

# AUTOMAKERS PREPARE NEXT ENGINE OIL SPECS

*Big Changes Loom  
for European Market*

*European automakers  
are in the midst of writing  
the region's next  
engine oil specifications  
for trucks and cars.*

The drivers for change are generally the same as for upgrades in the recent past: the need to reduce air pollution; the quest to reduce consumption of fossil fuels; and the demand for higher engine performance.

But that does not mean the coming upgrades will be the same old thing. In fact, these specifications, due to hit the market during the next two years, are in numerous ways shaping up as departures from the past. Conventional Group I base oils could be eliminated as an ingredient for many engine oils for new heavy-duty trucks. Oils for cars and trucks face fundamental changes in chemistry. Characteristics such as compatibility with bio-fuels and performance in direct-injection fuel injectors may become part of industry specifications for the first time.

It also appears that the new specifications will have significant impacts on various parts of the engine oil market. Lubricant additive suppliers expect to spend more than usual to develop the necessary chemical technology.

That means even larger cost increases for oil marketers, who may also see their markets further fragmented. Then there are little things, like the possibility of tractor-trailer drivers having their trucks suddenly crippled if a new maintenance fluid is not replenished on time.

"The drivers for new specifications are very similar to what we've seen in the past," said Alison Fisher, global business manager of heavy-duty engine oil additives for Lubrizol Corp. "But the step change is much bigger than what we've seen in the past."

These new specifications have not even been finalized yet, but they are already looking like a new kind of upgrade.

## PROTECTING THE AIR

Most observers agree that air pollution regulations have become the biggest factor pushing engine oil standards. The latest mandate in Europe is the Euro 5 Directive, adopted by the European Union Parliament in 2005. It reduces the ceiling for emissions of particulate matter from heavy-duty diesel engines by 42 percent, to 2 grams per kilowatt-hour in October 2008. For cars and light-duty trucks powered by diesel engines, new caps take effect a year later – dropping 80 percent to 5 milligrams per kilometer for particulate matter and 28 percent to 180 mg/km for nitrogen oxides.

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To meet these new caps, automakers are employing a variety of devices to capture pollutants, and the latest trend is to use them in combination. Manufacturers of heavy-duty trucks were already using exhaust gas recirculation, diesel particulate filters or selective catalytic reduction to meet requirements of Euro 4, which went into effect in 2005. For Euro 5, they expect to use two or more of these systems together and to switch to EGRs that recirculate higher volumes. In passenger cars and light-duty trucks, EGRs have been the primary solution.

Engine oils get tangled with many of these devices. EGR systems burden oils by dumping soot back into crankcases and increasing acid levels. On the other hand, engine oils with traditional levels of sulfated ash can cause diesel particulate filters to clog and cease functioning. Some automakers contend that phosphorus in engine oil poisons the catalyst in SCR systems. It is little surprise, then, that automakers are demanding engine oils that address these challenges.

### PREVIEW OF SPECS

The upcoming specifications are still being drafted, and there is little formal information in the public domain about their current status. Industry specifications in Europe are written by the European Automobile Manufacturers Association, ACEA. ACEA's meetings are not open to the public, although the

association does hold periodic meetings with lubricant additive suppliers and lubricant marketers. However, several industry sources have been willing to discuss general requirements likely to be included in the specs, some in presentations at industry meetings, others during interviews with *Lubes'n'Greases Europe - Middle East - Africa*.

The current Euro 4 specification has three categories (E4, E6 and E7), distinguished primarily by the drain intervals they offer. ACEA E2 is a category for oils that offer conventional performance for older vehicles. E7 is a "super high performance diesel" category offering longer drain intervals, and E4 and E6 oils are "ultra high performance" and afford still longer intervals.

Individuals familiar with discussions of the specification scheduled to be adopted next year say it will probably eliminate E2 and create a category, likely be named E9, for heavy-duty engines model year 2009 or later. They also say it is a safe bet that lower levels of sulfated ash, phosphorus and sulfur (SAPS) will be established in an effort to preserve emissions control systems. During a Feb. 15 presentation at this year's ICIS World Base Oils Conference in London, Lubrizol's Fisher said it appears that E9 and E6 will limit SAPS levels to 1 percent or have TBN thresholds of 7. SAPS levels above 1 percent would still be permitted in E7 and E4, but TBN would have to be higher.

While the Euro 5 standard for cars and light trucks is not scheduled to take effect until 2009, ACEA is writing a Euro 4-based upgrade that is scheduled to be adopted next year. It would also create separate tiers for low- and high-SAPS oils.

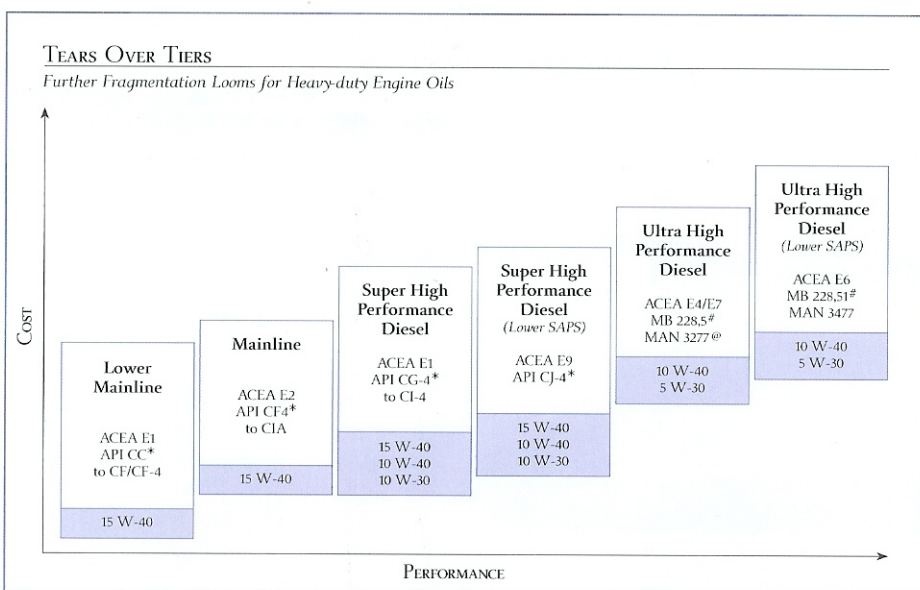
Formulators say reduced SAPS limits would be met in part through increased use of Group II or Group III base oils, which have lower sulfur levels than conventional Group I stocks. In the heavy-duty segment, additive company representatives have said it probably will not be practical to make low-SAPS ACEA E9 oils for 2009 model year engines using straight Group I base oils – a first for the segment in Europe. Instead, lubricant companies would have to switch to Group II or use a blend of Group I and Group III.

Stricter SAPS limits will also reduce the ability of formulators to use zinc dialkyldithiophosphate (ZDDP), a family of additives long depended on for both anti-wear and oxidation control.

"That will be the major change" in the new standards, said Meinrad Signer, deputy general manager with Italian light- and heavy-duty truck maker Iveco. "How to find new chemistry while continuing to meet the performance demands that we have developed for engine oils – it is a big challenge."

Additive companies say they have alternative chemistry available – thanks in part to experience gained in North America, where low-SAPS standards for passenger car and heavy-duty diesel engine oils went into effect in 2004 and 2006, respectively. But it's also clear that companies continue to seek solutions for the European market. Consider, for example, that the Additives 2007 conference, hosted by the Royal Chemical Society in London in April, featured at least four presentations by companies and institutions about different approaches to the search for viable alternatives.

"The additive companies all have experience in North America with the passage of [API] CJ-4," said Laurent Jumelle, Chevron Oronite's product line manager for automotive engine oil additives in Europe, Africa and the Middle East. The CJ-4 specification was introduced to the market in the fall of 2006. "That helps, but we have found it is always difficult to combine North American and European requirements together in one package. Since we are entering a new era for [additive] components, we will, to some extent, have to tailor those specifically for European vehicles."



Note: \* Equivalent North American specification  
# Mercedes-Benz specification  
@ Man specification

Source: Lubrizol's "Euro 5 and ACEA 2008 and Impact on European Base Oil Requirements," 2007

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### TOO MUCH DIRT

The soot dumped into crankcases by EGR systems creates two problems for the lubricant. First, that soot provides extra material that can end up as deposits on the inside of the engine. Second, it raises acid levels, compromising the oil's durability by making the oil more susceptible to oxidative breakdown. ACEA members have proposed, therefore, to require that oils demonstrate better TBN retention and better soot control.

Pollution laws are making things difficult enough for engine oil formulators, but other factors are also exerting pressure. Efforts to reduce consumption of fossil fuels led the European Commission to mandate an increase in biodiesel levels from a maximum of 5 percent today to 15 percent in 2010. This affects engine oils because biodiesel has a greater tendency than petroleum diesel to find its way into the lubricant.

So, for the first time, ACEA is considering adding a test to both the heavy-duty diesel and the gasoline and light-duty diesel specifications that would gauge oil compatibility with biodiesel. Pursuit of better fuel economy in cars has caused a shift toward diesel engines and increased use direct of fuel injection, so the passenger car upgrade could also include requirements for better direct injection performance.

To further compound the situation, vehicle manufacturers continue raising the bar for performance in ways that tax engine oils.

"For safety reasons, the size of engines is becoming smaller," said Michael Schenk, of DaimlerChrysler AG. "But we are also moving toward more powerful engines. When those trends are going on at the same time, it means higher engine operating temperatures. Also, more power means more torque, which means more pressure on the bearings."

More challenging engine oil standards usually translate into higher product development costs, meaning a greater investment by additive companies and higher price tags for the oils themselves. Sources predicted that the upcoming generation of oils will likely undergo a significant cost increase. But the transition is being felt in other ways, too.

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– Meinrad Signer, Iveco

### TAKING AWAY THE POWER

For one, all trucks with SCRs will also have devices that inject a urea solution onto the catalyst where it reacts with the nitrogen oxides, producing water and nitrogen. The solution – AdBlue is the commercial name for urea solution – will have to be refilled periodically. To ensure that it is, the EU has mandated that engines also carry on-board diagnostics that detect when nitrogen oxide levels start to rise too high, notify the operator and – believe it or not – automatically cut the engine's horsepower if the situation is not addressed within a short period.

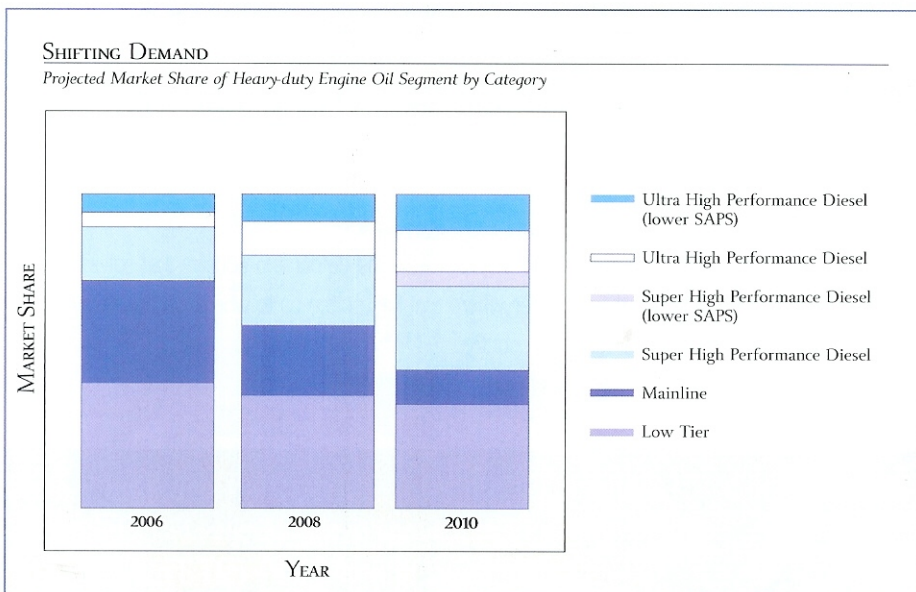
"This is a significant change in that we are forcing the driver to go out and buy a new kind of maintenance fluid," said Bengt Otterholm, lubricants coordinator for Volvo Technology Corp. and chairman of ACEA's Heavy-duty Diesel Engine Oil Subgroup, "and if he doesn't the vehicle automatically goes into limp-home mode and will be in violation of the law."

The creation of tiers for different SAPS or TBN levels will further fragment the market for heavy-duty engine oils, according to Lubrizol. Because engines built before 2008 will not require the new oils, and because they will presumably cost more, the market will continue to have a place for the various categories of oil.

Fragmentation is nothing new to engine oil marketers in Europe. Most original equipment manufacturers write their own oil specifications, adding layers of products for lube marketers to carry. But now vehicle operators are being pulled into the muck, too, thanks to the presence of the on-board diagnostics. If a new truck is filled with a high-SAPS oil, it could cause the particulate filter to clog and the diagnostic device to cut horsepower. The risk of having vehicles rendered practically unusable makes it more important than ever that those responsible for oil changes use the correct oil.

Traditionally, the industry has tried to avoid depending on operators to ensure that engines are properly lubricated.

"Everybody is trying to avoid that," said François Benard, automotive product development manager for Total. "The industry is not sure that people are ready to understand the differences between different categories of oil, or even to look at their engines. So if you depend on them to choose the correct oil it is conceivable that the whole system would break down."



Source: Lubrizol's "Euro 5 and ACEA 2008 and Impact on European Base Oil Requirements," 2/07

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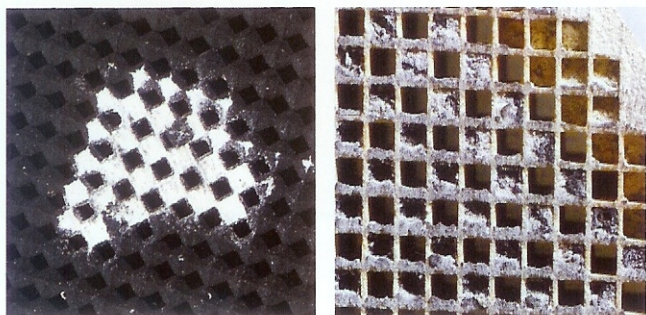
– François Benard, Total

Fortunately, a growing percentage of passenger car owners have their oil changed by professionals – such as dealerships or maintenance shops – rather than changing it themselves. Mike McCabe, Lubrizol’s regional business manager in Europe for engine oils, says the professionals have demonstrated an ability to absorb information about the differences between various categories of oil and which to use on different vehicles.

“Over the last few years the number of OEMs recommending lower viscosity grade oils such as 5W-30, 5W-40 and 0W-30 has increased,” McCabe said. “This has been a big change and has led to a move away from heavier viscosity grades which now only tend to be used in older vehicles.

“Independent research has also shown that over the last 5 years the people providing the oil change in workshops have become more aware of the importance of the using an oil which meets the performance recommended by the OEM, not just an oil of the correct viscosity grade.”

That kind of ability to adapt should come in handy for various players of the engine oil market, especially as it prepares for oil standards that look likely to bring so much change for so many. ❖



Diesel particulate filters clogged with particulate matter.  
Photos courtesy Lubrizol Corp.

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