AMSOIL®
MAGAZINE
DECEMBER 2021

HOLDING ITS CHARGE

DEALER OPPORTUNITY WILL REMAIN STRONG AS EVs JOIN OUR ROADS

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Keep Diesels on the Road with AMSOIL Diesel Fuel Additives | PAGE 13

AMSOIL MAGAZINE

DISTRIBUTOR EDITION

DECEMBER 2021

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THE COVER

As the vehicle market changes, plenty of opportunity will remain for AMSOIL Dealers.

AMSOIL INTERCEPTOR® POWERS 35,000-MILE POLARIS* SNOWMOBILE

It'd be tough to find someone in the state of Michigan who's more dedicated to snowmobiling than Tom Holzwarth of Mio, Mich. The machine-shop owner and AMSOIL Dealer was named the 2016 Snowmobiler of the Year in the Wolverine State; he hopes to be inducted into the Snowmobile Hall of Fame in St. Germain, Wis.; and he and his wife are in charge of trail grooming in his county.

Lifelong love of snowmobiling

"I've been around snowmobiling my whole life," said Holzwarth. "I bought my first brand-new Polaris* in 1983, and I've just been a Polaris guy ever since." In 2000, he bought an XCR 800 for its triple motor, which uses three cylinders. "It was supposed to be the hottest thing on snow, and it was pretty good back in its day," he said.

After initially using the manufacturer's oil, he switched to AMSOIL INTERCEPTOR Synthetic 2-Stroke Oil (AIT) when the sled had about 2,000 miles (3,200 km) on it. Today, the sled has accumulated 35,400 miles (56,970 km) with no engine trouble. In fact, the engine has never been taken apart.

No engine problems after 20 years

"You always see people get to 4,000-5,000 miles (6,400-8,000 km) and say, 'I have to put new rings in or put in a new top end.' I've never had to do it," said Holzwarth. The water pump is the only component on his sled that has required work following 20 years of riding.

Holzwarth typically rides the vast trail network in the northern region of Michigan's lower peninsula. Occasionally, he trailers his sled to the Upper Peninsula. He'll put a couple thousand miles on his sled a season if conditions warrant. "A normal trip when we go riding for the day will be anywhere from 150-200 miles (240-320 km) a day," he said.

> The water pump is the **only** component on Holzwarth's Polaris that has required work following **20 years of riding.**

Holzwarth admits he's not as hard on the sled as he used to be, owing to having "gotten a little smarter" over the years. But he'll still stretch it out on a long straightaway on occasion. He also likes to hit the local grass air strip to drag race against friends sometimes. "I've had the speedometer buried on it when I was younger." His XCR 800 tops out at 120 mph (193 km/h).

Holzwarth's "meticulous" maintenance regimen includes pulling and cleaning the exhaust power valves every 500 miles (800 km). They never show signs of sticking and they appear cleaner than they did using the manufacturer's oil. "When I was using the Polaris oil, I noticed a difference when I went to INTERCEPTOR; they weren't as dirty," said Holzwarth.

Local snowmobiling celebrity

The remarkable condition of Holzwarth's Polaris has made him something of a local celebrity. He once stopped by a local dealership and the owner introduced him to someone as "the guy with 35,000 miles on his sled." The dealer maintains a compilation of customers' success stories as a marketing tool. He included Holzwarth's picture after he hit 10,000 miles, 20,000 miles and again after 30,000 miles. "The snow hasn't been as good this year (2020-2021), because I was going to push it hard to go past 40,000 miles," Holzwarth said.

He uses his sled as a sales tool for AMSOIL products. "AMSOIL is the finest out there, in my opinion. I think it's proven itself just by looking at my snowmobile and how well it still runs."

Not only that, but his wife's 2004 Polaris has amassed 20,000 miles (32,200 km) with no engine problems, while his son's sled currently has 10,000 trouble-free miles (16,000 km). Both use INTERCEPTOR.

"You're talking 65,000 miles with no engine problems between all three sleds," said Holzwarth. "They just keep going."

LETTERS TO THE EDITOR

CATALOGS

This year has presented some new issues for me as a Dealer. The catalog comes out in April and October. Since April, I've worked with several potential customers to evaluate whether they should be P.C.s or Dealers. As a Dealer, I don't have easy access to P.C. pricing, which makes it difficult to show comparisons to candidates, especially since the catalog shows P.C. prices less than what a Dealer can buy the product for. Dealers need online access to be able to quickly make price comparisons.

Herb Wilm

AMSOIL: *Thanks for sharing your concern, Herb. We will evaluate methods of delivering pricing information and make changes as warranted in the year ahead. Meanwhile, we want to highlight that determining the proper program for new customers should not rely on pricing; rather, it should hinge on the person's desires. Does he/she want to earn money? Then he/she should be a Dealer. If the person just wants to save money on AMSOIL products, he/she should become a P.C. The Factory-Direct Catalog (G100/G300) features P.C. pricing and full online/catalog pricing for AMSOIL products; it does not display Dealer pricing. Dealer pricing is always lower than P.C. pricing. You can access all pricing (wholesale, P.C., MSRP, full online/catalog) on a single page by using the Pricing Lookup in the Dealer Zone.*

BYPASS OIL FILTER

I was kind of surprised that in the September 2021 edition of the *AMSOIL Magazine* there was no mention that there apparently is a problem with the availability of the EABP100 Bypass Oil Filter. It was an item I ordered back on July 30, 2021, and still have yet to get one. The AMSOIL Customer Service response in late August was that it was "temporarily unavailable," and I take it, it still is.

In all the years I've been with AMSOIL, it always appeared that it was a company that was on top of things. The AMSOIL Bypass Filter seems to be a key filter, and if there is a significant problem with the production and/or availability of that product, especially over a month's time, AMSOIL Dealers should be made aware of it and how long the delay will be. Maybe AMSOIL could suggest similar products that are available that could be used instead, especially shortly after an order has been made.

William J. Kluge, Jr.

AMSOIL: *We're sorry for this delay, William. Supply-chain issues are creating significant challenges for manufacturers in all industries, including AMSOIL. All manufacturing components, including steel, chemicals, synthetic filter media and even drivers to deliver raw materials and finished goods, are in short supply. In a few cases, we are unsure when regular supply will resume. While there isn't a similar product that can be used in place of the EABP100, we encourage you to continue checking AMSOIL.com (AMSOIL.ca in Canada) for availability. Going forward, backordered items will be identified online and we will not accept orders for products that are unavailable. The majority of AMSOIL products are available as normal and we expect that to continue; despite our best efforts, however, supplies of raw materials for grease, aerosols and filters continue to pose challenges and likely will for a few more months.*

MIRACLE WASH®

I just wish you would make the waterless car wash in liquid again. There is too much waste in the can. When you spray, it foams at the tip and down the can. My RV friends would like it in liquid; it would work so much better for them.

Thanks,

David Yoder

AMSOIL: *Thank you for your suggestion, David. This is the first we have heard of Miracle Wash foaming at the tip and running down the can. Miracle Wash has had very positive reviews throughout the years, and our goal is to always provide the highest quality products. The liquid Miracle Wash was discontinued many years ago due to low sales. We added your request to our suggestion tracking database, and we will review the demand and determine if it makes good business sense to return this product to our lineup. Other product suggestions can be entered at AMSOIL.com/w/contact.*

ORDERING

I'm so lost. As of right now I don't have anything to order, but if I think of something I like to leave it on the order sheet until I'm ready. But I cannot get it to do anything. I just don't know where to start. I have a new customer who hasn't ordered yet, and I'll just bet he can't figure it out. This is a two-hour drive for me and I would just be embarrassed to show up to ask for an order if I don't know anything.

And one more thing: I went to the university site and can't find the recording of the meeting you have every month. Why does everything have to be hidden?

Well, I'll see if one of my grandkids can help.

Thanks for listening.

Kevin Bohn

AMSOIL: *We're sorry to hear about your trouble, Kevin. We suggest starting by calling AMSOIL Customer Service at (715) 392-7101; an AMSOIL representative will answer your questions. As far as the Commercial Training meetings, once you are in AU Online, click Sales & Business Development, then click Commercial Program Training Recordings.*

Email letters to:
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Or, mail them to:
AMSOIL INC.
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Letters are subject to editing for length and clarity; please include your name, address and phone number. Unsigned letters will not be published.

Maximum Convenience ✓
Wide Market Coverage ✓
Excellent Protection ✓

• 2 or 2.5 quarts (depending on the kit) of AMSOIL 5W-50 Synthetic ATV/UTV Motor Oil • Oil filter

• 2.5 - 4 quarts (depending on the kit) of Formula 4-Stroke® Powersports 0W-40 Synthetic Motor Oil • Oil filter • O-ring & washers

AMSOIL ATV/UTV Oil Change Kits for Polaris* and Can-Am* machines include everything needed to perform an oil change on the most popular ATVs and UTVs from the two most popular brands. Customers love their combination of convenience and AMSOIL protection. There's just one thing left to do – **start selling**.

Viscosity breakdown

Lubricant viscosity affects wear protection, fuel efficiency and other critical areas of oil performance.

Matt Erickson | VP, PRODUCT DEVELOPMENT

Viscosity is one of the most important properties of a lubricant. Using the right viscosity oil is vital to providing your engine the best wear protection.

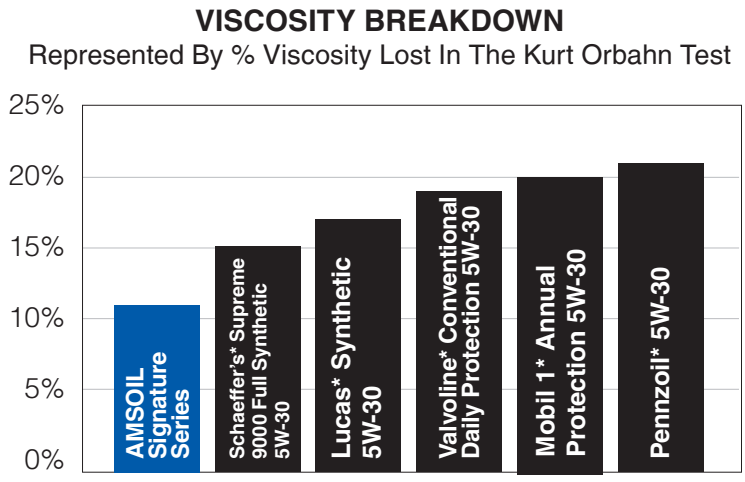
So, how much do you know about viscosity, and can you speak confidently about it if a customer poses questions? You can always refer technical questions to AMSOIL Technical Services (tech@AMSOIL.com; 715-399-TECH), but I know many AMSOIL Dealers and customers love to get into the technical details of our products, so let's dive in.

While viscosity is defined as **resistance to flow**, people often think of it as a fluid's thickness. Lower-viscosity fluids are thinner and flow more readily than higher-viscosity fluids. That's why water flows more easily than honey.

Lubricant viscosity influences the thickness of the fluid film that forms on metal components to prevent wear. Higher-viscosity oils form a thicker fluid film, offering increased protection against metal-to-metal contact. That being said, why not use 20W-50 in your car or truck instead of the 5W-20 or 5W-30 it probably takes?

Balance, that's why. A lubricant with viscosity that is too high for the application requires more energy to circulate, meaning fuel efficiency suffers. The increased internal friction also increases heat, which accelerates chemical breakdown (oxidation). Plus, thicker lubricants don't flow as readily at startup, especially in the cold, which reduces wear protection during cold starts.

Permanent viscosity loss due to mechanical shear can also affect protection. The intense pressure the oil bears as it's forced between the cam lobes and tappets, meshing gear teeth and other components can shear its molecules, causing it to lose viscosity and fail to deliver the required protection. Fuel dilution also reduces viscosity. This occurs when gasoline or diesel fuel blow by the piston rings and contaminate the oil in the sump.



Engineers build engines, transmissions and other components to operate best and last longest using a lubricant of a specific viscosity. Newer engines, for example, are built with tighter tolerances and clearances. They require lower-viscosity lubricants to ensure the oil flows fast enough at startup to fill the bearing cavities and prevent metal-to-metal contact. That's one reason many modern engines require 5W-20 or 0W-20 oil instead of the 10W-40 of yesteryear. Some Toyota* and Honda* engines even use 0W-16.

Viscosity is a result of choosing the right base oil combination. Base oils come in a variety of viscosities, and selecting the right combo is the starting point. Next, the viscosity modifier is chosen to thicken the oil and ensure it meets viscosity requirements for both the cold-temperature requirement (the "W" rating) and the operating-temperature requirement (the second number). Top-quality synthetic oils combined with high-performance viscosity modifiers result in oils that resist viscosity loss and chemical breakdown in tough operating conditions.

Using the right viscosity doesn't matter if the oil doesn't retain its viscosity despite shearing forces, extreme heat, fuel dilution and other conditions. As the graph shows, AMSOIL Signature Series Synthetic Motor Oil fights viscosity breakdown better than the competition,[1] providing superior protection of bearings, cams and pistons. It helps your engine maintain horsepower and deliver long life.

The ability to retain viscosity, and therefore provide excellent protection, is a great way to differentiate our products. Next time you have a potential customer interested in learning more about AMSOIL products, try explaining the importance of viscosity and how our products outperform the competition.

[1]Based upon independent testing of Mobil 1* Annual Protection Full Synthetic 5W-30, Schaeffer's* Supreme 9000 5W-30, Lucas* Synthetic 5W-30, Valvoline* Conventional Daily Protection 5W-30, Pennzoil* 5W-30 and AMSOIL Signature Series 5W-30 in the Kurt Orbahn test. Oils purchased on 05/03/18.

Hydrostatic transmissions require advanced fluids

Professionals have zero tolerance for zero-turn-mower inefficiency.

Mike Nelson | SENIOR PRODUCT DEVELOPMENT ENGINEER

Landscape professionals, some of our best potential commercial accounts, rely on their zero-turn mowers to get work done on time and up to standards. When a crew member jumps on a mower and pushes the handles forward, he expects instant and predictable mower response. Anything else wastes time and reduces efficiency.

This is where you step in. AMSOIL Synthetic Hydrostatic Transmission Fluid (AHF) helps deliver smooth, responsive operation. To understand how, let's look at how a zero-turn-mower hydrostatic transmission works.

In most systems, hydraulic lines connect a variable-displacement pump to a fixed-displacement motor that powers one of the rear wheels. Moving the mower handle forward increases pump displacement and turns the motor that turns the wheel. The system offers infinite variability, meaning the mower's engine can be running at 3,600 rpm, but wheel speed depends on how far forward the operator pushes the handle.

A typical hydrostatic transmission also uses a charge pump, which cycles new fluid into the hydrostatic loop to replace fluid that leaks through the pump cases. This provides the added benefit of cooling the pump and motor as new fluid enters the loop.

Variable-displacement piston pumps are the mainstay in zero-turns. They use a ring of pistons that ingest and compress fluid based on the angle of a swash plate connected to the control handle.

Some zero-turn mowers use what's called a gerotor motor. They use a valve body to pressurize fluid between a rotor and stator, which causes the rotor to orbit. As it orbits clockwise, it rotates counterclockwise at a much lower speed. The rotor is splined to the output shaft to turn the mower wheels.

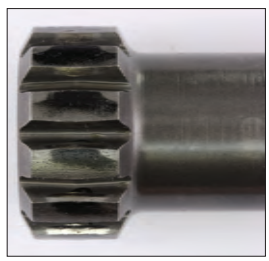
Hydrostatic drives place specific demands on fluid, which is where you enter the picture. The gerotor motor in particular generates increased sliding forces on the splines. This requires anti-wear additives like zinc and phosphorus to form a wear-resistant barrier on parts to prevent scuffing and wear. Because these transmissions operate with extremely tight clearances under high pressure, they mechanically shear lesser-quality oils, reducing viscosity and changing the behavior of the machine.

To deliver maximum performance, we formulate AMSOIL Synthetic Hydrostatic Transmission Fluid with high-quality base oils that resist shear. In severe service, they maintain viscosity better than fluids that use viscosity modifiers to compensate for lower-quality base oils. They also resist oxidation in extreme heat better due to their uniform molecular structure. This provides more predictable performance while fighting harmful varnish and deposits inside the drive.

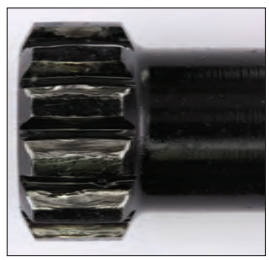
When developing our hydrostatic fluid, we tested various formulations in our mechanical lab. Our testing is designed to punish lubricants beyond conditions seen in the real world. We push them to the limit for up to 1,000 hours to see how the oil formulations and hydrostatic drives survive. Some of the wear-prone areas we see in these units are in the motors that drive the output shaft. As you can see in the bottom image, it's evident when a test formulation fails to protect metal in this critical area. Wear like this leads to inefficiency and increased replacement costs.

Zero-turn-mower hydrostatic drives are ingenious systems that help workers cover a lot of ground quickly – if the fluid can protect against wear and deposits. Thanks to extensive testing, AMSOIL Hydrostatic Transmission Fluid delivers. It helps mowers and other equipment provide the smooth, responsive operation needed to get jobs done on time and up to standards. Make this a selling point when talking to prospects.

Passing candidate oil



Failing candidate oil



Holding its Charge

OPPORTUNITY WILL REMAIN STRONG AS EVs JOIN OUR ROADS.

President Biden recently announced that he wants half of all new vehicles sold by 2030 to run on electric power, and he framed battery technology as a key to competing with China and fighting climate change. His plans call for investing in construction of a nationwide network of charging stations, incentives for consumers to buy electric vehicles (EVs) and subsidies for automakers and suppliers to retool to make them. The announcement comes at a time when technological advancements are increasing the range and variety of EVs and auto giants are investing billions to capture the emerging market. Add in a large dose of media buzz and it starts to feel like gas- and diesel-powered cars will soon be electric-vehicle roadkill. But read past the headlines and that outcome appears dubious. Yes, EVs are a market reality going forward. However, for several reasons, gas- and diesel-powered vehicles will remain dominant for years to come and will remain scrappy competitors for a long time after that.

Pushing EVs

Government regulations around the globe are demanding big investment in electric vehicles, including in China, Europe and California. U.S. Corporate Average Fuel Economy (CAFE) requirements, for example, are set to a 41-mpg target for 2021 with a tailpipe-emissions limit of 163 g/mi (CO_2 g/mi) through 2025. The Biden administration intends to tighten fuel-efficiency standards further. For automakers, adding hybrid electric vehicles (HEVs) and EVs to their lineups helps them reach those average fuel-economy thresholds.

Consumers are being incentivized too. Forty-five states offer EV incentives as of November 2020 and car buyers receive $2,500 to $7,500 in federal tax credit for purchasing an EV or HEV. But that incentive is limited to 200,000 vehicles per manufacturer – not enough to significantly change the North American car park.

The Biden administration's electrification goals are generally in line with what the major automakers are already planning. Virtually all of them have endorsed the plan, saying producing 40% to 50% electric vehicles is possible if there are enough charging stations for millions of cars. But, as we will discuss later, that's a big "if."

GM* has been spending billions to electrify its cars and trucks and announced it will stop selling gasoline-powered vehicles by 2035. However, almost in the same breath, GM announced its biggest, most powerful V8 engine ever, the ZZ632,* rated at 1,004 hp – hardly the moves of a company that plans to stop selling internal-combustion engines soon.

Down the same road

It's worth noting that EVs have been here before. As early as 1842 an electric road vehicle was powered by a non-rechargeable battery. By the late 1800s electric vehicles were common. But early EVs couldn't make it 20 miles before recharging, which wasn't realistic in a wide-open, rural country like the United States.

In 1969, *Popular Mechanics* published "How Far Can We Go with the Piston Engine?," which predicted an "early end" for the internal combustion engine and suggested "...we'll be running around with batteries, steam, fuel cells and atomic engines in another ten years."

What happened instead is gas and diesel engines continued to improve, reaching efficiency and pollution standards once thought impossible, while EVs have continued to struggle with price, charge times and range. Today, EVs still have a high cost of entry with rapid depreciation and a limited secondary market. Range anxiety still exists even as long-range EVs enter the market. At best, charging requires 30-60 minutes; chargers that come with EVs typically require 10 hours for a full charge.

Where are we now?

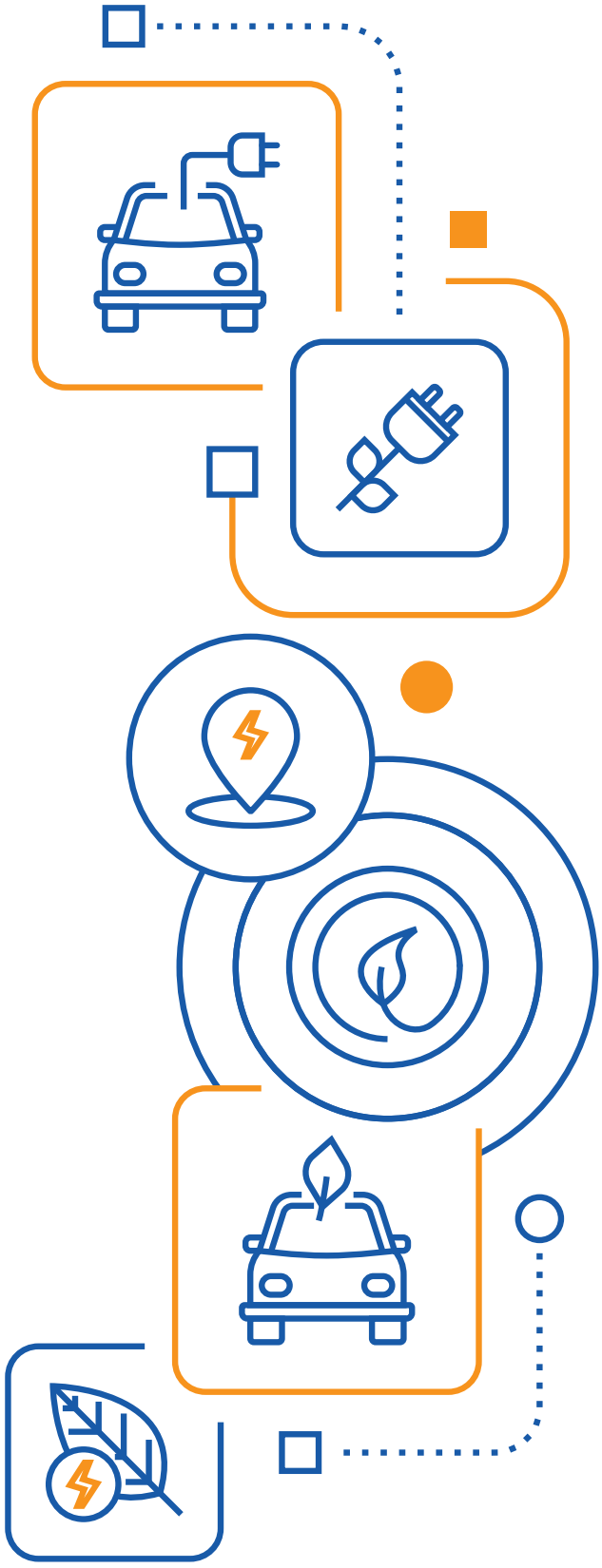
Most industry watchers agree: the internal-combustion engine is going to dominate new car sales through 2030. Currently, consumers are more interested in new pickup trucks and small SUVs than electrified vehicles. The market is seeing a significant shift from passenger cars to SUVs, CUVs and light trucks. By the numbers, these trends are much more significant than EV/HEV sales.

- Hybrid and full-electric cars held just 1.9% of the U.S. auto market in 2019.
- Fewer than 1% of total cars on U.S. roads use any electric power.
- EVs are concentrated in California, with 45% of total EV registrations. Florida and Washington are second and third, at 5% and 4% respectively.

North America contains the largest and oldest vehicles in the world, with the lowest percent of electrified vehicles. The high cost of new vehicles is driving a trend to maintain vehicles longer, and the average vehicle in the U.S. is nearly 12 years old. Seventeen million new vehicles drive off car lots annually in North America, but only nine million are scrapped. And they aren't sitting idle; miles driven by U.S. motorists grew 1.4% from 2014-2019, driving up demand for motor oil.

Not enough outlets

Something basic is standing in the way of President Biden's vision for vehicle electrification by 2030 – not enough outlets to plug in all those cars and trucks. EVs are not a viable option in regions where the density of charging stations is low or non-existent. In addition, to reach Biden's goals, 23% more power must be added to the grid to support the additional load. Because the desire is to have most of this power generated from renewable sources, that goal is a long way off.

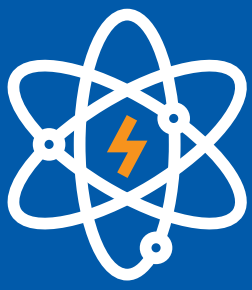


The U.S. has about 110,000 chargers; however, **only 15% of those are fast-charging stations.**

To reach critical mass with consumers, new battery chemistry and cell technologies are needed to reduce the cost of batteries to less than $100/kWh (ultimately $80/kWh) and increase the range of EVs to 300 miles or more.

On top of that, charge times need to be 15 minutes or less, closer to the average gas-station fill of about three minutes. Just to get a trickle charge takes 20-30 minutes or more with fewer opportunities to get them. The U.S. has about 110,000 chargers; however, only 15% of those are fast-charging stations. Auto experts say that number needs to be at least five to 10 times bigger to achieve the president's goal. Installing that many will cost tens of billions of dollars, far more than the infrastructure bill contains.

"Neither the current trajectory of consumer adoption of EVs, nor the existing levels of federal support for supply-and-demand-side policies, is sufficient to meet our goal of a net-zero carbon transportation future," stated the UAW president and other auto-industry trade groups in a letter to Biden.



The age of synthetics

New internal-combustion engine technologies continue to shift demand toward synthetic motor oil over conventional motor oil. Engine downsizing, improved power density, forced induction, multi-point fuel injection, cylinder deactivation and sophisticated emissions systems are all contributing to demand for synthetic oil. Conventional oil is simply not adequate to meet the performance demands of modern engine technologies. Today, 85% of new vehicles specify synthetic motor oil, up from 27% in 2011. Because of this increase in vehicle share, demand for synthetic oil is projected to rise substantially in the coming years.

Commercial Vehicles

A range of low- and zero-emission vehicle options are available today, but each are at different stages of readiness for commercial use. Electrification is an option for lighter trucks and shorter distances, but not for long-haul trucks and heavier loads. Commercial vehicles headed to electrification include buses and local-delivery vans. But, even for local deliveries, EV/HEV vehicles are not always financially viable. The cost of these technologies is high while the resale value is unknown. Being competitive on price with other fleets is the key to business survival for these companies. Fleets must take on a lot of risk to purchase battery-electric trucks, while the reward is uncertain. ExxonMobil* says electricity in commercial transportation will grow slowly due to upfront costs, range limitations, payload requirements and the pace of infrastructure development.

Powersports

Electrification is coming to powersports as well:

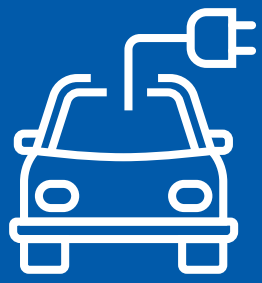
- Five brands offer electric ATV options.
- Nine brands offer electric UTVs, including Arctic Cat,* Polaris* and BRP.*
- Three brands, including Polaris, are making electrified snowmobiles.
- Four companies are making electric watercraft vehicles, including BRP.
- Electrified power equipment, from lawnmowers to blowers, has 32 companies in the mix.
- There has been pronounced growth in the motorcycle arena with 43 brands offering everything from electric sport motorcycles to electric bicycles.

Motorcycles and E-Bikes

While lightweight electric bicycles (e-bikes) offer an eco-friendly, inexpensive and reliable alternative for commuting and the trend is exploding, e-motorcycles are not likely to catch on as quickly. First, they are expensive and lack some of the draw. Riders are not able to experience the rumble, vibration and heat of a gas-powered motorcycle and they don't take you very far. Their range is just 95 miles on the highway when fully charged. The Harley Davidson* LiveWire* is the best-selling e-motorcycle in the U.S. The company produces around 200 LiveWire e-motorcycles per month, representing 2% of its total sales (Harley sold 103,650 motorcycles in 2020). Experts predict that within 10 years, e-motorcycles can achieve price parity with gas motorcycles and that sales of gas and e-motorcycles will equalize by 2040.

UTVs

Electric UTVs only require one charge per day, so you can plug in overnight and work or play all day. Nikola* NXT* currently has the best range at 90-150 miles of hardcore riding. Silent riding is beneficial for hunters and state-park workers. Electric UTV prices are competitive in today's market and they require minimal maintenance. However, electric side-by-sides are heavy, which means they always feel slow, and as the weight increases, the range decreases. Therefore, adding batteries won't increase range after a certain point, only more weight.



EV opportunities

EVs offer new opportunities. The size of the electrified-vehicle lubricant pie is expected to be $5.47 billion by 2029, with motor oil for HEVs driving most of the demand through 2040.

While it's true that full-electric vehicles do not require motor oil, they do require some lubricants and other related products. Coolant will drive the majority of EV fluid demand, while brake fluid is the most frequent service interval after 2-5 years.

EV fluids must have strong copper compatibility and protection, corrosion inhibitors and fire resistance to protect gears and bearings.

Battery and electrical coolants

Higher voltages enable faster charging. However, thermal management is a key consideration for keeping the batteries cool. Electrical coolant aids in fast charging and increases the longevity of the cells. It is also a major safety feature to prevent thermal runaway. Batteries and e-motors generate a large amount of heat, demanding thermal management with lubricants.

Electrified Transmission Fluid

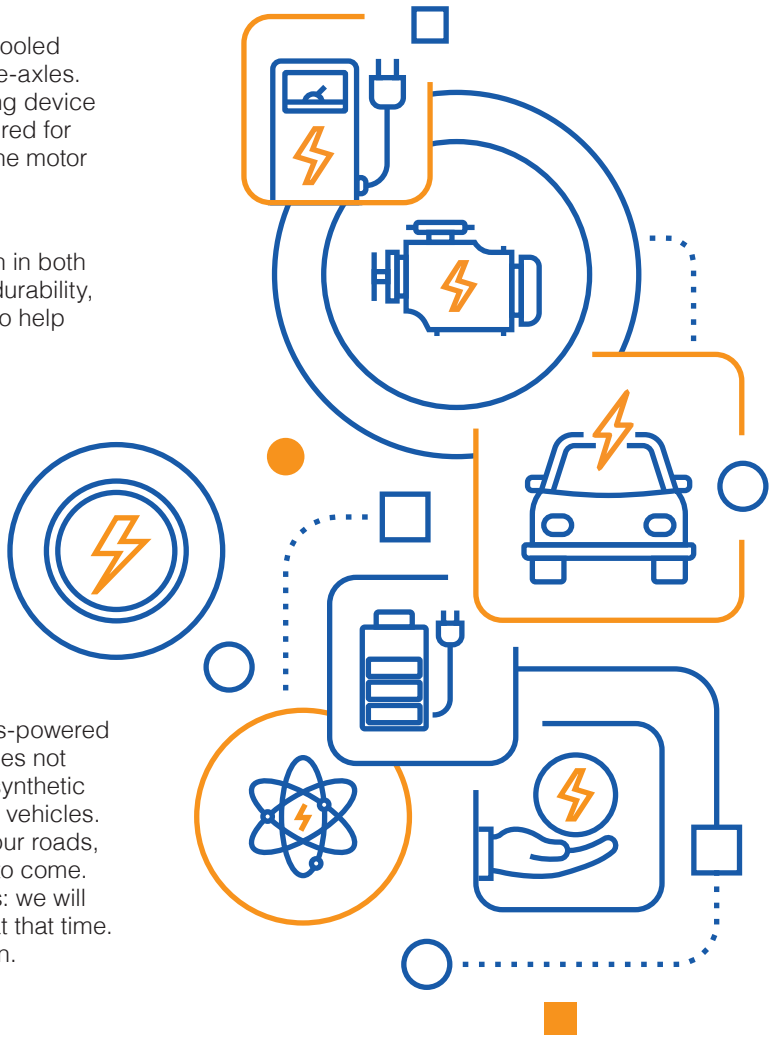
New non-corrosive additives are being created for direct-cooled electric motors with multi-speed systems, designed for all e-axles. These new fluids offer the friction capability to add a shifting device for multi-speed motors as well. A transmission fluid is required for integrated wet and dry e-motor-designed vehicles where the motor and gearbox are one unit.

Grease

EVs require high-speed electrical motor-bearing lubrication in both wet and dry e-motor designs with electrical compatibility, durability, efficiency and endurance, as well as electrical resistance to help endure the current flow through the lubricated bearings.

Keep driving forward

EVs are not the death knell to gas-and diesel-powered vehicles – and your independent Dealership has huge growth opportunities ahead. As more electrified vehicles roll off assembly lines, it is likely that we will have to adapt in some areas and double down in others. AMSOIL targets enthusiasts who will keep their vehicles on the road longer than the average person. Our customers are addicted to the rumble and thrill of the internal-combustion engine and are in no hurry to move away from it. And for many, going electric is not a practical option given the price, range limitations and lack of charging stations. Hybrid vehicles still have gas-powered supplement engines, so the need for AMSOIL products does not go away. New gas-powered vehicles increasingly require synthetic oil. And aftermarket opportunities still exist with full-electric vehicles. For all those reasons, even as EVs and HEVs merge onto our roads, the internal-combustion engine will dominate for decades to come. Beyond 2050 the details are anyone's guess. We know this: we will be here innovating lubricants for the vehicles on the road at that time. And the independent Dealer opportunity will keep rolling on.



Types of Electrified Vehicles

MILD HYBRID ELECTRIC VEHICLE (MHEV)
Electric motor cannot propel vehicle on its own. A gas engine is used to start, with electric acceleration assist and regenerative braking. Example: Honda* Civic*

FULL HYBRID ELECTRIC VEHICLE (FHEV)
Electric motor can power the car unassisted. Example: Toyota* Prius*

PLUG-IN HYBRID ELECTRIC VEHICLE (PHEV)
Full HEV where battery can be charged externally. Example: Ford* C-MAX Energi*

BATTERY-DRIVEN ELECTRIC VEHICLE (BEV)
Battery-driven electric motors and controllers used for propulsion. Example: Tesla*

RANGE EXTENDER ELECTRIC VEHICLE (REEV)
A BEV that also carries a gas-engine-driven electrical generator to supplement the batteries. Example: BMW* i3*

KEEPING LUBRICATION SYSTEMS CLEAN

Contaminants will inevitably corrupt any lubricating system, but quality lubricants considerably reduce contamination and extend oil service. There are four ways contamination occurs in lubrication systems.

- **First,** the system itself can generate contamination through poor system or component design, temperature-related chemical reactions or just normal use.
- **Second,** contamination can be caused by careless packaging or handling of components before or during installation.
- **Third,** contamination can be introduced though improper or careless maintenance.
- **Fourth,** contamination can be caused by another system leaking into the first system.

Base oils possess a varying degree of solvency (the ability to dissolve a solid, liquid or gas), which assists in maintaining internal cleanliness. However, commonly paired detergents and dispersants play a key role. These pairings maintain internal cleanliness by suspending contaminants, minimizing contaminant clumping (agglomeration) and preventing contaminants from adhering to components. Over time, degradation of the oil can result in a cleanliness issue, but oxidation inhibitors can reduce this effect.

Detergents added to lubricants minimize deposit formation in the high-temperature areas of an engine. The most used detergents in motor oil formulations are metallic (ash) soaps with reserve basicity to neutralize the acids formed as byproducts of combustion. Other detergents include metalorganic compounds of sodium, calcium and magnesium phenolates, phosphonates and sulfonates.

Dispersants are additives that help keep solid contaminants in suspension. By keeping contaminants suspended within the lubricant, sludge, varnish and other carbon deposits are prevented from forming on engine parts. Dispersants also prevent contaminants from agglomerating into larger and potentially dangerous particles.

Dirty components run poorly, pollute and don't last. They cause system failures in engines, compressors and gear box systems that dramatically increase downtime, increase operating costs and reduce equipment life. Clean lubrication systems, on the other hand, require less maintenance, produce more energy, use fuel more efficiently, increase equipment service life and run cleaner.

AMSOIL lubricants use detergent and dispersant additives to significantly reduce sludge and carbon deposit formation better than conventional oils.

One way to know how well a lubricant can protect your vehicles and equipment is to look at the total base number (TBN), which indicates its ability to neutralize contaminants such as combustion byproducts and acidic materials. It is a measure of (alkaline) additives in the oil. Higher-TBN oils can neutralize a greater amount of acidic materials, which results in improved protection against corrosive reactions.

TBN levels are targeted for the intended application. Typically, gasoline engine oils display lower TBN numbers, while oils in a diesel engine must manage the heavy contaminant loading from soot and sulfur and usually run higher.

TBN levels decrease as the oil remains in service. When the level reaches a point where it can no longer protect against corrosion, the oil must be changed.

Oils that are formulated specifically for extended drain intervals typically display elevated TBN numbers to ensure proper corrosion protection for the duration of the extended interval.

Base Number Test (ASTM D2896/ ASTM D4739)

The Base Number Test measures the detergents and dispersants in new oils. Two tests are commonly used in the industry to calculate TBN. ASTM D2896 typically results in slightly higher TBN values than ASTM D4739.

AMSOIL Advantage

High TBN

Because AMSOIL lubricants contain consistently high TBNs, they neutralize acidic contaminants formed during the combustion process and keep these contaminants in suspension to prevent corrosion.

KEEP DIESELS **ON THE ROAD** WITH AMSOIL DIESEL FUEL ADDITIVES

Diesel applications operating in extremely cold environments face some unique challenges.

As the temperature drops, the wax naturally found in diesel fuel begins to crystallize. The point at which wax crystals form is known as the cloud point. These wax crystals eventually clog the fuel filter and starve the engine of fuel, preventing it from starting or even stalling out a running engine. While low-quality fuels may form wax crystals in temperatures as warm as 40°F (4°C), most fuels have a cloud point near 32°F (0°C). The point at which the crystals clog the fuel filter is known as the cold filter-plugging point (CFPP).

Solutions

Using #1 diesel fuel is one traditional solution to cold-weather diesel fuel problems. While #1 diesel fuel has an advantage in low-temperature operability, the energy content of #1 diesel fuel is about 95 percent that of #2 diesel fuel, resulting in reduced fuel economy and less horsepower, and it costs more at the pump.

AMSOIL Diesel Cold Flow

AMSOIL Diesel Cold Flow (ADD) lowers the CFPP by up to 40°F (22°C) in ULSD. It minimizes the need for blending standard #2 diesel fuel with #1 diesel fuel, helping to maintain fuel economy and keep engines functioning normally.

- Lowers cold filter-plugging point (CFPP) by up to 40°F (22°C)
- Enhances engine reliability in cold temperatures
- Fights gelling in cold weather
- Improves low-temperature startability
- Prevents wax settling during storage
- Inhibits fuel-filter icing
- Safe for use in all diesel fuels, including biodiesel
- Reduces downtime and maintenance costs
- Alcohol-free

AMSOIL Diesel All-In-One

AMSOIL Diesel All-In-One (ADB) combines the superior detergency and improved lubricity of Diesel Injector Clean, the excellent cold-flow and anti-gelling properties of Diesel Cold Flow and the increased horsepower and cetane of Diesel Cetane Boost in one convenient package, providing the full potency and benefits of all three products at an affordable price.

What about untreated fuel that has already gelled?

AMSOIL Diesel Cold Flow must be added to diesel fuel before it reaches its cloud point, and it will not dissolve wax or liquefy diesel fuel once wax crystals have formed. So, what about untreated fuel that has already gelled?

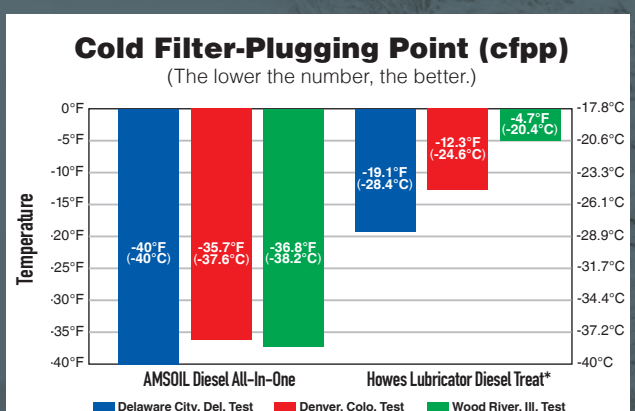
AMSOIL Diesel Recovery

AMSOIL Diesel Recovery (DRC) quickly dissolves gelled fuel to allow the operator to continue driving with minimal downtime. It separates the molecular bonds of wax crystals that have agglomerated in diesel fuel, and it effectively thaws frozen fuel filters and reduces the need for a new filter. Having a bottle of Diesel Recovery on hand is cheap insurance against being towed to a service station or getting stranded somewhere in subzero temperatures.

- Quickly dissolves gelled fuel
- Thaws frozen fuel filters
- Performs well in ULSD, off-road & biodiesel
- Alcohol-free
- Non-corrosive

Superior Cold-Temperature Protection

Provides as much as **32˚F better protection** against cold temperature gelling than Howes Lubricator Diesel Treat.[M] Plus raises cetane up to 4 points.



[M]Based on independent testing in July 2017 of AMSOIL Diesel All-In-One and Howes Lubricator Diesel Treat using diesel fuel representative of the U.S. marketplace and Howes' recommended treat ratio for above 0°F (-17.8°C.)

The bar for motor oil performance has been raised.

JUST NOT TO **OUR** STANDARDS.

GM* Dexos1™ Gen 3 is the next-generation motor oil specification designed to address the challenges today's engines present.

Dexos1™ Gen 3 highlights

- Updated performance standard for deposit and sludge control
- Revised stochastic pre-ignition (SPI) test
- Improved fuel economy
- Backward compatible with previous GM specifications

GM set a mandatory transition date of Sept. 1, 2022 to meet the new specification. **AMSOIL Signature Series, XL and OE Synthetic Motor Oils already outperform it.**

Labels and data sheets will be updated as stock is depleted.

New 2022 Calendars Available Now

Each month of the new 2022 AMSOIL calendar highlights a popular race series or motorsports event in which we're involved, such as Sturgis and the AMSOIL Championship Off-Road series.

December Close-Out

The last day to process December orders in the U.S. and Canada is the close of business on Thursday, Dec. 30. Individual telephone and walk-in orders will be processed if initiated by the close of business. Internet and fax orders will be accepted until 3 p.m. Central Time on that day. All orders received after these times will be processed for the following month. Volume transfers for December business will be accepted until 3 p.m. Central Time on Thursday, Jan. 6. All transfers received after this time will be returned.

Holiday Closings

The AMSOIL corporate headquarters, U.S. distribution centers and Canadian distribution centers will be closed Friday, Dec. 24 for Christmas Day and Friday, Dec. 31 for New Year's Day. The Toronto Distribution Center will be closed Monday, Dec. 27 for Boxing Day.

Holiday Shipping

Keep in mind that shipping companies are extra busy during the holiday season, possibly resulting in shipping delays. Plan accordingly and place orders earlier than normal to ensure they arrive on time.

New Chicago Distribution Center Opens Dec. 6

The current Chicago Distribution Center will close Friday, Dec. 3 at 12 p.m. It will re-open at its new location Monday, Dec. 6 at 9 a.m.

New Address:

1155 W Devon Av Ste 400 Itasca, IL 60143

Production of Certain AMSOIL Oil Filters Moving to Mexico

Production of certain AMSOIL Oil Filters (EAO/EA15K), Heavy-Duty Oil Filters (EAHD), Bypass Oil Filters (EABP) and Motorcycle Oil Filters (EAOM) has transitioned from the United States to Mexico. While we would prefer all AMSOIL oil filters be manufactured in the United States, our filtration partners don't have American factories that can manufacture these oil filters to our specifications, and we were faced with the decision to either move production or discontinue the filters. Discontinuing these popular filters would hamper our ability to offer superior AMSOIL filtration solutions to a large number of customers. While this decision will keep these oil filters in our product lineup, the transition and current supply chain issues have resulted in some temporary delays fulfilling orders.

AMSOIL Clothing and Promotional Items

AMSOIL clothing and promotional items make great Christmas gifts.

American Original T-Shirt

Long-sleeve, butter-soft t-shirt. Constructed of 65/35 polyester/cotton blend.

Stock#	G3739	S-XXX
U.S. Price:	20.00	
CAN Price:	27.00	

Work Light

Universal work light's 3W flashlight head can tilt up to 90 degrees. Includes folding clip for hanging, hidden COB (chip on board) light bar that provides a powerful lantern-like effect and strong magnetic base for adhesion to cars, work bench or other metal surfaces. Output: 80 lumens (top), 180 lumens (side). Includes four AAA batteries. Color may vary (black, red or blue).

Stock #	U.S.	Can.
G3339	15.00	20.00

FXR RRX Jacket

Constructed with a wind- and water-resistant 290g polyester tri-laminate Omni-Stretch™ shell and removable FXR Thermal Dry™ Active Liner with 200g Thermal Flex™ Fill. Snowproof and moisture-resistant FXR Dry Vent™ System, durable YKK® Vision front zipper with inner placket, YKK hand pocket zippers with fleece lining, YKK side body vent zippers, removable/adjustable hood, hook and loop adjustable cuffs, reflective screens, LYCRA cuff extensions on removable inner liner, shock cord adjustable bottom hem, fade-free sublimation prints.

Limited quantities available

Stock#	G3738	S-XL
U.S. Price:	195.00	
CAN Price:	258.00	

Stock#	G3738	XXL-XXX
U.S. Price:	215.00	
CAN Price:	284.00	

Women's American Original 3/4 T-Shirt

3/4-sleeve raglan ladies' shirt. Constructed of 50/25/25 polyester/ring-spun combed cotton/rayon with rib knit neck.

Stock#	G3708	S-XXX
U.S. Price:	16.00	
CAN Price:	21.00	

Charcoal Hooded Sweatshirt

Constructed of 65/35 ring-spun combed cotton/polyester fleece with rib knit side gussets, cuffs and hem with spandex, white lace drawcords. Gray tick stitching and front pouch pocket.

Stock#	G3743	S-XXX
U.S. Price:	52.00	
CAN Price:	69.00	

AMSOIL Drive Street Sign

95% recycled-aluminum 5" x 24" embossed street sign.

Stock #	U.S.	Can.
G3753	10.00	13.00

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Merry Christmas and Happy New Year! Stay tuned in 2022 for exciting developments designed to help you thrive well into the future. AMSOIL.com

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