

Just how good are those new synthetic oils?

By JIM DUNNE / PS Detroit Editor

The worse your driving conditions, the greater the advantages promised by synthetic motor oils: longer oil-change intervals, better stability at extremely high temperature, and reduced engine wear

Can you imagine running your car for 25,000 miles before changing oil? Out of the question, you'll say, even with today's maxi-oils [PS, Aug. '73]. But synthetic oils may go that far—and farther—without deterioration. They might go 50,000 miles—or 100,000 miles. It sounds unbelievable, but that's what is claimed for these so-called "miracle" motor oils.

Do they work? Pacer Petroleum Co., which markets an ester-base synthetic oil, is cooperating with the Houston, Texas, police department in a long-term test, in which a group of cars using Pacer synthetic oil will run without an oil change for as long as possible. Checks are made periodically to see how the oil is performing. One engine was torn down after 20,000 miles. Wear was said to be "less than average" for engines using conventional oils and having it changed at recommended intervals, for the same mileage. In March of this year, the remaining cars had run 50,000 miles without an oil change, and the test is continuing.

Mobil lubrication engineers report from Europe that a rally car sprang a leak in its oil cooler during the Monte Carlo rally. This car was running on Mobil's hydrocarbon-type synthetic oil, and the team simply disconnected the oil cooler. The engine completed the remaining distance—over 1000 miles of nonstop driving through the Alps—running at extremely high temperature, but finished the rally in good condition. A teardown showed no signs of excessive wear.

"The major advantage of synthetic oils is their ability to stand up under high-temperature conditions." That's what Robert Trites told me. He is manager of product application for Hatco Chemical Division, a major manufacturer of synthetic oils. He explained: "The viscosity of a conventional oil will jump as much as 400 percent in very hot driving conditions, such as when pulling a heavy trailer at high speed on a hot day. The viscosity of a synthetic oil used under the same conditions will rise only 20 percent." The high viscosity rise in conventional oils

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will turn the oil into sludge, compounding the engine's problems until it eventually fails. The synthetic oils maintain oil pressure better, and protect the engine better. Their better viscosity stability means that oil consumption will be reduced, because the oil circulation is better controlled. The engine will also run cleaner with synthetic oils.

There are two different families of synthetic oils. One family is based on esters, which are chemical combinations of alcohol and acids. The other family uses synthesized hydrocarbon products, derived from olefins by a polymerization process. The base prod-

ucts for the ester-type synthetics come from animal or vegetable oils, while the hydrocarbon-base synthetics are petrochemicals, composed of hydrocarbons with a molecular structure resembling mineral oils.

Synthetic oils are not new. They have been around for more than 20 years. They are used almost universally in turbojet aircraft engines, for instance. But they are new to the automobile. Conventional oils have done a good job, and synthetic oils are very expensive. But now that high operating temperature is creating lubrication problems in auto engines, the time has come when the car manufacturers are getting interested in synthetic oils.

C. H. Ruof, a research engineer in the fuel-sciences department at Ford Motor Co., explains that this interest in synthetics arises because the engine compartment is getting "highly crowded," with oil temperatures rising from year to year. Auto engineers expect even more heat with the '75 emission-control equipment next year, so Ford and other auto makers are looking for a type of oil that can do the job without breaking down prematurely.

It's both cheaper and more expensive

As for the cost, synthetic oils sell for \$1.89 to \$4.50 per quart at service stations and other retail outlets, compared with \$1.25 for top-grade conventional oils. Nevertheless, Pacer Petroleum's John B. Williams says: "It's the most expensive oil you can buy, and yet it's the most economical." Here's how that works out. The initial cost is high. An oil fill-up with synthetic oil can run between \$11 and \$24 including a filter change. But if the oil lasts 25,000 miles, so that you can skip five normal oil changes, you'll save money. At \$5 to over \$6 per refill with conventional oil, plus the cost of a filter, the synthetic oil will be cheaper in the long run. Of course, if the synthetic oil is good beyond 25,000 miles, you save even more.

So far, Detroit has little experience with synthetic oils, and most important, there is no standard test in existence today that measures the life of a motor oil in excess of the test specifications now used by the auto companies. Since they call for a 4000- to 6000-mile oil-change interval, they have not written up the test conditions for measuring how much longer the oil could last.

Today, motor oils are measured against three tests, approved by the Society of Automotive Engineers, the American Petroleum Institute, and the American Society for Testing and Materials. Any oil passing all three tests qualifies to carry the "SE" label on the can, and is declared safe to use in any car. It meets the manufacturer's requirements for keeping the warranty valid. The first test is the Oldsmobile IIC sequence, which measures rust and acid accumulation in the crankcase during stop-and-go driving conditions. The second test is the Oldsmobile IIC sequence, mea-

suring viscosity increase during high-temperature conditions, and sludge and varnish formation. The third test is the Ford VC sequence, which measures oil-screen clogging, oil-ring clogging, sludge and varnish formation on a simulated urban driving cycle. All of the major synthetic oils now on the market have passed these tests and carry the SE designation.

When new, there's little difference between a conventional oil and a synthetic. They have similar additives, and do the same job initially. It's when the conventional oil begins to deteriorate that the fundamental

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superiority of synthetic oils begins to count. Claims that synthetic oils will run for many times the mileage of conventional SE oils have not yet been proved under scientific conditions, and the reason is that an official test has not been proposed or adopted. Tests like those in rally cars and police-car or private fleets may not be universally valid, since they do not subject the oil to all the rigors it may face in your private car, under your operating conditions. Typically, police cars run for at least an hour at a time, and the engine is given a chance to warm up completely before it is shut off. Many private-car owners, however, make a number of short trips in the course of a week, barely letting the engine reach normal operating temperature before it is shut off. This contributes to high acid and water content in the crankcase, and leads to corrosion damage and premature engine wear.

"Aunt Minnie driving is murder on the engine," says an oil expert. He defines Aunt Minnie as the driver who makes no trips of over 10-20 minutes' duration. What happens in her engine is that the hydrocarbons and water that gather in the crankcase are not vaporized, because the engine never gets warm enough. The water and hydrocarbons remain in the crankcase, where they will finally overwhelm the oil additives that were put in there to combat them. The results of the fleet test in Houston therefore leave a big question unanswered. In addition, the temperate climate in Houston does not allow the cars to experience the cold-weather conditions of snow-belt states.

Fewer problems with synthetics

Makers of synthetic oils do not expect any service problems, even in cold climates or with Aunt Minnie driving, since synthetic oils do not have the impurities that are present even in many highly refined conventional oils. That's just as true of hydrocarbon-base synthetic oils as of the ester-base types. Mobil's synthetic hydrocarbon oil contains no wax (which also assures a low pour point, an advantage in cold-weather operation because it gives better low-temperature fluidity). This will give a higher cranking speed and easier cold starts. The oil is almost entirely paraffinic, containing no naphtha and no aromatics, and is free of nitrogen, sulfur, and metallic impurities. The Mobil engineers point out that its low-temperature sludge formation has been far below expected values for conventional oils.

As we have seen, synthetic oils have replaced conventional oils in gas turbines. There are two main reasons—first, the extremely high shaft and bearing temperatures, and second, the turbine's low overhaul frequency (which makes oil durability an important point). The question now comes up whether there are advantages in applying synthetic oils in rotary (Wankel) engines. Rotary engines have no particular lubrication problems, but one of the projects GM is working on with its RC-206 [PS, April] is concerned with using the same fluid in the engine and in the automatic transmission, with a common reservoir. It will be easier to formulate a combined motor oil/transmission fluid using synthetics than with conventional mineral oil (and additives).

In tests run with Mazda engines, synthetic oils demonstrated their ability to reduce apex-seal wear (with carbon-aluminum seal strips). Tests with Citroën M-35 single-rotor engines and FerroTic apex seals also showed reduced wear. Deposit levels on the rotor face and side walls were lower than with conventional oils in the Mazda engines, but about the same in the Citroën. Apex-seal sticking was not experienced at all with synthetic oils, and the intervals for cleaning or changing spark plugs were extended.

Manufacturing firms like Hatco Chemical Division, and Emery Industries, in Cincinnati, make ester-based synthetic base oils, and add detergents, dispersants, rust inhibitors, oxidation inhibitors, antifoaming agents, and other additives to complete the motor-oil base "stock." These stocks are then sold to distributors throughout the country where they are marketed under brand names like Eon-11, Amzoil, Frigid-Go, and L.T.L. Some of the distributors add their own special chemicals, which entitles them to make special claims for their own product. John Williams of Pacer Petroleum says that his company adds a solvent and an acid modifier to give Eon-11 longer life.

Don't these additives wear out?

Yes, they do. But the synthetic-oil companies point out that topping off the oil level with a fresh quart every 6000 miles or so will keep the additives replenished, and maintain the quality.

Switching to synthetic oil for your car is no problem, say the makers. If your car is still under warranty, use of synthetic oils won't cause the warranty to be voided. Ford's C. H. Ruof points out that the warranty on an engine runs out after 12 months in most cases, and that's a lot sooner than the claimed lifetime of the synthetic oils.

"What it all boils down to is the reputation of the oil company," says Ruof. "The company that stands behind the SE rating will guarantee that the oil it produces will do the job your engine is designed for."

If the API, SAE, and ASTM can develop a test procedure for oil longevity, the consumer who is looking for superior oil for his car will stand to benefit greatly. It would also be in the interest of the industry to get its claims certified by an independent authority. The sooner that happens, the sooner the day may come when synthetic oils are as important in automobiles as they already are in aircraft.