History of Our Synthetic Lubricant Technology

Pioneering a New Era of Superior Lubrication
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ExxonMobil has a rich history as an innovator in lubrication technology. The story begins in 1866 with the invention of vacuum distillation, a revolutionary technology that enabled us to manufacture breakthrough lubricants for America’s first automobiles and industrial machines.

The story takes on a new dimension with the chance invention, decades later, of unique lubricant molecules. Alert scientists recognized new potential in these molecules, classified as “synthetics” and management envisioned a second revolution in lubrication technology—one that would drive equipment efficiency, reliability, and productivity far beyond what was possible with ordinary oils.

To kick off this revolution, we brought into play technical and business competencies that had taken a century to build and hone. There were many hurdles to overcome—the higher cost of synthetics was one. But, through innovative problem solving and dogged persistence, the vision prevailed.

One measure of our success is our dominance of the synthetic lubricant market. Over the past 35 years, we have commercialized more than 175 synthetic lubricants for virtually every engine and machine that needs lubrication, delivering breakthrough performance to transportation, industrial production, the movement of goods, the military, and space exploration. Unequaled by any standard, this unique family of synthetic lubricants includes:

- Mobil 1® and Mobil Delvac 1®, proven to keep automobile and heavy duty diesel engines at their peak performance for 1,000,000 miles and longer
- Mobil Jet Oil II, which has dramatically improved aircraft reliability
- Mobil SHC® 600, which significantly improves the efficiency of industrial plants
- Mobilgrease®, NASA’s choice for the life-support back packs used in space walks
- Mobil EAL Syndraulic, designed for construction equipment in sensitive environments
- Mobil Pegasus 1®, for rapid start-up of emergency power generators
- Mobilgard® 1 SHC, which extends service life in shipboard engines

The list goes on, with each of our synthetic lubricants bringing longer equipment and oil life, energy savings, increased productivity, less greenhouse gas production, and less used oil to dispose of. It all adds up to quality—quality of life, quality of business, and the quality of our environment.

And this is just the beginning. Our synthetic lubricant technology will be a critical factor as we address the critical issues of the 21st century. Application of our synthetics could save the United States alone millions of barrels of crude and cut its carbon dioxide emissions by millions of tons a year.

Early Days of Synthetic Lubricants

Our involvement with synthetics dates back to the end of World War II. The USA, poised for dramatic growth in the years ahead, faced a real possibility of running short of crude oil. This challenged America’s oil companies to seek ways of manufacturing lubricants—in addition to fuels—from natural gas and other non-crude resources.

The goal in those days was to find a synthetic that acted just like a conventional oil. And the reason was just as simple: virtually all engines and machines were (and still are) built around the characteristics of conventional oils. So a synthetic would have to match conventional oils in three key functions:

- Lubricate the metal parts
- Dissolve chemical additives that are needed to protect metal parts from contaminants and by-products formed during use
- Keep rubber seals pliable and leak free
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We pioneered synthetic lubricants over 50 years ago and have been a leader in synthetic lubricant research and manufacturing ever since.

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- Lubricate the metal parts
- Dissolve chemical additives that are needed to protect metal parts from contaminants and by-products formed during use
- Keep rubber seals pliable and leak free
During the war, crude-poor Germany made many attempts to synthesize lubricants, but none really measured up to the performance of natural lubricants made from petroleum or vegetable oils. Our work focused on a number of possibilities—polyglycols, silicones, and synthetic esters—but these early synthetics were quite limited in application. Clearly, breakthroughs were needed to propel synthetics into broad market application. Meanwhile, engine and equipment designs were advancing rapidly, demanding higher performance conventional oils, and driving research to develop performance-enhancing additives.

### A Fateful Discovery

One of our researchers was attempting to synthesize step-out additive compounds. The experiment was a failure—it did not give the desired results. But, the researcher let curiosity be his guide and discovered that one of the compounds was a very interesting material. The fluid looked very much like a conventional oil and easily mixed with conventional oils. But in two very important ways, the new material was very unlike conventional oil. It was an excellent lubricant at very high temperatures (>300 °F)—where conventional oils become too thin to protect rubbing surfaces. And it flowed extremely well at low temperatures (−70 °F)—where conventional oils become thick and solid.

The researcher noted his discovery in his lab book, dated May 18, 1949. That day, the first synthetic poly-alphaolefin (PAO) was invented, marking the start of a second revolution in lubrication science.

Then a funny thing happened on the way to market. With the development of the Mid-East oil fields, petroleum supplies became plentiful. Interest in synthetics waned. And the researcher turned his exploring eye to more pressing needs—but not before filing a Patent Information document describing the invention of PAO.

Seven years later, another set of eyes—those of a new research manager, a former Penn State professor who had cataloged all known lubricating compounds—would rediscover the potential of PAOs as high performance synthetic lubricants. “I had never seen anything like it,” he recalled later. “In that lab notebook, I saw a new future for lubrication.”

That was the birth of an intense synthetic lubricant research program at ExxonMobil—research that would create a new level of lubrication science that has yet to reach its full potential.

### Designer Lubricants

Synthetics differ significantly in composition and performance from conventional oils. Because they are distilled from crude, conventional oils contain thousands of different molecules that happen to share the same boiling range. Some of these molecules are good lubricants, but many are not. Some break down easily causing sludge. Some cause the oil to become too thin at high temperature, and at low temperature, some form wax crystals that make the oil so thick it stops flowing.

By contrast, synthetics are “designer” fluids, composed of a very few of the best lubricant molecules. They stay together at high temperatures, keeping the metal surfaces clean and maintaining the lubricant film. They are virtually wax-free, so the oil keeps flowing at very low temperatures. And they can be tailored to meet any viscosity requirement.

With all these unique features, it was clear that synthetics were vastly superior to conventional oils, capable of delivering a quantum leap in performance just by changing the oil in almost any engine or machine.
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# Our Key Patents in Synthetic Lubricants

<table>
<thead>
<tr>
<th>Year</th>
<th>Patent Title</th>
<th>Patent Number</th>
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<tbody>
<tr>
<td>1960</td>
<td>Synthetic Lubricants (PAO)</td>
<td>US 2,937,129</td>
</tr>
<tr>
<td>1964</td>
<td>Olefin Synthetic Lubricant</td>
<td>US 3,149,178</td>
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<tr>
<td>1966</td>
<td>Mobil Jet Oil II</td>
<td>US 3,247,111</td>
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<tr>
<td>1967</td>
<td>Non-Flammable Hydraulic Fluid</td>
<td>US 3,303,132</td>
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<tr>
<td>1971</td>
<td>Stabilized Synthetic Ester Lubricants</td>
<td>US 3,553,131</td>
</tr>
<tr>
<td>1997</td>
<td>Mobil SHC Lubes</td>
<td>US 5,602,086</td>
</tr>
<tr>
<td>1998</td>
<td>Mobil Refrigeration Oil</td>
<td>US 5,705,086</td>
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Laboratory Notes:

May 18, 1949, Marking the Discovery of PAO

With very low pour point and high viscosity index, PAOs broke through the temperature limits of conventional oils, enabling engines and machines to operate reliably at temperature extremes.

Wax crystals, inherent in conventional oils, inhibit oil flow at low temperatures.
Capturing the Vision

Possible applications were brainstormed—from motor oils for cars and trucks, to industrial oils for gearboxes, to greases for submarines and rocket guidance systems. While several niche aircraft applications were being exploited, we chose Europe as the stage for a full-scale introduction of a new, all-synthetic passenger car engine oil that would improve the reliability of small cars being driven at high speeds on European highways.

Rolled out in 1973, Mobil® SHC was an instant hit among car enthusiasts and owners of expensive, high-performance cars. It piqued the interest of engine builders, who were amazed that simple changing oil could deliver a significant leap in engine protection. It also proved to our management there was a market segment that could readily see the benefits of synthetic lubricants. It would take time, though, to understand just how large that market was.

Then came the energy crisis, and a national commitment to conserve energy. We responded by applying our synthetic technology to produce the first successful energy-saving motor oil for the American market—a lubricant well outside the norm of the industry at that time. Our leadership in this national crisis was unlike the response of any of our competitors.

The new oil was Mobil 1, a unique SAE 5W-20 synthetic oil formulated to improve fuel efficiency. Mobil 1 reduced gasoline consumption by 5% compared to all conventional oils, extending the time before a driver had to get back in a gas line.

Eventually premium conventional oils were developed that, with newer engine designs, would close the gap in fuel savings. But new generations of Mobil 1 would raise the bar for other key performance criteria—high temperature protection, cold starts, engine life, for example—that no conventional oil has ever challenged.

The success of Mobil 1 in passenger cars strengthened our belief that, with synthetic technology, we held the key to increasing the performance of almost anything needing lubrication. Acting on that belief, we deliberately set out to establish a new superior category of lubricants. And we did!

<table>
<thead>
<tr>
<th>Synthetic Solutions</th>
<th>Problem Solved</th>
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<tr>
<td>Mobilgrease 28</td>
<td>- Aircraft Wheel Bearing Failures</td>
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<tr>
<td>Mobil Jet Oil II</td>
<td>- Jet Engine Reliability</td>
</tr>
<tr>
<td>Non-Flammable Oil</td>
<td>- Helicopter Crew Safety</td>
</tr>
<tr>
<td>Mobil SHC 600</td>
<td>- High Temperature Deposits</td>
</tr>
<tr>
<td>Mobilgard SHC</td>
<td>- Engine Valve Deposits</td>
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<tr>
<td>Mobil Delvac Arctic SHC</td>
<td>- Starting Alaskan Pipeline Trucks</td>
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<td>Mobil Jet Oil 254</td>
<td>- In-Flight Engine Shut-Downs</td>
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<td>Mobil 1</td>
<td>- Sludge Forming in Car Engines</td>
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<td>Mobil Pegasus 1</td>
<td>- Slow Start-up of Emergency Engines</td>
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<td>Mobil EAL Arctic</td>
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We have developed and commercialized more than 175 synthetic lubricant products for virtually every business, engine and machine—a feat unequaled by any other company. Our family of synthetic lubricants includes:

- Mobil 1®, recognized as the best motor oil for passenger cars
- Mobil Delvac 1® for heavy-duty diesel engines
- Mobil SHC® 600, a synthetic circulating oil
- Mobilgear® SHC 600, for severe industrial gear applications
- Mobil SHC® 500 and Mobil Gargoyle Arctic SHC® for industrial hydraulic equipment and refrigeration compressors
- MobilJet® Oils for jet aircraft and NASA
- Mobil Pegasus 1® for gas engine driven hospital emergency power generators
- Mobil SHC® PM for paper machines
- Mobil EAL Arctic® for CFC-free refrigeration systems
- Mobilube SHC® and Mobiltrans SHC® for automotive rear axles and transmissions
- Mobilit® greases for automotive, industrial, and aviation uses.

And the family continues to grow, with new synthetic lubricant products added each year.

Customer-Focused

Helping customers solve operational problems—now considered a “best practice”—was the modus operandi of Vacuum Oil a century ago. It’s still our core competency. Today, customers ask us to survey plants and fleets to identify opportunities (often not obvious to the customer) to use synthetic lubricants to improve their business. To enable the customer to realize the potential value of synthetics in their operations and to make informed business decisions, we have also become an educator, sharing knowledge via in-plant training, seminars, literature, and oil analysis programs.

Customers consider us a trusted partner, a key factor in our tremendous success in marketing synthetic lubricants.
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Strong Equipment Builder Relationships

Our close ties with leading equipment builders—unique in the lubricant industry—is a key factor in the shift to synthetic lubricants.

Through cooperative research programs with key builders, new equipment and new lubricants are developed in parallel. This ensures that the right lubricant is available when new equipment reaches the market, enabling users to achieve maximum reliability and efficiency. It also positions builders to design equipment to take advantage of the high performance of our synthetic lubricants.

A measure of the importance of builder relations to us is the fact that Mobil 1 is endorsed by DaimlerChrysler, GM, Porsche, Aston Martin, VW, and BMW.

Innovative Product Testing

In the quest for higher performance lubricants, we have become a leader in creating new tests and using standard tests in innovative ways.

While others rely on simple “pass-fail” glassware tests, we have developed techniques that allow formulators to study lubricant performance at conditions that simulate what happens inside bearings, engines, or hydraulic systems. An example is our Thin Film Oxidation Test, in which a very thin layer of lubricant is spread over a hot, metal surface in an air-rich environment, simulating the high-stress environment encountered in bearings, pumps and jet engines.

The ability to quickly test and retest experimental oils promotes rapid learning, enabling our formulators to minimize weaknesses, optimize strengths, and speed the product to field trials and market tests prior to commercialization. And, because the tests simulate extreme conditions, they provide clear indicators of the performance advantages of synthetic oils.

Consistent Production of High Performance Products

“There shall be no compromise with quality,” was the dictum of the Vacuum Oil Company, the first lube supplier to adopt worldwide standards of lube quality. We are building on that heritage today.

Synthetics actually make it easier to ensure product quality. Composition is simpler—and much more controllable.

Documenting the Benefits

Our synthetic lubricants deliver higher performance, longer equipment and oil life, improved operational reliability, greater energy efficiency, and tolerance to extreme operating temperatures, than is possible with conventional oils.

Long Equipment Life

Equipment life depends on an extremely thin lubricant film to separate moving parts and keep them from wearing out. Because of their inherent film strength and stability, our synthetics provide a more consistent and durable film than conventional oils. And synthetics contain almost no impurities, so there is little to interfere with the action of performance enhancing additives.

As a result, engines and plant machinery are “healthier” when lubricated with our synthetics. Diesel engine life can exceed 1,000,000 miles and plant machinery can last five times longer. Bearings in machines can last 10 times longer with synthetic greases. The customer’s return on investment is greater, equipment productivity is increased, and business is more competitive.

Operational Reliability

While many of our customers use synthetic lubricants to resolve a problem, most quickly find that engines and machinery operate in a more reliable manner—reducing the maintenance requirements and enhancing the safety of industrial plants, aircraft, trucks, ships and cars. Some examples:

Passenger Cars. In a dramatic demonstration of durability, a normal passenger car logged more than 1,000,000 miles on Mobil 1. At the end of the test, all vital engine parts were in outstanding condition—proof that with Mobil 1, car drivers can expect long trouble-free life from their engines.
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Prior to the introduction of Mobil Jet Oil II in 1963, jet engines required overhauls every 500 to 3000 hours. Today, using the ultra-stable Mobil Jet Oil II, jet engines are rebuilt only on an as-needed basis—typically 20,000 hours of safe, trouble-free operation. Confidence in Mobil Jet Oil II has been so great that after 35 years, it is still the lubricant of choice for many carriers.

Marine. To ensure rapid and reliable cold-weather start up of medium-speed and high-speed marine diesel engines, marine operators have chosen Mobilgard 1 SHC. This synthetic lubricant is thin at cold temperatures, enabling diesel engines to rapidly start, and has a long useful life, which reduces out of service maintenance time. The result: enhanced performance and safety.

Space Exploration. Reliability and safety are top priorities at NASA, which selected Mobil Jet Oil II to lubricate electric power generation units in space and synthetic Mobilgrease 28 to ensure reliability of the life-support backpacks astronauts use for space walks.

Increased Efficiency

Our synthetic lubricants enable engines and machines to operate more efficiently, reducing fuel and power use. This is especially true for engines and gears, where easy flow and superior separation of metal surfaces significantly reduce internal friction. In hundreds of different applications, documented fuel and power savings have averaged 3 to 5%.

Over-the-Road Trucks. These heavyweights, essential for commerce, are not known for fuel efficiency, and fuel costs are a significant expense for the truck business. Small gains in fleet fuel efficiency can have big impacts on the bottom line. Fleet tests have documented an average 1-3% reduction in fuel consumed.

Diesel truck engines lubricated with Mobil Delvac 1 were driven 2 to 6 times farther between oil changes than with ordinary oils. Similar results are documented for Mobil synthetic transmission and axle lubes.

Industrial Plant Machinery. Hydraulic systems, pneumatics and power transfer gears lubricated with our synthetics, typically require 5% less electric power (as much as 10% less, in some cases) than with ordinary oils. And they run cooler—up to 35°F lower and beyond. This is evidence that our synthetic technology lowers manufacturing costs.

Extended Oil Life

Because our synthetic lubricants are more stable at high temperatures, they resist the thermal degradation that leads to performance-robbing sludge, deposit build-up, and viscosity breakdown in conventional oils. That is why synthetics do not need to be changed as frequently.

Extended drain intervals reduce maintenance expenses, conserve a valuable resource, and reduce the volume of used oil that finds its way into the environment.

Operation at Extreme Temperatures

Our synthetic lubricants work at both ends of the temperature scale. At high temperatures, they maintain a stable lubrication film when conventional oils become too thin. And they continue to flow inside equipment at low temperatures that solidify the wax inherent in conventional oils.

Our synthetics help eliminate the wasteful practice of continually idling equipment for extended periods to keep it warm in cold climates. This was a common practice during the construction of the Alaskan oil pipeline until we introduced a unique synthetic diesel engine oil that enabled contractors to start their trucks at cold temperatures.

Another extreme-temperature synthetic, Mobilgrease 28, is credited with making flight operations safer for high-flying military and commercial jet aircraft. Conventional bearing greases would solidify at high altitudes, and on landing—particularly the hard landings on a carrier—the frozen wheel bearings were not lubricated and failed frequently. Mobilgrease 28, with its wide temperature range, eliminated the problem.
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Our synthetic lubricants work at both ends of the temperature scale. At high temperatures, they maintain a stable lubrication film when conventional oils become too thin. And they continue to flow inside equipment at low temperatures that solidify the wax inherent in conventional oils.

Our synthetics help eliminate the wasteful practice of continually idling equipment for extended periods to keep it warm in cold climates. This was a common practice during the construction of the Alaskan oil pipeline until we introduced a unique synthetic diesel engine oil that enabled contractors to start their trucks at cold temperatures.

Another extreme-temperature synthetic, Mobilgrease 28, is credited with making flight operations safer for high-flying military and commercial jet aircraft. Conventional bearing greases would solidify at high altitudes, and on landing—particularly the hard landings on a carrier—the frozen wheel bearings were not lubricated and failed frequently. Mobilgrease 28, with its wide temperature range, eliminated the problem.
Intangibles
An important intangible is peace of mind, the knowledge that equipment lubricated with our synthetic lubricants—aircraft, passenger cars, trucks, ships, tanks, farm tractors, construction machinery, equipment assembly lines—will be protected. Our synthetics also add to the reliability of industrial machines and aircraft, leading to enhanced overall safety.

Increased Productivity
When a truck does not have to stop to change oil, it keeps producing income and profits for the owner. Current Mobil Delvac 1 and Mobil fully synthetic drivetrain fluid users save millions of dollars per year. In the future, the savings could increase to more than a billion dollars a year, as more truckers switch to Mobil synthetic engine oils and drivetrain fluids.

Airlines have enjoyed the reliability of Mobil Jet Oil II for 25 years, avoiding tremendous costs to rebuild jet engines. Mobil Jet Oil II’s contribution to increased airline productivity is estimated to be more than $90,000,000.

Using Mobil synthetic lubricants enables engines and machines to last longer. This means more total productivity from the capital invested in engines and machines—just by changing the type of oil used.

The Bottom Line
Over time, a mountain of credible real-world evidence has been amassed showing that our synthetics deliver high return on investment. They keep businesses competitive and jobs stable by controlling costs and improving productivity.

Through innovative marketing programs, we have effectively leveraged this evidence to win more customers and builders over to synthetics and thus build the momentum needed to achieve our vision. In doing so, we have become recognized as a company to trust, a company to emulate, and the company to beat in synthetic lubricants.

Most frequently asked questions about Mobil Delvac 1 and Mobil fully synthetic drivetrain fluids

Will Mobil Delvac 1 void my engine manufacturer’s warranty?
No. Mobil Delvac 1 meets or exceeds the most recent industry and OEM specifications for all major manufacturers.

In addition, Mobil Delvac 1 is backed by our exclusive Performance Warranty.

The majority of engine manufacturers today specify in their owners’ manuals an API quality rating oil, such as CI-4, without specifying or restricting the use of synthetics.

Will Mobil Delvac 1 work with older engines with high mileage?
Yes. As long as the engine is in good mechanical condition, Mobil Delvac 1 will help extend engine life while offering longer oil drains and supreme performance in extreme conditions.

How does Mobil Delvac 1 handle soot?
Mobil Delvac 1 is formulated with proprietary componentry and is unsurpassed in its ability to handle soot loading—proven beyond 7% in standard OEM tests!

How often will I need an oil drain?
Mobil Delvac 1 can extend your oil drain interval up to 4 times your current schedule, depending on type of engine, service conditions, and driving habits. We also have closely monitored and controlled fleets performing Mobil Delvac 1 oil drains at 100,000 miles and beyond.

Off-highway units may experience much more variable operating conditions (predominantly very high loads and dusty conditions). Mobil Delvac 1 has provided excellent service and extended drains for off-highway units, but we recommend that you monitor fuel consumption, in addition to operating hours, keep watch on engine loads and either have a comprehensive air
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Mobil Delvac 1 has provided outstanding performance at 100,000 mile drains, and Mobil fully synthetic drivetrain fluids have been run by fleets for over 1 million miles without an oil change.

When do I need an oil analysis if I am extending oil drains?
We recommend that you perform a complete oil analysis no later than halfway through your extended drain interval period and again at your scheduled drain. With extended drain intervals it is not unusual to see a higher wear metal reading on oil analysis reports. This is a result of the extended drain interval and low oil consumption. It in no way affects the lubrication protection provided by Mobil Delvac 1.

How are safety checks and other lubrication intervals affected?
You should keep the same schedule you are currently using for all safety inspections and other lubrication requirements.

What are the filter requirements?
We recommend that you discuss filter change recommendations with your filter supplier or retailer.

How much fuel can I save by using Mobil Delvac 1 and Mobil fully synthetic drivetrain fluids in my vehicle?
The exceptional lubrication properties of Mobil fully synthetic fluids, coupled with the superior low-temperature flow characteristics, can provide you with 1% or more improvement in fuel economy. Individual tractor units may see variation based on engine type, driver habits, and driving conditions, but fleets that measure fuel economy using a well-designed test program have seen improvements of 2% to 6%.

How will Mobil Delvac 1 and Mobil fully synthetic drivetrain fluids affect my engine and gearbox/transmission life?
Mobil fully synthetic lubricants will provide excellent component life – even at extended drain intervals – when used with appropriate maintenance practices. The performance capabilities of Mobil synthetics allow you to gain productivity and profitability (through lower oil changes) while you get excellent wear protection (through exceptional lubricating characteristics at both low and high temperatures). We have documented performance of over 1 million miles before overhaul for Mobil Delvac 1 and Mobil fully synthetic drivetrain fluids.

How will Mobil Delvac 1 affect my engine oil consumption?
Our experience – and that of many of the fleets and owner operators currently using Mobil Delvac 1 – is that oil consumption decreases. The combination of resistance to oxidation and reduced evaporation at high temperatures results in less oil being consumed. Be aware, however, that if your engine burns oil today due to a mechanical condition, Mobil Delvac 1 may also experience high oil consumption. There is no substitute for fixing mechanical problems.

Why doesn’t Mobil Delvac 1 come in a 15W-40 viscosity grade like conventional heavy-duty diesel engine oils?
The technology used in Mobil Delvac 1 naturally has better low-temperature flow characteristics than conventional engine oil. This results in the SAE 5W grade, which provides easier starting and faster oil flow characteristics than an SAE 15W grade. Sometimes this is referred to as lower internal friction, or reduced resistance to flow. Mobil Delvac 1 can offer the advantages of better low-temperature performance and improved fuel economy, while also providing better lubrication protection at hot engine operating conditions than a conventional SAE 15W-40.

Mobil Delvac 1 is formulated to meet or exceed industry requirements – including being able to handle up to 7% soot as demonstrated by industry tests.
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How will Mobil Delvac 1 affect my oil pressure?

The efficient lubrication properties and easy pumpability of Mobil Delvac 1 may result in slightly lower oil pressure vs. your conventional oil. As long as the oil pressure is stable, there is no reason to be concerned.

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When can Mobil fully synthetic engine oils and drivetrain fluids first be used?

You can start using Mobil synthetics in new vehicles at any time. Or you can start using them in equipment with a number of miles already on it. As long as the equipment is in good mechanical condition, you can start getting the advantages of Mobil synthetics today.
Mobil synthetics provide bumper-to-bumper protection. We work closely with all the major vehicle manufacturers, even at their engine design phase, to make sure our lubricants work as an integral operational component.

Mobiltrans SHC and Mobilube SHC are widely recognized as the industry benchmark in drivetrain lubricants, and are approved by major original equipment manufacturers (OEMs) for extended warranties.

**Can Mobil Delvac 1 be run in gasoline engines?**

Mobil Delvac 1 is an excellent gasoline engine oil. Mobil Delvac 1 meets the API SL service classification.

**I have heard a lot about semi-synthetic oils. How do Mobil fully synthetic lubricants compare with semi-synthetics?**

Semi-synthetic oils are quite common in today’s marketplace. Mobil Delvac 1 and our Mobilube SHC and Mobiltrans SHC drivetrain lubricants are fully synthetic. The low-temperature performance of Mobil fully synthetic lubricants is substantially better than a semi-synthetic, since the impurities found in conventional lubricants are still present.

The overall lubrication performance and equipment protection of Mobil fully synthetic lubricants is better than those of semi-synthetics since the componentry of our synthetic lubricants has been tuned to provide exceptional performance.

Properly formulated semi-synthetic oils should provide improved performance vs. most conventional fluids. However, the use of fully synthetic lubricants provides maximum performance.

**I am used to running a 40 weight (or 15W-40). Can Mobil Delvac 1 be used as a replacement for all 40-weight oils?**

“All 40 weight oils” is a very broad category. Mobil Delvac 1 can be used in engines that call for a 40-weight straight grade or multi-viscosity grade oil meeting API CI-4 or CH-4 specification. Mobil Delvac 1 can also be used in gasoline engines that call for an API SL oil. That covers a lot of engines.

If you are not sure if Mobil Delvac 1 is appropriate for your application, call us at 1-800-MOBIL-25.

**Can you explain the difference between API service categories CH-4 and CI-4?**

In order to meet the EPA’s requirement for reduced truck emissions, many engine manufacturers chose to use a technology called EGR (exhaust gas recirculation). The technology works just as its name describes, where a percentage of exhaust gas is allowed to remix with air coming into the intake. While this technology is effective in reducing exhaust emissions, it also stresses engine oils more than older engines, particularly due to higher soot loads, elevated temperatures, and increased acid by-product formation. In order to account for these stresses, as well as provide other performance improvements, the API CI-4 engine oil category was developed. This category provides all the performance attributes of the previous API CH-4 category, but also contains the oil performance improvements needed for EGR engines. As a result, API CI-4 oils not only can be used in modern EGR engines, but will also provide improved performance in older engines that had previously called for API CH-4 oils.

**For what other applications is Mobil Delvac 1 appropriate?**

Mobil Delvac 1 is a very effective lubricant in a number of diesel engine applications - both in mobile equipment and in stationary equipment - where minimum maintenance, extended drains and extended component life are critical concerns. Examples include: mobile refrigeration units (reefers), diesel engines, old and new engine-driven air compressors, on-site light and power generators and close-coupled engine gear sets.

**Is Mobil Delvac 1 compatible with conventional engine oils and engine seals?**

Yes, Mobil Delvac 1 is compatible with conventional and synthetic diesel engine oils meeting the current API classifications. However, for maximum benefit, drain your equipment before switching to a fully synthetic fluid.

Mobil Delvac 1 does not cause leaks. It is fully compatible with the elastomer materials from which automotive seals and gaskets are made. If an older engine is in good condition and does not have oil leaks, Mobil Delvac 1 provides the same advantages as when used in a new engine. If the engine does have oil leaks, we recommend taking measures to repair the leaks, then using Mobil Delvac 1. We also always recommend following the manufacturer’s manual for the proper oil to use.
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Our Mobilith SHC family of greases is endorsed by major equipment manufacturers worldwide. In the United States, Mobilith SHC 007 is the semi-fluid wheel hub grease of choice for hundreds of customers for millions of non-driven wheel ends.

Fact: Mobil Delvac has 75 years of experience in heavy-duty lubricants—something no competitor can match.

Can I top up with a fully synthetic fluid like Mobil Delvac 1 or Mobil fully synthetic drivetrain fluids if I don’t know exactly which oil is in my equipment now?

We never recommend that our fully synthetic lubricants be mixed with any other lubricant since the performance of our fully synthetic products would be diluted. We also recommend that if at all possible, the top-up fluid be the same as the fluid that was filled in the equipment. However, if the composition of the lubricant is unknown, it is best to be conservative and top-up with Mobil Delvac 1 or Mobil fully synthetic drivetrain fluids since they are compatible with both conventional and synthetic fluids. By topping-up with Mobil fully synthetic fluids, if the equipment already contains those products, performance will be maintained, while the performance of conventional lubricants will also not be degraded (and may even be improved). This practice is most important in drivetrain components, where use of manufacturer approved fully synthetic fluids is required for extended drain and extended warranty performance.

If I want to switch to Mobil fully synthetic lubricants, do I need to flush my equipment?

Although the maximum benefits of using Mobil synthetics will be achieved if your equipment is fully drained of conventional oil, there is no need to flush/purge your system before switching to Mobil synthetics.

Other companies have offered lubes that they claim are synthetics – and the prices seemed fairly reasonable. Do these products provide superior performance?

Be careful! The word ‘synthetic’ should never be accepted as a blanket cure-all. Any lube, synthetic or conventional, is only as reliable as the supplier behind it. Meticulous research, custom formulations and rigorous real world testing of high-performance synthetic lubricants are essential. Eliminating any of these steps could result in a cheaper product; it could also result in a synthetic lube that is less effective than a well-made conventional product.

The people who make the decisions at our place are on a real efficiency drive. How many ways can synthetic lubes help us save time?

The short answer is ‘a lot.’ But here are several ways that synthetics will save you time:

- By lasting longer, so you’re spending less time changing oil.
- With a wider temperature range to help you eliminate seasonal changeovers.
- And, of course any time you eliminate an oil change means less time is spent handling used oil.
- Fewer oil changes means your equipment spends less time out of service so your operators spend more time on the job they’re paid to do.
- Faster cold weather starts means you’ll save time trying to get equipment up and running. (You may also save some extra time by replacing fewer batteries and starters!)
- When synthetics make brakes and steering more responsive, operators can work at a normal pace, feeling a lot more comfortable at the controls.
- Greater thermal stability will mean fewer deposits, less time to spend cleaning components.
- Superior lubrication means longer life for your parts, less time spent making routine replacements.
- When equipment is better cared for, there are fewer breakdowns to wreak havoc with production schedules, affecting the output of an entire shift – or worse.

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Which applications are most likely to benefit from a switch to synthetics?

Start with the very obvious, such as outdoor temperature extremes, or situations where the temperature may suddenly revert back after you’ve made a seasonal change. High-temperature applications are very likely prospects, as are any situations where you’re experiencing equipment failure problems. Equipment located in hard-to-reach places is also a potential candidate for a longer-life synthetic. Not only will you sharply reduce the amount of time spent on changing oil in these difficult locations, you’ll also reduce employees’ exposure to those areas where personal safety may be an issue.

Mobil synthetics help provide significant advantages over conventional oils, such as:

**ENGINE CLEANLINESS**
- Superior protection against harmful deposits
- Cleaner running engines

**ANTI-WEAR**
- Helping engines last longer
- Superior protection under heavy engine loads/stress, such as hauling
- Minimizing oil degradation

**ALL TEMPERATURE**
- Faster lubrication at start-up in low temperatures
- Superior protection at high temperatures
- Superior resistance to thermal breakdown

**ENGINE EFFICIENCY**
- Greater resistance to oil oxidation (thickening)
- Lower oil consumption under high-speed conditions
- Optimizing engine efficiency

Can I use an oil supplement and/or engine treatment with Mobil Delvac 1?

We strongly discourage this practice. According to the American Petroleum Institute (API), “certified oils eliminate the need for supplemental engine oil additives.” In fact, the use of any oil supplement is not recommended by equipment manufacturers and may void a warranty.

Considering the comprehensive testing and engineering that has gone into Mobil Delvac 1, nothing can be gained by using these supplements.

Is it true that new equipment needs a break-in period using conventional oil?

That is a myth. In the past, break-in was necessary to remove any metal flashing (called swarf) or abrasive material left inside the equipment after machining, as well as to allow engine valves and rings to “seat” properly. Today’s equipment is built with much tighter tolerances, much improved machining, and under much cleaner conditions compared to equipment built 10 or 20 years ago. Current manufacturing technology does not require a break-in period using conventional oils.

Can I use Mobil Delvac 1 as a break-in for a rebuilt engine?

Yes, but the timing of your first oil change will depend largely on the quality of the rebuild. Due to the tighter tolerances and improved machining of today’s engines, the traditional concept of “engine break-in” is not as critical. However, if the engine rebuilder is using older machining equipment or lower-quality components, abrasive material can be left inside the engine. In this case, you should use a short drain interval on your initial oil fill.

Will Mobil Delvac 1 really perform as promised?

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Where can I find more information about Mobil Delvac 1?

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Mobil Delvac 1 Advantage

Mobil Delvac 1 offers numerous advantages over conventional oil, including:

- **Wear protection** – Significant wear can take place at engine start-up, especially under cold operating temperatures. Mobil Delvac 1 flows easily at very low temperatures, allowing it to reach all areas of the engine and valvetrain quickly. Mobil Delvac 1 is formulated with proprietary high-performance componentry that continues to provide wear protection during long-term use.

- **High-temperature stability** – High temperatures can oxidize lubricants, causing the viscosity to increase (the oil thickens). By using high-performance fluids and a robust antioxidant system, Mobil Delvac 1 resists oxidation better than conventional oils, even at temperatures as high as 400 °F.

- **Cold-temperature performance** – Conventional oils can thicken as components crystallize at very low temperatures, impeding oil flow. Because of the superior flow of its high-performance components, Mobil Delvac 1 will pump quickly to moving parts, even at temperatures as low as –40 °F.

- **Deposit protection** – Sludge formation from oil breakdown can block oil passages, impede oil flow and cause piston rings to stick. Mobil Delvac 1’s uniquely balanced formulation provides outstanding protection against deposits and sludge.

The Additive Story

In addition to their synthetic components, Mobil fully synthetic lubricants are comprised of a unique selection of additives, each designed to accomplish certain goals. Here’s a summary of the kinds of additives found in our fully synthetic fluids:

- Anti-wear agents: including zinc/phosphorous-based components, as well as proprietary, step out Trimer componentry.
- Detergents/dispersants: designed for optimal engine cleaning, these agents help reduce varnish, carbon, sludge and harmful deposits.
- Rust and corrosion inhibitors: hold acids in suspension.
- Oxidation inhibitors: these elements offer high-temperature protection and cause the molecules that create oxidation to be neutralized.
- Foam inhibitors: particularly beneficial in high-performance applications, such as sustained high engine revs.
- Friction modifiers: aid in wear protection and provide fuel-economy benefits.
- Viscosity Index improvers: While synthetics require a lesser amount of these additives, the V.I. improvers used are among the most shear-stable available.
- Seal-swell agents: designed to enhance compatibility with engine seals in all engines (new and old).

Mobil Synthetic Lubricants, Pioneering a New Era of Superior Lubrication
Mobil Delvac 1 Advantage

Mobil Delvac 1 offers numerous advantages over conventional oil, including:

- **Wear protection** – Significant wear can take place at engine start-up, especially under cold operating temperatures. Mobil Delvac 1 flows easily at very low temperatures, allowing it to reach all areas of the engine and valvetrain quickly. Mobil Delvac 1 is formulated with proprietary high-performance componentry that continues to provide wear protection during long-term use.

- **High-temperature stability** – High temperatures can oxidize lubricants, causing the viscosity to increase (the oil thickens). By using high-performance fluids and a robust antioxidant system, Mobil Delvac 1 resists oxidation better than conventional oils, even at temperatures as high as 400°F.

- **Cold-temperature performance** – Conventional oils can thicken as components crystallize at very low temperatures, impeding oil flow. Because of the superior flow of its high-performance components, Mobil Delvac 1 will pump quickly to moving parts, even at temperatures as low as –40°F.

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History of Our Synthetic Lubricant Technology

Pioneering a New Era of Superior Lubrication