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# LUBRICANT DEVELOPMENT TO MEET THE CHALLENGE OF EUROPEAN EMISSIONS CONTROL LEGISLATION

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*The following article is a summary of a presentation given on behalf of the BLF by Colin Middleton, BLF Vice President, Marketing and Communications, at the Institute of Road Transport Engineers Conference at Telford last May. As part of the agreed Marketing and Communications initiative, the BLF will become increasingly involved in presentations to suitable organisations on lubricant-related topics.*

This article describes how American API and European CCMC and ACEA specifications have been driven by the impact of Emissions control legislation both sides of the Atlantic since the mid- 80's.The approaches and evolution in engine designs to achieve the legal limits set for Emissions Control will be described, as will the lack of harmonisation of world-wide oil/fuel standards. Consensus on the latter would benefit Transport Engineers, the lubricants industry and particularly the OEMs. Historical examination of the US API categories highlights a progressive reduction in the life cycle of each category coupled with very substantial costs increases in testing costs. The API CD requirement introduced in 1995 remained in force for some 30 years before being updated; the associated test costs were some $21K, whereas the forthcoming PC - 7 category for emission controlled engines with extended drain is only likely to survive some 4 years, at an estimated test cost of some $435K.

The development funding costs of the 88 tests needed to achieve and verify PC-7 currently stand at $1.78 million for the US lubricants and chemicals industries and $250,000 for the engine manufacturers association.

On the European scene the original CCMC Sequences were introduced in 1983. Revisions taking place in 1989 (after 6 years) covered uprated Emissions control and long drain specifications. In 1991 CCMC (Common Market Constructors Committee) was dissolved and replaced by ACEA.

(European Association des Constructeurs Europeans d' Automobiles)

- ACEA was set up to replace CCMC sequences to remove tests that were obsolete and/or no longer available.
- Ensure that new sequences contain tests and classes that are suitable for ACEA members current and future needs IN Petrol, light duty and heavy duty diesel categories.
- Establish an Oil Quality Management system which was both externally auditable and supported by the appropriate test data.

The European Engine Lubricants Quality Management system (EELQMS) for short, is made up of:-

The Motor Manufacturers (ACEA)

The Additive Manufacturers (ATC)

The Lubricants Marketeers (ATIEL)

Test Developers (CEC) (Co-ordinating European Council) (Test Standardisation)

This is the most significant step forward to ensure the lubricants industry produce products that definitely meet OEM requirements.

ACEA sequences form the basis of a European Quality Management system for engine lubricants EELQMS is supported by all interested parties as demonstrated.

All participants must be ISO 9000

Test laboratories to be EN 45001 approved

Both are externally auditable plus all relevant test documentation

All Engine tests must be pre-registered since 1/10/95

i.e. no more "meets the requirements of", it either "does or it doesn't".

The benefits of ACEA performance requirements to the Fleet Operator may be summarised as follows:

**Long drain:** ACEA requires performance testing of lubricants to provide the engine protection necessary to allow drain intervals to be extended.

**Greater fuel economy:** Currently more relevant to petrol oil engine sequences

**Lower Emissions** - key driving force behind ACEA - 96 performance levels

**Lower maintenance costs** - ACEA requirements for Engine wear and soot/sludge control protection reduces engine deterioration and power loss i.e. performance retention.

ACEA categories cover 3 main types Petrol, light and heavy duty diesel. This presentation concentrates on Heavy Duty Diesel sequences E1, E2 and E3.

The 3 designations represent increasingly severe service for lower maintenance longer drain and conserved engine performance retention leading to maintained emissions over the life of the vehicle. Modern Euro 2 heavy duty engines are different from those which concerned CCMC in the past.Viscosity increase due to soot formations is a critical factor to be discussed shortly, hence the inclusion of the MACK T-8 test, until a suitable European test is determined, verified and the repeatability established. Mercedes Benz wear tests are relevant to all sequences due to the adoption of the OM364A and OM602A engine tests at MB227, MB228.1, MB228.3 and MB228.5 levels as indicated.

The need to harmonise fuel and lubricants specifications on a global basis would be beneficial to all industry groups affected by the changes due to:

The escalating costs of multiple test approvals.

International power train exchanges

Increasing demand for modern lubricants in many new and developing markets

Commonised power train design complexity.

To achieve standardisation a '3 tier' system for fuels and lubes is proposed each tier being related to the technology of the engine using the fuel or oil.

With time the performance of each tier would be increased. The lowest tier would become progressively restricted to a reducing percentage of the market as the developing countries made their standards more restrictive.

The development of a commonised specification between API and ACEA would be particularly beneficial to the UK market due to the large population of US parentage engines and less dependence on European truck engine builders in comparison with other European countries.

However, it would be unrealistic to expect harmonisation to be achieved before the year 2010.Whereas the desire to achieve standardisation exists particularly amongst global OEM's the influence currently exerted by regional OEM's in terms of specific engine tests both in and outside ACEA, CEC, API, ASMT and JAMA will continue to frustrate the process of harmonisation until well into the next millennium and probably beyond 2010.

The BLF believe that the proper selection of tests and limits could cost effectively achieve the goals of the OEMs for international harmonisation and provide a cost effective and focused means of significantly improving oil quality.

It would be as well to now review the multiple factors facing the lubricant developers which in many instances technically compete against each other in the desire for universal all embracing products which, as will be discussed, is becoming increasingly difficult to achieve.

The key driving force is of course, emissions control. This has had a direct impact on:

- API / ACEA specifications and updates
- OEM Engine design parameters and evolution
- Fuel lubricity and economy
- Long drain and base oil selection criteria

All ultimately have a stress impact on the lubricant.

The primary challenge of Emissions Control legislation is the trade off between particulate

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