

Independent Tests Confirm the Superior Performance of Royal Purple®

Independent tests clearly document the power, protection and performance of Royal Purple® Motor Oil.

| | |
|------------|---|
| 400% | Greater Film Strength - Reduces Wear ¹ |
| 300 - 500% | Greater Oxidation Stability - Increases Oil Life ² |
| 1.5 - 3.0% | Increase in Engine Horsepower and Torque |
| 3 - 5% | Saves Fuel over Other "Energy Conserving" Oils |
| > 20% | Reduces Harmful Exhaust Emissions |
| Up to 12% | Reduces Engine Heat |

Summary of Tests -- Some data fields are blank because the data field was not a part of the original test criteria.

Data Source: Oklahoma State University - 2001

Description of Test: Brand Name 15W40 engine oil vs. Royal Purple® 15W40 on full chassis HD truck dynamometer⁴.

| Engine Type | Fuel Savings | Emissions Reductions | Performance Improvement |
|-------------|--------------|----------------------------------|-------------------------|
| Diesel | 4.4% | Smoke Opacity (SNAP Test) 22% | Horsepower 2.8% |

Data Source: North Carolina State University - July 2002

Description of Test: Brand Name "energy conserving" 10W30 motor oil vs. Royal Purple® 5W30 in 25 vehicle fleet test (North Carolina Highway Patrol).

| Engine Type | Fuel Savings | Emissions Reductions | Performance Improvement |
|-------------|--------------|----------------------|-------------------------|
| Gasoline | 2.5% | | |

Data Source: North Carolina State University - July 2002

Description of Test: CLR Research Engine Test (15W40 motor oils).

| | Engine Type | Fuel Savings | Emissions Reductions ³ | | |
|--|-------------|--------------------|-----------------------------------|-----------------|--------|
| | | | Soot | NO ₂ | CO |
| Royal Purple® vs. Brand Name mineral oil | Diesel | 3.68% @1200 RPM | 11.75% | 8.5% | 17.7% |
| | | 2.48% @1600 RPM | 17.58% | -6% | 21.0% |
| Royal Purple® vs. Premium synthetic oil | Diesel | 3.37% @1200 RPM | 4.3% | 7.2% | 28.15% |
| | | 1.48% @1600 RPM | 3.0% | same | 33.87% |

Data Source: North Carolina State University - July 2002

Description of Test: CLR Research Engine Test (5W30 "energy conserving" motor oils).

| | Engine Type | Fuel Savings | Emissions Reductions ³ |
|--|-------------|--|--|
| Royal Purple® vs. Brand Name mineral oil | Gasoline | 4.5% @1200 RPM 5.0% @1600 RPM | NO ₂ was over 50% lower @1200 RPM where complete combustion occurred. CO levels with Royal Purple® were low at all loads. Royal Purple® tended to prevent incomplete combustion. |
| Royal Purple® vs. Premium synthetic oil | Gasoline | 2.5% @1200 RPM 3.0% @1600 RPM | |

Data Source: North Carolina State University - July 2002

Description of Test: EPA 75 (city) and HWFET (Highway Fuel Economy Test) tests comparing a Brand Name 10W30 "energy conserving" motor oil to Royal Purple® 5W30 motor oil.

| Engine Type | Emissions Reductions ³ | | |
|-------------|-----------------------------------|---------------|-----------------|
| | CO | HC | NO ₂ |
| Gasoline | EPA 75 29% | EPA 75 16% | EPA 75 1% |
| | HWFET 62% | HWFET 19% | HWFET -23% |

Data Source: *Hot Rod Magazine* - March 2002

Description of Test: Replaced existing mineral oil in new GM 383 V-8 Motor.

| Engine Type | Performance Improvement | |
|-------------|-------------------------|----------------|
| Gasoline | Horsepower 1.7% | Torque 2.0% |

Data Source: "Hot Rod TV" - May 2002 / *Hot Rod Magazine* - August 2002

Description of Test: Replaced existing 20W50 engine oil, GM Dexron III® ATF fluid, and 75W90 differential fluids with Royal Purple's 20W50 Motor Oil, Max ATF® and Max-Gear® 75W90 in a 400 HP '65 Mercury Comet and tested on full chassis dynamometer.

| Engine Type | Performance Improvement | |
|-------------|-------------------------|----------------|
| Gasoline | Horsepower 2.5% | Torque 1.5% |

Data Source: "Hot Rod TV" - December 2002

Description of Test: Replaced existing mineral oil to Royal Purple's Racing 21 motor oil (viscosity similar to 5W30) and Max-Gear® 75W90 in a 1962 Ford Galaxy.

| Engine Type | Fuel Savings | |
|-------------|---------------|------------------|
| Gasoline | City 23.4% | Highway 28.8% |

Data Source: "Horsepower TV" - May 2002

Description of Test: Replaced existing 5W30 synthetic engine oil, GM Dexron III® ATF mineral oil and 75W90 synthetic differential fluid with Royal Purple's 5W30 Motor Oil, Synchronax® manual transmission fluid and Max-Gear® 75W90 in a 2000 Camaro SS and tested on full chassis dynamometer.

| Engine Type | Performance Improvement | |
|-------------|-------------------------|-------------|
| Gasoline | Horsepower 2.9% | Torque — |

Data Source: *Drag Sport Magazine* - April 2003

Description of Test: Replaced existing 20W50 engine oil with Royal Purple's 10W30 Motor Oil in a 1994 SR20DET Turbo 2.0L engine from Japan fitted in a 1989 240 SX and tested on full chassis dynamometer.

| Engine Type | Performance Improvement | |
|-------------|-------------------------|----------------|
| Gasoline | Horsepower 3.2% | Torque 1.5% |

Data Source: *Tuner Performance Reports Magazine* - Issue 003, Fall 2003

Description of Test: Replaced existing stock motor oil with Royal Purple's high performance motor oil in a 2002 Honda Accord and tested on full chassis dynamometer.

| Engine Type | Performance Improvement | |
|-------------|-------------------------|-------------|
| Gasoline | Horsepower 1.8% | Torque — |

Data Source: D & D Performance Enterprises - December 2003

Description of Test: Replaced existing synthetic motorcycle oil with Royal Purple's Max-Cycle® 20W50 in a 2004 Harley Davidson 1200XL (Sportster Roadster) on a Super Flow Cycle Dyne Eddy Current Load Dyno.

| Engine Type | Performance Improvement | |
|-------------|-------------------------|----------------|
| Gasoline | Horsepower 1.2% | Torque 1.3% |

Data Source: *Performance Auto & Sound Magazine* - January 2004

Description of Test: Replaced existing engine oil and transmission fluid with Royal Purple's 5W30 Motor Oil and Royal Purple's Max-Gear® 75W90 transmission lubricant in a 1999 Nissan Maxima.

| Engine Type | Performance Improvement | |
|-------------|-------------------------|-------------|
| Gasoline | Horsepower 3.0% | Torque — |

Data Source: Longview Inspection - January 2004

Description of Test: Replaced existing OEM motorcycle oil with Royal Purple's Max-Cycle® 20W50 in a 2003 Harley Davidson Soft-Tail Standard with a Twin Cam 88 engine to determine if switching to Royal Purple® would reduce operating temperatures. Temperatures continuously monitored with a FLIR Model 550 Radiometer during testing.

| Engine Type | Performance Improvement |
|-------------|--|
| Gasoline | Temperature Reduction 24° F - 44° F |

- 1 Film Strength based on comparison of leading 5W30 vs. Royal Purple® 5W30 Motor Oil in Falex No. 1 "high pressure" test. (Scar widths mm. Leading 5W30 motor oil: 5.9 mm - scored; Royal Purple® 5W30 Motor Oil: 1.4 mm - polished.)
- 2 Oxidation life based on U.S. Bureau of Standards TFOUT oxidation test (leading synthetic 5W30 oil - 409 minutes; leading 5W30 mineral oil - 246 minutes; Royal Purple® 5W30 - 1300 minutes.)
- 3 Terminology:
CO = Carbon Monoxide (a poisonous gas);
HC = Hydrocarbons (unburned fuel - normally occurs when fuel to oxygen mixture is too rich);
NO₂ = Nitrous Oxide (cited as a contributor to smog, ozone, acid rain and regional haze and is exacerbated by the elevated combustion temperatures of "lean burn" engines where more oxygen exists than is needed to completely burn the fuel);
HP = Horsepower;
CO and NO₂ are typically on polar opposites. When one increases, the other decreases;
- 4 Fuel and horsepower tests performed on 1996 Peterbilt truck with Caterpillar C-12 engine. Emission testing performed on Detroit Series 60 and Caterpillar 3176B engines.