

It's All in the Formulation

Motor oils, drivetrain lubes and hydraulic oils are formulated to carry out specific tasks.

Motor Oil

In the early days of automotive lubrication, motor oil was just plain base oil. When wax modifier was added to the base oil in the 1930s to address the problems created by wax residue, the motor oil additive market was born. Today, motor oils contain a wide variety of additives designed to improve their protection and performance capabilities. Motor oil additives serve three essential functions: protecting metal surfaces, expanding the lubricant's application range and extending the lubricant's life.

Surface Protection Additives

Surface protection additives effectively address issues related to metal surfaces:

- Anti-wear agents protect against friction, wear, scoring and seizure.
- Corrosion and rust inhibitors protect internal metal parts against corrosion and rust.
- Detergents keep surfaces free of deposits.
- Dispersants prevent insoluble contaminants from agglomerating by keeping them dispersed in the lubricant.
- Friction modifiers alter the oil's coefficient of friction.

Performance Additives

A second group of additives serves to improve the lubricant's performance:

- Pour point depressants (used in petroleum lubricants) modify wax crystal formation and enable oils to flow at lower temperatures.
- Seal swell agents help swell elastomeric seals by causing a chemical reaction in the elastomer.
- Viscosity modifiers help reduce the rate of viscosity change when temperatures rise or drop.

Protective Additives

A third group of additives works to extend the service life of the lubricant:

- Anti-foamants reduce surface tension and speed the collapse of foam.
- Anti-oxidants reduce the oxidation rate by decomposing peroxides and terminating free-radical reactions.
- Metal deactivators reduce the catalytic effect of metals on the oxidation rate, further slowing oxidation.



Combining the industry's premier synthetic technology with AMSOIL premium additives, AMSOIL synthetic motor oils exceed the high performance demands of modern engines, effectively withstanding the stress of higher horsepower, higher heat and complicated emission control systems. AMSOIL synthetic motor oils consistently outperform competitive conventional and synthetic motor oils for superior protection and performance over extended drain intervals.

Drivetrain Lubricants

Although gear oil faces many of the same challenges as motor oil, it also has additional responsibilities, such as carrying damaging wear debris away from contact zones and muffling the sound of gear operation. Gear oils are placed under extreme levels of pressure, often leading to boundary lubrication conditions (when a full fluid film does not exist between surfaces). Differentials in cars and trucks feature a ring-and-pinion hypoid gear set that can experience boundary lubrication, pressures and sliding action that can wipe most of the lubricant off the gears. Extreme-pressure (EP) additives are added to gear oil in order to provide additional protection within this extreme environment.

Additional Challenges

Additional challenges faced by gear oils include rust and corrosion protection. Because many of the components found in the drivetrain consist of ferrous material, drivetrains are more susceptible to rust and corrosion than engines.

Gear sets found in the drivetrain can be noisy and may be subjected to shock-loading conditions. The viscosity and extreme-pressure formulation of gear oil quiets gears and dissipates shock loading.



The rotating motion of gear sets churns the gear lube, subjecting it to foaming and significantly reduced load-carrying capacity. When gear teeth come into contact with each other, trapped air bubbles compress and reduce the thickness of the separating oil film, leading to direct metal-to-metal contact and increased wear levels. Only the air is compressible; the oil is not. The gear oil must have the ability to dissipate this entrapped air, ensuring a sufficient lubricating film exists to protect the gears from contact wear.

Drivetrain Fluid Additives

Like motor oil additives, drivetrain fluid additives improve the protection and performance capabilities of the base oil. Many of the challenges faced by drivetrain fluids are met by the additives.

- Extreme-pressure and anti-wear agents minimize component wear in boundary lubrication situations.
- Pour point depressants improve low-temperature performance.
- Rust and corrosion inhibitors protect internal components.
- Oxidation inhibitors reduce the deteriorating effects of heat, increasing the lubricant's service life.
- Viscosity index improvers allow the lubricant to operate over a broader temperature range.
- Anti-foam agents reduce the harmful effects of air trapped in a lubricant.
- Friction modifiers reduce friction.

AMSOIL Severe Gear® Synthetic Extreme Pressure (EP) Gear Lubes are specifically engineered for maximum performance in severe-duty applications. Featuring an exclusive blend of high viscosity, shear-stable synthetic base oils and an extra treatment of high-performance additives, Severe Gear maintains its viscosity for long-lasting protection against metal-to-metal contact. The proprietary AMSOIL additives form an iron-sulfide barrier coating on gear surfaces, providing the ultimate line of defense against wear, pitting and scoring.

AMSOIL Synthetic Universal Automatic Transmission Fluid (ATF) is engineered to exceed the performance requirements of domestic and foreign automatic transmission fluids, offering smooth shifting, long transmission life and excellent lubricating protection and performance in temperature extremes.

AMSOIL Synthetic Fuel Efficient Automatic Transmission Fluid (ATL) is engineered to exceed the requirements of GM, Ford and Toyota where low-viscosity oil is required, providing outstanding protection and performance over extended drain intervals, even in severe operating conditions.

Hydraulic Fluid

Hydraulic oil not only provides the medium for hydraulic power, it is also responsible for lubricating hydraulic components, cooling the system by transferring heat and minimizing wear, friction, deposits, rust and corrosion.

Standard hydraulic fluids are composed of about 99 percent base oil and 1 percent additives. Although



water was used as the original hydraulic fluid, it was replaced by mineral oil base stocks in the 1920s due to their lubricating properties and higher boiling points. Modern hydraulic fluids are composed of either mineral, synthetic or natural (vegetable) oil base stocks, as well as a wide range of additives such as antioxidants, anti-wear agents, demulsifiers, detergents, dispersants, foam inhibitors, pour point depressants, metal deactivators, rust inhibitors and viscosity modifiers. A variety of different additive packages are used in different hydraulic fluids, and selecting the right package is critical to equipment performance and life.

AMSOIL Synthetic Anti-Wear Hydraulic Oils (AWF, AWG, AWH, AWI, AWJ) are shear-stable, long-life lubricants formulated with premium synthetic base oils and additive systems that inhibit oxidation, rust and foam. Synthetic Anti-Wear Hydraulic Oils also contain a very effective zinc-based anti-wear/antioxidant additive that prevents wear in high-speed, high-pressure vane and gear pumps while meeting the lubrication requirements of axial piston pumps with bronze-on-steel metallurgy. Synthetic Anti-Wear Hydraulic Oils reduce maintenance costs by extending drain intervals and reducing labor associated with repairs, downtime and change outs.

AMSOIL Synthetic Biodegradable Hydraulic Oil (TBI) is designed to biodegrade to its natural state when subjected to sunlight, water and microbial activity. Because it is formulated with ashless additives that do not contain heavy metals, it has a very low toxicity level. TBI is based on high-quality, synthetic oil chemistry that outperforms vegetable oil-type, biodegradable hydraulic oils.