Oil's changing

New standards for engine lubricants are on the way to help operators meet the challenge of transition to 'carbon-free' road transport, writes Richard Simpson

Although the date for the end of fossil-fuelled truck production has been announced by the European manufacturers as 2040, there is no sign whatsoever that development of heavy-duty internal combustion engines has been halted by them. Quite the reverse, in fact.

Engines that will run cleaner and more efficiently and perhaps use different fuels are obviously still on the way, because the OEMs are asking the lubricant industry to produce new oils to cope with these demands.

Motor industry body European Automobile Manufacturers' Association (ACEA) sets universal standards, known as 'sequences', that encompass the differing demands of the various car and truck engine manufacturers' approvals. As engine technology has evolved to include systems such as exhaust gas recirculation and selective catalytic reduction as well as higher internal temperatures and pressures, the sequences have changed.

Engine manufacturers have also sought better wear protection to increase component life, and to improve fuel consumption by specifying oils with friction-reducing additives and reduce the parasitic drag caused by the pumping and churning losses generated by the oil itself. The official view of Daimler, whose own standards form the basis for ACEA's, is: "It is basically good to have a European standard on lubricants."

Current heavy-duty ACEA sequences date back to 2016. New sequences were due in 2018, then postponed until 2020. They are still not published, but the latest statement from ACEA indicates they will be finalised at least in part in the first quarter of this year. ACEA appears to have been hit by a double whammy of a fast-evolving technical and legislative landscape, and disruption caused by COVID.

Paul Timmis, group technical manager at Exol Lubricants, says: "The ACEA 2021 HD revisions occur during a period of significant change in the commercial vehicle industry, with pressures of decreased emissions, increased efficiency, advances in hardware as well as the adoption of alternative fuels. Revised specifications represent better alignment with key OEM specifications and hardware now and into the future."

Rudi Sanders, senior product and technology support chemist at Chevron Global Lubricants adds: "Currently, the ACEA 2016 Oil Sequences contain four heavy-duty diesel-engine oil categories: E4-16, E6-16, E7-16, and E9-16. The new ACEA 2020 Oil Sequences will contain six heavy-duty diesel categories: four within the E-class and two categories within the newly-defined F-class.

"The four E-categories define the engine oil requirements for heavy-duty vehicles that require engine oils with a dynamic viscosity requirement, better known as HTHS, of minimum 3.5cP.

PREVIEW

"Several requirements, such as seal compatibility, foam tendency and biofuel impact on piston cleanliness (OM646LA Bio) will become more severe in all four E-categories, while also the bore polishing and piston cleanliness engine test OM501LA will be replaced by the OM471LA engine test which is currently under development.

"Two of the E-categories will be replaced by new categories: E6-16 by E8-20 and E9-16 by E11-20. The new E-categories, E8-20 and E11-20, will include the severe oil oxidation test Volvo T13 and the Caterpillar oil aeration test. These tests meet the higher requirements of modern engines that

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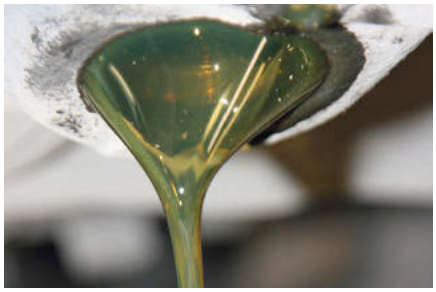

Long drain-interval oils are only appropriate for some vehicles and applications

IVECO has developed a 0W-20 oil in conjunction with Petronas

Workshops may have to carry a greater range of lubricants in future

put much more thermal stress on the engine oils.

"To lower fuel consumption, some heavy-duty engines can now run on engine oils with lower dynamic viscosity (high-temperature, high-shear, HTHS). But these engine oils cannot be used in older vehicles or vehicles requiring higher dynamic viscosity, since they may cause excessive wear, resulting in engine damage."

The new ACEA engine oil F-class contains two categories: F8-20 and F11-20, the low-viscosity versions of E8-20 and E11-20 respectively. They additionally contain two soot wear tests. Covering bearing and ring/liner wear, they ensure the lower viscosity products will not cause wear in heavy-duty vehicles. They are still in development.

"Backwards compatibility will not be possible on the F8 and F11 sequences," cautions Adrian Hill, automotive product manager at Morris Lubricants.

"These are equivalent to E8 and E11, and give improved fuel efficiency, but with reduced oil film thickness. Therefore, they can't replace them in existing designs. Engines must be designed for them. E6 and E9 lubes will continue to be available, too."

And for very good reason: ACEA's own data reveals the average age of a heavy truck in the European Union is 13 years: the UK has a much 'younger' truck parc, but the average age is still over seven years. The respective UK and EU bus parcs are even older.

The introduction of Euro VII – expected between 2026 and 2029 – is planned to focus on lower CO_2 emissions and reduced fuel consumption. That will increase the demand for lower-viscosity engine oils. How low the viscosity of an engine oil can drop will depend on the engine technology solutions that OEMs can develop and introduce.

EURO VII

ACEA is expected to introduce fuel economy retention tests to ensure lower fuel consumption during the lifetime of the engine oil. Also, engine oils with less than 1% sulphated ash are anticipated to extend the lifetime of particulate filters. Chevron has recently introduced an ultra-low ash engine oil that produces 0.4% sulphated ash, versus the current so-called Low SAPS 1% sulphated ash oils (see also *www.is.gd/zumimo*).

In Europe, the heavy-duty OEMs prescribe predominantly SAE 10W-40 and SAE 5W-30 engine oils, but several of these OEMs have started filling some of their engines with SAE 5W-20/SAE 0W-20 engine oils. In addition, they have developed or are developing specifications for SAE 5W-20/SAE 0W-20 aftermarket engine oils from independent suppliers.

The continual demand for reduced emissions – not only NOx, CO_2, and particulates, but also ammonia and methane – will also require the development of new or enhanced after-treatment systems. These developments will require Low SAPS engine oils and will reduce the demand for higher SAPS (E4 and E7) engine oils in the future.

These factors will push the automotive industry to introduce more fuel-efficient, low-emissions engine oils. Additionally, new materials and contact surface designs will decrease friction in engines. These will require oils that are compatible with the new materials without causing excessive bearing wear. Steel pistons enable engines to achieve greater BMEP (brake mean effective pressures) and better thermal management, requiring higher thermal and oxidative stability in future oils.

As the 2040 deadline approaches, the automotive industry is developing many different propulsion technologies. Each OEM has specific projects, and it will become much clearer in the next few years which way or ways the industry will evolve. New lubricant technologies and standards will no doubt be produced to cope with the specific demands arising from new fuel and energy storage technologies for decades to come. TE

ODDS AND SODS

Standard-drain oils have 'odd' sequence numbers (E9 and E11). Long drain-interval oils have 'even' sequence numbers (E6 and E8). The (usually higher) cost of the lube must be balanced against its longer life and savings in parts such as filters, and labour.