

**S**ynthetic oils make up only a small part of the lubricant market, but they are set to take on a more significant role. Additional demands are being made of engine protection with predicted longer trade cycles. They can help with fuel economy for lower operating costs and help diesel engine manufacturers meet mandated fuel economy targets.

Already, the U.S. Environmental Protection Agency's stringent controls on NOx and particulate emissions have prompted the use of more synthetics in some of the latest CJ-4 oils. As more fleets start buying trucks again, there will be more pressure to switch from CI-4 to the newer category.

Thanks to all these factors, the market for synthetic oils is expected to increase from its current 10 percent share. Predictions range from 3 percent, according to Valvoline's director for

**Made to measure**

Synthetic engine lubricants are not new, but their cost has made them unattractive. That may be changing.

C&I marketing, Pete Thomson, to 7 percent per year as reported by George Gill in *Lubes'n'Greases* magazine earlier this year.

### About synthetics

What is a synthetic lubricant? It is a lubricating oil with a base stock from one of three categories of base stock oils. These "Groups" range from the severely hydrogenized mineral oils of Group III to the "designer" oils manufactured from natural gas: the poly alpha olefins (PAO) of Group IV and the esters of Group V, explains Valvoline's Thomson. The first Groups in the series – I and II – are the conventional mineral oils or mildly hydrogenized oils.

For the heavy-duty diesel engine – and the truck driveline – the synthetic base stocks we are most concerned with are the Group III and Group IV oils that have significant additional manufacturing costs.

Lube oils that use them as the base stocks are more expensive than base mineral oil. By the time

Steve Sturgess • Executive Editor

they are formulated, packaged and placed on the shelves, they are at least twice as expensive.

According to all-synthetic oil formulator Amsoil, the price of synthetics today is on a much more equal footing with straight mineral oils than used to be the case, when they were five to 10 times as costly. Part of the reason, says Spokesman Ed Newman, is that the reformulation of diesel lubes through CI-4, CI-4+ and the latest CJ-4 API oil classifications has been very costly. The research and qualification for the classification, plus the increased cost of the base oils (some of them being Group III synthetic), has raised the cost of the lubricant. At the same time, however, the price of a full Group III-based (and especially a Group IV-based) oil has remained pretty stable.

The important thing about Group III and IV synthetics is that the less desirable characteristics found in components of conventional mineral oils are engineered out. Thus, as a general rule, the higher the Group category of the base stocks, the better the performance, the better the temperature stability and the better the pumpability.

This is what allows synthetics to perform at low temperatures, easing the cranking and speeding the delivery of lubricant to the engine's working surfaces much more quickly in cold weather. It also makes them more stable and oxidation-proof at high temperatures, resisting viscosity increase over time and making longer extended drains possible.

In fact, says Mark Betner, Citgo heavy duty lubricants manager, Citgo's Citgard SynDurance has a 25- to 30-degree cold cranking advantage over lubes based on straight mineral oils. This confers a number of advantages that offset the synthetics' higher price. Northern-based fleets have discovered that even down to very low ambient temperatures, they can dispense with plugging the truck block heaters in overnight. With electricity a dollar per kW per day, the savings for a big fleet can be significant. And wherever a truck is based, the engine turns over easier in any start, with oil flowing sooner to protect in the first few moments of the engine firing up.

Dan Arcy, Shell's OEM technical manager, says tests have shown a significant difference in the energy consumed in starting a truck lubricated by a conventional 15W-40 compared with a synthetic 5W-40. That means less wear and tear on the batteries and starting system. And since the electric energy to swing the starter comes ultimately from the fuel tank, it also is a contributor to fuel economy. In the days of 40 percent idle time, this

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was likely unmeasurable. With idle time now coming down to 10 percent or less, more engine starts are required, and the energy savings start to add up. Certainly, the good pumpability of the synthetic should help offset any additional wear such increased starting activity might be promoting.

Arcy also suggests that the synthetic lube's low-temperature starting performance and its stability at high temperatures means that it is a natural lubricant to use in an auxiliary power unit. After all, you want the APU to start on demand – otherwise it is worthless – and to run in the hottest of summer temperatures. With a sump capacity of only about a gallon, the slightly higher cost of synthetic lubes is insignificant.

### Fuel economy

The improvement in fuel economy has long been a claim of synthetic lube suppliers. Amsoil's Newman says the company has done extensive testing for economy.

activity a few years ago when fuel was \$4 to \$5 a gallon, with big Citgo fleet customers looking for economy. Many switched to 5W-40 synthetics at that time.

Part of the reason behind the fuel economy improvements is the lower viscosity rating of the oils. But it's the synthetic base stocks that have helped allow these lower viscosity oils to still offer the protection needed by today's heavy-duty engines.

### Economy mandates

Betner also points to European engine manufacturers and trucking fleets, which operate in a \$6 and \$7 fuel environment. There the use of synthetic lubes is widespread for their economy advantage. And with the current administration mandating fuel economy improvements for heavy-duty diesels in the 2014 time-frame, he believes engine manufacturers may well be driven to the first fill of synthetic lubes as a relatively easy way to kick up fuel economy.

The new 12.9-liter Paccar MX in both Peterbilt and Kenworth is factory filled with 5W-40 in Europe, where it powers the heaviest Paccar DAF trucks – and has done so very successfully for four years.

Underscoring this argument is the experience in the passenger car environment, where CAFE standards have forced an ever-increasing use of wide-temperature-range low-viscosity synthetics. Just

recently, Toyota switched to a 0W-20 oil!

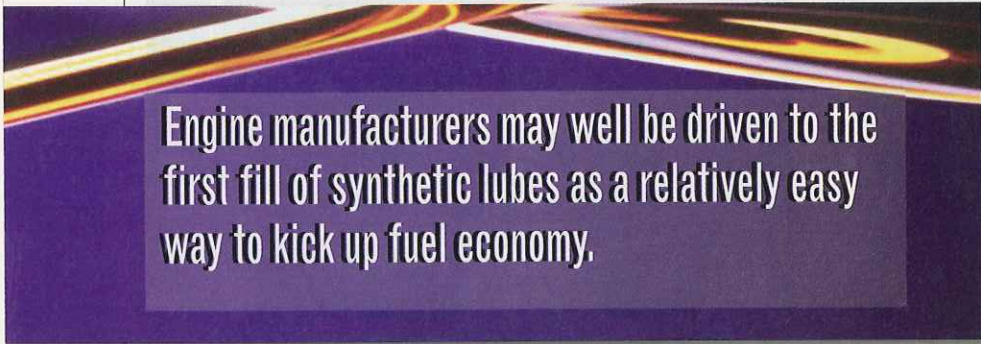
### Additive packages

Because they have a premium price point, synthetics also generally get a more robust additive package. Newman says Amsoil's formulation includes "a beefier additive package" that also offers significantly more engine protection even above the robustness of the Group 4 base stock in Amsoil's all-synthetic products. This, he says, means a properly managed oil change program can see significantly increased oil drain intervals. Not only does this mean less oil consumed and less to haul away, but less packaging to discard as well. And as a real bonus, equipment lasts longer.

Citgo's Betner agrees. He cites a major bus fleet operator and a major beverage delivery fleet as seeing longer, less troublesome engine life even as oil change intervals are doubled (always in conjunction with oil analysis programs).

And, adds Thomson, synthetics are less volatile, so there is little need to add oil between changes.

Betner also says the switch to synthetic has been welcomed by some mixed fleets that have cars, light trucks,



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The difference between a truck with no synthetic lubes in the engine, drivetrain and hubs and one with synthetics throughout has measured out at an 8 percent fuel economy improvement, he says.

With just a switch from a regular 15W-40 to its 5W-40 synthetic, Valvoline's Thomson says there is a measurable economy improvement. In fact, in the fall of 2009, Valvoline announced its Fuel Proof Guarantee, where the company would offer participating fleets fuel economy gains of 4 percent or more underwritten by a guarantee. To qualify, a fleet must run Valvoline's synthetic Premium Blue Extreme engine oil and Syn Gard transmission and axle lube together. (They must also use the innovative tiwi driver performance device introduced at the same time.)

Thomson says the actual economy improvement varies by fleet and vocation, and the Fuel Proof Guarantee target is reached by local field people working with each fleet and application.

Citgo's Betner agrees that the economy benefits will vary by vocation. He says some fleets test and test and find no measurable advantage, while others are delighted with the improvements. Certainly there was a flurry of

## Synthetics for drivelines

**W**hile only a few percent of truck fleets use full synthetics lubes in engines, in drivelines the numbers are effectively reversed for over-the-road fleets. Most Eaton transmissions and Eaton and Meritor axles are factory-filled with synthetic lubes. The performance of the lubes in these demanding components allows Eaton and Meritor to offer a matching driveline warranty of up to 500,000 miles.

According to Rick Muth, Eaton's manager - lubricants, since the extended warranty/synthetic lubes program was introduced in the late 1980s, it has been a win-win both for the company and customers: improved products, lower warranty costs despite the vast mileage, and a small bonus of improved fuel economy have made synthetic lubes a no-brainer for most.

As the synthetic lubes evolved over the last two decades, the lower running temperatures of the synthetic-lubed gears and bearings have seen a number of transmission oil coolers deleted from the required spec, saving truck customers some additional cost.

While Paccar divisions offer the synthetic factory-fill as standard, other OEMs make it an option, accounting for a lower take for the synthetic lube among vocational truck orders - a market Muth says he is keen to address to get more truck purchasers on board with the advantages of synthetics. As of July 1, the Roadranger field service people will now go in and work with fleets to customize warranties to extend them out to as much as five years and 750,000 miles to support plans to run trucks longer.

The important thing is to drain the lubes at 500,000 miles and refill with the Eaton-specified synthetic. There are a lot of familiar supplier brands in the list, though most of the lube is rebranded from only a few suppliers. But if it's on the list, it's good to go as far as Eaton is concerned, says Muth.

There's an added choice now in the Roadranger (and Shell) branded FE lube in the 75W-90 weight. This is a recent evolution of these synthetic Group IV base stocks that deliver a proven 1 percent fuel savings. It is a very popular choice; 60 percent of the drive axle lube today is FE, he says.

medium and heavy vehicles. One lubricant can be used for all, meaning less stocking and no opportunity for getting the wrong product into the wrong engine.

Fleets such as school buses and beverage distributors are perfect examples of the benefits and long-term payback of a switch to synthetic lubes, he says. The improved low temperature and starting performance of these vehicles, the longer drains, but more importantly the protection of the engines from the high-performing oils are important in fleets where the trucks may be kept for 10 or 15 years. And that is becoming more important as many fleets stretch their trade cycles in the new post-recession environment.

### Lifetime payback

The fuel economy advantage of the 5W-40 synthetic will likely contribute an offset to the additional cost of a switch to synthetic.

Betner notes there's a "bridge" 10W-30 mineral-oil option that can potentially deliver economy advantages comparable with 5W-40 under some operating conditions. But it does not have the same robustness and doesn't offer the same low-temperature cranking performance or high-temperature oxidation stability as a full synthetic.

It may not give the same extended oil drains of the full synthetic formulations, either. These offer additional paybacks in maintenance savings from fewer changes, less downtime and lost opportunity cost and, at the end of the day, better protection for the engine and the starter system.

Synthetic engine lubes may not be for every fleet, but maintenance managers and finance executives need to look at the bigger picture. With the closing of the gap between the cost of conventional 15W-40 and the true synthetics, the other benefits can offer sufficient offsets. A decision that will see more life out of the truck, more revenue to the bottom line and lower maintenance cost may also be one that actually lowers operations cost over time.

In fact, the switch to a more expensive, premium synthetic could well prove to be a saving, not a cost. ■