
The First in Synthetics ®

# Product Features and Benefits

# Review: Features and Benefits

From the G-1229 *How to Sell AMSOIL Products Manual*, you will recall that features and benefits are the core of an AMSOIL sales presentation.

**Feature:** A product characteristic.

**Benefit:** A useful function that comes from a feature.

| Features | Benefits |
|---|---|
| • No paraffin or wax | • Easy cold temperature starting |
| • Low coefficient of friction | • Excellent gas (or fuel) mileage |
| • Oxidation resistance | • Clean engine |

Benefits are easier to understand than features are. That's why successful salespersons, according to the G-1229, talk almost exclusively about product benefits – and develop a keen understanding of product features so they may explain the "whys" behind the benefits if they are asked.

## *AMSOIL Benefits*

*Synthetic lubricants are pure, uniform and designable.*

With AMSOIL, vehicles and equipment:

- last longer
- need fewer repairs
- perform better – more responsive, more power
- get better fuel economy (more miles to the gallon)
- emit cleaner exhaust ...

... and AMSOIL synthetic lubricants last longer than other lubricants do.

## *AMSOIL Features*

What are the features of AMSOIL synthetic lubricants that support these benefits? To find our answer, let's review some basics about synthetic lubricants. Synthetic lubricant basestocks are:

**Pure** – Because they are derived from pure chemicals, synthetic lubricants contain no contaminants or molecules that "don't pull their own weight."

**Uniform** – Because synthetics contain only smooth lubricating molecules, they slip easily across one another. On the other hand, the potpourri of jagged, irregular and odd-shaped molecules of refined lubricants don't slip quite so easily. The ease with which lubricant molecules slip over one another affects the lube's ability to reduce friction, which in turn, affects wear control, heat control and fuel efficiency. Synthetics are superior.

Uniformity also helps synthetics resist thinning in heat and thickening in cold, which helps them protect better over a system's operating temperature range and helps lubes provide better seals than conventional lubes do.

**Designable** – Synthetic lubricants may be made to fulfill virtually every lubricating need. On the other hand, the applicability of conventional lubes is limited, due to their functional limitations in high temperatures, low temperatures and other demanding conditions.

# AMSOIL Features and Benefits: putting it all together

## *Benefits: Vehicles and equipment last longer, need fewer repairs and emit cleaner exhaust.*

Failure and wear may lead to shortened equipment life. They often require vehicles and equipment to need repair. And when excessive wear occurs in an engine, increased exhaust emissions are almost always the outcome.

**Feature:** Synthetic lubricant molecules are uniform.

**HEAT CONTROL**

Lubricated components are designed to operate in a range of temperatures which are considered optimal. However, demands for more power, faster operation and more load-carrying capacity often push actual operating temperatures above the optimal range. High temperature operation is often a cause of component failure and even more often a significant cause of component wear.

Because uniformly smooth synthetic lubricant molecules slip easily over one another, they are superior friction-reducers to conventional lubricants. (Technically, because they slip more easily over one another, synthetics are said to have a lower "coefficient of friction" than conventional lubricants.) The less friction in a system, the less heat in it, too. Friction and heat are two major contributors to component failure and wear. By controlling friction and heat more effectively, synthetics significantly reduce the incidence of component failure and significantly reduce the rate of component wear.

In addition, uniformly sized synthetic lubricant molecules makes them better heat transfer agents than conventional lubricant molecules. Some petroleum lubricant molecules

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are large and heavy. Others are small and light. As oil flows in a lubricated system, the small, light molecules tend to flow in the center of the oil stream while the large, heavy ones get stuck on the metal surfaces where they create a barrier against the movement of heat from the component and into the oil stream. In effect, the large, heavy molecules work like a blanket around hot components. If those large, heavy molecules are chemically unstable, they may also breakdown and form deposits on component surfaces, making the blanketing effect even more pronounced.

Since synthetic lubricants have no large heavy molecules, they don't blanket hot components. Instead, every molecule is equally likely to touch the hot component surface and take some of its heat into the oil stream which carries the heat away. Also, since synthetics tend to be chemically stable, they are not prone to form deposits.

*High viscosity index lubricants protect better and provide for greater efficiency than low viscosity index lubricants do.*

## VISCOSITY INDEX

Lubricant viscosity plays an important role in component efficiency and life expectancy. (Remember, viscosity is a measure of fluid flow.) If a component is lubricated with a lubricant whose viscosity is too low, the component will not be protected adequately and will wear excessively. If the component is lubricated with a lubricant whose viscosity is too high, the component will expend excess energy doing its job, which reduces efficiency and may affect the life of other components, such as motors.

"Viscosity index" is a number assigned to lubricants to describe how much their viscosity changes with temperature changes. The higher the viscosity index, the less the lubricant's viscosity changes. High viscosity index lubricants protect better and provide for greater efficiency than low viscosity index lubricants do because the high viscosity index fluids are more apt to retain the correct viscosity for the job, neither thickening as much in cold nor thinning as much in heat.

Synthetic lubricants have higher viscosity indexes than conventional lubricants, due, in part, to the uniformity of synthetic lubricant molecules. Large, heavy lubricant molecules tend to increase lubricant viscosity more in cold temperatures than smaller, lighter lubricant molecules do. Conventional lubricants, which contain some relatively large, heavy molecules, tend to thicken in cold temperatures more than synthetic lubricants, with their uniformly sized molecules, do. Since temperature affects the viscosity of conventional lubricants more than it does the viscosity of synthetic lubricants, conventional lubricants have a lower viscosity index than synthetics do.

**Feature:** Synthetic lubricants are pure.

## THERMAL AND OXIDATIVE STABILITY

Some of the chemicals in conventional lubricants break down at temperatures within the normal operating range of many vehicle and equipment components. Some are prone to break down in these relatively mild temperatures if oxygen is present, which it almost invariably is in vehicles and equipment. These thermally and oxidatively unstable contaminants do not help the lubrication process in any way. They are present in conventional oils simply because removing them is impossible or too expensive.

When conventional oil contaminants break down, they coat components with varnish, deposits and sludge and leave the lubricant thick, hard to pump and with very poor heat transfer ability.

Because synthetic lubricants do not contain contaminants, they are much more resistant to thermal and oxidative breakdown. That means they can be used in higher temperatures than conventional oils can without breaking down and they are impervious to breakdown at normal operating temperatures. With synthetics, components stay varnish-free, deposit-free and sludge-free.

And, because thermally and oxidatively stable lubricants retain their fluidity, pumpability and original heat transfer abilities, they protect and lubricate better, longer.

## COLD TEMPERATURE FLUIDITY

You're familiar with paraffin. It hardens at room temperature. Conventional lubricants often contain paraffins which cause the lubricants to thicken in cold temperatures as the paraffin gels.

However, a lubricant must flow readily throughout the system it protects or the system goes unprotected, and cold-thickened lubricants lose their ability to flow readily, or sometimes even to flow at all. In fact, at startup, conventional oils may leave working parts unprotected for as long as five minutes – plenty of time for significant wear to occur.

Synthetic lubricants do not contain paraffins or other waxes that thicken dramatically in cold temperatures. Synthetic lubricants flow readily in extremely cold temperatures, much colder than those at which conventional oils flow, which provides rapid post-startup lubrication and protection, keeping startup wear in check.

The superior cold temperature fluidity of synthetic lubricants also helps engines start more dependably in cold temperatures than they do with conventional oils. Cold thickened conventional oils sometimes hinder the rotation of the crankshaft so much, it cannot rotate fast enough to start the engine.

*Because synthetic lubricants do not contain contaminants, they are much more resistant to thermal and oxidative breakdown.*

*The superior cold temperature fluidity of synthetic lubricants also helps engines start more dependably in cold temperatures than they do with conventional oils.*

## *Benefit: Vehicles and equipment perform better and get better fuel economy.*

The "goal" of the engine and drivetrain is the maximum transfer of the energy released from fuel combustion to the wheels to move the vehicle.

The engine and drivetrain accomplish their goal mechanically. Each mechanical component has moving parts that require lubrication for friction, heat and wear control. Ironically, while parts move with significantly reduced friction when a lubricant separates them than when one doesn't, the lubricant itself contributes some friction to the system, due to the way its molecules slip over one another.

**Feature:** Synthetic lubricant molecules are uniform.

### FRICTION CONTROL

Uniform, smooth synthetic lubricant molecules slip across one another easily. That minimizes friction, which in turn, improves power and fuel economy because more of the energy released from fuel combustion reaches the wheels and moves the vehicle. The vehicle accelerates more quickly and powerfully because more of the fuel goes to moving the vehicle rather than to overcoming friction. The vehicle also works more efficiently, getting better fuel economy (more miles to the gallon) for the same reason – more of the fuel goes to moving the vehicle than to overcoming friction.

### LOW VOLATILITY

The small, light molecules in conventional lubricants "boil off" at relatively low temperatures: just as you put less energy into throwing a light ball into the air than you do a heavy one, so light molecules require less energy, in the form of heat, to lift out of solution and into the air than heavier molecules do. The tendency of a liquid to boil off is referred to as its "volatility." Conventional lubricants are more volatile than synthetic oils are.

Volatility affects more than the rate of oil consumption. Because the light molecules are lost through volatility, volatile oils tend to grow thick with use, which makes them hard to pump. The harder the oil pump works, the more energy it consumes, which reduces fuel economy and the quicker the pump wears out. Plus, parts require more energy to move through thicker oil than they do through thinner oil. All the energy spent on pumping and moving through thick oil is energy lost to performance and fuel economy.

Synthetic lubricants lose very little to volatility, because their molecules are uniformly sized. None are smaller and lighter than others and therefore more susceptible to boiling off. The low volatility of synthetic lubricants keeps performance and fuel economy at their peak.

## *Benefit: AMSOIL synthetic lubricants last longer than other lubricants do.*

Predictive maintenance is a growing practice in commercial and industrial applications. Predictive maintenance practice calls for oil drain intervals based on used oil analysis. As a result, commercial and industrial lubricant users of AMSOIL synthetic lubricants are finding their lubricant drain intervals may be substantially increased with no danger to their vehicles and equipment. The practice of extending drain intervals saves them money on used oil disposal costs and replacement oil costs, and most importantly, it saves them downtime.

"Downtime" to a motorist may mean inconvenience – a lost Saturday afternoon changing oil or having to take the bus while the car is being serviced. The value of a Saturday afternoon or the convenience of having the car may be very high.

**Feature:** Synthetic lubricant molecules are pure.

Heat and oxidation are the main enemies of lubricant basestocks – especially of the contaminants in conventional basestocks. Once heat or oxidation cause a lubricant to breakdown, the lubricant must be replaced or the equipment or vehicle may be damaged by a lack of lubrication or by chemical attack. The excellent resistance of synthetic lubricants to thermal and oxidative breakdown allow them to be safely used for much longer drain intervals than conventional lubricants. In fact, AMSOIL synthetic motor oils may be used for 25,000 miles or one year.

**Feature:** Synthetic lubricant molecules are uniform.

Because their uniform and smooth molecular structure allows AMSOIL synthetic lubricants to operate with less friction than conventional lubricants do, they control heat better than conventional lubricants. By keeping heat lower, the lubricant is stressed less, which helps it last longer. And because oxidation and heat are directly related – more heat leads to more oxidation – the lubricant is less stressed by oxidation, too, which also helps it last.

*Conventional lubricants are more volatile than synthetic oils are.*

# *What benefits come from the feature of designability?*

For industry, the feature of designability is often important. In industrial applications, lubricants may be exposed to temperatures, loads and other stresses far beyond the capabilities of conventional products to endure. The nearly infinite designability of synthetic lubricants makes synthetics the only products useful for such applications.

# *Is there more to a lubricant than its basestock?*

Lubricants contain basestocks and additives, with the basestock comprising the greatest volume of the finished lubricant. Additives either enhance basestock properties or add properties to the finished lubricant that the basestocks don't have.

Very broadly, each additive performs one or more of the following functions:

- Protect metal surfaces
- Extend the range of lubricant applicability
- Extend lubricant life

The largest market for lubricant additives is in the transportation field, including additives for lubricants used in engines and drivetrains.

**Surface protective additives**

- Antiwear agents inhibit wear
- Rust and corrosion inhibitors inhibit rust and corrosion
- Detergents keep surfaces free of deposits
- Alkalinity additives neutralize acids
- Dispersants keep insoluble materials dispersed in the lubricant to inhibit wear
- Friction modifiers reduce friction

**Lubricant applicability extending additives**

- Viscosity modifiers reduce the rate of viscosity change with changes in temperature
- Seal swell agents help form and maintain tight seals

**Lubricant life enhancing additives**

- Antifoam agents inhibit lubricant foaming
- Antioxidants inhibit lubricant oxidation

**Feature:** AMSOIL synthetic lubricants contain high quality additives.

Just as quality differences exist between lubricant basestocks, quality differences also exist between lubricant additives. For example, low quality viscosity modifiers are often damaged by the shearing forces in the engine. Once damaged, they no longer work to increase the lubricant's viscosity in high temperatures, leaving lubricated components open to wear and damage during high temperature operations.

The quality of lubricant additives is directly related to their cost. Lubricants made to be sold at a low price contain low cost additives, and, of course, a low cost conventional basestock. Lubricants formulated for performance contain additives proven to perform, despite

*The excellent resistance of synthetic lubricants to thermal and oxidative breakdown allow them to be safely used for much longer drain intervals than conventional lubricants.*

their usually higher cost. Over time, the performance-formulated lubricant proves to be the more cost effective choice, due to the superior lubricant and protection it provides. Vehicles and equipment last longer and perform better with performance-formulated lubricants.

Additive quality also affects lubricant life. For example, some alkalinity additives last much longer than others do. In diesel engines, the lubricant must be replaced when the alkalinity additives are used up or the engine is subject to corrosion which may cause failure or significantly accelerated wear. It doesn't pay to pair long-life additives with short-lived conventional basestocks. It does pay, however, to pair long-life additives with long-life synthetic basestocks. Here, too, quality pays – in reduced oil drains, reduced used oil disposal costs and reduced downtime.

In fact, every benefit attributed to AMSOIL synthetic lubricants comes not only from the lubricants' synthetic basestocks, but also from their top-quality additives.

## *AMSOIL Benefits*

With AMSOIL, vehicles and equipment:

- last longer
- need fewer repairs
- perform better – more responsive, more power
- get better fuel economy (more miles to the gallon)
- emit cleaner exhaust ...

... and AMSOIL synthetic lubricants last longer than other lubricants do.

Remember: sell the benefits!

# Which Product? How Much?

When a prospect is ready to buy an AMSOIL lubricant or filter, you may determine which product and how much the prospect needs in one of four ways:

1) **Recommend the same type of product the prospect is using** – If your prospect uses a 10W-30 motor oil now, you may recommend AMSOIL Synthetic 10W-30 Motor Oil to replace the prospect's present product – provided 10W-30 motor oil is the correct product for the application. Of the four, recommending products based on current use is the least reliable method of making recommendations.

*Additives either enhance basestock properties or add properties to the finished lubricant that the basestocks don't have.*

*Just as quality differences exist between lubricant basestocks, quality differences also exist between lubricant additives.*

2) **Check the owner's manual** – If the owner's manual for your prospect's vehicle recommends 80W-90 gear lube for the rear differential, you may recommend AMSOIL Synthetic 80W-90 Gear Lube to replace the prospect's present product.

3) **Check with the equipment or vehicle dealership** – If the prospect doesn't have an owner's manual, call the dealership for product recommendations.

4) **Use an AMSOIL reference** – If you know the make, model and engine of your prospect's vehicle or the make and model of your prospect's equipment, you can use the **AMSOIL Product Selection Guide (G-50)** or the **AMSOIL Oil and Air Filter Application Guide (G-194)** to determine which products and how much you need.

**The G-50 AMSOIL Product Selection Guide** contains lubricant recommendations for domestic and foreign passenger cars, trucks, tractors, outboard motors, motorcycles, snowmobiles, chain saws and lawn mowers. To use it, first read the "How to Use This Selection Guide and Cross Reference." Next, go to the Table of Contents and find the appropriate section. For example, let's say you want to know what lubricant to use in the crankcase of a Buick passenger car. The appropriate section to look in is "Passenger Cars & Light Trucks."

The passenger car listings are arranged alphabetically, with "Crankcase" being the first heading under each listing. Here, motor oil requirements by model year and operating temperatures are listed. You will find the quantity required for the application under the bold heading, "CAPACITY, Refill."

Go to the section titled, "AMSOIL Product Selection Guide and Cross Reference," and find the lubricant symbol, "API★," in the right hand column. The description shows which AMSOIL Products are API-certified. When you cross-reference the AMSOIL lubricant product codes in the boxed chart in the left hand column, you will find which AMSOIL Products meet the API requirements for the subject car.

**The G-194 AMSOIL Oil/Air Filters Application Guide** contains information to help you determine which AMSOIL filters correspond to the application you wish to fill. You may use the guide to make oil and air filter recommendations based on one of two pieces of information:

**1) The vehicle's make, model, year and engine.** A Table of Contents appears in the G-194 Oil and Air Filter Guide. Note that the chapter, "Arrangement of Passenger Cars, Light Duty Trucks and Vans," contains important information about "Passenger Cars, Light Duty Trucks, and Vans Application" listings, which you use to

find the oil and air filter for the application you wish to fit. Each vehicle make is divided according to model year with the most recent year appearing first.

Note the Vehicle Identification Number (VIN) code, next to the engine listing. The VIN code is included to help you verify the accuracy of the engine identification. For example, the "VIN Code Locations" chart shows that the 8th character in "1981 - on" GMC vehicles is shown in the VIN code description provided in the engine listing.

**2) The stock number and manufacturer of the filter you wish to replace.** Go to the Table of Contents. Note the chapter, "Manufacturers' Cross-Reference" contains important information about the "Arrangement of Manufacturers' Cross Reference" which you use to find the oil and air filter application you wish to fit. Note that oil and air filters are arranged in a single list.

Let's say you wish to replace a General Motors oil filter 5579164. Follow the alphabetical filter manufacturer listing until you reach, "General Motors." Under the General Motors heading, note the filter numbers are arranged numerically in plain type at the left side of each column (each page contains five columns). Follow the filter number listings until you reach, "5579164." The AMSOIL filter is listed in bold type to its right. The appropriate replacement oil filter is the AMSOIL SDF 96.

Let's say you also want to replace a General Motors air filter 6486924. Follow the left-hand filter number listings until you reach "6486924." The appropriate replacement air filter is the AMSOIL TS14.

| LUBRICANT SYMBOL | DESCRIPTION | AMSOIL LUBRICANT |
|---|---|---|
| **API*** | Motor Oil Licensed by API/ILSAC | **PCO, XLF, XLT, XLM, XLO** |

**AMSOIL PRODUCT CODES**

**PCO –** Synthetic Blend Diesel Oil, SAE 15W-40, API CF, CF2, CG4, CH-4, CI-4, SL

**XLF –** XL-7500 Synthetic Motor Oil, SAE 5W-30, API SL, ILSAC GF-3

**XLT –** XL-7500 Synthetic Motor Oil, SAE 10W-30, API SL, ILSAC GF-3

**XLM –** XL-7500 Synthetic Motor Oil, SAE 5W-20, API SL, ILSAC GF-3

**XLO –** XL-7500 Synthetic Motor Oil, SAE 10W-40, API SL

**GENERAL MOTORS CORP.**

5579164 .....**SDF96**

# Engine lubricants

## *How Does MOTOR OIL Work?*

**Lubricate and cool** – Generally, when people talk about "motor oil," they are talking about the oil that goes into the crankcase, a special oil reservoir, in a four-cycle engine, like the engine in your car. Motor oil lubricates the engine of a vehicle or piece of equipment and cools a significant portion of the engine.

While the engine is at rest, the motor oil rests in the crankcase, a pan bolted to the bottom of the engine block. When the engine starts, the oil pump feeds oil from the pan to the oil distribution system, a network of passages, tubes, grooves and holes leading to the engine bearings and other surfaces that receive a large volume of pressurized oil for lubrication. Other parts receive oil

through splash or spray. For example, the overhead valve system receives a carefully controlled quantity of non-pressurized oil for lubrication.

**Other functions** – In addition to lubricating and cooling engine parts, motor oil must allow easy engine starting, protect the engine from corrosion and oxidation, keep the engine clean, form a tight seal between piston rings and cylinder walls, and help the engine use fuel efficiently.

Diesel engines require protection against the corrosion caused by a combination of their extremely high operating temperature and acidic products introduced into the engine by diesel fuel and products of oil breakdown. Diesel oils provide protection against corrosion through detergent-alkalinity additives, which give the oil its Total Base Number (TBN). Oils with high TBN neutralize acids over a longer period than oils with low TBN do. In fact, in programs of used oil analysis, used by fleets to reduce their maintenance costs, an oil's fitness for ongoing service is determined largely by its TBN.

## *AMSOIL Motor Oils*

Series 2000 SAE 20W-50 Synthetic Racing Oil (TRO)

Series 2000 SAE 0W-30 Synthetic Motor Oil (TSO)

Series 3000 SAE 5W-30 Synthetic Heavy Duty Diesel Oil (HDD)

SAE 5W-30 XL-7500 Synthetic Motor Oil (XLF)

SAE 10W-30 XL-7500 Synthetic Motor Oil (XLT)

SAE 5W-20 XL-7500 Synthetic Motor Oil (XLM)

SAE 10W-40 XL-7500 Synthetic Motor Oil (XLO)

SAE 10W-40 High Performance Synthetic Motor Oil (AMO)

SAE 10W-30 Synthetic Motor Oil (ATM)

SAE 5W-30 Synthetic Motor Oil (ASL)

SAE 20W-50 High Performance Synthetic Motor Oil (ARO)

SAE 30 Synthetic Diesel Oil (ACD)

SAE 15W-40 Synthetic Blend Diesel Oil (PCO)

SAE 15W-40 Synthetic Heavy Duty Diesel and Marine Oil (AME)

SAE 20W-50 Synthetic Motorcycle Oil (AMV)

SAE 10W-40 Synthetic Motorcycle Oil (AMF)

SAE 0W-40 Formula 4-Stroke Synthetic Motor Oil (AFF)

SAE 60 Synthetic Super Heavy Weight Racing Oil (AHR)

## *Features and Benefits*

**Feature** Cooler operation.

**Benefit** Cooler engines resist stress and wear. They last longer, perform better and require fewer repairs.

**Feature** Thermal and oxidative stability – AMSOIL synthetic motor oils resist formation of sludge, varnish, acids, deposits and other degradation products.

**Benefit** Engines stay clean, which helps them perform better, last longer and require fewer repairs.

**Feature** Consistent viscosity in high and low temperatures.

**Benefit** Easier cold temperature starting. Better high and low temperature protection, which helps engines last longer and require fewer repairs.

**Feature** Superior friction reduction.

**Benefit** Lower wear rate, which helps engines last longer and require fewer repairs. Improves fuel economy.

**Feature** Low temperature fluidity.

**Benefit** Easier cold temperature starting. Better wear protection in cold temperatures, which helps engines last longer and require fewer repairs.

**Feature** Low volatility – AMSOIL synthetic motor oils don't evaporate.

**Benefit** Reduced oil consumption. Better oil flow gives better fuel economy and better wear protection.

**Feature** Broad temperature range of application.

**Benefit** AMSOIL synthetic motor oils work safely and protect at higher and lower temperatures than conventional oils do.

**Feature** High TBN (diesel oils).

**Benefit** Reduces rate of engine corrosion, which helps diesel engines last longer and require fewer repairs. Increases oil service life, which reduces maintenance costs.

**Feature** Extended service life capability.

**Benefit** AMSOIL synthetic motor oils last longer than conventional oils do, which saves motorists money and reduces the environmental impact of used lubricants.

## *Application and Market*

**Racing oils (TRO, ARO):** For use in gasoline-fueled four-cycle engines in race and performance vehicles.

**Super Heavy Weight Racing Oil (AHR):** For use in high-horsepower racing engines, typically supercharged and alcohol-burning or nitro-fueled.

**Passenger car motor oils (TSO, XLF, XLT, XLM, XLO, AMO, ATM, ASL):** For use in gasoline-fueled four-cycle engines in passenger cars.

**Diesel engine oils (HDD, ACD, PCO, AME):** For use in diesel engines in commercial vehicles and equipment.

**Motorcycle oils (AMV, AMF):** For use in four-cycle motorcycle engines.

**4-Stroke oil (AFF):** For use in four-cycle recreational equipment.

### *Availability*

AMSOIL synthetic motor oils are available in 1-quart, 1-gallon, 2½-gallon, 16-gallon, 30-gallon and 55-gallon containers. See your price list for more information.

*For More Information*

**G-52** *Motor Oil and Engine Filter Information*
**G-359** *Question and Answer Brochure*
**G-391** *Motorcycle Products Brochure*
**G-554** *15W-40 Fact Book*
**G-1053** *All Purpose Handout*
**G-1747** *Four-Stroke Brochure*

See your **G-15** *Literature and Sales Aids Price List* and **G-1045** *Literature and Business Tools Catalog* for appropriate product data bulletins and additional motor oil literature.

## *How Does TWO-CYCLE OIL Work?*

Two-cycle oil, used to lubricate two-cycle gasoline-fueled engines, mixes with the engine's gasoline and the mixture is burned for energy. Some engines are designed to use a gasoline-oil mixture that must be made before introducing the mixture into the engine's fuel tank; the oil used in these engines is called **pre-mix oil.** Some engines are designed for introduction of oil and gasoline into separate compartments with the oil injected into the combustion chamber or into the fuel system; the oil used in these engines is called **injector oil.**

Due to their light weight, two-cycle gasoline-fueled engines find application in outboard marine engines, motorcycles, ATVs, chainsaws, portable equipment and snowmobiles.

Two-cycle engines rev high, so they wear fast. If you were to leave a two-cycle engine and a four-cycle engine of the same displacement running for an hour, the four-cycle engine would complete about 100,000 revolutions while the two-cycle would complete 300,000 to 400,000. Each revolution causes wear.

# AMSOIL 2-Cycle Oils

Series 2000 2-Cycle Racing Oil (TCR)
Synthetic 2-Cycle Oil, 100:1 Pre-Mix (ATC)
Synthetic 2-Cycle Injector Oil (AIO)

## Features and Benefits

**Feature** Cooler operation.
**Benefit** Cooler two-cycle engines resist stress and wear. They last longer, perform better and require fewer repairs.

**Feature** Consistent viscosity in high and low temperatures.
**Benefit** Better high and low temperature protection, which helps two-cycle engines last longer and require fewer repairs.

**Feature** Superior friction reduction.
**Benefit** Lower wear rate, which helps two-cycle engines last longer and require fewer repairs. Improves fuel economy.

**Feature** Low temperature fluidity and miscibility (ability to mix with gasoline).
**Benefit** Better wear protection in cold temperatures, which helps two-cycle engines start better, last longer and require fewer repairs.

**Feature** Clean burning.
**Benefit** Reduced deposits and emissions.

**Feature** 100:1 2-Cycle Oil introduces less oil into engine than conventional 32:1 oils do.
**Benefit** Reduced emissions.

## Application and Market

**Racing oil (TCR):** For use in gasoline-fueled two-cycle engines in race and performance equipment.

**Pre-mix and injector oils (ATC, AIO):** For use in gasoline-fueled two-cycle engines in vehicles and power equipment.

## Availability

AMSOIL synthetic 2-cycle oils are available in 1½-oz, 8-oz, 1-quart, 1-gallon, 16-gallon, 30-gallon and 55-gallon containers. See your price list for more information.

*For More Information*

**G-11** *Two-Cycle Oils Data Bulletin*
**G-1008** *Marine Products*
**G-1056** *Lawn and Garden Book*
**G-1438** *Series 2000 2-cycle Racing Oil Brochure*
**G-1526** *Snowmobile Products Brochure*

# Suspension/Fork Fluids

## *How Does SUSPENSION FLUID Work?*

Suspension/fork fluids lubricate and protect the inner walls of shocks and forks in motocross and cruiser motorcycles, snowmobiles, ATVs and other high-performance and recreational vehicles. They may contain friction modifiers to reduce frictional energy loss and anti-wear agents to protect against premature wear and scuffing. Suspension/fork fluids also prevent fade and allow for smooth rebounds.

## *AMSOIL Shock Therapy Suspension Fluid (STL & STM)*

Shock Therapy Suspension Fluid (STL) – Lightweight Grade
Shock Therapy Suspension Fluid (STM) – Medium Grade

### *Features and Benefits*

**Feature** Cooler operation.
**Benefit** Cooler suspension systems resist stress and wear. They last longer, perform better and require fewer repairs.

**Feature** Thermal and oxidative stability - AMSOIL Shock Therapy Suspension Fluid resists formation of sludge, varnish, deposits, acids and other degradation products.
**Benefit** Suspension stays clean, helping it perform better, last longer and require fewer repairs.

**Feature** Broad temperature range of application.
**Benefit** Maintains ability to protect in temperature extremes, helping suspension systems last longer.

**Feature** Superior friction characteristics
**Benefit** Lower wear rate, reduces heat and frictional energy loss and helps shocks and forks last longer.

**Feature** Reduced aeration and foam
**Benefit** Limits shock fade and inconsistent dampening, provides for smooth rebounds.

**Feature** Seal conditioners
**Benefit** Keeps seals soft and pliable, extending their service life.

**Feature** Extended service life capability
**Benefit** Saves money and reduces the environmental impact of used lubricants.

### *Application and Market*

**Shock Therapy Suspension Fluid (STL):** For use in shocks and forks of motocross and cruiser motorcycles, snowmobiles, ATVs and other high-performance and recreational vehicles that require quick rebounds in temperature extremes.

**Shock Therapy Suspension Fluid (STM):** For use in shocks and forks of motocross and cruiser motorcycles, snowmobiles, ATVs and other high-performance and recreational vehicles that require more dampening and slower rebounds.

### *Availability*

AMSOIL STL and STM are available in 1-quart and 5-gallon containers. See your price list for more information.

*For More Information*: **G-1663** *Shock Therapy Suspension Fluid Data Bulletin*

# Chain case lubricants

## *How Does CHAIN CASE LUBRICANT Work?*

Chain case lubricants lubricate and protect enclosed chains, such as those on snowmobiles, ATVs, and other equipment. Chain case lubricants may contain extreme pressure additives for added wear protection. Chain case lubricants may also repel water and inhibit rust, oxidation and foam. Synthetic chain case lubricants allow easy cold temperature equipment startup, performance and protection.

## *AMSOIL Series 2000 Synthetic Chain Case Lubricant (TCC)*

### *Features and Benefits*

**Feature** Superior protection.
**Benefit** Longer lasting chains.

**Feature** Extreme pressure protection.
**Benefit** Protection in operations in which a full lubricating film does not develop, for longer lasting chains.

**Feature** Repels water and inhibits rust, oxidation and foam.
**Benefit** Longer lasting and better performing chains.

**Feature** Superior low temperature fluidity.

**Benefit** Easier cold temperature starting, better cold temperature performance and longer lasting chains.

# Drive train lubricants

## *How Does AUTOMATIC TRANSMISSION FLUID Work?*

Automatic transmission fluid (ATF) is used in passenger car and commercial vehicle automatic transmissions; off-highway construction, agricultural and mining equipment powershift transmissions; and in some industrial applications which require hydraulic fluids with extreme high or low temperature performance capabilities. Almost half of all ATF goes to the automotive transmission market.

A vehicle's transmission is the first link in transmitting the engine's power to the wheels, allowing the vehicle to begin moving from a standstill, move forward or in reverse, move at various speeds, or to allow the engine to continue running while the vehicle is stopped. An automatic transmission uses a hydraulic coupling between the engine and the gears. The hydraulic coupling, rather than the driver, does the work of selecting gears.

Automatic transmission fluid serves as a **hydraulic fluid**, transmitting power from the engine to the gears, and serves as a **lubricant**, cooling the torque converter assembly and lubricating the transmission gears. ATF is perhaps the most complex lubricant in existence.

**Notes:** (1) Due to the extremely narrow passageways in their electronic shift selectors, automatic transmissions are extremely sensitive to fluid viscosity and do not function properly when cold thickens ATF excessively. (2) Due to their extremely high operating temperatures, automatic transmissions tend to thermally and oxidatively degrade ATF rapidly. (3) Due to the special frictional requirements of lockup torque converters and continuously slipping converter clutches, automatic transmissions are vulnerable to shudder, a condition that develops after roughly 30,000 miles use and causes severe vehicle handling difficulties.

## *AMSOIL Automatic Transmission Fluid (ATF)*

### *Features and Benefits*

**Feature** Cooler operation.

**Benefit** Cooler transmissions resist stress and wear.

They last longer, perform better and require fewer repairs.

**Feature** Thermal and oxidative stability – AMSOIL synthetic ATF resists formation of sludge, varnish, deposits, acids and other degradation products.

**Benefit** Transmissions stay clean, which helps them perform better, last longer and require fewer repairs.

**Feature** Consistent viscosity in high and low temperatures.

**Benefit** Improved low temperature shifting. Better high temperature protection, which helps transmissions last longer and require fewer repairs.

**Feature** Superior friction characteristics.

**Benefit** Lower wear rate, which helps transmissions last longer and require fewer repairs. Improves fuel economy. Helps prevent shudder.

**Feature** Low temperature fluidity.

**Benefit** Improved low temperature shifting. Better wear protection in cold temperatures, which helps transmissions last longer and require fewer repairs.

**Feature** Low volatility – AMSOIL synthetic ATF doesn't evaporate.

**Benefit** Better ATF flow gives better fuel economy and better wear protection.

**Feature** Broad temperature range of application.

**Benefit** AMSOIL synthetic ATF works safely and protects at higher and lower temperatures than conventional ATF does.

**Feature** Extended service life capability.

**Benefit** Saves motorists money and reduces the environmental impact of used lubricants.

## *Application and Market*

For use in passenger car and commercial vehicle automatic transmissions.

## *Availability*

AMSOIL synthetic ATF is available in 1-quart, 2½-gallon, 30-gallon and 55-gallon containers. See your price list for more information.

*For More Information*: **G-173** *ATF Data Bulletin*
**G-1746** *ATF Brochure*

# How Does GEAR LUBE Work?

Gear lubes lubricate, cool and protect geared systems. They also carry wear debris away from contact zones between gears and muffle the sound of geared system operation. Gear lubricants are used in differential gears and some standard (non-automatic) transmission gears in equipment, commercial vehicles and passenger vehicles, with the majority of gear lubes going to the commercial vehicle market. Some industrial machinery gears are also lubricated with gear lubes.

The transmission carries the engine's power to the driveshaft and allows selection of appropriate gears to start the vehicle moving from a standstill, move up to road speed, pull a heavy load or move in reverse. The differential carries the power from the driveshaft to the wheels. Because the driveshaft and the wheels rotate at 90° angles to one another, the differential contains gears to change the direction of the rotational power it receives. The severe angle of differential gears does not allow them to maintain a full lubricating film to separate mating surfaces. Additionally, the severe angles of their contact tend to concentrate load on a very small area of the gear face. Due to the lack of full film separation and to the concentrated points of load, differential gears are protected from excessive wear by extreme pressure agents, additives that form a protective shield over surfaces.

**Notes:** (1) Vehicle power and load generate heat in the transmission and differential. Commercial vehicle differential temperatures have risen dramatically in recent years, due to increased engine output, increased vehicle loads and aerodynamic body styling. Higher temperatures increase the occurrence of thermal degradation of the lubricant, which leads to sludge, deposits and seal damage. **Thermally stable** gear lubes keep parts free of sludge and deposits, and protect seals, even when the gear lubes are subjected to sustained high temperature service.

(2) Gear lubes can lose their extreme pressure performance when they are subjected to sustained thermal stress. Loss of extreme pressure performance allows metal to metal contact in susceptible areas, causing wear rates to accelerate. **Thermally durable** gear lubes protect surfaces from wear, even when the gear lubes are subjected to sustained high temperature service.

# AMSOIL Gear Lubes

Series 2000 SAE 75W-90 Synthetic Gear Lube (TGR)
Series 2000 SAE 75W-140 Synthetic Gear Lube (TGO)
SAE 75W-90 Synthetic Gear Lube (AGR)

| | |
|---|---|
| SAE 80W-90 | Synthetic Gear Lube (AGL) |
| SAE 85W-140 | Synthetic Gear Lube (AGO) |
| SAE 80W-90 | Synthetic Gear Lube (AGT) |
| SAE 80W-90 | Synthetic Marine Lower Unit Gear Lube (ALU) |

## *Features and Benefits*

**Feature** Cooler operation.
**Benefit** Cooler gears resist stress and wear. They last longer, perform better and require fewer repairs.

**Feature** Thermal and oxidative stability – AMSOIL synthetic gear lubes resist formation of sludge, varnish, acids, deposits and other degradation by-products.
**Benefit** Gears stay clean, which helps them perform better, last longer and require fewer repairs.

**Feature** Thermal durability.
**Benefit** Gear surfaces remain protected even during extended high temperature service.

**Feature** Consistent viscosity in high and low temperatures.
**Benefit** Improved low temperature shifting. Better high and low temperature protection, which helps gears last longer and require fewer repairs.

**Feature** Superior friction reduction.
**Benefit** Lower wear rate, which helps gears last longer and require fewer repairs. Improves fuel economy.

**Feature** Low temperature fluidity.
**Benefit** Improved low temperature performance. Better wear protection in cold temperatures, which helps gears last longer and require fewer repairs.

**Feature** Low volatility – AMSOIL synthetic gear lubes don't evaporate.
**Benefit** Better gear lube flow gives better fuel economy and better wear protection.

**Feature** Broad temperature range of application.
**Benefit** AMSOIL synthetic gear lubes work safely and protect at higher and lower temperatures than conventional lubes do.

**Feature** Extended service life capability.
**Benefit** AMSOIL synthetic gear lubes last longer than conventional gear lubes do, which saves motorists money and reduces the environmental impact of used lubricants.

### *Application and Market*

Transmission, differential and industrial gears.

### *Availability*

AMSOIL synthetic gear lubes are available in 8-oz, 1-quart, 1-gallon, 2½-gallon, 5-gallon, 16-gallon, 30-gallon and 55-gallon containers. See your price list for more information.

*For More Information*

**G-19** *Gear Lubes Data Bulletin*

## *How Do DIFFERENTIAL ADDITIVES Work?*

Differential additives contain friction modifiers that quiet chatter within vehicle differentials by allowing clutches to slip freely under normal driving conditions and lock when a load is applied.

## *AMSOIL Slip-Lock Differential Additive (ADA)*

AMSOIL Slip-Lock Differential Additive is formulated with advanced friction modifiers that eliminate gear-housing chatter in cars, trucks and SUVs equipped with limited-slip, positraction and locking differentials. It also reduces the banging and clunking associated with automatic locking differentials.

### *Features and Benefits*

**Feature** Advanced friction modifiers.

**Benefit** Eliminates gear-housing chatter.

**Feature** Versatile.

**Benefit** Formulated for use with both synthetic and petroleum gear lubricants.

**Feature** Convenient flip-top dispenser.

**Benefit** Quick and easy application.

### *Application and Market*

For use in limited-slip, positraction and locking differentials experiencing gear-housing chatter.

### *Availability*

AMSOIL Slip-Lock Differential Additive is available in 4-ounce bottles. See your price list for more information.

# How Do POWERSHIFT and SUPERSHIFT TRANSMISSION FLUIDS Work?

Powershift transmission fluids protect and lubricate the powershift transmissions found in heavy equipment used in construction, logging, mining, farming and other equipment. In servo-equipped applications, powershift transmission fluids also serve as hydraulic fluids.

**Note:** Powershift transmissions equipped with advanced friction materials may suffer excessive brake noise and vibration, clutch slippage, friction surface deposits and design material degradation if fluids with inappropriate friction characteristics are installed. Excessive brake noise and friction, clutch slippage and friction surface deposits may cause loss of equipment control. Friction surface deposits and design material degradation cause equipment wear.

Heavy equipment manual transmissions built by Eaton-Fuller, Rockwell-Spicer and Clark and requiring a CD 50 or SAE 90 GL-1 lubricant may use powershift transmission fluids.

Supershift transmission fluid protects and lubricates automatic transmissions operating in high horsepower and torque conditions, specifically those found in racing applications. It is also recommended for wet brakes, clutches and gears of heavy equipment equipped with automatic transmissions.

***Note:*** *Supershift transmission fluid provides instant slip-free shifting for racing applications. It is not recommended as a standard replacement for Dexron, Mercon or ATF+ fluids, where smooth shifting is desired.*

# AMSOIL Powershift and Supershift Transmission Fluids

SAE 10W Powershift Transmission Fluid (CTG)
SAE 30 Powershift Transmission Fluid (CTJ)
SAE 50 Powershift Transmission Fluid (CTL)
SAE 10W Supershift Racing Transmission Fluid (ART)

## Features and Benefits

**Feature** Cooler operation.

**Benefit** Cooler transmissions resist stress and wear. They last longer, perform better and require fewer repairs.

**Feature** Thermal and oxidative stability – AMSOIL synthetic powershift and supershift transmission fluids resist the formation of sludge, varnish, acids, deposits and other degradation by-products.

**Benefit** Transmissions stay clean, which helps them perform better, last longer and require fewer repairs.

**Feature** Consistent viscosity in high and low temperatures.

**Benefit** Improved low temperature shifting. Better high and low temperature protection, which helps gears last longer and require fewer repairs. Reduces or eliminates the need for seasonal fluid changes and inventories of seasonal fluids.

**Feature** Superior friction reduction.

**Benefit** Lower wear rate, which helps transmissions last longer and require fewer repairs. Improves fuel economy.

**Feature** Low temperature fluidity.

**Benefit** Improved low temperature performance. Better wear protection in cold temperatures, which helps gears last longer and require fewer repairs.

**Feature** Low volatility – AMSOIL synthetic powershift and supershift transmission fluids don't evaporate and thicken.

**Benefit** Better fluid flow gives better fuel economy and wear protection. Reduces need for fluid top-offs.

**Feature** Broad temperature range of application.

**Benefit** AMSOIL synthetic powershift and supershift transmission fluids work safely and protect at higher and lower temperatures than conventional lubes do.

**Feature** Extended service life capability.

**Benefit** AMSOIL synthetic powershift and supershift transmission fluids last longer than conventional transmission fluids do, which saves users money and reduces the volume of used lubricants destined for disposal, an environmental consideration.

**Feature** Slip-free shifting

**Benefit** AMSOIL Supershift & Racing Transmission Fluid allows transmission gears to shift quickly and efficiently, helping racers improve on elapsed times.

**Feature** Advanced friction material compatibility.

**Benefit** Smooth brake and clutch operations and deposit-free friction material surfaces for dependable equipment control. Deposit-free friction material surfaces and design material compatibility, which helps transmissions last longer and require fewer repairs.

## *Application and Market*

*Powershift Transmission Fluids*:
Commercial vehicle and equipment powershift transmission.

*Supershift Transmission Fluid*:
Automatic transmissions facing high horsepower and torque conditions.

## *Availability*

AMSOIL Synthetic Powershift Transmission Fluids are available in 5-gallon pails and 55-gallon drums. AMSOIL Synthetic Supershift Racing Transmission Fluid is available in quart bottles. See your price list for more information.

*For More Information*: **G-1317** *Synthetic Powershift Transmission Fluids Data Bulletin*

**G-1646** *Supershift Racing Transmission Fluid Data Bulletin*

# WHEEL, CHASSIS AND FIFTH WHEEL LUBRICANTS

## *How Does GREASE Work?*

Grease is the lubricant of choice in applications where liquid lubricants cannot stay in place. Such applications include wheels and auto chassis. Because it is a semi-solid lubricant, grease stays in place; prevents debris from entering greased systems; and provides structure for the suspension of solid lubricating materials, such as molybdenum. The use of grease reduces lubricant loss and relubrication frequency.

**Note:** (1) High load applications, such as those in heavy equipment bearings, benefit from the addition of solid lubricant additives, such as molybdenum, which "plate out" on metal surfaces and protect them from lubricating film breakdown in extreme load conditions. (2) Many applications subject greases to water. To provide adequate protection against wear, greases must resist washing out. Rust protection is important, too.

(3) The automatic greasing systems used to distribute grease in industrial machinery require greases with good cold temperature characteristics for dependable feeding into the automatic grease system.

## *AMSOIL Synthetic Greases*

Series 2000 Synthetic Racing Grease (GRG)
Synthetic Multi-Purpose No. 0 Grease (GLA)
Synthetic Multi-Purpose No. 1 Grease (GLB)
Synthetic Multi-Purpose No. 2 Grease (GLC)
Synthetic Multi-Purpose No. 2 Spray Grease (GLC)
Synthetic Heavy Duty No. 1 Grease (GHB)
Synthetic Heavy Duty No. 2 Grease (GHD)
Synthetic Water Resistant Grease (GWR)
Synthetic X-treme Food Grade Grease (GXC)
Synthetic Lithium Complex 00 SPY GREASE (GSF)

## *Features and Benefits*

**Feature** Cooler operation.

**Benefit** Cooler components resist wear, last longer, perform better, require fewer repairs.

**Feature** Thermal and oxidative stability – AMSOIL synthetic greases resist formation of sludge, varnish, acids, deposits and other degradation products.

**Benefit** Components stay clean, which helps them perform better, last longer and require fewer repairs.

**Feature** Consistent viscosity in high and low temperatures.

**Benefit** Better high and low temperature protection, which helps components last longer and require fewer repairs. Allows dependable use in automatic feed systems.

**Feature** Superior friction reduction.

**Benefit** Lower wear rate, which helps components last longer and require fewer repairs. Reduces fuel or power consumption.

**Feature** Low temperature fluidity.

**Benefit** Better wear protection in cold temperatures, which helps components last longer and require fewer repairs.

**Feature** Broad temperature range of application.

**Benefit** AMSOIL synthetic greases work safely and protect at higher and lower temperatures than conventional greases do.

**Feature** Extended service life capability.

**Benefit** AMSOIL synthetic greases last longer than conventional greases do, which saves users money and reduces the environmental impact of used lubricants.

**Feature** High quality additives for rust protection.

**Benefit** Less rust helps components work better, last longer and require fewer repairs.

**Feature** Molybdenum additive (GHD).

**Benefit** Extra wear protection in high load conditions, which helps components last longer and require fewer repairs.

## *Application and Market*

**Series 2000 Synthetic Racing Grease (GRG):** For use in high speed/temperature/load applications, such as race vehicle wheel bearings. May also be used in low speed/high temperature/high load applications.

**Multi-Purpose No. 0 Grease (GLA) and No. 1 Grease (GLB):** For use in gearbox applications (where recommended by equipment manufacturer) and in low temperature applications.

**Multi-Purpose No. 2 Grease (GLC):** For use in high speed/high temperature applications, such as wheel bearings and electric motors.

**Heavy Duty No. 1 Grease (GHB):** For use in gearbox applications (where recommended by equipment manufacturer) and in low temperature applications.

**Heavy-Duty No. 2 Grease (GHD):** For use in low speed/high load applications, such as bearings in construction, farming and other heavy duty equipment.

**Water Resistant Grease (GWR):** For use in high speed/high temperature applications in which water exposure is likely, such as in low vehicle and boat trailer wheel bearings.

**Food Grade Grease (GXC):** For use in food processing and food packaging facilities.

**Lithium Complex 00 SPY GREASE (GSF):** For use in leaky gearboxes in industrial and fleet applications and in applications that are difficult to service.

## *Availability*

AMSOIL synthetic greases are available in 8-oz, 10.5-oz, 14-oz, 35-lb, 120-lb and 400-lb containers. See your price list for more information.

*For More Information*: **G-1207** *Grease Brochure*
**G-1809** *SPY GREASE Data Bulletin*

# *How Does FIFTH WHEEL AND OPEN GEAR COMPOUND Work?*

Semi-truck trailers attach to semi-truck tractors at the fifth wheel, which requires lubrication for steering and component wear control. The fifth wheel and trailer king pin dictate how articulate the movement is between the tractor and trailer, which directly affects steering. In warm temperatures, improper lubrication may cause binding of the fifth wheel and king pin, which leads to understeer. In cold temperatures, the friction between the tires and the road declines dramatically, and the friction between the fifth wheel and trailer increase, especially if the fifth wheel is improperly lubricated. The friction imbalance may lead to loss of control.

# *AMSOIL Synthetic Fifth Wheel and Open Gear Compound (GFW)*

AMSOIL Synthetic Fifth Wheel and Open Gear Compound's highly polar synthetic base materials gives the product exceptional metal adhesion. Its exceptional metal adhesion and outstanding cold temperature fluidity assure that the product does not flake off in cold temperatures. In high temperatures, its exceptional adhesion assures the product does not soften and migrate. Packaged as an aerosol spray, GFW applies easily, evenly and economically.

## *Features and Benefits*

**Feature** Broad temperature range of application.

**Benefit** AMSOIL Synthetic Fifth Wheel and Open Gear Compound dependably lubricates and protects in high and low temperatures for superior steering control and component wear inhibition.

**Feature** Strongly adhesive.

**Benefit** Resists displacement by water or temperature extremes for dependable component protection and steering. May be applied to imperfectly prepared surfaces for time savings.

**Feature** Spray application.

**Benefit** Applies quickly, neatly, easily and economically.

## *Application and Market*

For use on tractor-trailer fifth wheels, open gears, wire ropes, flexible couplings and the sliding surfaces of drag lines, shovels, construction equipment and dredging equipment.

## *Availability*

AMSOIL Synthetic Fifth Wheel and Open Gear Compound is available in 11½ oz. spray cans. See your price list for more information.

*For More Information*

**G-1359** *AMSOIL Synthetic Fifth Wheel and Open Gear Compound Data Bulletin*

# MACHINERY AND EQUIPMENT LUBRICANTS

## *How Does TRACTOR HYDRAULIC/ TRANSMISSION FLUID Work?*

Some heavy equipment use a single fluid, tractor hydraulic/transmission fluid, for transmission lubrication and transmission of hydraulic power. The benefit of using a common fluid for transmission lubrication and hydraulic power is threefold: it reduces equipment tankage requirements, reduces fluid inventories and reduces the opportunity for fluid misapplication.

Hydraulic power comes from applying pressure to a confined liquid, the hydraulic fluid, and forcing the fluid to flow with a given force in a given direction. The pressure applied to the liquid at one point will be transmitted to all points the fluid reaches. Hydraulic systems include a pump for generating fluid flow and force, pipes and tubes for directing the fluid, and cylinders or fluid motors to convert the fluid energy into mechanical work, such as raising the fork on a forklift.

**Note:** (1) Hydraulic power cannot be developed with cold-thickened fluids. Long equipment warmup periods require equipment idle-time and fuel consumption during idling. (2) Hydraulic pumps can work air into fluids, creating foam. Foamy fluids neither transmit hydraulic pressure fully nor lubricate and protect surfaces well. (3) Wet brake chatter, caused by frictional differences between brakes, leads to excessive brake vibration and difficulty in steering the equipment. Transmission fluid friction modifier additives aid control of wet brake chatter. (4) Hydraulic systems tend to accumulate water,due to the difference in temperature between ambient air and the hydraulic system, which generates foam and substantial heat.

## *AMSOIL Tractor Hydraulic/Transmission Fluid (ATH)*

### *Features and Benefits*

**Feature** Cooler operation.

**Benefit** Cooler hydraulic/transmission systems resist stress and wear. They last longer, perform better and require fewer repairs.

**Feature** Thermal and oxidative stability – AMSOIL Synthetic Tractor Hydraulic/Transmission Fluid resists formation of sludge, varnish, acids, deposits and other degradation products.

**Benefit** Hydraulic/transmission systems stay clean, which helps them perform better, last longer and require fewer repairs.

**Feature** Consistent viscosity in high and low temperatures.

**Benefit** Better cold temperature shifting and quick availability of hydraulic power during cold temperature operation. Better high and low temperature protection, which helps hydraulic/transmission systems last longer and require fewer repairs.

**Feature** Superior friction reduction.

**Benefit** Lower wear rate, which helps hydraulic/transmission systems last longer and require fewer repairs.

**Feature** Low temperature fluidity.

**Benefit** Better cold temperature shifting and quick availability of hydraulic power during cold temperature operation. Better wear protection in cold temperatures, which helps hydraulic/transmission systems last longer and require fewer repairs.

**Feature** Low volatility – AMSOIL fluid doesn't evaporate.

**Benefit** Better fluid flow gives better wear protection.

**Feature** Broad temperature range of application.

**Benefit** AMSOIL Synthetic Tractor Hydraulic/Transmission Fluid works safely and protects at higher and lower temperatures than conventional fluids do.

**Feature** Extended service life capability.

**Benefit** AMSOIL Synthetic Tractor Hydraulic/Transmission Fluid lasts longer than conventional fluids do, which saves users money and reduces the environmental impact of used lubricants.

**Feature** High quality foam and water control additives.

**Benefit** Control of foam and water increases fluid service life and helps hydraulic/transmission systems last longer and require fewer repairs.

**Feature** High quality friction modifiers.

**Benefit** Wet brake chatter control for improved control and safety.

## *Application and Market*

Heavy equipment with a common transmission/hydraulic fluid sump.

## *Availability*

AMSOIL Synthetic Tractor Hydraulic/Transmission Fluid is available in 1-quart, 5-gallon, 30-gallon and 55-gallon containers. See your price list for more information.

*For More Information*

**G-28** *Tractor Hydraulic/Transmission Fluid Data Bulletin*

# How Does HYDRAULIC FLUID Work?

Hydraulic power comes from applying pressure to a confined liquid, the hydraulic fluid, and forcing the fluid to flow in a prescribed direction. The pressure applied to the liquid at one point will be transmitted to all points the fluid reaches. Hydraulic systems include a pump for generating fluid flow and pressure, pipes and tubes for directing the fluid, and cylinders or fluid motors to convert the fluid energy into mechanical work, such as raising the fork on a forklift.

In addition to providing the medium for hydraulic power, hydraulic fluid lubricates hydraulic components and protects them from rust and contaminants.

**Note:** (1) Hydraulic power cannot be developed with cold-thickened fluids. Long equipment warmup periods require equipment idle-time and idle fuel consumption. (2) Hydraulic pumps can work air into fluids, creating foam. Foamy fluids neither transmit hydraulic pressure fully nor lubricate and protect surfaces well. (3) Hydraulic systems tend to accumulate water, due to the difference in temperature between ambient air and the hydraulic system.

# AMSOIL Synthetic AW Series Antiwear Hydraulic Oils

ISO 15 Synthetic AW Series Antiwear Hydraulic Oil (AWF)
ISO 22 Synthetic AW Series Antiwear Hydraulic Oil (AWG)
ISO 32 Synthetic AW Series Antiwear Hydraulic Oil (AWH)
ISO 46 Synthetic AW Series Antiwear Hydraulic Oil (AWI)
ISO 68 Synthetic AW Series Antiwear Hydraulic Oil (AWJ)
ISO 100 Synthetic AW Series Antiwear Hydraulic Oil (AWK)

# AMSOIL Synthetic Biodegradable Hydraulic Oils

ISO 32/46 Synthetic Biodegradable Hydraulic Oil (TBI)

## Features and Benefits

**Feature** Cooler operation.

**Benefit** Cooler hydraulics resist stress and wear. They last longer, perform better and require fewer repairs.

**Feature** Thermal and oxidative stability – AMSOIL Synthetic Hydraulic Fluid resists formation of sludge, varnish, deposits, acids and other degradation products.

**Benefit** Hydraulics stay clean, which helps them perform better, last longer and require fewer repairs.

**Feature** Consistent viscosity in high and low temperatures.

**Benefit** Quick availability of hydraulic power during cold temperature operation. Better extreme temperature protection, which helps hydraulics last longer, require fewer repairs.

**Feature** Superior friction reduction.

**Benefit** Lower wear rate, which helps hydraulics last longer and require fewer repairs.

**Feature** Low temperature fluidity.

**Benefit** Quick availability of hydraulic power during cold temperature operation. Better wear protection in cold temperatures, which helps hydraulics last longer and require fewer repairs.

**Feature** Low volatility – AMSOIL Synthetic Hydraulic Fluid doesn't evaporate.

**Benefit** Better fluid flow gives better wear protection.

**Feature** Broad temperature range of application.

**Benefit** AMSOIL Synthetic Hydraulic Fluid works safely and protects at higher and lower temperatures than conventional fluids do.

**Feature** Extended service life capability.

**Benefit** AMSOIL Synthetic Hydraulic Fluid lasts longer than conventional fluids do, which saves users money and reduces the environmental impact of used lubricants.

**Feature** High quality foam and water control additives.

**Benefit** Control of foam and water increases fluid service life and helps hydraulics last longer and require fewer repairs.

## *Application and Market*

For use in hydraulic machinery and equipment.

## *Availability*

AMSOIL Synthetic Hydraulic Fluid is available in 5-gallon, 30-gallon, 55-gallon and 275-gallon containers. See your price list for more information.

*For More Information*

**G-1009** *Industrial Products Sales Book*

**G-1253** *AMSOIL Synthetic AW Series Hydraulic Oils Data Bulletin*

**G-1257** *Biodegradable Hydraulic Oil Data Bulletin*

# How Does COMPRESSOR OIL Work?

Compressed air is a source of energy used for powering tools, inflating pneumatic tires and spraying liquids. Compressor oils lubricate compressor components, such as bearings, pistons, rings and valves.

The bicycle pump is a simple compressor: as the cyclist pulls the pump handle up, air is drawn past the leather cup "piston" into the cylinder of the pump and held at normal pressure. When the cyclist pushes the handle down, the resistance of the air in the cylinder spreads the leather cup, enabling it to compress the air in the cylinder until the air achieves sufficient pressure to pass through the non-return valve into the bicycle tire.

**Note:** (1) Because compressors often generate intense heat, small, high-pressure compressor oil leaks create an explosion and fire hazard. (2) Due to their exposure to ambient air, which always contains moisture, compressors accumulate water in the compressor oil. (3) Compressors can work air and water into fluids, creating foam, which impedes the oil's ability to protect surfaces.

# AMSOIL Synthetic Compressor Oils SIROCCO®: (SEI) PC Series: (PCH, PCI, PCJ, PCK, PCL) DC Series: (DCK, DCL)

## Features and Benefits

**Feature** Cooler operation.

**Benefit** Cooler compressors resist stress and wear. They last longer, perform better and require fewer repairs.

**Feature** Thermal and oxidative stability – AMSOIL Synthetic Compressor Oils resist formation of sludge, varnish, deposits, acids and other degradation products.

**Benefit** Compressors stay clean, which helps them perform better, last longer and require fewer repairs.

**Feature** Consistent viscosity in high and low temperatures.

**Benefit** Better high and low temperature protection, which helps compressors last longer and require fewer repairs.

**Feature** Superior friction reduction.

**Benefit** Lower wear rate, which helps compressors last longer and require fewer repairs.

**Feature** Low temperature fluidity.

**Benefit** Better wear protection in cold temperatures, which helps compressors last longer and require fewer repairs.

**Feature** Low volatility – AMSOIL Synthetic Compressor Oils don't evaporate.

**Benefit** Better fluid flow gives better wear protection.

**Feature** Broad temperature range of application.

**Benefit** AMSOIL Synthetic Compressor Oils work safely and protect at higher and lower temperatures than conventional fluids do.

**Feature** Extended service life capability.

**Benefit** AMSOIL Synthetic Compressor Oils last longer than conventional oils do, which saves users money and reduces the environmental impact of used lubricants.

**Feature** High quality foam and water control additives.

**Benefit** Control of foam and water increases fluid service life and helps compressors last longer and require fewer repairs.

**Feature** High flash and fire points.

**Benefit** Reduces fire and explosion danger.

## *Application and Market*

For use in air compressors.

## *Availability*

PCH, PCJ and PCL are available in 5-gallon and 55-gallon containers.

PCI and PCK are available in 1-quart, 5-gallon, 30-gallon and 55-gallon containers. SIROCCO® and DC Series are available in 5-gallon, 55-gallon, and 275-gallon containers. See your price list for more information.

*For More Information*

**G-1264** *AMSOIL Synthetic PC Series Compressor Oils Data Bulletin*

**G-1254** *AMSOIL Synthetic DC Series Compressor Oils Data Bulletin*

**G-1684** *AMSOIL SIROCCO® Synthetic Ester Oil/Coolant Data Bulletin*

# *How Does BAR AND CHAIN OIL Work?*

Bar and chain oil lubricates the contact between the stationary chain saw bar and the moving chainsaw chain. It also lubricates each articulated link in the chain. It is injected into a groove between the bar and the chain.

## *Synthetic Bar and Chain Oil (ABC)*

AMSOIL Synthetic Bar and Chain Oil contains a highly effective tackifier, which prevents the oil from splattering off the end of the chain saw as the chain moves around the bar at high speed. Because it is a synthetic lubricant, it also provides superior friction reduction and superior lubrication in high and low temperatures. All three features work to improve bar and chain durability.

### *Features and Benefits*

**Feature** Effective tackifier – keeps oil in place.

**Benefit** Keeping the oil in place reduces bar and chain wear so they last longer, perform better and require fewer repairs.

**Feature** High quality friction reduction; high quality high and low temperature protection.

**Benefit** Friction reduction and high and low temperature protection reduce wear, helping chainsaws last longer, perform better and require fewer repairs.

### *Application and Market*

For use on chainsaws.

### *Availability*

AMSOIL Bar and Chain Oil is available in 1-quart, 5-gallon, and 55-gallon containers. See your price list for more information.

# ENGINE AIR AND OIL FILTERS

## *How Do AIR FILTERS Work?*

Engines draw in air to form a fuel-air mixture for combustion; combustion cannot take place without air. In fact, one gallon of gasoline requires the air filling a 10′x15′x8′ room for complete combustion!

To complicate the picture, air contains tons of dirt per cubic mile. Dirt particles are sharp and capable of causing tremendous engine wear. To prevent rapid engine wear, the air filter must trap airborne dirt before it enters the engine. The air filter must balance airflow against dirt-trapping.

Coarse filter materials allow excellent air flow but allow passage of a high volume of debris. Fine filter materials prevent the ingestion of a high volume of debris but also stop the ready flow of air.

**Performance Characteristics of Paper Air Filters**

(1) Automotive filter paper, which surface-traps debris, starts with good air flow and adequate filtering capacity. As they age and become obstructed with debris, their filtering efficiency increases and their air flow capacity decreases. As air flow capacity decreases, engine performance declines.

(2) Paper filters wear and tear; holes allow excessive dirt to pass into the engine.

(3) Paper filters are single use products.

**Performance Characteristics of AMSOIL Air Filters**

AMSOIL air filters contain reusable oil-wetted foam filter elements. They provide substantially greater air flow and greater dirt stoppage than paper filters provide. Greater air flow promotes more complete combustion which enhances power output and enhances fuel efficiency in older, non-computer monitored vehicles.

(1) The thick foam elements in AMSOIL air filters contain twisted but spacious passageways. Air rushes through the porous foam, while the complex of tunnels obstruct debris particles. Tack oil holds debris to the filter so it cannot circulate once trapped. The tack oil also aids in the trapping of particles smaller than 5 microns.

(2) Soft filter foam "gives" easily, resisting tearing.

(3) The foam filter elements may be removed, washed with household detergent, rinsed, dried, reoiled with AMSOIL Foam Filter Oil and reinstalled in the vehicle. Filter foams may be reused for years as long as they remain undamaged. Plus, due to the thickness of the foam elements, AMSOIL air filters may be used for longer intervals between cleanings than paper filters may be used between replacements.

# *AMSOIL Air Filters*

2-Stage Air Filters (TS-)

POD Lifetime Air Filters (POD)

## *Features and Benefits*

**Feature** Superior debris trapping capability – Less debris enters the engine.

**Benefit** Engines perform better, last longer and require fewer repairs.

**Feature** Tear resistance.

**Benefit** Filters maintain their ability to protect dependably, helping engines perform better, last longer and require fewer repairs.

**Feature** Oil trapping of debris particles keeps debris trapped in the filter.

**Benefit** Less debris enters the engine. Engines perform better, last longer and require fewer repairs.

**Feature** Superior air flow for better combustion.
**Benefit** Better combustion improves power, performance and fuel economy.

**Feature** Reusability.
**Benefit** Cost savings and less generation of solid waste.

### *Application and Market*

**2-Stage Filters:** For use on passenger cars and light trucks.

**POD Filters:** For use on lawn and garden tractors, lawn mowers and other small engines.

### *Availability*

Packaged as single units. Please refer to the G-194 *AMSOIL Oil and Air Filter Application Guide* and the G-26 *Confidential Price List* for specific application recommendations.

*For More Information*

**G-44** *Air Filter Data Bulletin*

**G-385** *Filtration Fact Book*

## *Foam Filter Oil (AFO)*

### *Application and Market*

Replacement tack oil for use on AMSOIL air filters after they are cleaned.

### *Availability*

AMSOIL Foam Filter Oil is available in 8-oz containers. See your price list for more information.

## *How Do FULL-FLOW OIL FILTERS Work?*

Engine oil filters remove solid foreign matter, such as soot, wear particles and dirt, from the engine oil. Full-flow oil filters are installed between the oil pump and the body of the engine. All the engine oil is routed through the full-flow filter before it circulates in the engine. Full-flow filters are fitted with an oil pressure relief valve to assure a continuous flow of oil to the engine in the event the filtering element becomes obstructed. To prevent oil starvation in such an event, unfiltered oil bypasses the obstructed oil filter and lubricates the engine.

Solid foreign matter circulating in the engine oil causes abrasive wear. Solid materials also "soak up" motor oil additives, promoting additive depletion, and when

present in sufficient concentration, solid materials increase oil viscosity.

**Performance Characteristics of Paper Media Full-Flow Filters**

Paper media surface trap debris. Paper media allow the flow of a large volume of oil, but because filter paper becomes saturated quickly, paper media do not have much debris storage capacity, which limits their durability.

(1) As their surfaces become obstructed with debris, oil "channels" through the paper media and receives very little filtering before passing into the engine.

(2) Conventional automotive full-flow oil filters should be changed at 3000 mile intervals for optimal protection. For baseline protection, they should be changed at 6000 mile intervals.

**Performance Characteristics of AMSOIL Super Duty Full-Flow Oil Filter Elements**

The AMSOIL Super Duty Oil Filter contains a high-tech blend of cellulose, synthetic and glass fibers designed for extended drain intervals and severe service. In fact, testing shows AMSOIL Super Duty Oil Filters offer more than 75 percent better combined efficiency/capacity than conventional filters offer.

The AMSOIL Super Duty Oil Filter may be changed at six-month or 12,500-mile intervals. The AMSOIL Super Duty Motorcycle Oil Filter may be changed at twice the manufacturer's recommendation or six months when used in conjunction with AMSOIL motor oil.

AMSOIL manufactures and markets Super Duty Oil Filters to mount at the conventional oil filter site and also manufactures and markets mounting hardware for "remote" mounted Super Duty Oil Filters. "Remote" mounting allows placement of the filter anywhere in the engine compartment (within space and safety constraints), which increases the convenience of filter servicing.

# *AMSOIL Super Duty Oil Filter (SDF-) AMSOIL Super Duty Motorcycle Oil Filter (SMF-) AMSOIL Remote Full-Flow Mounting Kit (BMK-14)*

## *Features and Benefits*

**Feature** Non-channeling so underfiltered oil doesn't reach engine.

**Benefit** Proper filtration increases engine life; engines require fewer repairs.

**Feature** Greater capacity – holds more debris.

**Benefit** More dependable protection, especially over extended oil drain intervals.

## *Application and Market*

**Heavy duty truck filters**: For use on heavy-duty commercial trucks.

**Passenger car and light truck filters:** For use on automobiles and light trucks.

**Motorcycle and ATV filters:** For use on motorcycles and ATVs.

## *Availability*

Packaged as single units. Please refer to the G-194 *AMSOIL Oil and Air Filter Application Guide* and the G-26 *Confidential Price List* for specific application recommendations.

*For More Information*

**G-88** *Oil Filters Data Bulletin*

**G-385** *Filtration Fact Book*

# *How Do BY-PASS OIL FILTERS Work?*

By-pass oil filters are supplementary to the full-flow oil filter system. By-pass oil filters are not included as standard equipment in passenger cars. They are rarely, if ever, included as standard equipment on commercial vehicles and heavy equipment.

By-pass oil filters are placed outside the main line of oil circulation. They draw roughly five to ten percent of the total volume of oil from the system, filter it slowly through dense media and usually send it to the crankcase rather than to the engine. Used in conjunction with full-flow filters, by-pass filters require the addition of oil to the system.

Particles in the 5 to 20 micron size range may cause up to sixty percent of total engine wear. Full-flow filters remove particles sized 20 microns or larger. AMSOIL by-pass oil filters remove particles 5 microns in size or larger with efficiency approaching one hundred percent. They also remove particles smaller than 1 micron.

AMSOIL by-pass oil filters also remove water. Full-flow oil filters cannot remove water. Water depletes oil additives and promotes rust and corrosion of component surfaces.

Finally, the addition of oil to the system "spreads the workload" over a larger "workforce," which reduces stress and helps oil last longer than it would in a smaller volume system.

# How Does the AMSOIL DUAL REMOTE OIL FILTER Work?

The patented AMSOIL Dual Remote Oil Filter puts an AMSOIL Full-Flow Oil Filter and an AMSOIL By-Pass Oil Filter together on a single mount which may be located anywhere in the engine, within size and safety constraints. The system directs oil through the by-pass filter element first. If the engine requires greater oil flow than the by-pass can provide, the system redirects oil as necessary through the full-flow filter. Finally, unlike other by-pass systems, the Dual Remote directs oil cleaned by the by-pass into the engine rather than into the crankcase.

# AMSOIL By-Pass and AMSOIL Dual Remote Oil Filter Kits

By-Pass Single Mounting Kit (BMK-11)
Dual Gard Mounting Kit (BMK-12)
Dual Remote Mounting Kit (BMK-13)
Single Remote Full Flow Mounting Kit (BMK-14)
Dual Remote Filtration System (BMK-15)
Dual Remote Filtration System (BMK-16)
Dual Remote Filtration System (BMK-17)

## Features and Benefits

**Feature** Removes particles smaller than 1 micron.
**Benefit** Fewer and smaller wear particles circulating in the oil reduce wear rate so engines last longer, perform better and require fewer repairs.
**Feature** Removes water.
**Benefit** With no water circulating in the oil, engines undergo less rust and lubricants undergo less breakdown, helping engines last longer, perform better and require fewer repairs.
**Feature** Increased oil system capacity.
**Benefit** Increased oil in the system reduces oil temperature and oil stress, so oil protects better, helping engines last longer and require fewer repairs. Helps oil last longer, too.

## Application and Market

**BMK-11:** For use in passenger cars and light- and medium-duty trucks.
**BMK-12:** For use in commercial vehicles and equipment.
**BMK-13:** For use in passenger cars and light- and medium-duty trucks.

**BMK-14:** For use in passenger cars and light- and medium-duty trucks.

**BMK-15:** For use on Cummins light truck diesel engines. Equipped with filters.

**BMK-16:** For use on International light truck diesel engines. Equipped with filters.

**BMK-17:** For use on Duramax light truck diesel engines. Equipped with filters.

### *Availability*

Packaged as single units. Please refer to the G-194 *AMSOIL Oil and Air Filter Application Guide* and the G-26 *Confidential Price List* for specific application recommendations.

*For More Information*

**G-498** *By-Pass Oil Filters Data Bulletin*

**G-385** *Filtration Fact Book*

# Fuel Filter/Water Separators

## *How Do Fuel Filter/Water Separators Work?*

Fuel filter/water separators remove water and solid contaminants from fuel before they can cause wear, erosion, surface pitting and loss of pressure in the fuel pump and injection system. The AMSOIL Dahl system features a dual chamber 3-stage fuel filter/water separator, providing efficient water separation and contaminant filtration. Its unique patented depressurizer cone provides more area for the fuel to flow over, leading to greater separation of water and dirt from the fuel.

## *AMSOIL Dahl Fuel/Water Separators*

Separator Unit (ADF-75)

Separator Unit (ADF-10)

Separator Unit Marine (ADF-11)

Separator Unit (ADF-20)

Separator Unit (ADF-21)

### *Features and Benefits*

**Feature** Removes virtually 100 percent of water and contaminants in fuel.

**Benefit** Reduces wear and erosion rate, prolongs system life by eliminating pump and injector overhauls caused by water-contaminated fuel, reduces downtime.

**Feature** Less mechanical flow resistance.

**Benefit** Allows longer pump and element life.

**Feature** Unique patented depressurizer cone.

**Benefit** Efficient separation of water and dirt from the fuel, allows filter element to last up to 40,000 miles.

## *Application and Market*

**Separator Unit (ADF-75):** For use in commercial diesel engines and gasoline passenger cars and light duty trucks up to 80 hp.

**Separator Unit (ADF-10):** For use in commercial diesel engines and gasoline passenger cars and light duty trucks up to 200 hp.

**Separator Unit Marine(ADF-11):** For use in marine applications up to 200 hp.

**Separator Unit (ADF-20):** For use in commercial diesel engines and gasoline passenger cars and light duty trucks up to 800 hp.

**Separator Unit Marine (ADF-21):** For use in marine applications up to 800 hp.

## *Availability*

Packaged as single units. See your price list for more information.

*For More Information*: **G-1527** *AMSOIL Dahl Fuel/Water Sperator Brochure.*

# OIL ANALYSIS

## *How Does OIL ANALYSIS Work?*

**Trigard:** A stand-alone in the industry, Trigard offers a program of used oil analysis for owners of passenger cars and light trucks in non-commercial use. With Trigard, AMSOIL customers may increase their oil drain intervals beyond the 25,000 mile or one-year intervals recommended by AMSOIL INC for AMSOIL synthetic motor oils. The Trigard program requires use of AMSOIL synthetic motor oil, an AMSOIL air filter and an AMSOIL By-Pass Oil Filter and participation in the Trigard used oil analysis program.

**Oil Analyzers Inc.** Oil Analyzers Inc. offers a program of used oil analysis for vehicles and equipment in commercial and non-commercial service. Oil analysis services offered by Oil Analyzers Inc. do not require the use of any AMSOIL products.

Oil Analyzers Inc. services may be used to extend lubricant drain intervals and monitor the well-being of vehicles and equipment, which may lead to decreased downtime, increased production, longer equipment life, elimination of equipment failures, streamlined maintenance protocols and reduced capital expenditures.

# *AMSOIL Oil Analysis Programs*

Trigard Oil Analysis Program (ATG)

Oil Analyzers Inc. Oil Analysis and Kits (G-1451, G-1454, G-1455, G-1318, G-1321, G-1322, G-1910)

## *Features and Benefits*

**Feature** Extended oil service life.

**Benefit** Longer lasting lubricants save motorists and commercial operators money and reduce environmental impact of used oil disposal.

**Feature** Monitor equipment serviceability.

**Benefit** Problems are caught in early stages, saving motorists the cost of major repair or a new engine.

## *Application and Market*

ATG-01, 02 may be used by passenger car and light truck operators who do not use the vehicles for commercial purposes.

G-1451 - G-1455, G-1318 - G-1322 and G-1910 may be used by commercial vehicle and equipment operators and non-commercial vehicle and equipment operators.

## *Availability*

Trigard participants receive a personal Trigard identification number and an oil sample kit, which includes sample bottles and sample identification forms.

ATG-01 For first-time Trigard users.

ATG-02 For ongoing Trigard users.

Oil Analyzers Inc.

G-1451 (1) two-way postage-paid sampling kit

G-1454 (50) two-way postage-paid sampling kits

G-1455 (100) two-way postage-paid sampling kits

G-1318 (1) sampling kit

G-1321 (50) sampling kits

G-1322 (100) sampling kits

G-1910 (1) Canadian Sampling Kit

*For More Information*

**G-254** *Trigard Sales Brochure*

**G-1465** *Oil Analyzers Inc. Brochure*

# FUEL ADDITIVES

## *How Do FUEL ADDITIVES Work?*

Gasoline and diesel fuel are refined crude oil products. They contain materials which function as contaminants, fouling the fuel system as they burn. Fuel system deposits interfere with the combustion process and lead to performance problems, excessive exhaust emissions and poor fuel economy. Deposits also accelerate fuel system component wear. Finally, diesel engines face fuel-related performance and durability issues involving their cold temperature performance, overall power and the durability of their fuel system components.

Fuel additives are substances that may be added to a vehicle's fuel, via the fuel tank, on a regular basis to prevent or correct the problems caused by gasoline and diesel fuel.

**Gasoline** – Partially burned or unburned gasoline may leave carbon and varnish deposits at various sites along the fuel delivery and combustion system. Fuel injector deposits interfere with the fine atomization of fuel necessary for complete combustion and efficient fuel usage. Hesitation, poor fuel economy and excessive exhaust emissions may result. Intake valve deposits interfere with valve seating, which results in poor power, an opportunity for the intake valves to be burned by hot exhaust gases and, sometimes, vehicle backfiring. Combustion chamber deposits can cause engine knock, an uncontrolled, explosive form of combustion. Knock explosions damage combustion chamber surfaces by dislodging material from them. Engines with severe engine knock perform roughly and consume excessive fuel. Finally, gasoline may contain water, which promotes rust and corrosion.

**Diesel** – Partially burned or unburned diesel fuel products may cause carbon and varnish deposits at various sites along the fuel delivery and combustion system, leading to poor fuel economy, excessive exhaust emissions and a need for regular injector maintenance.

Diesel fuel also contains wax, which crystallizes at temperatures commonly observed in northern tier states during winter months. Wax crystallization causes filter plugging or fuel line blockage, which results in a loss of ability to start the engine or a loss of ability to keep the engine running.

Since the October 1993 federal mandate requiring the use of "low sulfur" diesel fuel (diesel fuel with 0.05 percent by weight or lower sulfur content), diesel fuel has

lost some of its ability to lubricate injectors and other fuel system components. Low sulfur diesel fuel's low lubricity accelerates injector pump wear and sometimes causes pump failures.

Cetane number is a measure of the ignition quality of diesel fuel. Fuels with high cetane numbers ignite after a short delay from the time they are injected into the combustion chamber. Fuels with low cetane number ignite after a long delay. Diesel engines require fuels whose cetane number falls within a narrow range of values. Most North American diesel fuel have lower cetane numbers than are recommended for most diesel engines operating in the region. To provide optimal performance, North American diesel fuel requires additives to boost their cetane.

Operating a diesel engine on fuel with insufficient cetane causes difficulty in cold temperature starting, diesel knock, rough operation, poor power, excessive white smoke emissions and carbon deposits on various fuel system components.

## *AMSOIL Series 2000 Octane Boost (AOB)*

AMSOIL Series 2000 Octane Boost maximizes power and improves performance in all two-cycle and four-cycle gasoline engines. It increases octane numbers up to seven points. It reduces engine knock, improves ignition and engine response, helps fuel burn cleaner and inhibits corrosion. Recommended for off-road and racing use. Also excellent as a lead substitute at same treat rates in collector automobiles, older off-road equipment and pleasure vehicles.

## *PI Performance Improver Gasoline Additive (API)*

AMSOIL Performance Improver removes deposits, and its use prevents the formation of new deposits. API also protects surfaces from rust. Regular use of API may correct hesitation, stalling and excessive emissions, and restores power and fuel economy. API often helps vehicles pass emissions tests.

## *PI Quick Shot Gasoline Additive (AQS)*

PI Quick Shot offers the stay-clean benefits of AMSOIL Performance Improver in a single application container.

## AMSOIL Gasoline Stabilizer (AST)

AMSOIL Gasoline Stabilizer reduces the oxidation process that occurs when fuel is stored for extended periods. It prevents the formation of varnish and sludge which can clog injectors, stick floats and cause poor engine performance. It is ideal for stored seasonal equipment, such a snowmobiles, lawnmowers and boats.

## Diesel Fuel Additive Concentrate (ADC)

AMSOIL Diesel Fuel Additive Concentrate cleans existing fuel system deposits, prevents formation of new ones, reduces the temperature at which wax crystallizes and increases fuel lubricity. The use of ADC increases fuel economy, reduces emissions and black smoke, reduces the frequency at which injector maintenance is required, ensures dependable cold temperature starting and running, and protects pumps and other components from the effects of low lubricity fuel. ADC also stabilizes stored fuel. ADC is formulated for use in heavy duty diesel engines.

## Diesel Fuel Modifier (ADM)

AMSOIL Diesel Fuel Modifier performs the same functions as AMSOIL Diesel Fuel Additive Concentrate, and is formulated for use in light duty diesel engines, such as those found in passenger cars and light trucks.

## Cetane Boost (ACB)

AMSOIL Cetane Boost may be used to ensure dependable cold temperature starting, prevent diesel knock, rough operation and poor power, reduce white smoke emissions and reduce the formation of carbon deposits. Adds 3 to 7 cetane numbers.

## Home Heating Fuel Additive (AHF)

Home Heating Fuel Additive improves fuel economy, reduces smoke output, removes deposits and keeps new ones from forming, stabilizes fuel during storage and keeps furnaces clean and rust-free.

### Features and Benefits

**Feature** Increases octane up to 7 points

**Benefit** Reduces engine knock, improves performance (AOB).

**Feature** Inhibits deposit formation (AOB, API, AQS, ADC, ADM, AHF).

**Benefit** Clean engines last longer, perform better and require fewer repairs.

**Feature** Rust and corrosion inhibition (AOB, API, AQS, ADC, ADM, AHF).

**Benefit** Rust- and corrosion-free equipment lasts longer and requires fewer repairs.

**Feature** Improved fuel efficiency (AOB, API, AQS, ADC, ADM, AHF).

**Benefit** Savings on fuel costs.

**Feature** Lubricity aid (ADC, ADM).

**Benefit** Lubricity reduces wear. Lower wear rates help engines last longer, perform better and require fewer repairs.

**Feature** Low temperature fuel fluidity (ADC, ADM).

**Benefit** Low temperature fluidity helps engines start and run dependably in cold temperatures and increases their cold temperature fuel efficiency.

**Feature** Fuel stabilization (AST, ADC, ADM).

**Benefit** Helps stored fuels "keep."

**Feature** Improved fuel ignition quality (ACB).

**Benefit** Helps diesels start dependably in cold temperatures; helps them run powerfully and smoothly; reduces their smoke and emissions.

## *Application and market*

**AOB and AST:** For use in gasoline-fueled two-cycle or four-cycle engines, or in gasoline destined for use in such engines.

**API and AQS:** For use in gasoline-fueled four-cycle engines. Passenger car owners comprise the largest market. Those living in areas subject to mandated vehicle inspection and maintenance programs may be interested in the product's ability to help their car pass emissions tests.

**ADC:** For use in heavy duty diesel fueled two- and four-cycle engines, such as those found in semi-trailer trucks and heavy equipment. AMSOIL does not recommend ADC for use in light duty diesel engines.

**ADM**: For use in light duty diesel fueled two- and four-cycle engines, such as those found in passenger cars and light trucks.

**ACB:** For use in all diesel fueled engines. ACB is fully compatible for use with ADC or ADM; however, ACB and ADC or ACB and ADM should not be pre-mixed. The products may be added individually to the vehicle's fuel tank while the vehicle is refueled.

**AHF**: For use in oil burning home furnaces.

### *Availability*

AMSOIL fuel additives, except AQS, are available in 12-oz, 16-oz, 1-gallon, 5-gallon, 30-gallon and 55-gallon containers. AQS is available in 6-oz bottles. See your price list for more information.

*For More Information*

**G-221** *Home Heating Fuel Extender flyer*
**G-1104** *Heavy Duty Diesel Additives brochure*
**G-1135** *PI and Diesel Fuel Modifier flyer*
**G-1431**Series 2000 Octane Boost flyer

# Cleaning and Protecting Products

## *How Do CLEANING and PROTECTING Products Work?*

Metal surfaces exposed to water, combustion processes or conventional lubricants may become deposit-ridden and worn with use. Cleaning products, usually through the actions of solvents, restore them to performance at or near their original level. Protectants, usually through the actions of rust inhibitors, water displacers and lubricants, help components retain their optimal performance characteristics.

## *Metal Protector (AMP)*

Metal Protector is a greaseless all-purpose metal protectant, rust preventive and water displacing agent. May be used to loosen rusted fasteners such as nuts and bolts, dry wet ignition systems and protect metal components. Metal Protector is ideal for use on firearms and small sensitive componentry.

## *Heavy Duty Metal Protector (AMH)*

Heavy Duty Metal Protector is a heavy duty spray lubricant fortified with special rust and corrosion inhibitors. It penetrates and adheres to metal surfaces, leaving a long-lasting protective dry wax-like film. Heavy Duty Metal Protector is ideal for lubricating hinges, wire ropes and springs, chains, nuts and bolts.

# *Power Foam Engine Cleaner and Degreaser (APF)*

Power Foam cleans the combustion intake system and exterior engine surfaces. Use of APF improves fuel efficiency and engine power, reduces or eliminates engine knock, removes rust and grease and frees stuck chokes. Power Foam is a spray-on, rinse-off product. It will not harm fuel injectors, catalytic converters or emission control devices.

# *Silicone Lubricant Spray (ALS)*

Silicone Lubricant Spray is formulated for use anywhere a light-duty or silicone lubricant is recommended. It is ideal for lubricating metal-to-nonmetal or nonmetal-to-nonmetal materials. Applied as an aerosol, Silicone Lubricant Spray leaves a dry lubricating film on surfaces. It may be used in food processing or packaging applications in which incidental food contact may occur.

# *Engine Flush (AEF)*

Engine Flush cleans the crankcase, cylinder walls, pistons and piston rings of gasoline-fueled four-cycle engines and diesel-fueled two- and four-cycle engines. Removing sludge and deposits increases fuel economy and power and enhances component durability.

## *Features and Benefits*

**Feature** Cleans and protects (all).
**Benefit** Clean engines and equipment run better, last longer and require fewer repairs.

**Feature** Rust and corrosion prevention (AMP, AMH, APF).
**Benefit** Rust- and corrosion-free engines and equipment run better, last longer and require fewer repairs.

**Feature** Improved fuel efficiency (APF, AEF).
**Benefit** Savings on fuel costs.

**Feature** Displaces water (AMP, AMH).
**Benefit** Ignitions, electrical contacts and metal components work properly when kept water-free. Water displacement restores original performance and helps components last longer and require fewer repairs.

## *Application and Market*

**AMP:** For use on small geared equipment, chains, hinges, electrical contacts and more.

**AMH:** For use on hinges, wire ropes and springs, chains, nuts and bolts. Also works well as an undercoat.

**APF:** For use on two- and four-cycle gasoline-fueled engine combustion intake systems and exteriors.

**ALS:** For use lubricating non-metallic surfaces that come into contact with metal, nylon, cardboard, fiberglass, wood or plastic surfaces.

**AEF:** For use in gasoline four-cycle and diesel two- and four-cycle engines. AMSOIL recommends treating engines with Engine Flush prior to converting a vehicle to AMSOIL synthetic motor oils to remove the sludge and deposits frequently left by other oils. The Engine Flush treatment eliminates or reduces the temporary increase in oil consumption that commonly accompanies a conversion to AMSOIL synthetic motor oils.

Because AMSOIL synthetic motor oils contain powerful cleaning agents, they remove sludge and deposits, carrying materials to the oil filter. The deposit-laden filter allows dirty oil to by-pass the filter. The circulation of dirty oil impedes the tight piston ring-cylinder wall seal, which increases oil consumption by allowing oil to enter the combustion chamber, where it is burned, or by pushing it out the positive crankcase valve, via the action of the higher pressure combustion gases pushing on the lower pressure air in the crankcase.

Using Engine Flush before installing AMSOIL synthetic motor oil reduces the sludge and deposit load in the engine, which, in turn, keeps oil consumption after conversion at or close to normal levels.

## *Availability*

AMSOIL cleaning and protecting products are available in 8¾-oz spray cans, 10-oz. spray cans, 18-oz spray cans and 16-oz, 1-gallon, 5-gallon, 30-gallon and 55-gallon containers. See your price list for more information.

*For More Information*

**G-172** *Engine Flush Brochure*
**G-1136** *Power Foam and M.P. Flyer*
**G-1247** *Silicone Lubricant Spray Flyer*

# Engine Coolant

## *How Does ANTIFREEZE/COOLANT Work?*

Coolant keeps the temperature of the top sixty percent of the engine below the critical range at which the engine undergoes heat-related failure. Virtually all coolants contain water. To prevent the water from freezing, expanding and damaging the engine during periods of freezing temperatures, coolants contain anti-freeze, chemicals that physically combine with water and lower the temperature at which the coolant freezes. Those chemicals also prevent water from boiling off during high temperature engine operations, so they are also important as cooling agents. Anti-freeze/coolant products also contain additives to prevent radiator corrosion and erosion. Corrosion is a chemical process in which surface material is removed from metal surfaces. Erosion is a mechanical process in which the explosive force of bubbles bursting in the coolant "blast" materials from metal surfaces; it is also called "pitting." Diesel engines are particularly subject to corrosive and erosive damage.

Conventional anti-freeze contains ethylene glycol, a product with good ability to moderate engine temperature and prevent coolant freeze-up. However, ethylene glycol, a poisonous product, smells and tastes sweet and causes injury or death to many small children, pets and wild animals every year.

## *AMSOIL Propylene Glycol Antifreeze and Coolant (ANF)*

Propylene glycol may also be used in anti-freeze coolant mixtures and provides good high and low temperature radiator protection. Propylene glycol, which smells and tastes bland, is significantly less toxic than ethylene glycol is. In fact, propylene glycol is available in food and pharmaceutical grades for use in human foods and medications and in grades appropriate for use in pet foods.

Compared to ethylene glycol products, propylene glycol products appear to provide equal, or in some instances, superior protection against corrosion and erosion in diesel engines, which are more prone to both types of damage than are gasoline engines.

When crankcase oil is contaminated by coolant, bearing damage occurs at a lower concentration with ethylene glycol than it does with propylene glycol; one percent ethylene glycol in the engine oil may lead to bearing damage. Bearings treated to eight percent

propylene glycol contamination of the engine oil remained undamaged.

Finally, while both ethylene glycol and propylene glycol biodegrade at about the same rate, propylene glycol's lower toxicity makes it environmentally less hazardous during the biodegradation process.

AMSOIL ANF is formulated for use in gasoline engines, light duty diesel engines and heavy duty diesel engines. Some other propylene glycol products do not contain an additive system appropriate for use in heavy duty diesel engines.

### *Features and Benefits*

**Feature** Low toxicity.
**Benefit** Safer than EG coolants for humans and animals in case of ingestion.

**Feature** Formulated for gasoline and diesel engines.
**Benefit** May be used by more customers than some propylene glycol antifreezes can, due to their formulation for gasoline engines only.

**Feature** Superior erosion and corrosion protection in diesel engines.
**Benefit** Radiators last longer and require fewer repairs.

**Feature** Increased bearing safety in case of coolant contamination of engine oil.
**Benefit** May prevent catastrophic bearing failure.

### *Application and Market*

For use in the radiators of gasoline-fueled four-cycle engines, diesel-fueled light and heavy duty engines.

### *Availability*

AMSOIL Propylene Glycol Antifreeze and Coolant is available in 1-gallon, 6-gallon and 55-gallon containers. See your price list for more information.

*For More Information*
**G-1156** *Antifreeze and Coolant flyer*

# OTHER PRODUCTS

## *How Do CLEANING CONCENTRATES Work?*

Cleaning concentrates are concentrated cleaners that, when diluted with various volumes of water, can achieve a multitude of cleaning tasks, from heavy-duty to light-duty.

# *BriteSide™ T6 Cleaning Concentrate*

BriteSide T6 Cleaning Concentrate tackles the toughest cleaning jobs, yet when diluted with water, is safe and effective on virtually every surface or material. BriteSide T6 (Task six) represents six categories of application.

## *Features and Benefits*

**Feature** Super concentrated.
**Benefit** Saves money, time and labor.

**Feature** Versatile.
**Benefit** Safe and effective for virtually all cleaning chores.

**Feature** Biodegradable.
**Benefit** Environmentally safe.

## *Application and Market*

For use as a multi-purpose cleaner in the house, garage and yard.

## *Availability*

BriteSide T6 Cleaning Concentrate is available in 64-ounce bottles. See your price list for more information.

*For More Information:* **G-1750** *BriteSide T6 Cleaning Concentrate Brochure*

# *How Do WATERLESS HAND CLEANERS Work?*

Waterless hand cleaners effectively remove oils, greases and other complex chemicals from the skin without the use of water.

# *BriteSide™ Heavy Duty SCRUB Hand Cleaner (BSH)*

BriteSide™ Heavy Duty SCRUB Hand Cleaner dissolves and assimilates oils, greases and complex chemicals on hands with little or no rubbing action and without the use of abrasive pumice.

## *Features and Benefits*

**Feature** Unique formulation.
**Benefit** Cleans hands more effectively than simple soaps.
**Feature** Requires no water.
**Benefit** Convenient.
**Feature** No pumice.
**Benefit** Cleans hands without harsh abrasion.

### *Application and Market*

For commercial, industrial and home applications.

### *Availability*

BriteSide™ Heavy Duty SCRUB Hand Cleaner is available in 16-ounce bottles, 1-gallon containers and 10-ml sample packets. See your price list for more information.

## *How Do CAR APPEARANCE PRODUCTS Work?*

Automobile interior and exterior surfaces are subject to sun damage and the accumulation of dirt. To maintain their appearance, they must be cleaned, and to further protect their appearance and integrity, protectants may be applied.

## *BriteSide™ Miracle Wash (AMW)*

Miracle Wash is a waterless car wash which sprays on, lifts dirt and wipes off easily, leaving a brilliant shine and tough protection from the sun's harmful ultraviolet rays.

## *Pro-Formula Car Polish (PCP)*

Pro-Formula Car Polish, a liquid, may be applied with a cloth and buffed lightly to produce a high shine. It protects the automotive exterior finish from the elements, including the sun's ultraviolet rays.

## *Pro-Formula Vinyl and Leather Cleaner (PFC)*

Pro-Formula Vinyl and Leather Cleaner deep cleans upholstery and leaves a rich, protective finish with a pleasant leather scent. Spray-on, wipe-off formulation.

## *Pro-Formula Vinyl and Leather Protectant (PFP)*

Pro-Formula Vinyl and Leather Protectant imparts a deep, rich luster and shields leather, vinyl and rubber from the harmful effects of sun and weather. Spray-on, wipe-off formulation.

## *Pro-Formula Metal Polish (PFM)*

Pro-Formula Metal Polish cleans, polishes, seals and protects all metal surfaces. It removes even the most stubborn oxidation, rust and tarnish without ammonia or harsh abrasives. Smooth-on, buff-lightly formulation.

## *Application and Market*

For automotive applications.

## *Availability*

AMSOIL Car Appearance Products are available in 13-oz spray cans, 16-oz bottles and 8-oz bottles. See your price list for more information.

*For More Information*

**G-1277** *Miracle Wash Flyer*
**G-1349** *Automotive Appearance Products Brochure*

# *How Do WINDSHIELD PROTECTANTS Work?*

Windshield protectants contain chemicals which cause water to bead up and run off the windshield to improve the driver's ability to see through the windshield during heavy rain, an important safety feature. They also form a coating on the windshield which makes dirt and ice adhere loosely, making cleaning and scraping the windshield easy.

# *Rain Clear Windshield Protectant (ARS)*

Rain Clear may be applied with a soft cloth and provides excellent water, dirt and ice repellancy for superior visibility and cleanability. Rain Clear leaves a highly durable protective film and needs only occasional reapplication.

## *Application and Market*

For use on all glass surfaces, particularly those in automobile windshields.

## *Availability*

AMSOIL Rain Clear is available in 4-oz containers. See your price list for more information.

*For More Information*

**G-1349** *Automotive Appearance Products Brochure*

AMSOIL products and Dealership information are available from your local AMSOIL Dealer.

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