

Things you should know about Car Care and AMSOIL products

“As far as I’m concerned, mineral based lubricating oils are about as antiquated as the Model-T.”

“I would buy and use a synthesized polyester-based engine oil – even if I had to pay \$10 a quart or more for it.”

From POWER SECRETS by Smokey Yunick (1983)

“Synthetics do reduce engine wear, improve gas mileage and . . . increase horsepower.”

“Synthetics have a higher resistance to heat than mineral-based oils.”

From “Synthetics: The Auto Industry’s Best Kept Secret” – MUSCLE MUSTANGS

“For instance, how does one place a precise value upon such benefits as . . . cleaner engine; longer engine life; fewer repairs, lower operating temperatures; fewer oil and filter changes; less oil consumption; lower octane requirements; longer battery/starter/alternator/spark plug/turbo unit/PCV component life; increased fuel mileage; the convenience of exceptional four season performance with a single motor oil . . . and so on.”

From THE COMPLETE GUIDE TO SPECIALTY CARS
SYNTHETIC OIL – Rx For Long Engine Life 1983

“I’ve had tremendous success with synthetics, both grease and oil, in all my cars. In several instances where we have compared petroleum-lubricated engines with those which used synthetics, the latter were cleaner, with less carbon and sludge. And the engines produced more horsepower, which meant better mileage and longer life.”

From article in *The Family Handyman*
By Renowned race-car driver Bobby Unser

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Sensible Answers to Questions About Automotive and Equipment Maintenance With AMSOIL Premium Products

Maintenance of automobiles, light trucks, big trucks, lawnmowers, boats, and every other piece of equipment in between now involves advanced knowledge of many very involved sciences. It used to be that a basic mechanical aptitude was enough, but now electronics and ongoing concern about environmental emissions have made it near impossible for the average person to maintain, let alone actually do repairs on their personal mode of transportation.

Although changing the oil or other driveline fluid is often seen as a chore better left to the corner quick lube, this aspect of maintenance is probably the most important. Unfortunately, the basic oil change and replacement of filters, even when done right, falls far short of providing the protection and performance that is deserved considering the investment in the vehicle.

But there are aspects of maintenance that the individual can still perform, or at least vigorously oversee, that can improve the performance and extend the life of their equipment.

This pamphlet is put together in a Question & Answer format so you may browse the questions addressed without delving into each area and learn how you can take an active roll in maintaining your vehicle and making sure that you get the performance, long life, and full benefit from your investment that you deserve.

The introduction of AMSOIL synthetic motor oil in 1972 set all-new standards for motor oil quality. AMSOIL synthetic motor oil outperformed conventional petroleum motor oils on all counts. It was clear from the start that this innovative product would play a major role in engine performance and engine life. AMSOIL added to this success with other innovative products including other lubricants, filtering systems, and other products.

AMSOIL products are available through our Retail Catalog, which is available at no charge. If you are considering a major purchase, ten dollars gets you a six-month trial Preferred Customer membership for buying AMSOIL products at wholesale prices.

Want more? Try an AMSOIL Dealership. AMSOIL products are sold through independent Dealers. Earn extra money. No quotas, no inventory requirements, you're your own boss. Contact me for additional information.

Chuck Burnell

How does motor oil work, and why should I use AMSOIL?

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.

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 oil has numerous features that provide benefits not available with the use of conventional or lower quality synthetic motor oils. See Table 1.

What Effects Will A Switch To AMSOIL Have On My Warranty?

Users of AMSOIL Synthetic Motor Oil need not fear altering their warranty coverage. The contention that using an aftermarket product like AMSOIL Synthetic Motor Oil could void new car warranty protection is simply not true.

Major auto manufacturers and regulatory agencies have determined that warranties must cover all equipment failures they would normally cover that are not caused by the aftermarket product. Consequently, an AMSOIL user’s new car warranty still covers all failures resulting from defective original equipment or faulty workmanship by the manufacturer.

The second element of your protection is the AMSOIL Limited

Table 1

AMSOIL Motor Oils

Feature	Benefit
Cooler operation.	Cooler engines resist stress and wear. They last longer, perform better and require fewer repairs.
Thermal and oxidative stability — AM-SOIL synthetic motor oils resist formation of sludge, varnish, acids, deposits and other degradation products.	Engines stay cleaner, which helps them perform better, last longer and require fewer repairs.
Consistent viscosity in high and low temperatures.	Easier cold temperature starting. Better high and low temperature protection, which helps engines last longer and require fewer repairs.
Superior friction reduction.	Lower wear rate, which helps engines last longer and require fewer repairs. Improves fuel economy.
Low temperature fluidity.	Easier cold temperature starting. Better wear protection in cold temperatures, which helps engines last longer and require fewer repairs.
Low volatility — AMSOIL synthetic motor oils don't evaporate.	Reduced oil consumption. Better oil flow gives better fuel economy an better wear protection.
Broad temperature range of application.	AMSOIL synthetic motor oils work safely and protect at higher and lower temperatures than conventional oils do.
High TBN (diesel oils).	Reduces rate of engine corrosion, which helps diesel engines last longer and require fewer repairs. Increases oil service life, which reduces maintenance costs.
Extended service life capability.	AMSOIL synthetic motor oils last longer than conventional oils do, which saves motorists money and reduces the environmental impact of used lubricants.

Warranty (use AMSOIL Synthetic Motor Oil as recommended in mechanically sound equipment, and the warranty covers lubricant related failures). Since AMSOIL motor oils have never once been deemed the cause of an engine's failure, however, this is merely added protection.

As for the extended drain of AMSOIL Synthetic Motor Oil, keep in mind that the recommendations of the manufacturer set forth in their manuals calling for a drain interval of 5,000 or 7,500 (or some other mileage), keep in mind that these recommendations must be based on the lowest common denominator of products available that meet minimum specifications. You can go into a discount store and find oil for less than seventy-five cents per quart that carries an SAE viscosity grade and API classification, but is this oil equivalent to AMSOIL? AMSOIL has formulated a premium product, utilizing the best in synthetic base stocks, and adding the highest quality additives in an intensity designed to last for 25,000 miles or one-year, and longer. The manufacturer merely requires that the oil you use must stay in specification and do the job for the duration of the period. AMSOIL has demonstrated in the lab as well as in the field that their products will perform, and keep on performing long past that change interval set by the manufacturers.

How Soon Can I Switch to AM-

SOIL?

This is a common question. With a new car or truck with a gasoline engine you can change over to AMSOIL at the first oil change. Because of manufacturing debris sometimes in the engine, this is often as soon as 500 miles. Many people feel they should wait until the warranty runs out. This is wrong. You will accumulate unnecessary wear by that time and AMSOIL far exceeds the minimum specifications set by the engine manufacturers.

Keep in mind that some cars, such as the Corvette, the Northstar engine in some Cadillacs, and new Porsche's come with synthetic oil already installed.

Diesel engines take longer to break in, and a switch to AMSOIL should not be made until there is 8,000 to 10,000 miles on the engine. Break in is complete when oil consumption has been reduced to a normal level, based on the engine.

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regulatory agencies have determined that warranties must cover all equipment failures they would normally cover that are not caused by the aftermarket product. Consequently, an AMSOIL user's new car warranty still covers all failures resulting from defective original equipment or faulty workmanship by the manufacturer.

The second element of your protection is the AMSOIL Limited Warranty (use AMSOIL Synthetic Motor Oil as recommended in mechanically sound equipment, and the warranty covers lubricant related failures). Since AMSOIL motor oils have never once been deemed the cause of an engine's failure, however, this is merely added protection.

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I was always told to change my oil every 3,000 miles if I wanted to keep my car running well. How is it possible to drive 25,000 miles without an oil change using AMSOIL, and will extending my oil change interval void my warranty?

AMSOIL Synthetic Motor Oil is guaranteed to run for 25,000 miles or one year in a mechanically sound engine, providing, of course, the oil is kept free of contaminants by changing the oil filter according to the Manufacturer's recommendation or, when using an AMSOIL Oil Filter, changing the filter at six months or 12,500 miles, whichever comes first. AMSOIL coined the phrase "extended drain interval" and it's been validated by over 30 years of industry testing and by tens of thousands of motorists and millions of over-the-road miles. Based on their results, 25,000 miles is a conservative estimate!

AMSOIL Synthetic Motor Oil performs so well for so long because it doesn't break down in intense heat like conventional petroleum oils do. It doesn't form performance-robbing deposits and it does-

Table 2

Compare "Price" with true "Cost"

AMSOIL	1 yr./25,000 miles	Petroleum	3,000 miles
6 qts. @ \$5.95/qt.=	\$35.70	40 qts. @ \$1.00/qt.=	\$40.00
2 filters @ \$10.80=	\$21.60	8 filters @ \$3.00=	\$24.00
Subtotal	\$57.30	Total Cost	\$64.00
2% increase in fuel mileage			
20 mpg to 20.4 mpg			
\$1.60 per gallon	(\$39.22)		
Total Cost	\$18.08		

n't volatilize, which can adversely affect lubricant performance by altering viscosity and increasing oil consumption. Finally, AMSOIL's additive package, a key element in a lubricant's ability to function, holds up under engine stresses, remaining serviceable for the full 25,000 miles.

Note also that extending drain intervals, like using AMSOIL Synthetic Motor Oil in general, does not affect new car warranties. In fact, according to a General Motors representative, "Warranty applicability is contingent upon the cause of failure and generally covers defects in material and workmanship only." In other words, the only situation in which warranty coverage would change is the case of lubricant-related failure (in which case the AMSOIL Limited Warranty protects the consumer).

AMSOIL costs more than my regular oil does. How can I justify paying this higher cost?

AMSOIL Synthetic Motor Oil is more expensive off the shelf than most petroleum oils. But comparing AMSOIL and other motor oils is like comparing apples and oranges: AMSOIL's performance so far exceeds that of conventional motor oil, it's really a different class of product. AMSOIL is a premium product that rightfully commands a premium price.

Like anything of real value, however, the true consumer cost doesn't end with the off-the-shelf price. AMSOIL Motor Oil is extremely cost effective compared to conventional 3,000-mile drain interval oils in savings realized in fuel economy, reduced repairs, fewer oil changes, reduced downtime, reduced maintenance and extended engine life.

Compare the cost of using conventional oil and the cost of AMSOIL in Table 2.

I bought a new car a year ago, and I've been running petroleum motor oil in it ever since. Could switching to AMSOIL now cause mechanical problems?

Switching from petroleum motor oil to AMSOIL (or even mixing the two, if the need arises) is perfectly safe. AMSOIL is 100 percent compatible with petroleum oils. Mixing AMSOIL and petroleum is not recommended (having petroleum motor oil mixed in detracts from the superior performance of AMSOIL), but there is no danger in doing so. Those who have been using petroleum motor oil in their mechanically sound vehicles can switch to AMSOIL safely. Petroleum motor oil and AMSOIL Synthetic Motor Oil are only incomparable in the way they perform, not incompatible.

I've been using a petroleum motor oil since I started driving – that was a long time ago. Why should I switch to AMSOIL when I haven't had any problems with what I'm using?"

Chances are, you're not driving the same car you were when you started driving. Automotive technology has changed a great deal, even in just the past few years. Today's cars have more power, use less gas and have smaller engines than ever before. High perform-

ance mixed with small engines means high stresses and increased demands on motor oil.

How expanding technology and modern engine needs affect motor oil is a primary concern of AMSOIL engineers. High-tech engines need high-tech oils like AMSOIL Synthetic Motor Oil – designed, not refined. AMSOIL Synthetic Motor Oil's basestock is composed of uniform molecules chosen for their lubricating characteristics. Petroleum oils are a hodge-podge of molecules; some lubricate, others detract from the ability to lubricate. The bottom line? AMSOIL's engineers can design their motor oil to meet the needs of you and your vehicle, petroleum refiners can't.

Using an oil designed for today's needs can make a world of difference for you and your automobile by providing lower repair costs, the convenience of fewer oil changes, easier starts in cold weather, better gas mileage and longer engine life. You can also expect better engine performance. These factors and the overall savings realized by using AMSOIL Synthetic Motor Oil make switching to AMSOIL the smart and easy choice!

Is there any situation where I should not use AMSOIL Synthetic Motor Oil?

Only a few. If your car leaks oil badly, AMSOIL will make a nui-

sance leak an expensive leak. Better to fix the leak, but don't penalize the engine by using "cheap" oil and then put off fixing the leak. In the long run, your engine will pay the price in increased wear from cheap oil, increased heat stress (the oil carries the heat away from engine components in the lower portion of the engine, and running without a full crankcase hurts the oils ability to cool the engine).

If the engine is on its "last legs", putting in AMSOIL will not solve pre-existing problems.

Also, some older engines, especially small block General Motors engines, used a piece of rope wrapped around the rear main seal to keep the oil in. This seal worked best when dirt had impacted the piece of rope. AMSOIL is a high-detergent oil. It will clean the dirt out and possibly cause this seal to leak. If the seal has been replaced with an up-to-date neoprene seal, AMSOIL will work great

What About Switching A High Mileage Engine to AMSOIL?

As long as it is a sound engine, in good mechanical condition, it should be no problem. Just make sure you use AMSOIL Engine Flush in the change-over and follow the oil filter change recommendations to make sure you remove the accumulated dirt from the system.

Although it is a bit of an involved ritual, here is what I recommend for any car over 60,000 miles. Purchase two inexpensive oil filters at the local discount store and replaced the filter on the vehicle with one of these cheap filters without draining the oil pan. Also take a clean container and drained a cup of oil into it and then catch in mid-stream oil in an Oil Analyzers sample bottle (about 4 oz.) to send off for oil analysis. Put the extra oil in the cup back in the engine. Prepare to send the oil sample to Oil Analyzers, Inc. This sets a baseline for the condition of the engine and determines that the engine is in good shape. Although the AMSOIL warranty is better than the average warranty out there (when was the last time you read the warranty for Pennzoil or Valvoline?), the AMSOIL warranty does provide that the warranty covers engines in good mechanical condition. Twenty thousand miles from now, you want some idea what condition the engine was in back then. It also is just a good idea to test the oil periodically, even if you don't use AMSOIL or any synthetic, just to know what is going on inside your engine.

Next add a can of AMSOIL's Engine Flush. If you leave the old filter in place, the dirt the Engine Flush cleans off the surfaces in the engine would just go around and around and not provide any further cleaning. Installing the new, cheap oil filter reduces the oil level by a quart, leaving room for the flush and this new filter will catch the

dirt as it is circulated. You don't want to over-fill the crankcase so it works well to replace the filter, then replace the lost oil with the Engine Flush. Also, you don't want to drive the car during this engine-cleaning phase. Adding the Engine Flush thins the oil quite a bit. Let the vehicle idle for 30 minutes and then drained the oil and remove the first inexpensive filter while hot. Needless to say, the oil will likely be really dirty.

If possible, let the drain plug off over-night. Every drip of oil brings out more dirt. Next fill the engine with the AMSOIL oil of choice.

Now install the second inexpensive oil filter. The oil will continue to clean the engine and plan on leaving this second inexpensive filter on for a short time. If the engine has 60,000 miles on it, use this filter for 1,000 to 1,500 miles. If it has over 100,000 miles on it, use it for only 500 to 700 miles. The reason for this step is that the AMSOIL Synthetic Motor Oil is a high detergent oil with a very intense additive package. It will continue to clean the inside of the engine and deposit the dirt and accumulated varnish into this filter. Because of the volume of dirt being circulated, this filter will likely reach capacity quickly.

If you have ever heard of someone complain that they changed their oil and then started using oil after just 1,500 miles or so, what probably happened is they changed oil

brands. When you change oil brands, the new oil has a unique and different chemical makeup and will often go about doing its job cleaning the engine and depositing the dirt into the filter. The filter becomes clogged. The clogging causes the by-pass valve in the filter to open and the dirty oil circulates around the filtering media in the filter, getting dirtier and dirtier. The dirt accumulates behind the rings and the engine loses compression seal, increasing blow-by the oil consumption. Often the oil and filter is changed and the problem goes away because now the oil is clean and the filter is functioning properly, but the oil that was in there is wrongly blamed for not performing adequately, when it was really just doing its job of cleaning the engine.

After the second inexpensive filter has run for the same appropriate period, change it out and install the appropriate AMSOIL Super Duty Filter. You need not change the oil as the oil is still good! You will need to add whatever oil is necessary to bring the oil level up to full on the dip stick.

Your vehicle is now set to go for 6-months or 12,500-miles (gasoline engine), whichever comes first, before the next filter change. Diesel engines should have their filters changed at 7,500-miles or 6-months, whichever comes first.

How do Air Filters Work?

Table 3

AMSOIL Air Filters

Feature	Benefit
Superior debris trapping capability — Less debris enters the engine	Engines perform better, last longer and require fewer repairs
Tear resistance	Filters maintain their ability to protect dependably, helping engines perform better, last longer and require fewer repairs
Oil trapping of debris particles keeps debris trapped in the filter	Less debris enters the engine. Engines perform better, last longer and require fewer repairs
Superior air flow for better combustion.	Better combustion improves power, performance and fuel economy.
Reusability	Cost savings and less generation of solid waste

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' x 15' x 8' 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 airflows 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.

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. Paper filters wear and tear; holes allow excessive dirt to pass into the engine. Paper filters are single use products.

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.

The thick foam elements in AM-SOIL 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.

Soft filter foam "gives" easily, resisting tearing. The foam filter elements may be removed, washed with household detergent, rinsed, dried, re-oiled 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 clean-

ings than paper filters maybe used between replacements.

Table 3 summarizes the features and benefits of AMSOIL Foam Air Filters.

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.

Table 4

AMSOIL Full-Flow Oil Filter

Features	Benefits
Non-channeling so under-filtered oil doesn't reach engine.	Proper filtration increases engine life; engines require fewer repairs.
30% Greater capacity — holds more debris	More dependable protection, especially over extended oil drain intervals
35% longer life	More dependable protection, especially over extended oil drain intervals; cost savings.

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.

- 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.
- As their surface become obstructed with debris, oil “channels through the paper media and receives very little filtering before passing into the engine.

Conventional full-flow oil filters should be changed at 3,000 mile intervals for optimal protection. For baseline protection, they should be changed at 6,000 mile intervals.

The AMSOIL Full-Flow Oil Filter contains lofted fiber media, which features greater depth than is found in paper media used in conventional filters. The lofted fiber filtering media’s greater depth provides greater debris storage capacity and greater durability. In fact, testing shows AMSOIL Full-Flow Oil Filters **offer thirty percent more capacity** and **thirty-five percent longer life** than conventional filters offer. The depth-type

filter eliminates “channeling”, so the engine receives only filtered oil. The AMSOIL Full-Flow Oil Filter may be changed at six month or 12,500 mile intervals.

AMSOIL manufactures and markets lofted fiber Full-Flow Oil Filters to mount at the conventional oil filter site and also manufactures and markets mounting hardware for “remote” mounted lofted fiber Full-Flow 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.

See Table 4 for a summary of features and benefits of the AMSOIL Full-Flow oil filter.

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 a 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 resulting in an increase

in total oil capacity.

A conventional full-flow oil filter is designed to maintain a volume of oil flow necessary to service the engine. These conventional full-flow filters will typically remove and hold dirt contaminants larger than 25 to 45 microns (by comparison, a human hair may be 50 to 100 microns in diameter). If the full-flow filter were to stop and hold smaller contaminants in this size range its life would be considerably shorter than 3,000 miles.

Particles in the 5 to 20 micron size range may cause up to sixty percent of total engine wear. Full-flow filters remove the particles larger than 20. AMSOIL by-pass oil filters remove particles 3 mi-

crons in size or larger with efficiency approaching one hundred percent. They also remove particles small than 1 micron. This is a significant factor in reducing wear as the finest tolerances in your engine are in the five micron range. Removing all contaminants larger than five microns mean you are virtually eliminating all wear caused by dirt in your oil.

Studies at the Cummins Engine Co. Technical Center using various size contaminant particles concluded that wear can be reduced by up to 91 percent as a result of using a by-pass filter in combination with a full-flow filter

Your oil will not remain clean as new oil, but any dirt not held in the

Table 5

AMSOIL By-Pass Oil Filters

Features	Benefits
Removes particles smaller than 1 micron	Fewer and smaller wear particles circulating in the oil reduce wear rate so engines last longer, perform better and require fewer repairs
Removes water	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
Increased oil system capacity	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.

filter will be able to freely circulate through your engine, even through the finest tolerances and not cause the wear you experience now utilizing only a full flow oil filter. This is especially significant in engines that are often under high-load conditions, such as heavy trucks and vehicles that tow travel trailers, horse trailers, boats, etc.

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. This is especially important in engines that are not used often due to the high likelihood of condensation, and in marine engines where operation in wet conditions are common. AMSOIL has a Dual Remote Bypass Filter system specifically for recreational and light marine applications that meet U.S. Coast Guard regulations.

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 System 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 compartment, 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.

How does Oil Analysis work?

Oil Analysis involves taking a small sample of the motor oil, usually about four ounces, and having a laboratory specializing in such analysis test the oil to determine the level of additives that remain, the level and type of wear metals present, the level of dirt or other contaminants in the oil, including water, fuel or antifreeze, and test for the viscosity of the oil. By evaluating these characteristics of the oil and comparing it to the oil when new and to prior oil samples, the oil analysis will disclose much about the engine condition.

An oil analysis that shows the presence of glycol or other elements indicate antifreeze in the oil, which can severely effect engine life. Fuel in the oil may mean carburetor or fuel injection problems and will thin the oil, also leading to engine failure. A certain amount of dirt can be present (changing the oil does not remove residual oil or dirt, so even an oil change will leave some dirt behind), but excessive dirt may indicate mechanical

problems, or maybe a dirty or leaking air filter.

There will always be some sign of wear metals in a lubricant. The trick is to determine if they are excessive and determine what types of metals they are to ascertain where in the engine you have problems. Some of the metals evaluated include iron, aluminum, copper, and tin. Often several sequential oil analysis are compared to ascertain if there is a trend of a certain metal to increase, indicating some part or problem is developing. This is called *predictive maintenance*. Unusually high iron may be a sign of cylinder wear, possibly a broken piston ring. High copper may indicate main or rod bearing wear. Aluminum may be a bad thrust washer. An indication of a problem can allow you time to do repairs, such as a bearing change, before a catastrophic failure. Oil analysis might foresee the likelihood of a certain component failure, if certain components, like the fuel injection system, is working at optimum performance levels, and whether the oil itself is good for continued use. The same level of analysis can also be gained by submitting samples of transmission fluids, gear lubes, hydraulic fluids, etc. to gain insight into the internal workings of the particular component.

A stand-alone in the industry, AM-SOIL's Trigard System offers a program of used oil analysis for owners of passenger cars and light trucks in non-commercial use.

With the Trigard System, AM-SOIL customers may increase their oil drain intervals beyond the 25,000 mile or one-year intervals recommended by AM-SOIL for its synthetic motor oils. The Trigard program requires use of AM-SOIL synthetic motor oil, an AM-SOIL full-flow oil filter, an AM-SOIL air filter, an AM-SOIL By-Pass Oil Filter and participation in the Trigard used oil analysis program.

Oil Analyzers Inc. offers a program of used oil analysis for vehicles and equipment in commercial and non-commercial service. Oil Analyzers Inc. services may be used to extend lubricant drain intervals and monitor the well-being of vehicles and equipment. Determining that a lubricant is in condition for extended service life saves motorists and commercial operators money and reduce environmental impact of used oil disposal. In addition, used oil analysis may lead to decreased downtime, increased production, longer equipment life, elimination of equipment failures, streamlined maintenance protocols and reduced capital expenditures.

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 appli-

cations 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

Table 6

AMSOIL Synthetic Automatic Transmission Fluid

Features	Benefits
Cooler operation	Cooler transmissions resist stress and wear. They last longer, perform better and require fewer repairs.
Thermal and oxidative stability — AM-SOIL synthetic ATF resists formation of sludge, varnish, deposits, acids and other degradation products.	Transmissions stay clean, which helps them perform better, last longer and require fewer repairs.
Consistent viscosity in high and low temperatures	Improved low temperature shifting. Better high temperature protection, which helps transmissions last longer and require fewer repairs.
Superior friction characteristics	Lower wear rate, which helps transmissions last longer and require fewer repairs. Improves fuel economy. Helps prevent shudder.
Low temperature fluidity.	Improved low temperature shifting. Better wear protection in cold temperatures, which helps transmissions last longer and require fewer repairs.
Low volatility — AMSOIL synthetic ATF doesn't evaporate.	Better ATF flow gives better fuel economy and better wear protection.
Broad temperature range of application	AMSOIL synthetic ATF works safely and protects at higher and lower temperatures than conventional ATF does.
Extended service life capability.	Saves motorists money and reduces the environmental impact of used lubricants.

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.

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 temperatures thicken ATF excessively. Due to their extremely high operating temperatures, automatic transmissions tend to thermally and oxidatively degrade ATF rapidly. 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.

Table 6 summarizes the features and benefits of using AMSOIL synthetic ATF

What Is Involved In Changing My Automatic Transmission

Fluid To AMSOIL?

Most dealerships and garages will gladly do a fluid change in your automatic transmission fluid, but beware that most times they just change the fluid that is in the transmission oil pan, which does not involve a full fluid change. The automatic transmission fluid that is in the torque converter, pump, and cooling lines does not drain out and is typically a quantity of fluid about equal to what is in the fluid pan. You are therefore only getting half of a fluid change.

Although AMSOIL Automatic Transmission Fluid is fully compatible with conventional petroleum automatic transmission fluid, to gain all the benefits of a 100% Synthetic Fluid, you should have the very highest percentage AMSOIL in the unit as possible.

The easiest way for the do-it-yourselfer to accomplish this takes a little prep-work for changing out the transmission fluid. Make sure you have a pan replacement gasket and transmission filter or screen, as the case may be, and enough fluid to do a complete change (often 10-14 quarts). You will also need a piece of clear plastic tubing with an inside diameter of about 3/8 inch (purchased at the hardware store for about \$1.50). Next, with the engine off, pull the transmission dip stick and note where the fluid level is on the stick. It is probably just slightly above the full mark.

First, disconnect one of the fittings holding the 3/8" tubing running from the transmission up to the radiator. You want the tube that is

the return line from the radiator to the transmission. Place a catch pan under the transmission. After tapping the ignition key (don't start

Table 7

AMSOIL Synthetic Gear Lube

Features	Benefits
Cooler operation.	Cooler gears resist stress and wear. They last longer, perform better and require fewer repairs
Thermal and oxidative stability — AM-SOIL synthetic gear lubes resist formation of sludge, varnish, acids, deposits and other degradation by-products.	Gears stay clean, which helps them perform better, last longer and require fewer repairs.
Thermal durability.	Gear surfaces remain protected even during extended high temperature service.
Consistent viscosity in high and low temperatures.	Improved low temperature shifting. Better high and low temperature protection, which helps gears last longer and require fewer repairs.
Superior friction reduction.	Lower wear rate, which helps gears last longer and require fewer repairs. Improves fuel economy.
Low temperature fluidity.	Improved low temperature performance. Better wear protection in cold temperatures, which helps gears last longer and require fewer repairs.
Low volatility — AMSOIL synthetic gear lubes don't evaporate.	Better gear lube flow gives better fuel economy and better wear protection.
Broad temperature range of application.	AMSOIL synthetic gear lubes work safely and protect at higher and lower temperatures than conventional lubes do.
Extended service life capability.	AMSOIL synthetic gear lubes last longer than conventional gear lubes do, which saves motorists money and reduces the environmental impact of used lubricants.

the engine), see whether fluid came out of the tubing or the transmission housing. If the fluid came out of the housing, re-installed the tube and disconnect the other line.

Next remove, drain and clean the automatic transmission fluid pan and replace the transmission filter (or clean the screen) and gasket. Put in enough AMSOIL Synthetic Automatic Transmission Fluid to bring the level to where it was before your started. Then connect the clear plastic hose of the transmission return and routed it into a bucket. It's a good idea to use a bucket or pan that has marks on the side so you will know when you have removed two quarts, four quarts, etc.

The next step usually takes two people. As one person starts the car, the other must start feeding ATF into the filler tube. As the engine runs, fluid is pumped out of the pan and into the torque converter, then out of the torque converter, through the line to the radiator, and then through the return line into the clear plastic tube and into the bucket. The idea is to feed new fluid into the fill tube at about the same rate that the old fluid is being pumped out of the return line into the bucket. At an idle, and in neutral, this is not a very fast process. Watch the color of the ATF in the clear tubing coming out of the transmission so that when either: 1) the color of the fluid changes from a dark red, almost burgundy, to the lighter color red of the AMSOIL ATF, or 2) the amount of

fluid pumped into the bucket reaches a point where all of the fluid removed from the transmission equals the rated capacity of the transmission, then just switch off the ignition key. Re-connect the tube and you're done. Start the engine up and allow it to run for a few minutes, shifting through the gears. Check the fluid level and top it off if necessary.

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 drive shaft 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 drive shaft to the wheels. Because the drive shaft and the wheels rotate at 90 deg. angles to one another, the differential contains gears to change the direction of the rotational power it receives. The severe an-

gle 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.

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.

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.

See Table 7 for a summary of the

features and benefits of using AM-SOIL synthetic gear lubes.

How do I change the gear lube fluid in the differential?

This is the easiest of fluid changes. Some differentials and transfer cases have drain plugs. Remove the plug while the unit is hot and allow it to drain. Refill with the appropriate lube. Some transfer cases use an ATF, some a gear lube. Make sure you have the right one.

If the differential or transfer case does not have a drain plug, purchase a turkey baster (Walmart, for about \$3.00) and fit a piece of plastic tubing over the end, holding it in place with a nylon cable tie. With the unit hot, unscrewed the fluid level plug on the differential. Using the turkey baster, suck out as much of the old gear lube as possible. Depending on how level the ground is where you are working, you may have fluid hung up in the axle housing. It sometimes helps to jack up one rear wheel and then the other to allow it to drain out of the axle housing into the pumpkin part of the differential. AMSOIL has a flexible quart-bottle top attachment you can get for \$.50 (Product Code G-1230), and a nozzle end that fits on the attachment for \$.60 (Product Code G-1242) that makes putting the gear lube in even in tight places a

breeze. In most cases, you should use between two and three quarts of AMSOIL 100% Synthetic Gear Lube.

How does 2-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 en-

gines 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**.

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.

Table 8

AMSOIL Synthetic 2-Cycle Oils

Features	Benefits
Cooler operation.	Cooler two-cycle engines resist stress and wear. They last longer, perform better and require fewer repairs.
Consistent viscosity in high and low temperatures.	Better high and low temperature protection, which helps two-cycle engines last longer and require fewer repairs.
Superior friction reduction.	Lower wear rate, which helps two-cycle engines last longer and require fewer repairs. Improves fuel economy.
Low temperature fluidity and miscibility (ability to mix with gasoline).	Better wear protection in cold temperatures, which helps two-cycle engines start better, last longer and require fewer repairs.
Clean burning.	Reduced deposits and emissions.
100:1 2-Cycle Oil introduces less oil into engine than conventional 32:1 oils do.	Reduced emissions.

There has been considerable effort on the part of 2-cycle engine manufacturers to make their engines run longer, cleaner, and with less emissions. As a result, 2-cycle oil formulations have been upgraded significantly. But without an industry standard that differentiates the high-quality oils from “all the rest”, many manufacturers have upgraded formulations and imposed requirements on equipment owners to use only their OEM 2-cycle oil. This is the manufacturer’s way of dealing with the shelves of low quality bargain products now on the market.

AMSOIL has addressed the different needs of different 2-cycle engine designs with different Synthetic 2-Cycle Oil that far exceed any of the manufacturer’s OEM formulations. AMSOIL has made 100% Synthetic 2-Cycle Oil since 1973, and knows what it takes to get it right.

AMSOIL has two Synthetic 2-Cycle Pre-mix Oil formulations. *Saber Professional* is a formulation for hand-held power equipment such as chainsaws and lawn utility equipment. *Saber Outboard* has a performance emphasis on cooler operations of water-cooled motors, such as outboard boat engines.

For the best performance in injector-type 2-cycle engines, AMSOIL has *HP Injector* for direct fuel injector technology, such as outboard motors. *Dominator* is AM-

SOIL’s racing two-cycle oil for high horsepower and modified racing or trail motors. *Interceptor* 2-cycle oil is a high performance oil with emphasis on engines equipped with exhaust power valves, such as snowmobiles.

Table 8 summarizes the features and benefits of using any of AMSOIL’s Synthetic 2-Cycle Oils.

The dealership where I purchased my motorcycle told me not to use an automotive type oil in my bike, and said that synthetic oil should not be used. How is AMSOIL Synthetic Motorcycle Oil better for my bike?

Motorcycle manufacturer rhetoric against the use of automotive oils in motorcycles has become very strong. The reason given is that up until a few years ago API automotive oils used zinc and phosphorus additives to help reduce wear, especially under high-pressure conditions, such that exist on cam lobes. These additives have been important to most cycle engines, which typically have steep cam slopes, creating high pressure between the parts. These additives, however, were greatly reduced when the API-SJ formulation was introduced several years ago because they degrade catalytic converters and oxygen sensors over time.

Oils formulated for water-cooled engines typically operate with oil temperatures lower than 200 deg F. Motorcycle engines, on the other hand, are air-cooled and typically

operate with engine temperatures greater than 200 deg. F. What is misleading about the motorcycle manufacturer's claims is that SAE 10W-40 and 20W-50 oils are not required to be formulated with the reduced level of critical additives claimed by the motorcycle manufacturers.

AMSOIL's Synthetic Motorcycle Oil actually has more intensive zinc and phosphorus levels than Harley-Davidson's® own conventional petroleum oil. In tests, none of the popular motorcycle oils, including Harley-Davidson® 20W-50, compared favorably to the AMSOIL products in wear additive content. In addition, in wear tests conducted at temperatures higher than 200 deg. F AMSOIL's motorcycle oils tested better than any of the leading motorcycle oils including Harley 20W-50.

Harley-Davidson® has seen the writing on the wall, and with the introduction a few years ago of their own Screamin' Eagle® Synthetic Lubricant indicates the Motor Company has finally recognized the benefits of running synthetic motorcycle oil in their air-cooled engines. After years of advising dealers and customers to avoid using synthetic oils in their bikes, it's natural to wonder why the company is suddenly marketing one.

AMSOIL Synthetic Motorcycle Oils has superior resistance to oxidation and thermal degradation. Most significant, however, is that

the bikes run considerably cooler, evident from the fact that supplemental oil coolers are no longer necessary on most bikes.

In addition, the same AMSOIL V-Twin Synthetic 20W-50 Motor Oil can be used in the engines, primary chaincases and transmissions of most Harley-Davidson® motorcycles, including Evolution XL, Evolution 1340, Twin Cam 88 and 88B, Revolution and Buell models.

AMSOIL Synthetic Motorcycle Oils are also compatible with bikes that utilize a combined oil pan for the engine and wet clutch system. The cleaner operation operation with AMSOIL will provide better clutch performance and lower maintenance costs.

I've heard that synthetic oil or gear lube should not be used in a motorcycle or ATV with a wet clutch. Is this true?

Motorcycles, ATVs, tractors and some other types of relatively small vehicles and equipment have wet clutches. Relatively small equipment, small vehicles and other applications with large power-to-weight ratio have wet clutches to help ensure smooth clutch engagement and long clutch life. Wet clutches ensure smooth clutch engagement because the fluid acts as a buffer or shock absorber against sudden engagement.

Wet clutches have longer life than

dry clutches because they run cooler, which prevents warping and inhibits wear. In dry clutches, excessive loading sometimes leads to the formation of hard spots on the pressure plate which causes shudder.

Wet clutches are suspended in oil for cooling. The clutch has its own oil pan and the oil specified or wet clutch applications is generally motor oil or gear lube.

The wet clutch engages whenever its clutch plates press together. Wet clutches are designed to allow some slippage during engagement in over-torqued situations to maintain smooth operations.

Wet clutches sometimes develop excessive slippage, which interferes with clutch engagement. Worn or deposits-ridden clutch plates are the most common causes of excessive wet clutch slippage.

There has been some concern that synthetic lubricants cause excessive wet clutch slippage, due to their superior friction-reducing ability. In fact, because synthetics remove deposits, they actually correct some cases of excessive slippage.

Look at it this way. Wet sandpaper removes paint as well as dry sandpaper does. The slipperiness of the water does not impede the sandpaper's ability to function. The same applies to the slipperiness of synthetic lubes in wet clutches. It is simply not an issue.

However, just as rinsing the sandpaper keeps it cleaner longer so it functions better longer, so the synthetic lubricant keeps wet clutch plates cleaner longer so they function better longer. And, since synthetics are superior cooling agents to conventional lubes, using synthetics will help wet clutches last longer also.

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 re-lubrication frequency.

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. Many applications subject greases to water. To provide adequate protection against wear, greases must resist washing out. Rust protection is important, too.

The automatic greasing systems used to distribute grease in indus-

trial machinery require greases with good cold temperature characteristics for dependable feeding into the automatic grease system.

AMSOIL has synthetic grease in formulations for Multi-Purpose High Speed applications, Heavy Duty low speed applications, Water Resistant applications, Racing

Table 9

AMSOIL Synthetic Grease

Feature	Benefit
Cooler operation.	Cooler components resist wear, last longer, perform better, require fewer repairs.
Thermal and oxidative stability — AM-SOIL synthetic greases resist formation of sludge, varnish, acids, deposits and other degradation products.	Components stay clean, which helps them perform better, last longer and require fewer repairs.
Consistent viscosity in high and low temperatures	Better high and low temperature protection, which helps components last longer and require fewer repairs. Allows dependable use in automatic feed systems.
Superior friction reduction.	Lower wear rate, which helps components last longer and require fewer repairs. Reduces fuel or power consumption.
Low temperature fluidity.	Better wear protection in cold temperatures, which helps components last longer and require fewer repairs.
Broad temperature range of application.	AMSOIL synthetic greases work safely and protect at higher and lower temperatures than conventional greases do.
Extended service life capability.	AMSOIL synthetic greases last longer than conventional greases do, which saves users money and reduces the environmental impact of used lubricants.
High quality additives for rust protection.	Less rust helps components work better, last longer and require fewer repairs
Molybdenum additive (GHD)	Extra wear protection in high load conditions, which helps components last longer and require fewer repairs.

Table 10

AMSOIL Fuel Additives

Features	Benefits
Deposit removal and ongoing cleanliness (ADC, ADM)	Clean engines last longer, perform better and require fewer repairs.
Rust and corrosion prevention (ADC, ADM)	Rust- and corrosion-free equipment lasts longer and requires fewer repairs.
Improved fuel efficiency (all).	Savings on fuel costs.
Lubricity aid (ADC, ADM).	Lubricity reduces wear. Lower wear rates help engines last longer, perform better and require fewer repairs.
Low temperature fuel fluidity (ADC, ADM)	Low temperature fluidity helps engines start and run dependably in cold temperatures and increases their cold temperature fuel efficiency.
Fuel stabilization (ADC, ADM).	Helps stored fuels “keep”.
Improved fuel ignition quality (ACB).	Helps diesels start dependably in fold temperatures; helps them run powerfully and smoothly; reduces their smoke and emissions.

Grease, and Food Grade grease.

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.

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 offers the benefits of AMSOIL Performance Improver in a single application container.

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.

AMSOIL Diesel Fuel Additive Concentrate (ADC) 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 com-

ponents from the effects of low lubricity fuel. ADC also stabilizes stored fuel. ADC is formulated for use in heavy duty diesel engines.

AMSOIL Diesel Fuel Modifier (ADM) 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. Use ADM in diesel engines with glow plugs.

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 Cetane Boost (ACB) 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.

Table 10 provides details on the features and benefits of the various AMSOIL fuel additive products.

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 Anti-freeze and Coolant (ANF) utilizes propylene glycol as an anti-freeze coolant mixture 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.

If you are a commercial fleet owner of cars, trucks, heavy equip-

Table 11

AMSOIL Propylene Glycol Antifreeze/Coolant

Features	Benefits
Low toxicity.	Safer than EG coolants for humans and animals in case of ingestion.
Formulated for gasoline and diesel engines.	May be used by more customers than some propylene glycol anti-freezes can, due to their formulation for gasoline engines only.
Superior erosion and corrosion protection in diesel engines.	Radiators last longer and require fewer repairs.
Increased bearing safety in case of coolant contamination of engine oil.	May prevent catastrophic bearing failure.

ment, or an industrial user of antifreeze and coolant products, you should be aware that ethylene glycol (used in the most widely sold form of antifreeze and coolant) is listed as a hazardous material, and the spill of just one pound of ethylene glycol is a reportable occurrence to the Environmental Protection Agency, as outlined in the Code of Federal Regulations (CFR Title 40, Part 302, Section 302.4) . This is a link directly to the U.S. Government Printing Office online service. Table 302.4 "List of Hazardous Substances and Reportable Quantities" is presented in this document. Ethylene Glycol is designated as a hazardous substance and listed on Page 305. See the reference to footnote "1*" at the end of the table (Page 337) which sets forth that the 1-pound Reportable Quantity is a CERCLA (Superfund) statutory Reportable Quantity for ethylene glycol requiring notification of the National Response Center in Washington, D.C. (CFR Title 40, Part 302, Section 302.6[a])

YOU CAN AVOID THE COST AND THE LIABILITY EXPOSURE ASSOCIATED WITH THE SPILL OF JUST ONE POUND OF ETHYLENE GLYCOL BY USING AMSOIL's PROPYLENE GLYCOL ANTIFREEZE AND COOLANT, WHICH IS NOT A LISTED HAZARDOUS MATERIAL.

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.

Table 11 summarizes the features and benefits of AMSOIL Propylene Glycol Antifreeze/Coolant.

Notes

Preferred Customer Membership or AMSOIL Dealership

The Choice is Yours

Preferred Customer Memberships are recommended for people who are not necessarily interested in the business opportunity, but want the lowest possible prices on the best lubrication and filtration products for their vehicles and equipment. Preferred Customers pay the same low prices for AMSOIL products that AMSOIL Dealers pay. Cost: \$10.00 for a 6-month trial membership — \$20.00 per year

Independent AMSOIL Dealerships are recommended for people who want to own their own businesses, be their own bosses and set their own goals. The AMSOIL business opportunity is versatile and dynamic so that each person can create his or her own personally tailored business. Cost: \$15.00 for a 6-month trial Dealership — \$30.00 per year

Personal Sales

As an AMSOIL Dealer, you purchase AMSOIL products at Dealer cost and then sell them at the suggested retail price. Your income starts building immediately with retail profits and commission bonuses!

Catalog Sales

Dealers distribute AMSOIL catalogs, and AMSOIL Inc. takes it from there. AMSOIL takes the order, ships the product, bills the customer and collects the money. The Dealers collect the retail profits and the commissions.

Retail On-The-Shelf Sales and Commercial Sales

Retail On-The-Shelf Accounts are retail outlets such as auto parts, quick lubes and hardware and sporting goods stores. These stores stock AMSOIL products on their shelves to sell to their customers. Commercial Accounts are

businesses which have vehicles, equipment and machinery that use the quality lubricants and filters available in the AMSOIL product line. Once you've established one of these accounts, AMSOIL extends them credit, takes their orders, ships their product, invoices the product and collects the payment. AMSOIL then sends you your monthly commission earnings from the account.

Internet Sales

Dealers link their websites to the corporate AMSOIL website, or purchase products through the AMSOIL On-Line Store, and Dealers get the retail profits and commissions.

Building Your Sales Group

A necessary part of any business is expansion. You can expand your AMSOIL Dealership by developing your own personal sales force.

AMSOIL Dealership Requirements:

- Minimal start-up fee
- No inventory requirements
- No administrative headaches
- No capital investment
- No employee requirement
- You choose your level of time investment

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