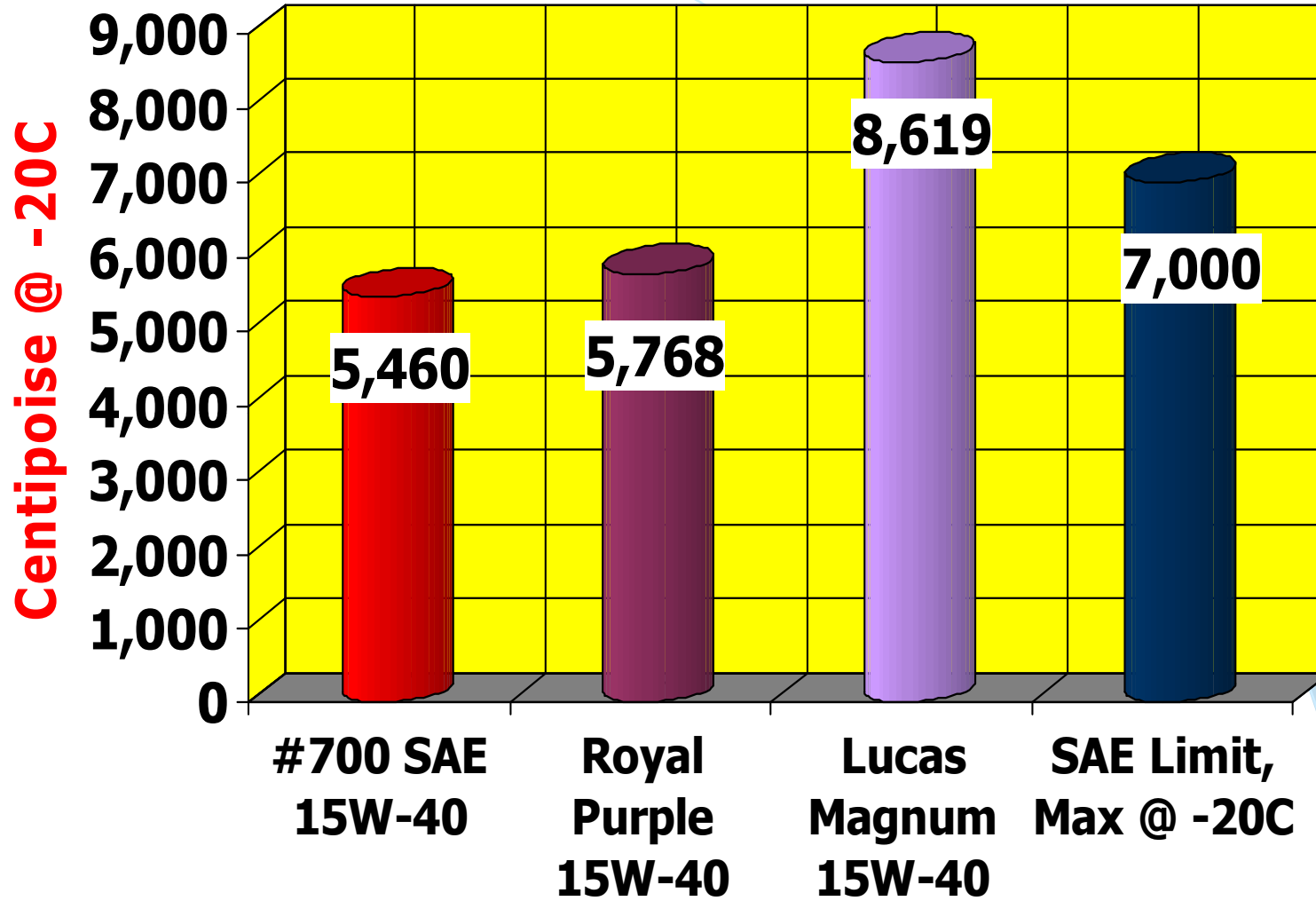
CCS @ -20C



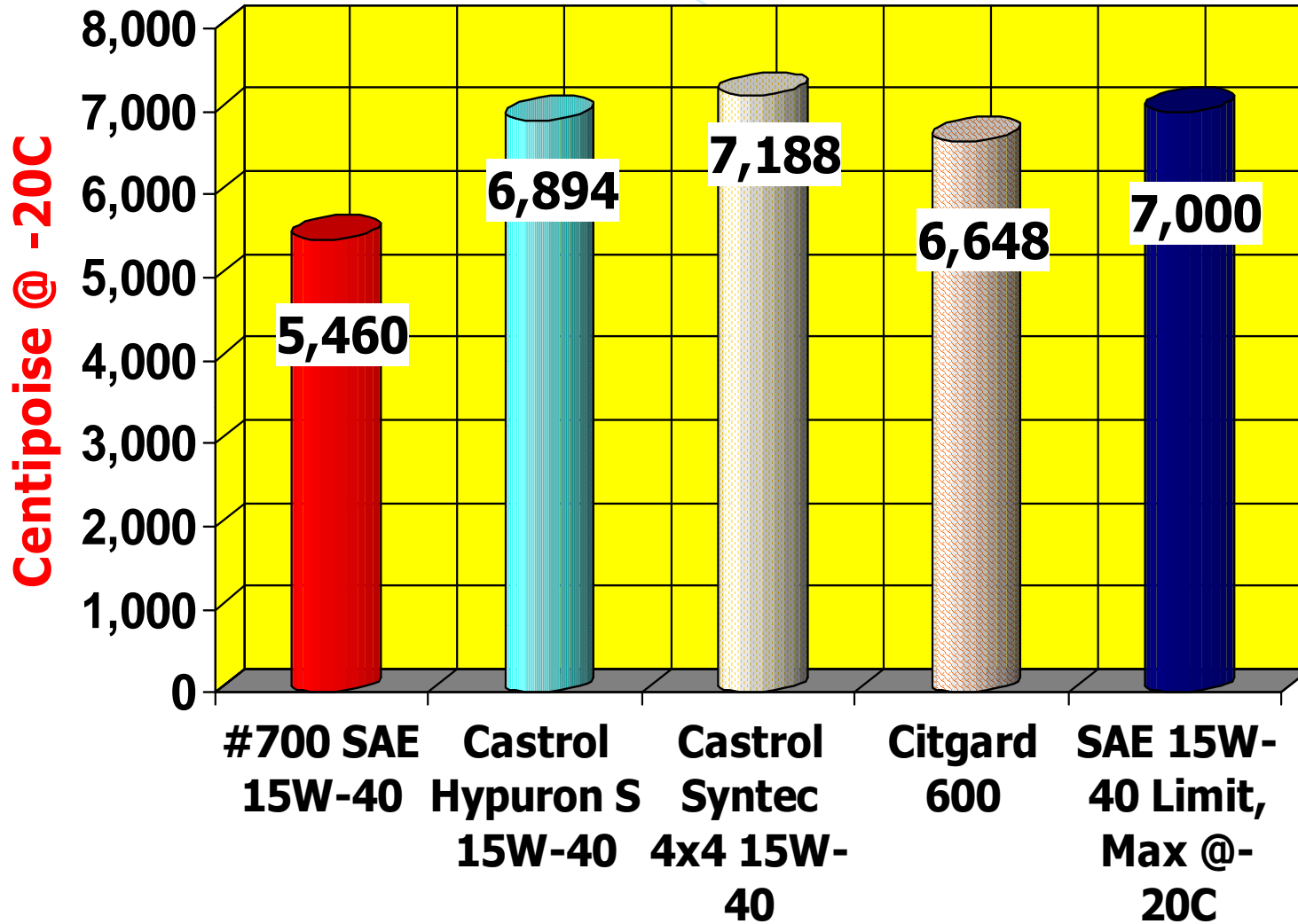
CCS @ -20C



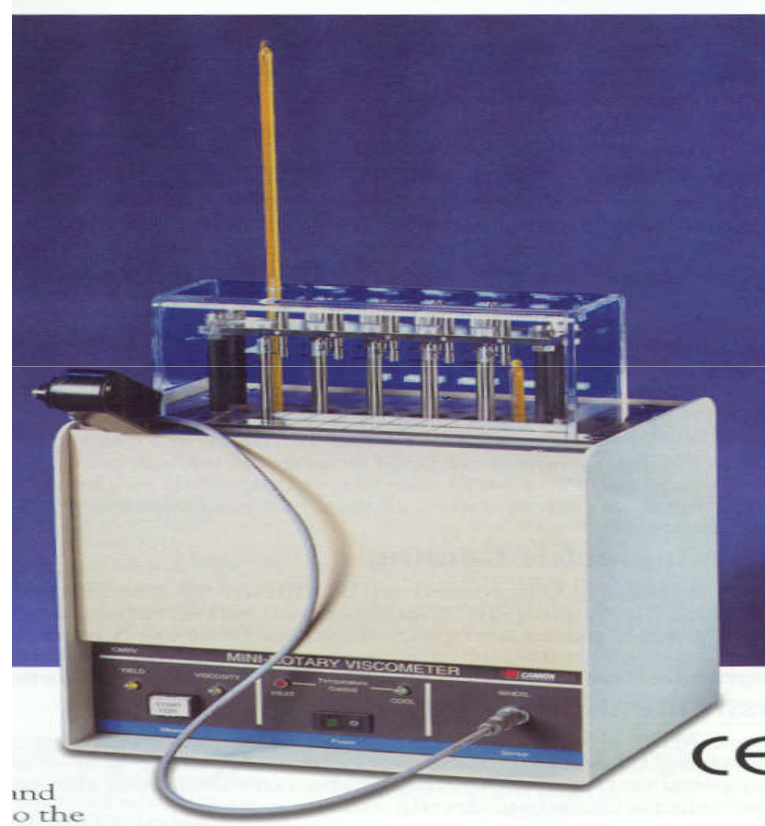
CCS @ -20°C



CCS @ -20°C

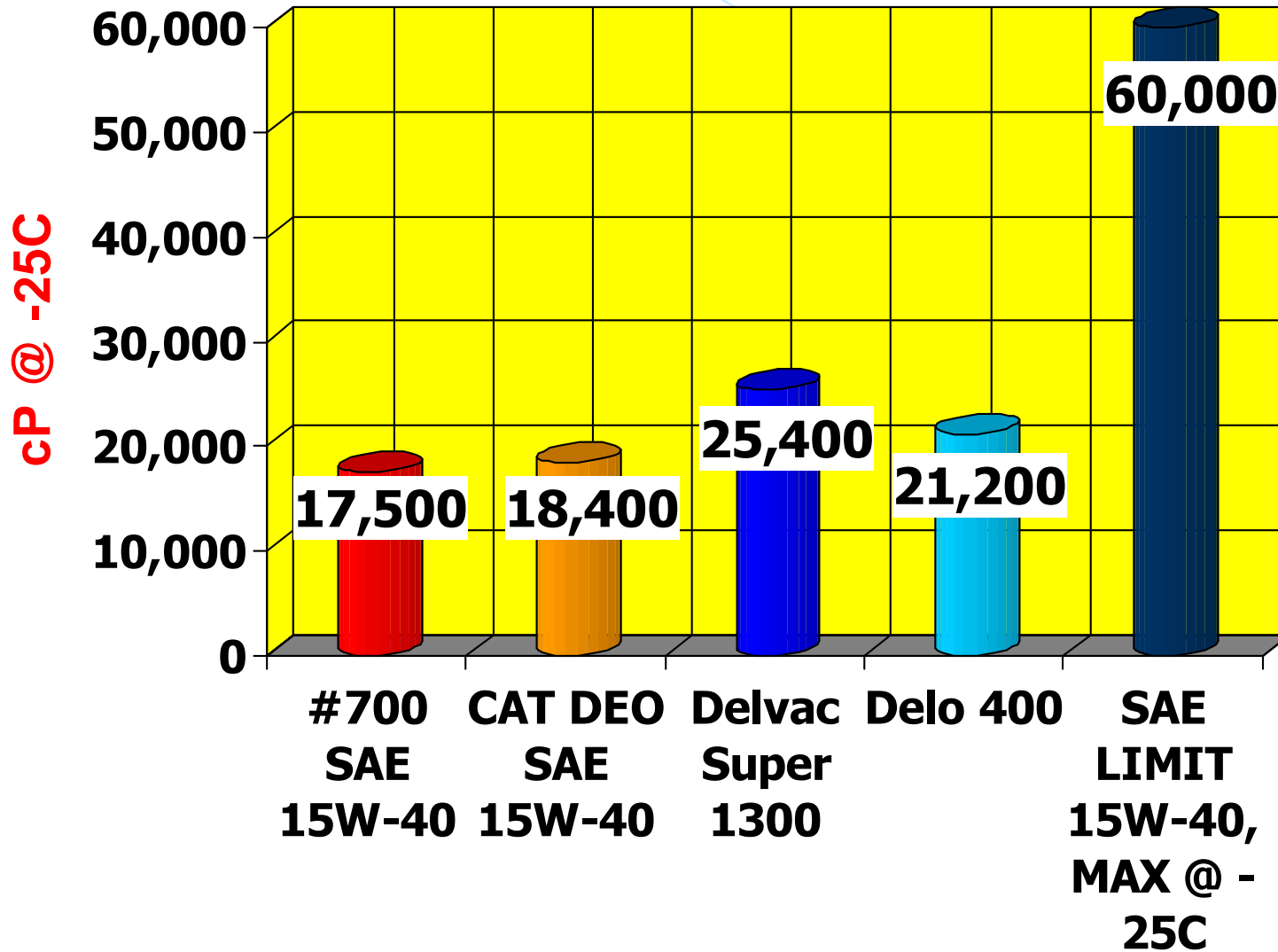


MRV TP-1 ENGINE OIL PUMPABILITY (ASTM D4684) TEST RESULTS

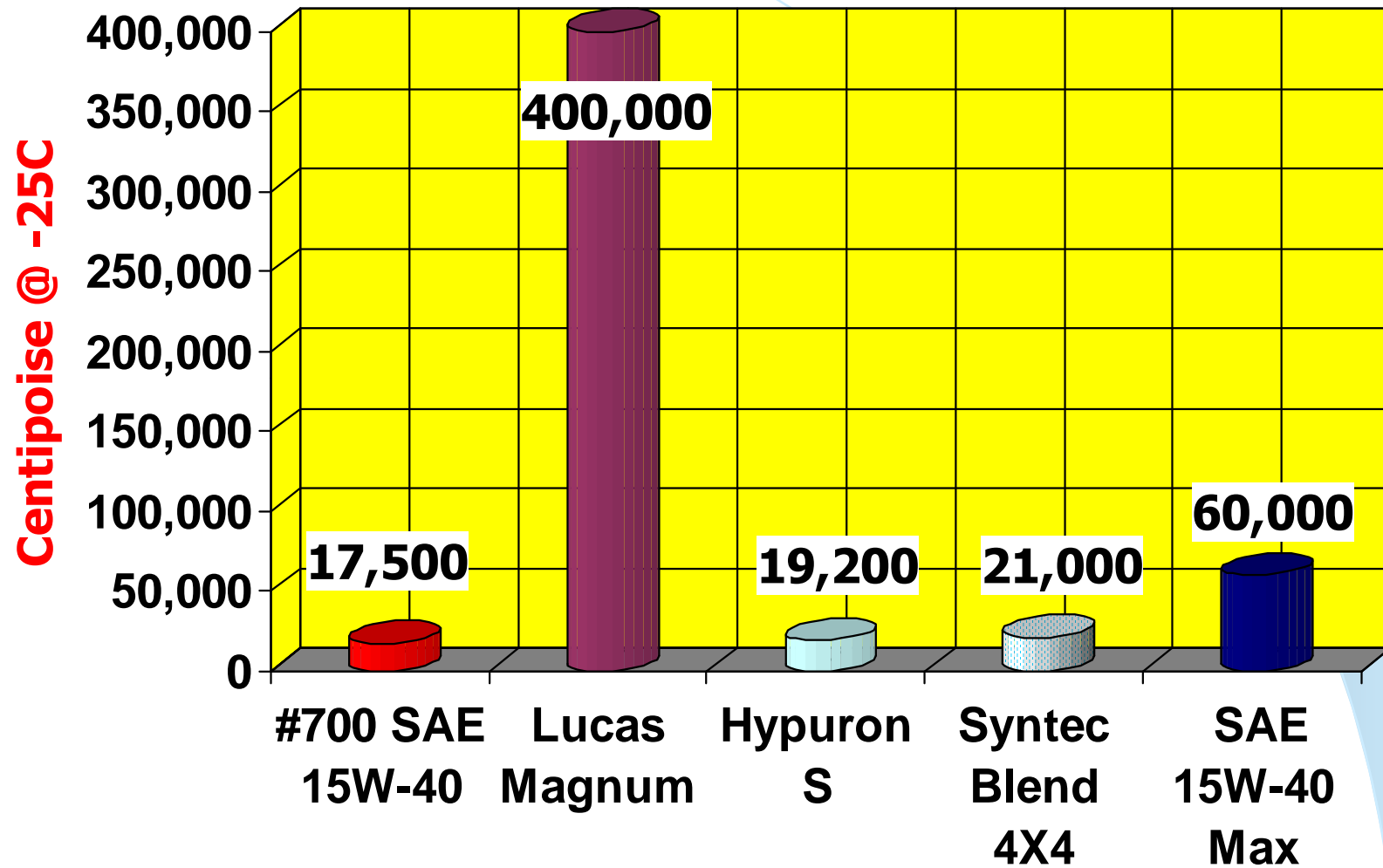


**MRV TP-1 Engine Oil Pumpability Test results
from independent testing of commercially obtained samples.**

MRV VISCOSITY @ -25°C



MRV VISCOSITY @ -25°C

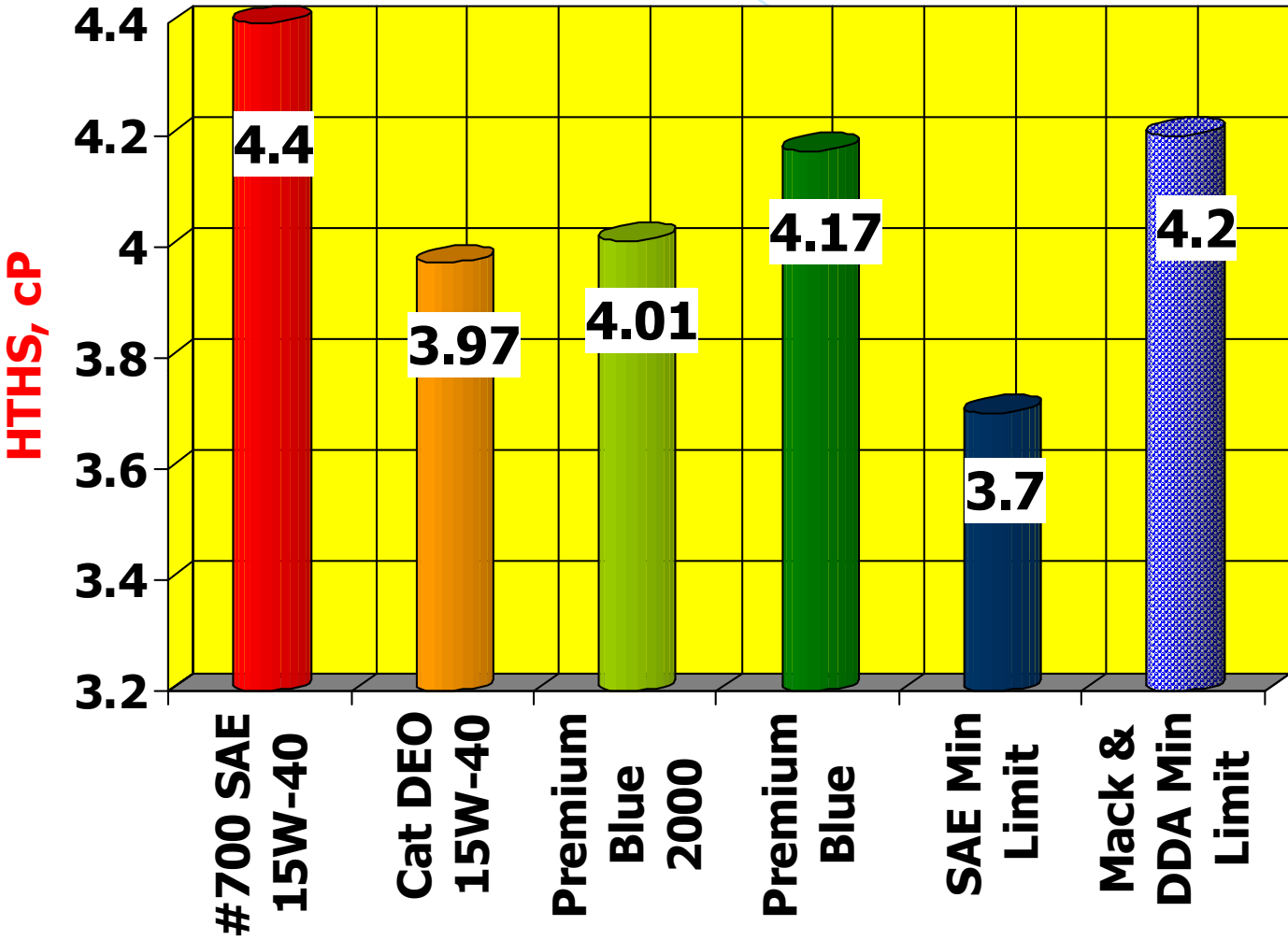


HIGH TEMPERATURE HIGH SHEAR VISCOSITY ASTM D-4683

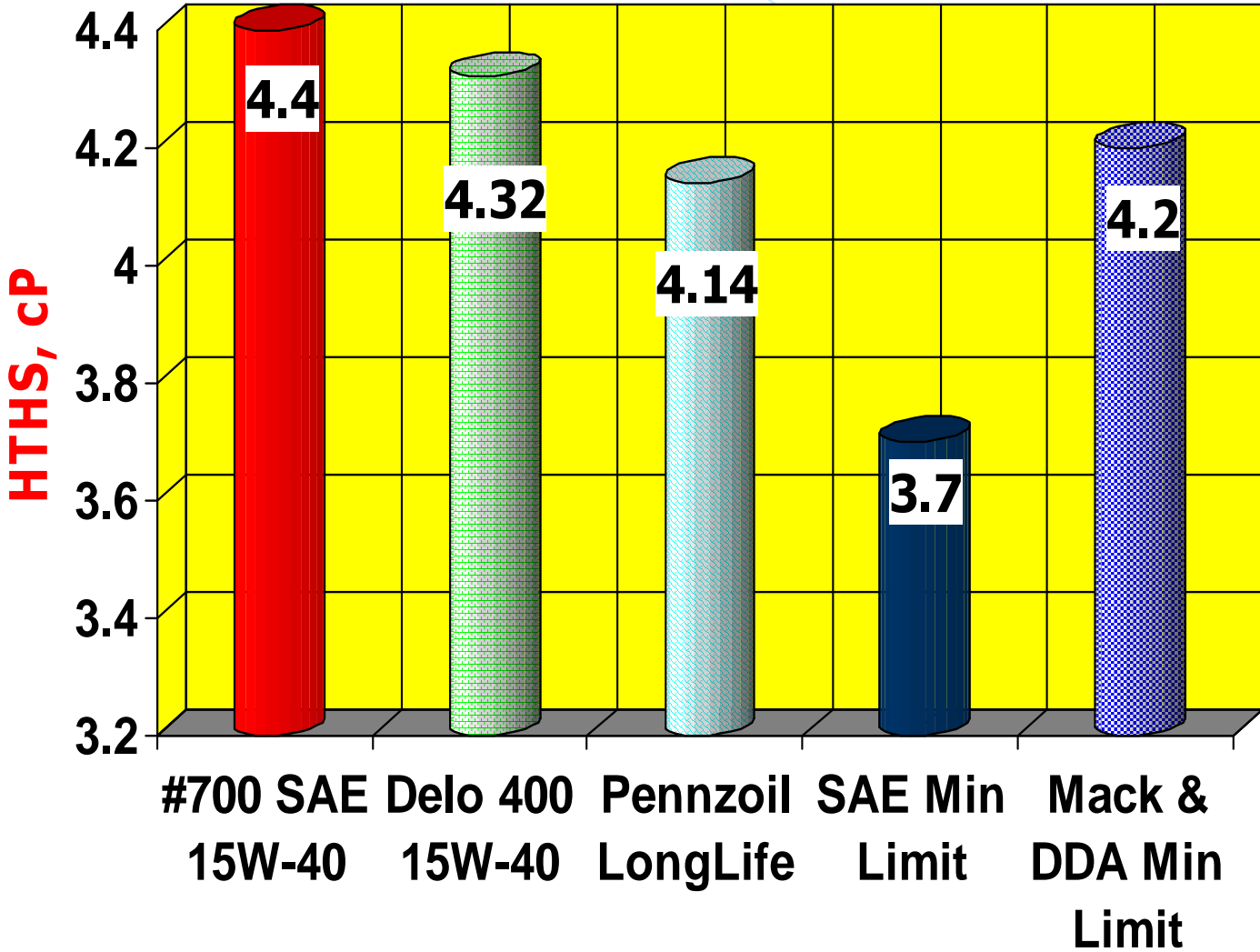
- ❖ **To insure that SAE 15W-40 engine oils provide the proper viscosity in order maintain engine durability in high load, severe service applications, the SAE and different OEMs have set the following minimum high temperature high shear rate viscosity limits.**

SAE 15W-40 Limit	3.7 minimum
Mack EO-N Premium Plus-03	4.2 minimum
Detroit Diesel Power Guard	4.2 minimum

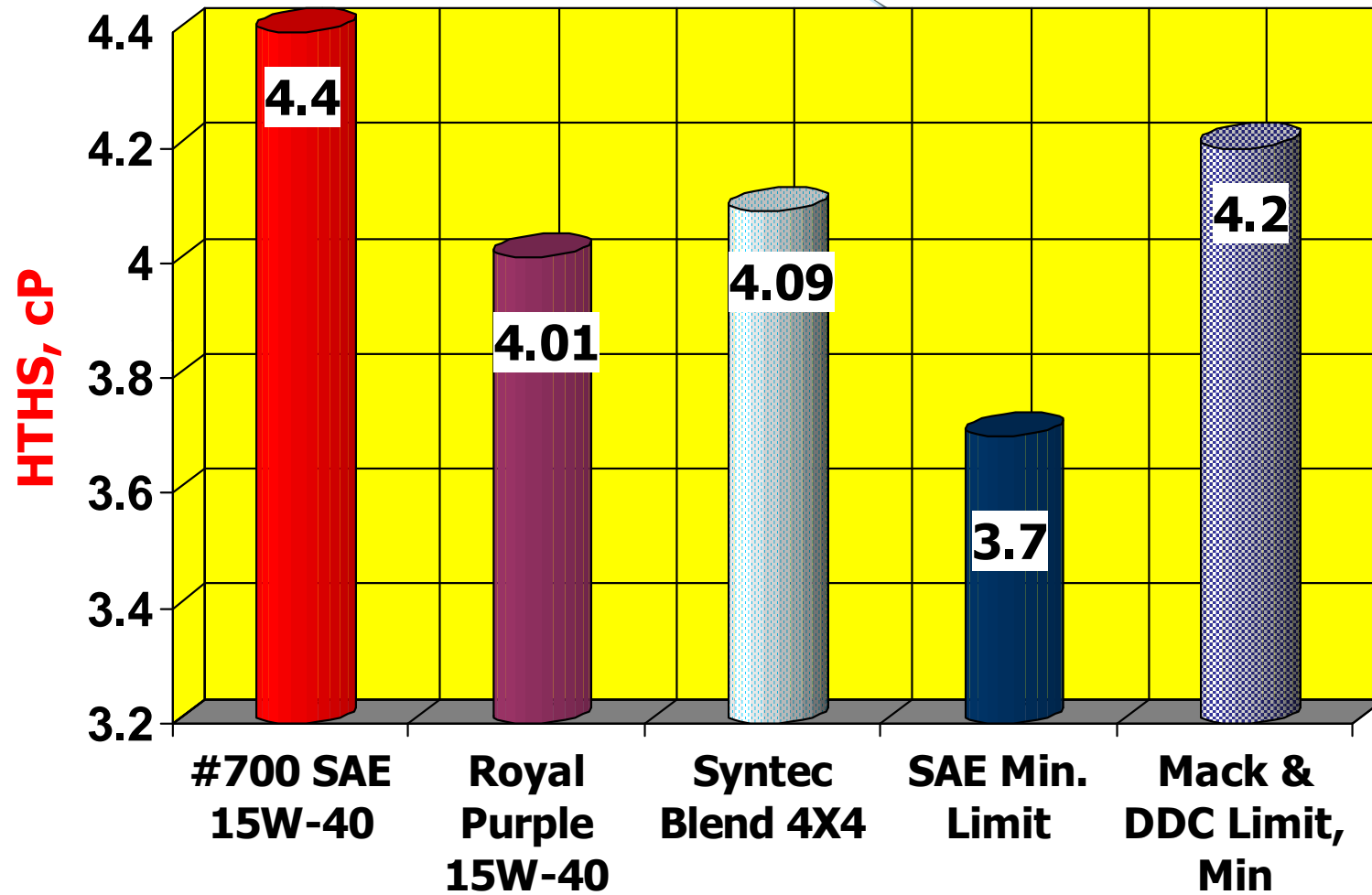
INCREASED HIGH TEMPERATURE HIGH SHEAR PROTECTION



INCREASED HIGH TEMPERATURE HIGH SHEAR PROTECTION



INCREASED HIGH TEMPERATURE HIGH SHEAR PROTECTION



#700 SUPREME 7000 SAE 15W-40 EXHIBITS IMPROVED SHEAR STABILITY VS. THE COMPETITION

Orbahn Shear Test results from independent testing of commercially obtained samples.

PRODUCT	cSt @ 100°C Unsheared	cSt @ 100°C Sheared	Viscosity Loss (%)
#700 Supreme 7000 SAE 15W- 40	15.35	13.83	9.90%
Cat DEO SAE 15W-40	13.61	12.27*	9.85%
Valvoline Premium Blue 2000	14.50	12.31*	15.10%

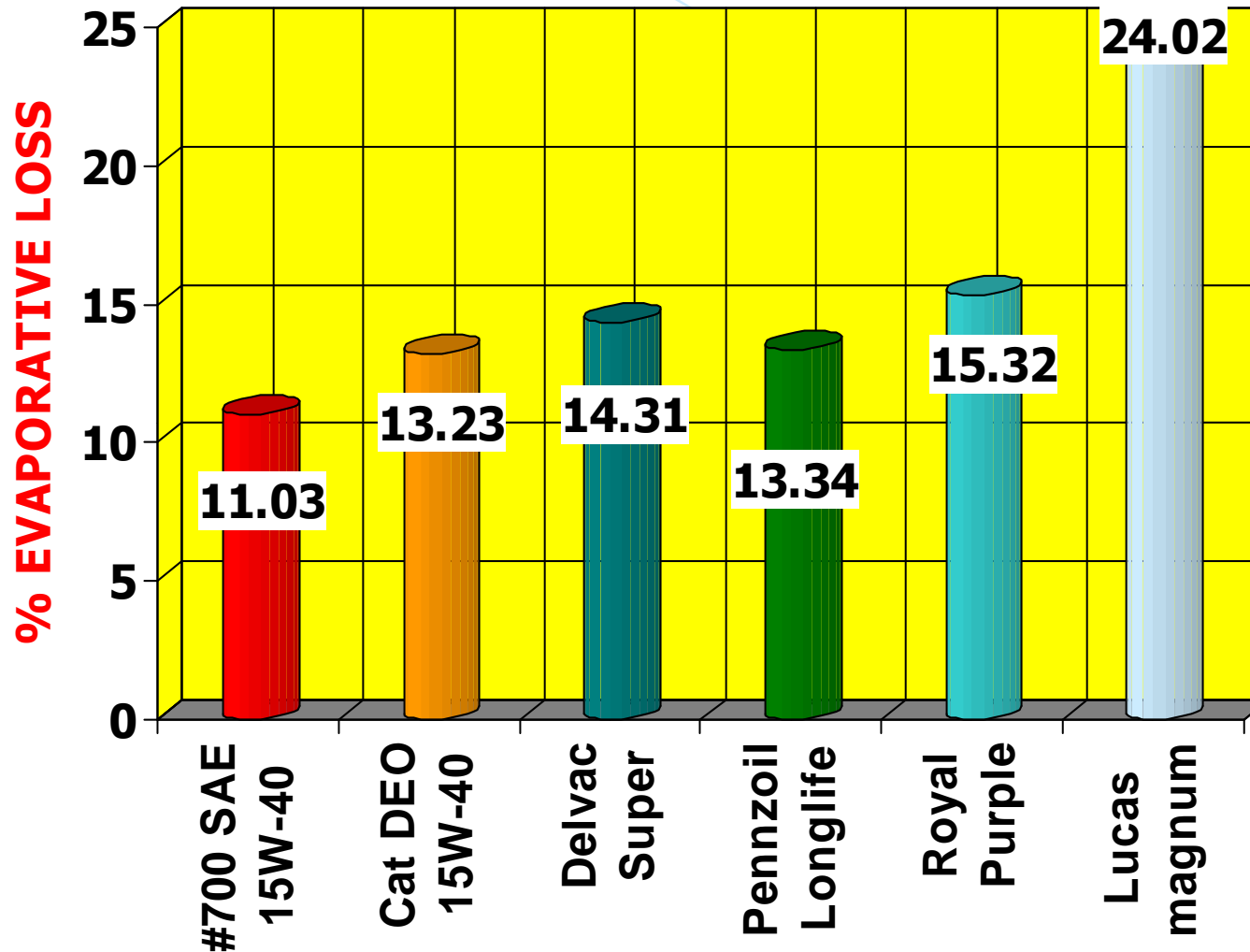
#700 SUPREME 7000 SAE 15W-40 EXHIBITS IMPROVED SHEAR STABILITY VS. THE COMPETITION

Product	cSt @ 100°C Unsheared	cSt @ 100°C Sheared	Viscosity Loss (%)
Chevron Delo 400	15.18	13.35	15.21%
Shell Rotella T SAE 15W-40	15.62	13.74	12.40%
Royal Purple 15W-40	14.57	12.06*	17.23%
Lucas Magnum 15W-40	16.28	13.99	14.07%
Castrol Syntec 4X4	14.90	12.50*	16.11%
Citgo Citgard 600	15.60	12.49*	19.94%

A decorative graphic consisting of a thin light blue curved line starting from the top left and extending towards the center, and a larger, thicker light blue curved shape on the right side that tapers towards the bottom right.

VOLATILITY CHARACTERISTICS
NOACK VOLATILITY ASTM D-5800

UP TO 54% LESS VOLATILITY THAN COMPETITIVE ENGINE OILS



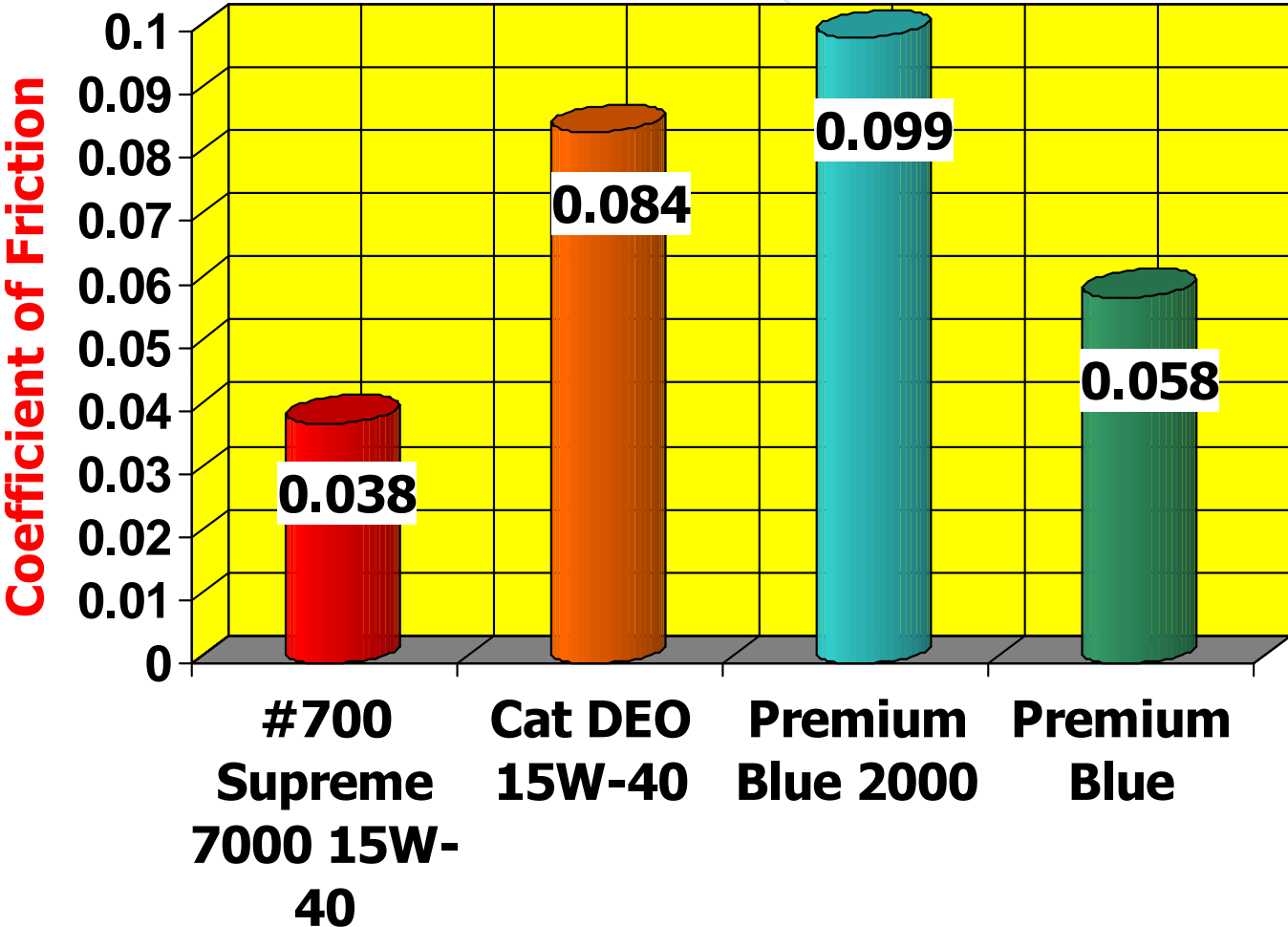
CI-4 Plus Limit – 15% Maximum

CI-4 Plus/Mack/Detroit Diesel – 13% Maximum

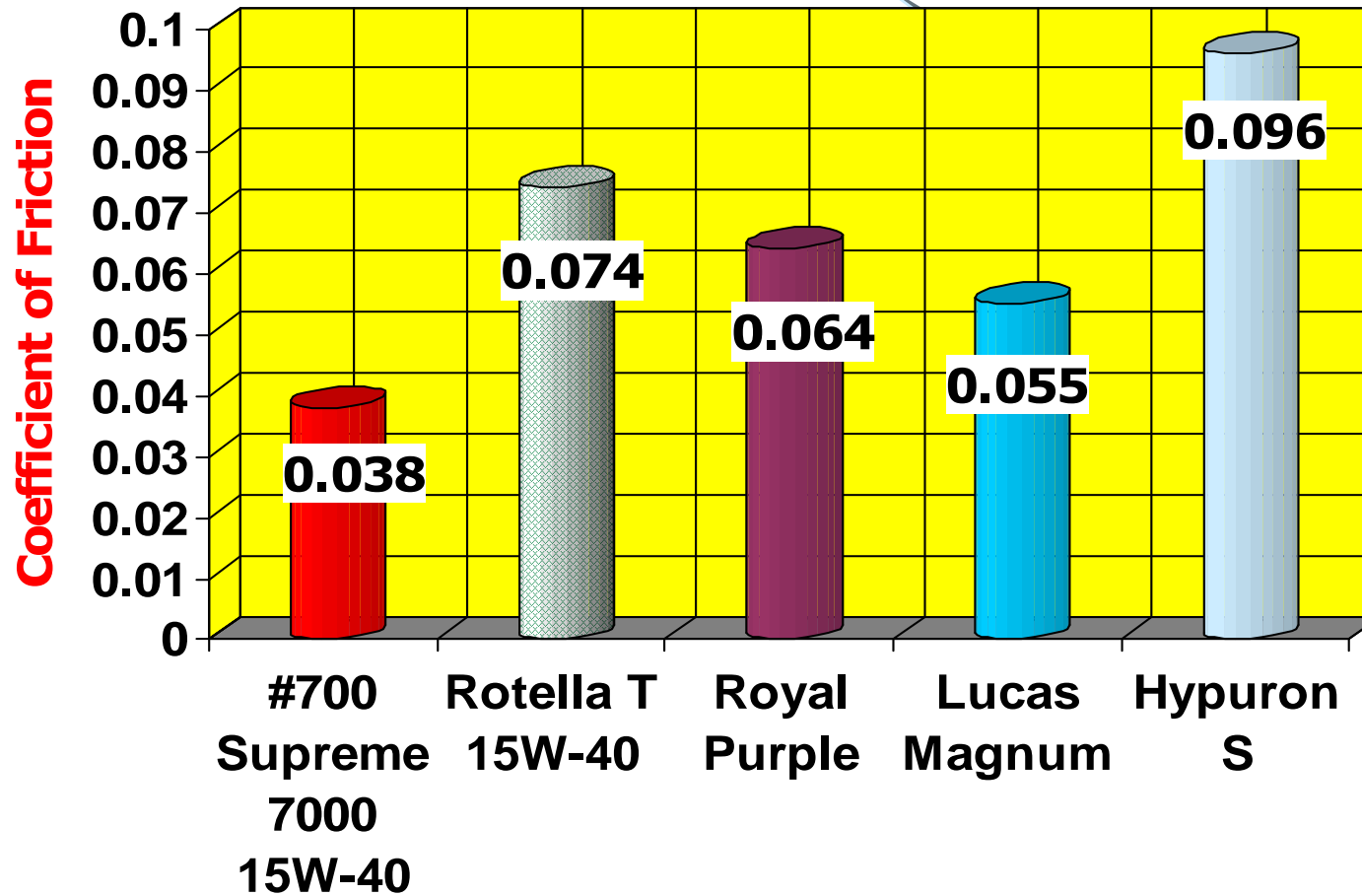
A decorative graphic element consisting of a thin light blue curved line starting from the top left and extending towards the center. From the center, a darker blue wedge-shaped area expands outwards to the right, ending in a vertical light blue bar on the far right edge.

**INCREASED WEAR PROTECTION
WITH MICRON MOLY[®]
AND PENETRO[®]**

45% to 63% GREATER PROTECTION AGAINST FRICTIONAL DRAG AND WEAR



45% to 63% GREATER PROTECTION AGAINST FRICTIONAL DRAG AND WEAR



INCREASED SOOT PROTECTION

- ❖ **Non-EGR engines have always introduced abrasive soot into the engine.**
- ❖ **With the addition of EGR even more soot is being introduced into the engine oil resulting in higher related wear and increases in the engine oil's viscosity due to thickening.**
- ❖ **Schaeffer's #700 Supreme 7000 SAE 15W-40 and #9000 Supreme 9000 SAE 5W-40's all calcium based detergent chemistry and unique dispersant chemistry provides a Margin of Safety that provides a greater degree of freedom against abrasive soot wear, viscosity thickening and deposits.**

CALCIUM BASED DETERGENCY VS. MAGNESIUM BASED DETERGENCY

- ❖ **Calcium Based Detergents have been found to neutralize acidic compounds and maintain their acid neutralization capabilities more effectively than Magnesium Based Detergents.**
- ❖ **Magnesium Based Detergents do not fully neutralize any weak acids that have been formed by the combustion of the diesel fuel.**
- ❖ **Magnesium Based Detergency is primarily used in passenger car engine oil formulations to allow these oils to pass the various engine sequence tests used to measure wear protection.**

CALCIUM BASED DETERGENCY VS. MAGNESIUM BASED DETERGENCY

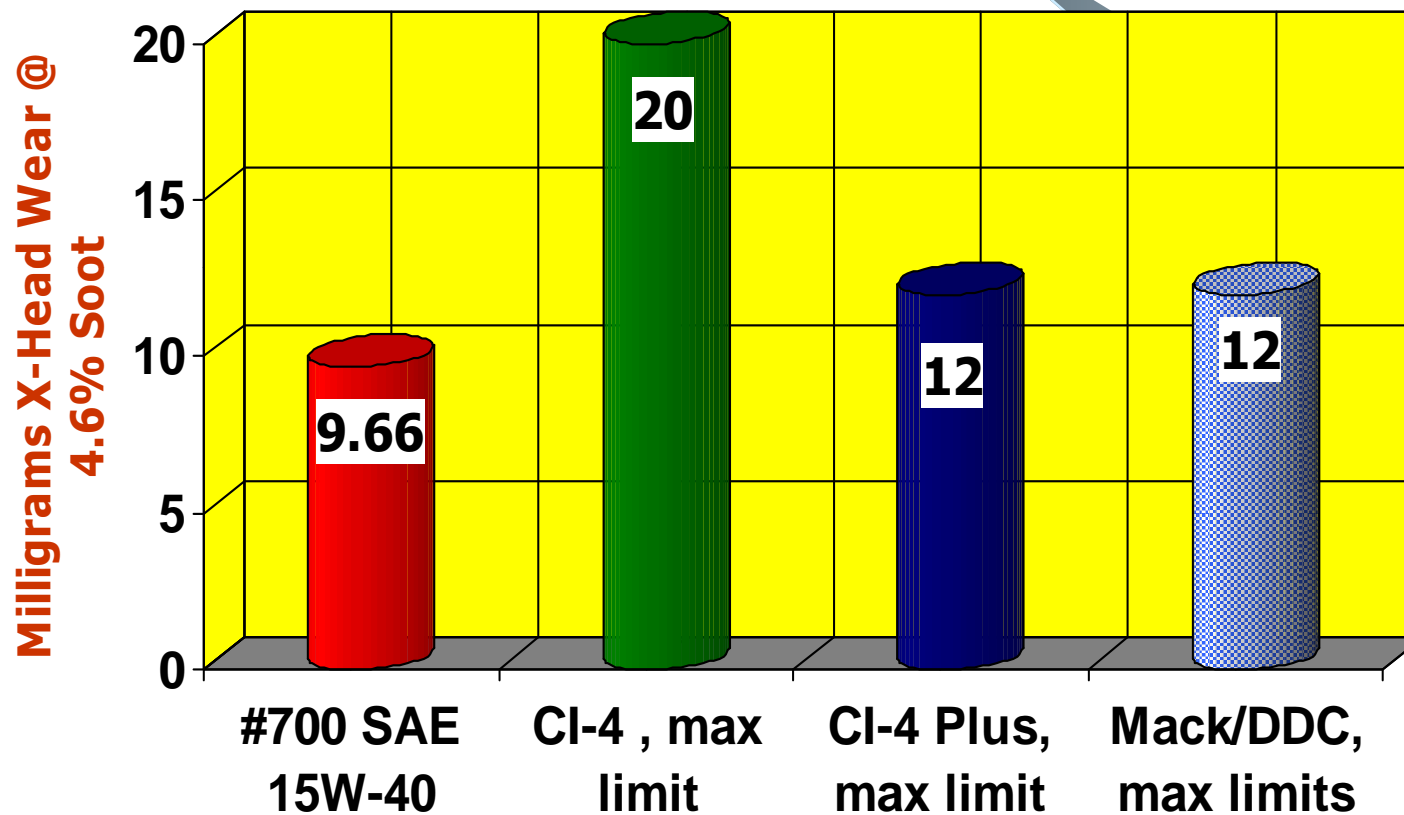
- ❖ **Magnesium Based Detergents result in higher wear in the piston ring-belt area of the engine.**
- ❖ **Magnesium Based Detergents form Magnesium Oxide (MgO) as a by-product of the neutralization reaction. Magnesium Oxide is hard in consistency and can abrade and polish the cylinder walls.**
- ❖ **Calcium Based Detergents form Calcium Sulfate as a by-product of the neutralization reaction. Calcium Sulfate is soft, fluffy in consistency and is oil soluble.**

CALCIUM BASED DETERGENCY VS. MAGNESIUM BASED DETERGENCY

- ❖ **Calcium Based Detergents enhance a diesel engine oil's ability to provide excellent high temperature piston cleanliness.**
- ❖ **Calcium Based Detergents provide excellent protection against bore polishing.**
- ❖ **Calcium Based Detergents have been found to provide superior protection against deposit formation, bore polishing, and soot control in engine sequence tests that employ the use of EGR systems.**

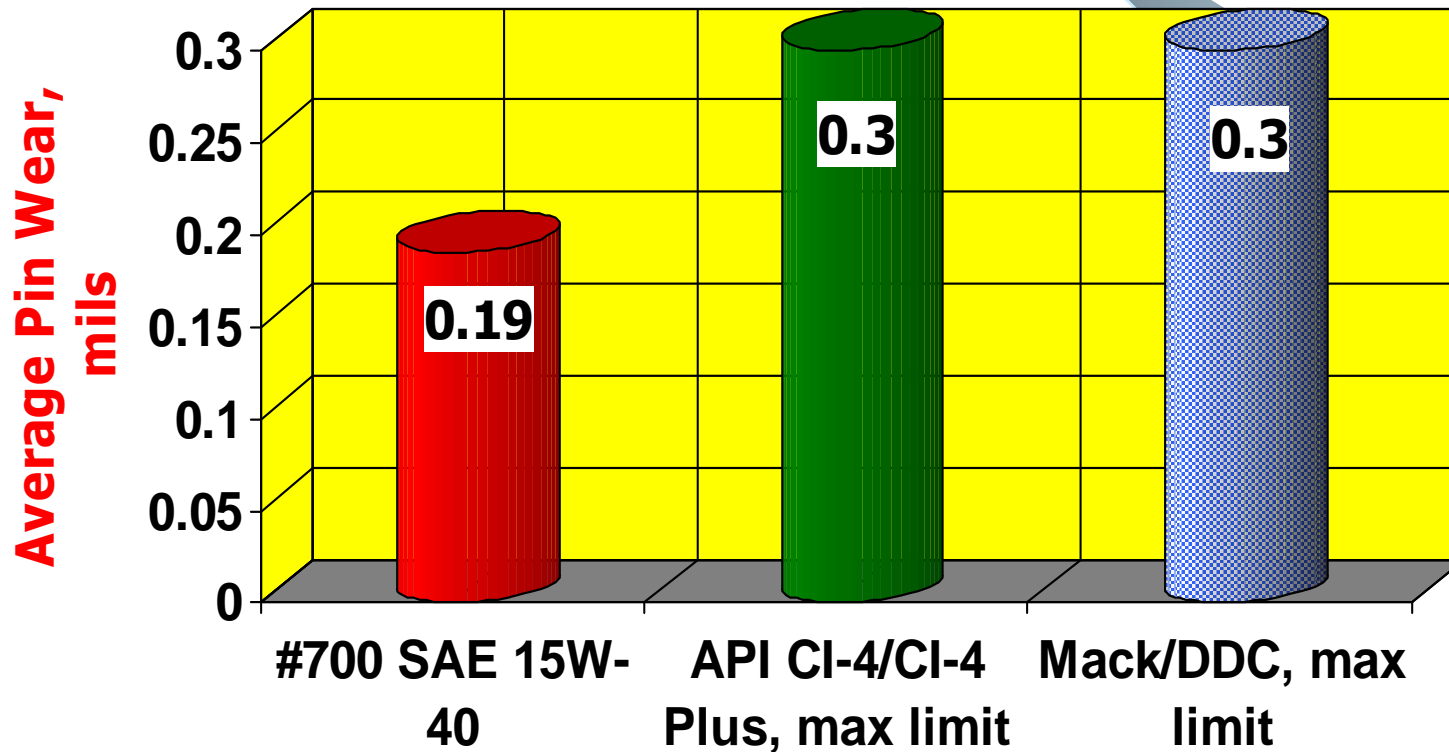
19% to 52% BETTER PROTECTION AGAINST SOOT INDUCED CROSSHEAD WEAR

CUMMINS M11EGR



51% BETTER PROTECTION AGAINST ABRASIVE SOOT WEAR

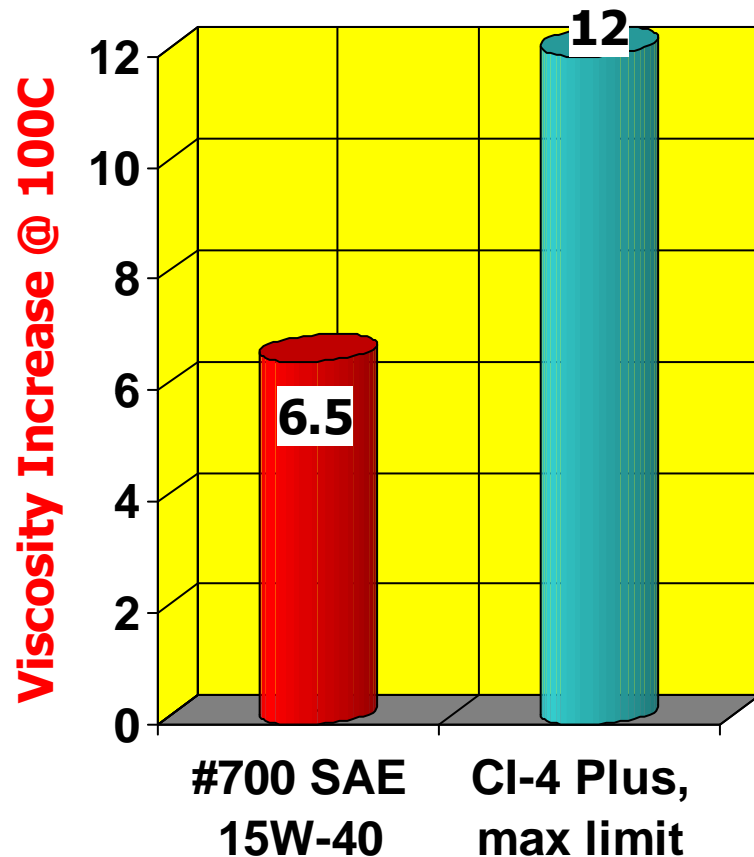
GM 6.5L Roller Follower Wear Test ASTM D-5966



PROTECTION AGAINST SOOT INDUCED VISCOSITY THICKENING

- ❖ **Levels as high as 6% soot are being experienced in the field.**
- ❖ **High soot levels have resulted in significant increases in engine oil viscosity. This results in the lack of proper lubricant flow and poor oil pumpability, especially during low temperature operating conditions.**

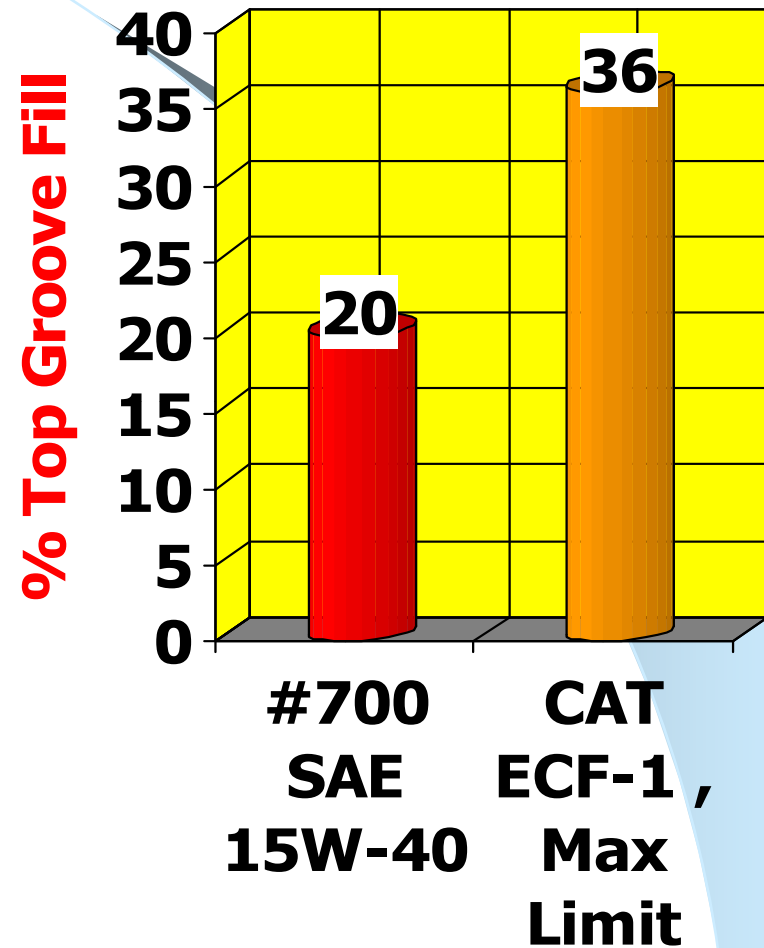
46% INCREASED PROTECTION AGAINST SOOT INDUCED VISCOSITY INCREASE



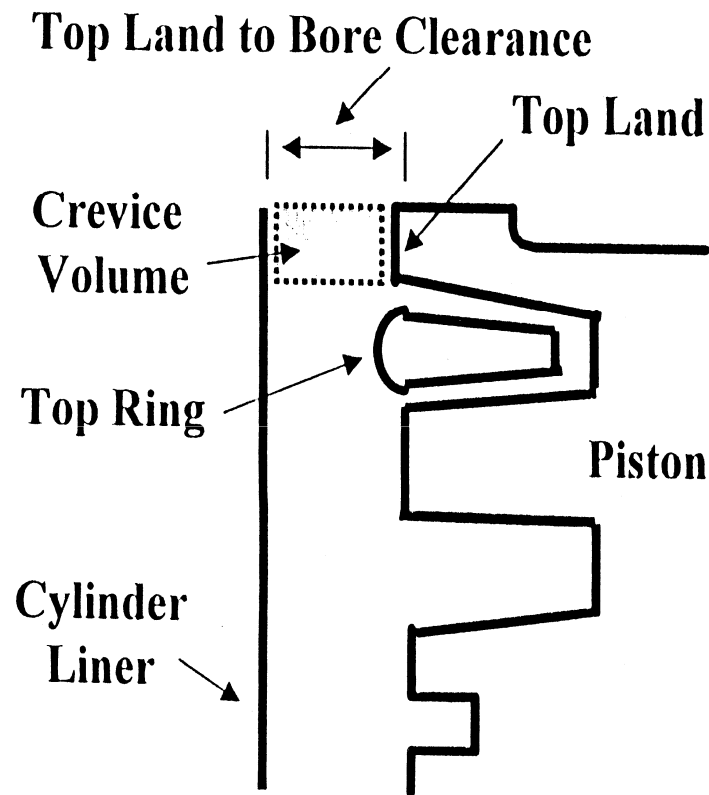
- ❖ The Mack T-11 Test is used to measure an engine oil's viscosity control performance at elevated soot levels.
- ❖ To meet the requirements of API CI-4 Plus, Mack's EO-N-03 Premium Plus Specification and Detroit Diesel's Power Guard the oil must exhibit an increase in viscosity no greater than 12.0 centistokes in the 300-hour test.

44% INCREASED PROTECTION AGAINST PISTON DEPOSIT FORMATION

- ❖ **The Caterpillar 1P SCOTE**
Test is an engine sequence test used as part of the CAT ECF-1 Specification. It measures a diesel engine oil's ability to protect against piston deposits.
- ❖ **The Caterpillar 1-P evaluates** the engine oil's ability to minimize piston deposits on those engines that employ the use of articulated two piece pistons with a forged steel crown and an aluminum skirt.



PROTECTION AGAINST BORE POLISHING



Note: Figure Not to Scale

- ❖ **Bore polishing occurs when deposits form on the top land and polish the cylinder liner much like sand paper.**
- ❖ **This polishing removes the honing lines on the cylinder walls resulting in excessive oil consumption.**
- ❖ **Many engine designs used to improve emissions have resulted in a reduction in the land to bore clearance and crevice volume.**

65% INCREASED PROTECTION AGAINST BORE POLISHING

