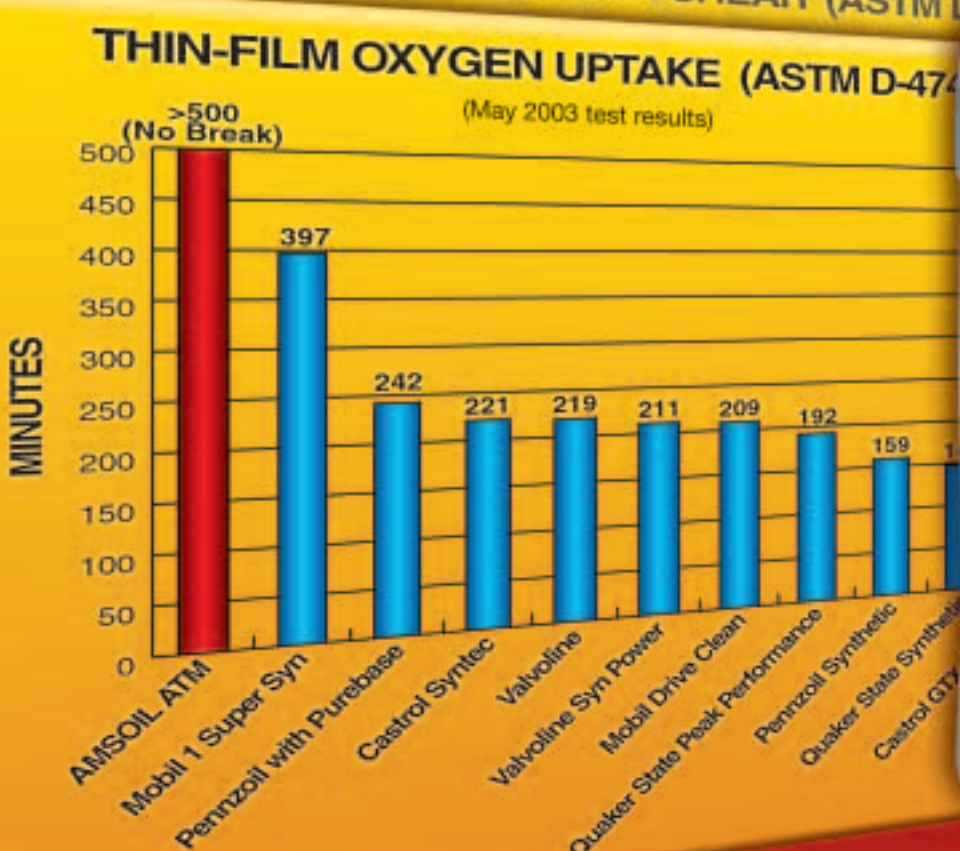




The First in Synthetics®

# Comparative Motor Oil Testing

FOUR-BALL WEAR (ASTM D-4172)  
COLD CRANKING VISCOSITY (ASTM D-5293)  
TOTAL BASE NUMBER (ASTM D-2896)  
POUR POINT (ASTM D-97)  
NOACK VOLATILITY (ASTM D-5800)  
HIGH TEMPERATURE / HIGH SHEAR (ASTM D-4059)



# Motor Oil Testing

AMSOIL Synthetic 10W-30 Motor Oil (ATM) and 10 competing conventional and synthetic 10W-30 motor oils were subjected to a series of motor oil tests. The competing oils included petroleum-based Castrol GTX Drive Hard, Mobil Drive Clean, Pennzoil with Purebase, Quaker State Peak Performance and Valvoline, as well as synthetic-based Valvoline Synpower, Quaker State, Castrol Syntec, Pennzoil and Mobil 1 SuperSyn Multi-Vehicle.

## Motor Oils Tested

AMSOIL ATM (Synthetic)  
Castrol GTX Drive Hard (Petroleum)  
Valvoline Synpower (Synthetic)  
Mobil Drive Clean (Petroleum)  
Pennzoil with Purebase (Petroleum)  
Quaker State (Synthetic)  
Quaker State Peak Performance (Petroleum)  
Castrol Syntec (Synthetic)  
Valvoline (Petroleum)  
Pennzoil (Synthetic)  
Mobil 1 SuperSyn Multi-Vehicle (Synthetic)

## Test Areas

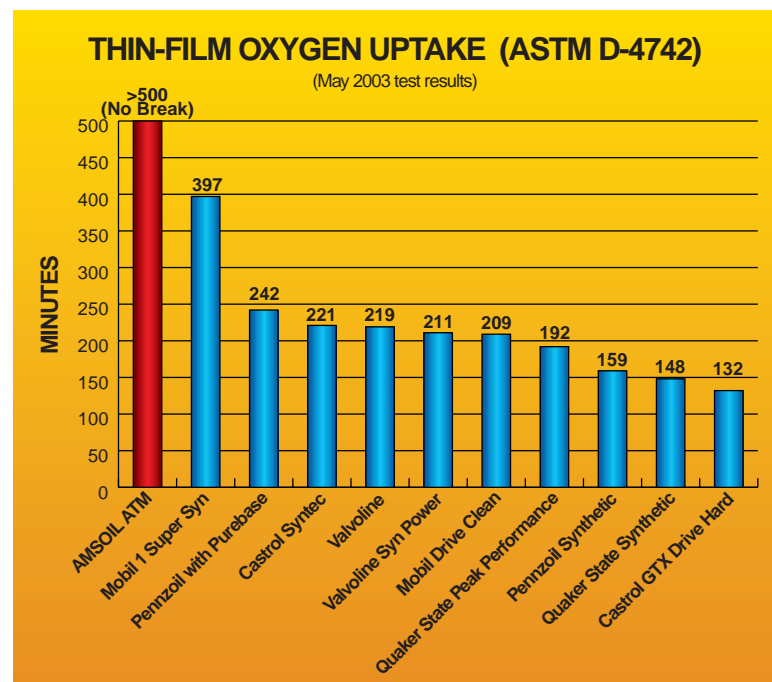
Thin-Film Oxygen Uptake (ASTM D-4742)  
High Temperature/High Shear (ASTM D-4683)  
NOACK Volatility (ASTM D-5800)  
Pour Point (ASTM D-97)  
Total Base Number (ASTM D-2896)  
Cold Cranking Simulator (ASTM D-5293)  
Four-Ball Wear (ASTM D-4172)

Seven tests were run on the motor oils. The Thin-Film Oxygen Uptake Test (TFOUT) measures the oxidation stability of engine oils. The High Temperature/High Shear Test (HTHS) measures a lubricant's viscosity under severe operating conditions. The NOACK Volatility Test measures the evaporation loss of oils in high temperature service. Pour Point indicates the lowest temperature at which a fluid will flow. Total Base Number (TBN) is the measurement of a lubricant's reserve alkalinity for combating acids. The Cold Cranking Simulator Test (CCS) measures a lubricant's viscosity at low temperatures and high shear rates. The Four-Ball Wear Test measures a lubricant's wear protection properties. The impressive test results show AMSOIL Synthetic 10W-30 Motor Oil outperformed the competitors in each test.

## Thin-Film Oxygen Uptake (ASTM D-4742)

The Thin-Film Oxygen Uptake Test evaluates the oxidation stability of lubricating oils. A mixture of the test oil and chemistries found in gasoline engine operation (oxidized/nitrated fuel, soluble metals and distilled water) are placed in a test vessel, which is pressurized with oxygen and placed in a heated bath. Anti-oxidant breakdown is evident when the oxygen pressure in the vessel rapidly decreases. At this point, the induction time (break point) of the oil is recorded. As shown in the graph, AMSOIL Synthetic 10W-30 Motor Oil had the highest induction time of all the tested oils. In fact, it didn't reach its break point in over 500 minutes of testing.

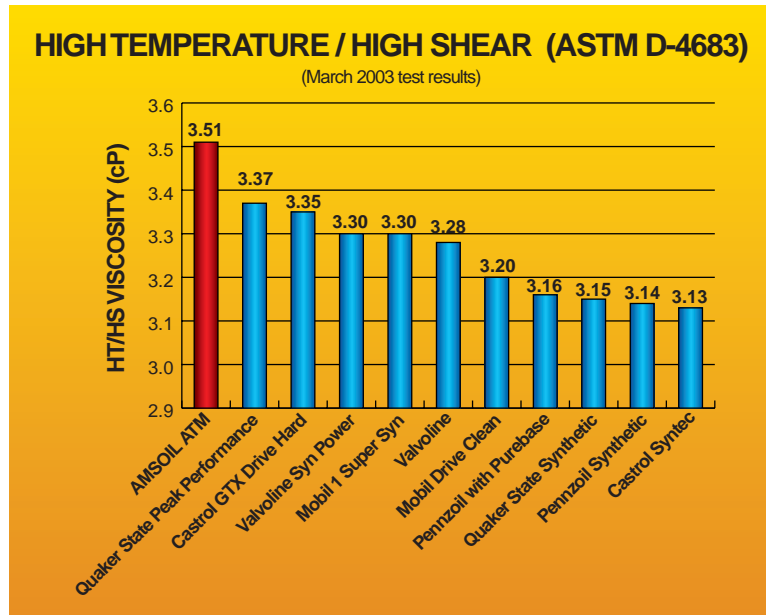
The superior oxidation stability of AMSOIL Synthetic 10W-30 Motor Oil allows it to effectively resist the formation of engine deposits and sludge, keeping engines running clean and efficient and extending oil life. It also resists thickening, maintaining its superior wear protection and lubricating properties and maximizing fuel efficiency.



# High Temperature/High Shear (ASTM D-4683)

The High Temperature/High Shear Test measures a lubricant's viscosity under severe high temperature and shear conditions that resemble highly-loaded journal bearings in fired internal combustion engines. In order to prevent bearing wear, it is important for a lubricant to maintain its protective viscosity under severe operating conditions. The minimum High Temperature/High Shear viscosity for a 30 weight oil is 2.9 cP. As shown in the graph, AMSOIL Synthetic 10W-30 Motor Oil surpasses this minimum standard and displayed the highest High Temperature/High Shear viscosity in the group.

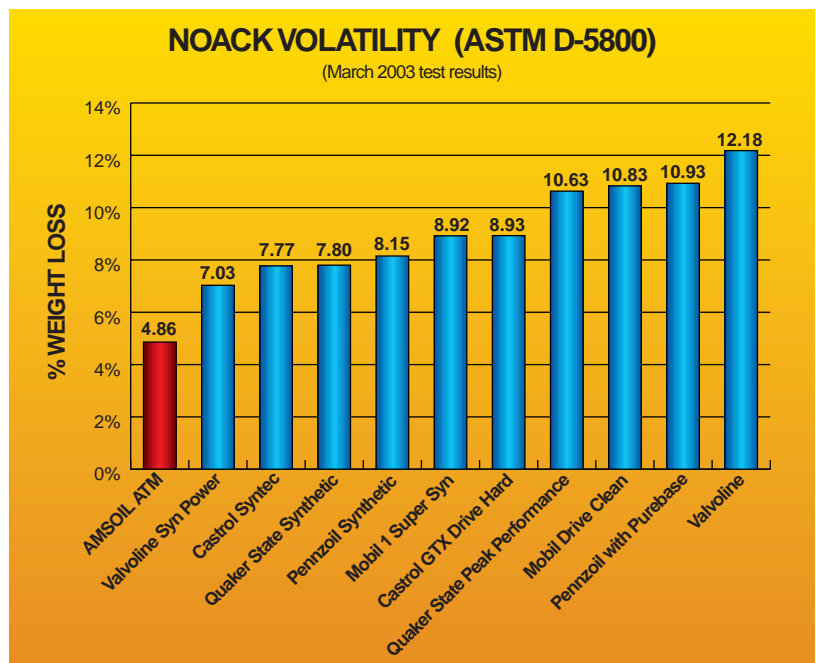
The superior viscosity retention of AMSOIL Synthetic 10W-30 Motor Oil in the face of severe temperature and shear conditions allows it to provide continuous, unsurpassed protection for engine bearings, extending equipment life and preventing wear.



# NOACK Volatility (ASTM D-5800)

The NOACK Volatility Test determines the evaporation loss of lubricants in high temperature service. The more motor oils vaporize, the thicker and heavier they become, contributing to poor circulation, reduced fuel economy and increased oil consumption, wear and emissions. A maximum of 15 percent evaporation loss is allowable to meet API SL and ILSAC GF-3 specifications. As shown in the graph, AMSOIL 10W-30 Synthetic Motor Oil outperformed its nearest competitor by over 30 percent.

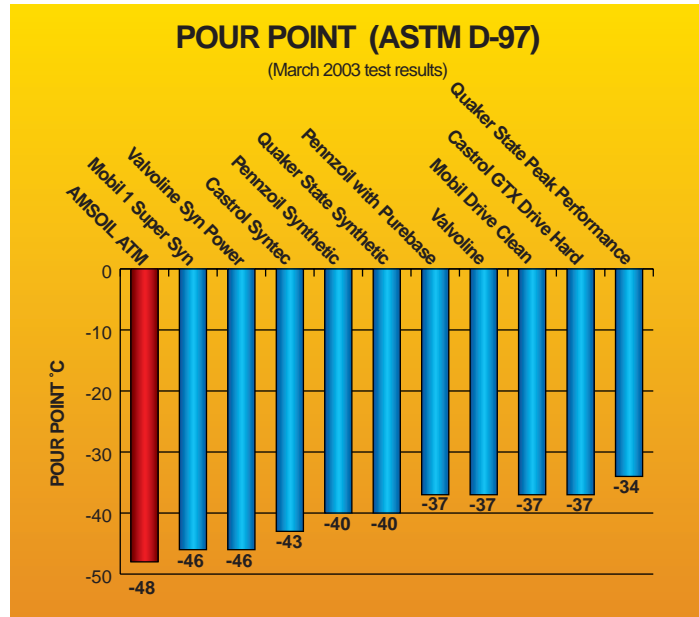
The extremely low volatility of AMSOIL Synthetic 10W-30 Motor Oil allows it to maintain its superior protective and performance qualities throughout extended drain intervals, even when faced with severe operating temperatures. In addition, oil consumption and emissions are minimized and fuel efficiency is maximized.



# Pour Point (ASTM D-97)

The Pour Point Test determines the lowest temperature at which a lubricant will flow when cooled under prescribed conditions. The lower a lubricant's pour point, the better protection it provides in low temperature service. As shown in the graph, AMSOIL Synthetic 10W-30 Motor Oil has the lowest pour point of the tested oils.

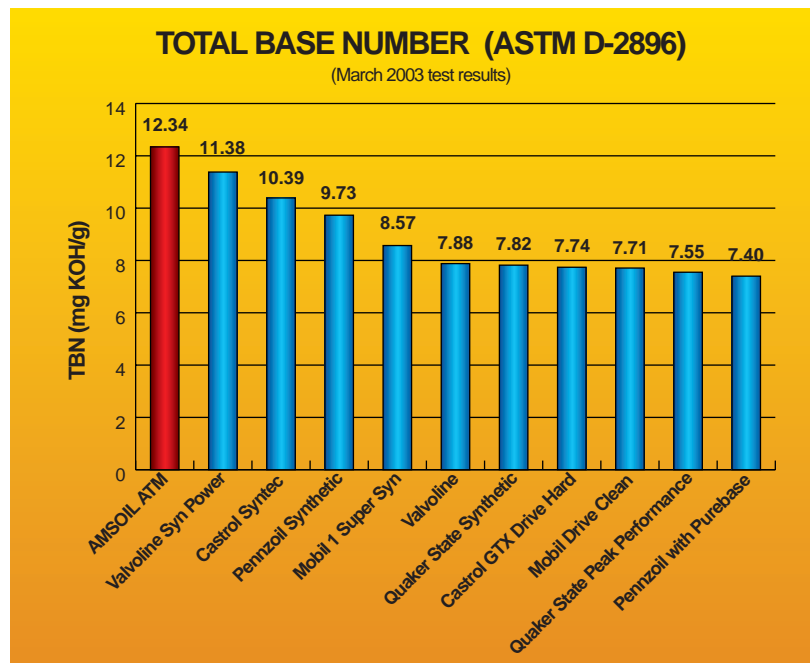
The low pour point of AMSOIL 10W-30 Synthetic Motor Oil allows it to maintain its fluidity in extremely low temperatures, reducing drag on moving vehicle parts, providing critical engine components with quick, essential lubrication and easing startup in cold temperatures. Wear is greatly reduced and equipment life is extended.



# Total Base Number (ASTM D-2896)

Total Base Number (TBN) is the measurement of a lubricant's reserve alkalinity, which aids in the control of acids formed during the combustion process. The higher a motor oil's TBN, the more effective it is in suspending wear-causing contaminants and reducing the corrosive effects of acids over an extended period of time. As shown in the graph, AMSOIL Synthetic 10W-30 Motor Oil has the highest TBN of the tested oils.

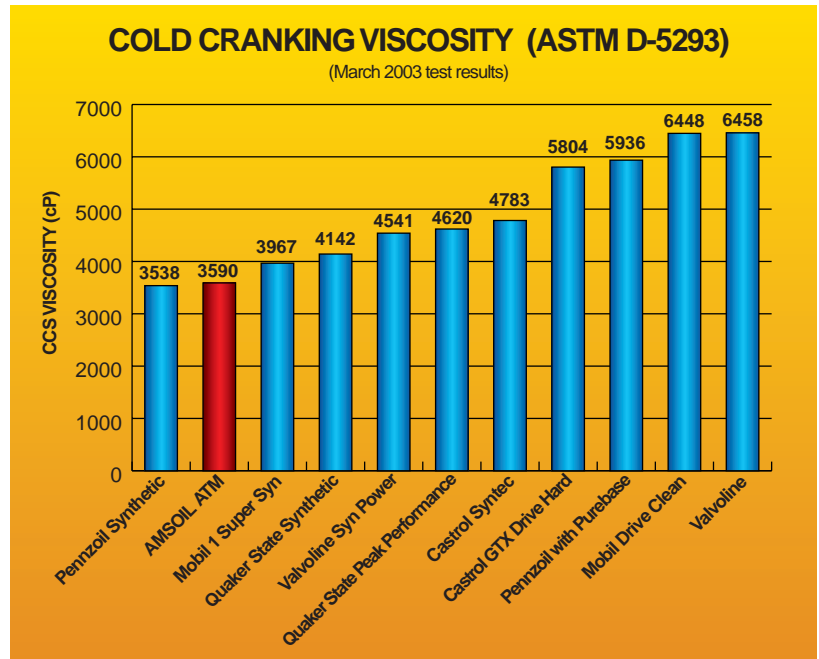
The high TBN of AMSOIL Synthetic 10W-30 Motor Oil allows it to effectively combat wear-causing contaminants and acids, providing superior protection and performance over extended drain intervals.



# Cold Crank Simulator (ASTM D-5293)

The Cold Crank Simulator Test determines the apparent viscosity of lubricants at low temperatures and high shear rates. Viscosity of lubricants under these conditions is directly related to engine cranking and startability. The lower a lubricant's cold crank viscosity, the easier an engine will turn over in cold temperatures. 10W motor oils are tested at -25°C and must have a viscosity below 7000 cP to pass. As shown in the graph, AMSOIL Synthetic 10W-30 Motor Oil is well below the maximum requirement, while many of the competing oils barely pass.

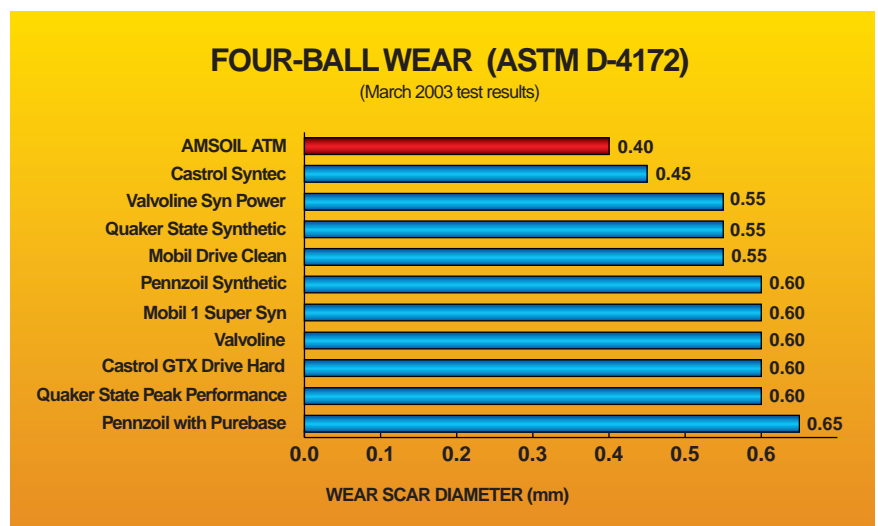
The low cold crank viscosity of AMSOIL Synthetic 10W-30 Motor Oil reduces drag on moving engine parts and allows engines to achieve critical cranking speed in extremely frigid temperatures. Engines turn over quickly and dependably in the coldest winter temperatures.



# Four Ball Wear (ASTM D-4172)

The Four Ball Wear Test determines the wear protection properties of a lubricant. Three metal balls are clamped together and covered with the test lubricant, while a rotating fourth ball is pressed against them in sliding contact. This contact typically produces a wear scar, which is measured and recorded. The smaller the average wear scar, the better the wear protection provided by the lubricant. As shown in the graph, AMSOIL Synthetic 10W-30 Motor Oil produced the smallest wear scar of the tested lubricants.

AMSOIL Synthetic 10W-30 Motor Oil provides unsurpassed protection against engine wear. Equipment life is extended, and repairs, down-time and expenses are reduced.



# The Company of Firsts

## Over 30 Years of Innovation and Leadership

- **First** to develop an API rated 100 percent synthetic motor oil.
- **First** to introduce the concept of “extended drain intervals” with a recommended 25,000-mile/12-month drain interval.
- **First** U.S. company to utilize the NOACK volatility test as a standard of performance excellence.
- **First** to produce synthetic motor oils for diesel engines, racing engines, turbos and marine engines.
- **First** to introduce synthetic oils that legitimately contribute to improving fuel efficiency.
- **First** to manufacture synthetic gear lube for automotive use.
- **First** to manufacture a 100:1 pre-mix synthetic 2-cycle oil.
- **First** to manufacture a synthetic automatic transmission fluid for automotive use.

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