



ATIEL's role in the European Lubricants Industry

Why updates to ACEA heavy duty engine oil sequences and EU CO₂ emissions regulations for heavy duty vehicles are so important.

Argus Base Oils

February 2025

Introduction to ATIEL

- ATIEL is a non for profit association (ASBL) representing the combined knowledge and experience of leading European and international engine oil manufacturers and marketers
- By drawing on the technical know-how of its membership, ATIEL promotes consensus on key technical, product stewardship and sustainability issues, ensuring that engine oils continue to contribute to improved wear protection, deposit control, lower emissions, and fuel economy CO₂ emissions efficiency
- Through ATIEL Code of Practice provides guidelines for development of lubricants that meet OEM performance requirements. <https://atiel.eu/>



About the EELQMS

- The European Engine Lubricant Quality Management System (EELQMS) is a quality management system for automotive engine lubricants
- It has been developed jointly by ACEA, ATC and ATIEL
- Although the EELQMS is a voluntary system, it may be required by third parties and, in these circumstances, it may be mandatory
- Provides assurance of the quality of engine lubricants on the market that claim to meet the performance requirements of ACEA



EELQMS

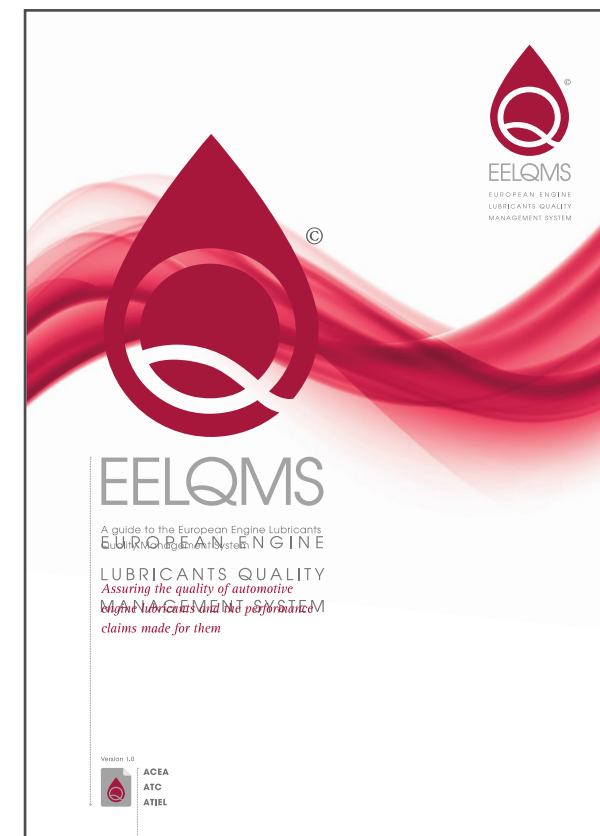
EUROPEAN ENGINE
LUBRICANTS QUALITY
MANAGEMENT SYSTEM

EELQMS Structure



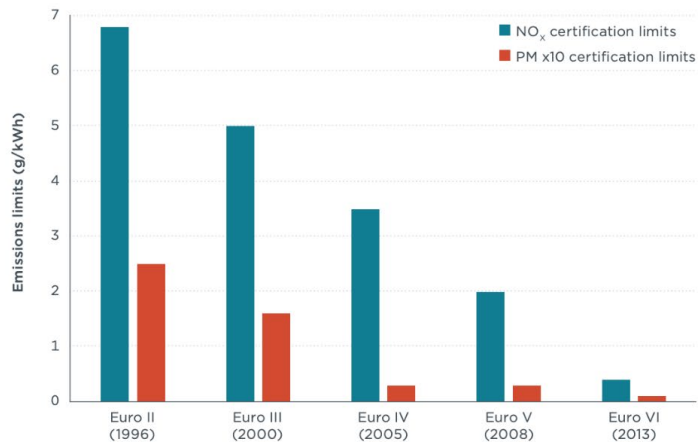
Summary of EELQMS Guidelines

- Lubricant marketers developing engine lubricants in compliance with ACEA Oil Sequences shall carry out formulation development, blending and marketing in accordance with the **guidelines in the ATIEL Code of Practice and ATC Code of Practice**:
 - incorporating EELQMS guidelines in a quality management system (e.g., ISO 9001, or IATF 16949).
 - ensuring an independent audit of the lubricant development process
 - having Codes of Practice checklists signed off by an authorised company representative
 - blending products according to requirements of ATIEL Code of Practice, including accreditation to an auditable quality management system
 - signing a Marketers' Letter of Conformance and registering it with ATIEL



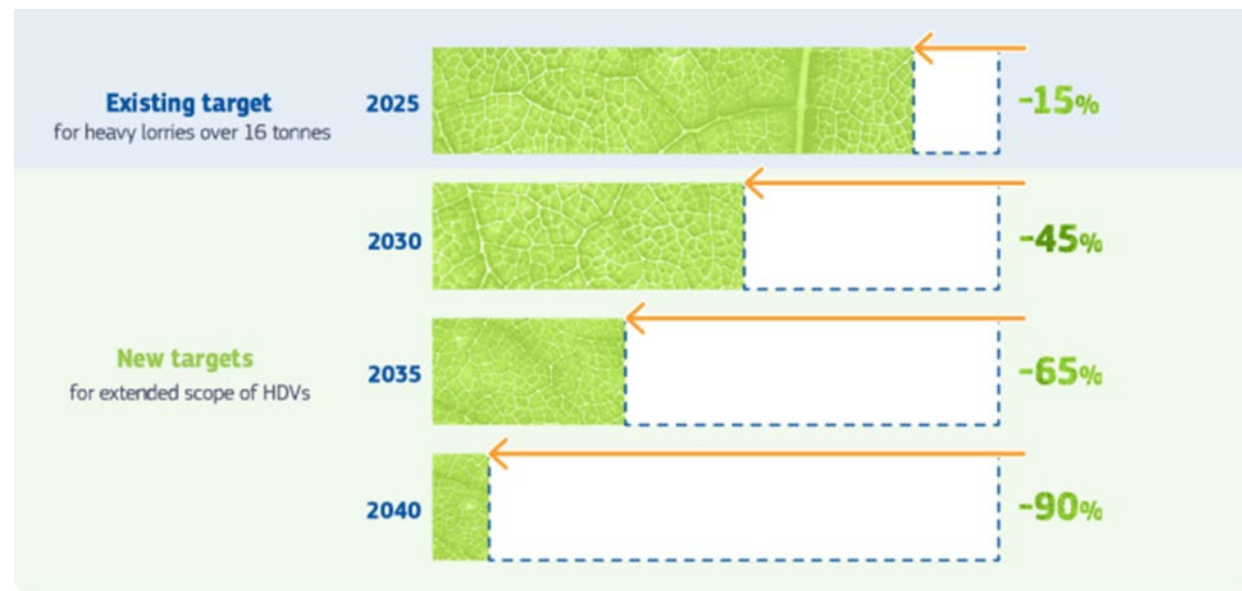
EU CO2 emission standards for heavy-duty vehicles

Heavy-duty vehicle emission standards



NOx and PM emission standards for diesel engines used in heavy-duty vehicles

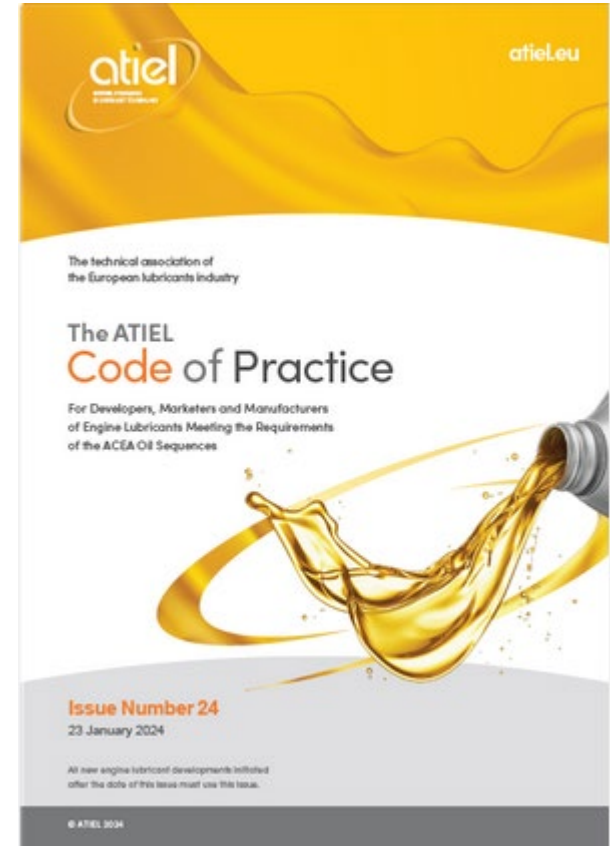
Source : https://theicct.org/wp-content/uploads/2021/12/F_Posada_CCAC-Soot-Free-HDVI-Working-Group-Opportunities-Euro-VI-and-eHDVs.pdf



Source : https://climate.ec.europa.eu/eu-action/transport/road-transport-reducing-co2-emissions-vehicles/reducing-co2-emissions-heavy-duty-vehicles_en

ATIEL Code of Practice

- Key element of the EELQMS.
- Provides formulation guidelines that represent accepted industry best practices.
- Common approach and standards for the whole industry to follow.
- Enables lubricant companies to comply with EELQMS and the ACEA Oil Sequences.



ACEA Oil Sequences v Code of Practice

The ATIEL Code of Practice is updated regularly and in line with each evolution of the ACEA Oil Sequences.

The table below shows the ATIEL CoP issues in relation to the corresponding ACEA Oil Sequences issues.

ACEA Oil Sequences issue	ATIEL Code of Practice issue
2008	Issue 16
2010	Issue 17
2012	Issue 19
2016	Issue 20/21
2021	Issue 22/23
2022	Issue 23
2023	Issue 24

ACEA Oil Sequences **HD 2024**

acea

December 2024

ACEA Oil Sequences
Heavy-duty engines



VALIDATION OF OLD AND NEW EDITIONS OF ACEA HEAVY-DUTY OIL SEQUENCES

As new sequence editions are published older editions have to be withdrawn. Validities of new and old editions overlap for limited periods of time, as shown in the following table and the accompanying text below. When a new ACEA Oil Sequence is introduced, oils with claims against the previous issue can be marketed for another two years only.

Sequences issue	First allowable use	Mandatory for new claims	Oils with this claim may be marketed until
2004	1 November 2004	1 November 2005	31 December 2009
2007	1 February 2007	1 February 2008	23 December 2010
2008	22 December 2008	22 December 2009	22 December 2012
2010	22 December 2010	22 December 2011	22 December 2014
2012	14 December 2012	14 December 2013	1 December 2018
2016	1 December 2016	1 December 2017	1 May 2024*
2022	1 May 2022*	1 May 2023*	1 October 2026*
2024	1 October 2024*	1 October 2025*	

* ACEA Oil Sequences for Heavy-Duty Engines only

ACEA Oil Sequences **HD 2024**

E/F: Heavy Duty Diesel Engine Oils

acea

December 2024

ACEA Oil Sequences
Heavy-duty engines



On-Highway

Engine Oil Sequence	Euro VI	Euro I, II, III, IV, V	EGR engine compatibility	Exhaust treatment (DPF, SCR & Cathalyst)	Fuel compatibility		How to read the table
					High Sulfur*	Biodiesel**	
E4	X	!	!	X	✓	!	✓ recommended ! for some applications X not recommended
E7	X	!	✓	X	✓	!	
E8	✓	✓	✓	✓	!	✓	
E11	✓	✓	✓	✓	!	✓	
F01	✓	✓	✓	✓	!	✓	

* >50 ppm Sulfur

** Recommendations may differ between engine manufacturers, especially with >B7 biodiesel blends; please consult driver manuals and/or dealers if in doubt.

Off-Highway

Engine Oil Sequence	Stage IIIb, IV, V	Stage I, II, IIIa	EGR engine compatibility	Exhaust treatment (DPF, SCR & Cathalyst)	Fuel compatibility		How to read the table
					High Sulfur*	Biodiesel**	
E4	X	!	!	X	✓	!	✓ recommended ! for some applications X not recommended
E7	X	!	✓	X	✓	!	
E8	✓	✓	✓	✓	!	✓	
E11	✓	✓	✓	✓	!	✓	

ACEA Oil Sequences HD 2024

acea

ACEA Oil Sequences

Heavy-duty engines

December 2024

E/F: Heavy Duty Diesel Engine Oils

The OEM manual is mandatory, the below table gives an overview
For oil drain interval information please refer to the OEM manual

Engine Oil Sequence	Euro VI Stage IIIb, IV, V	Euro I, II, III, IV, V Stage I, II, IIIa	EGR engine compatibility	Exhaust treatment (DPF, SCR & Catalyst)	Fuel compatibility		How to read the table
					High Sulfur*	Biodiesel**	
					E4	X	
E7	X	!	!	X	✓	!	
E8	✓	✓	✓	✓	!	✓	
E11	✓	✓	✓	✓	!	✓	
F01	✓	✓	✓	✓	!	✓	

*100 ppm Sulfur
** Recommendations may differ between engine manufacturers, especially with >87 biodiesel blends; please consult driver manuals and/or dealers if in doubt.

Engine Oil Sequence	Euro VI Stage IIIb, IV, V	Euro I, II, III, IV, V Stage I, II, IIIa	EGR engine compatibility	Exhaust treatment (DPF, SCR & Catalyst)	Fuel compatibility		How to read the table
					High Sulfur*	Biodiesel**	
					E4	X	
E7	X	!	!	X	✓	!	
E8	✓	✓	✓	✓	!	✓	
E11	✓	✓	✓	✓	!	✓	

*100 ppm Sulfur
** Recommendations may differ between engine manufacturers, especially with >87 biodiesel blends; please consult driver manuals and/or dealers if in doubt.

	2024 ACEA Oil Sequences for Heavy-Duty Engines	October 2024 Revision 1
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REQUIREMENT	TEST METHOD	PROPERTIES	UNIT	LIMITS					
				E4-24	E8-24	E7-24	E11-24	F01-24	
1. LABORATORY TESTS									
1.1 Viscosity		SAE J300 Latest active issue		No restriction except as defined by shear stability and HTHS requirements. Manufacturers may indicate specific viscosity requirements related to ambient temperature.					XW-30
1.2 Shear stability	CEC L-14-93 or ASTM D6278 or ASTM D7109	Viscosity after 30 cycles measured at 100°C.	mm ² /s	Stay in grade					
	ASTM D7109	Viscosity after 90 cycles measured at 100°C.	mm ² /s		Stay in grade				
1.3 HTHS viscosity	CEC L-38-90	Dynamic viscosity at 150°C and Shear Rate of 10 ⁶ s ⁻¹	mPa·s	≥3.5			≥ 2.9 & ≤ 3.2		
		Dynamic viscosity at 100°C and shear Rate of 10 ⁶ s ⁻¹	mPa·s	Report					

Marketer's Letter of Conformance

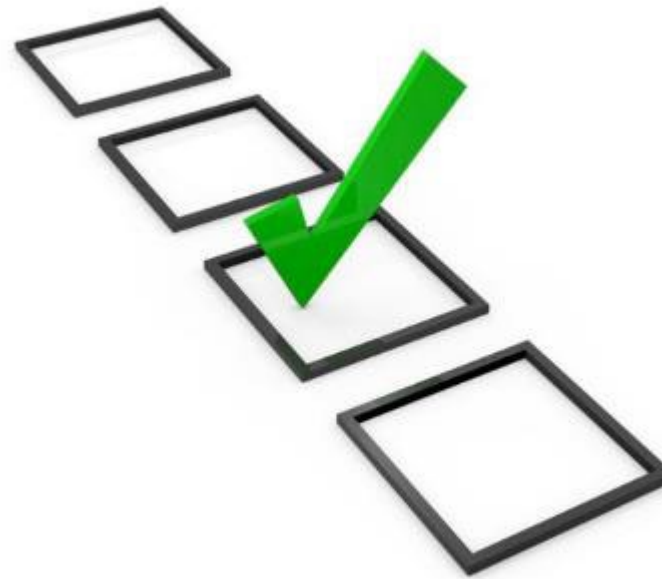
Compliance with the EELQMS includes signing a **Lubricant Marketers' Letter of Conformance:**

- Required for ACEA performance claims
- Confirms compliance with EELQMS
- Signed Letters held by SAIL (EELQMS administrator)
- SAIL confirms relevant quality system is implemented by the market or manufacturer
- List of signatories publicly available on SAIL website
- Renewed every year
- Membership of ATIEL not required to be a signatory
- Letter of Conformance template available from SAIL website: www.sail-europe.eu



ATIEL Quality Surveys

- Enhance the overall robustness of quality management
- One of the most effective ways to measure levels of compliance with EELQMS
- Has become an ongoing activity and a core part of ATIEL's Quality Management Committee's initiatives
- Conducted and administered on behalf of ATIEL by SAIL



Products/brands Registration and Compliance

- Register with SAIL and submit a signed Marketers' Letter of Conformance
- Template letter available on SAIL website: www.sail-europe.eu
- Registrants have exclusive right to use of the EELQMS quality logo on product documentation and labels
- Quality of products claiming compliance are checked regularly through SAIL's product survey programme, covering all LoC signatories
- Pay annual registration fee



Lubricants Manufacturers **Responsibilities**

Before making ACEA performance claims lubricant marketers, who are responsible for all aspects of product liability, should ensure:

- They have followed the EELQMS development programme guidelines and requirements
- If making a combined claim the lubricant formulation is fully compliant with the limits of ALL the engine and laboratory tests required for each individual ACEA engine category
- The claim is against a valid edition the ACEA Oil Sequences
- The claim is compliant with ACEA claims labelling language and terminology
- We may refer to latest version of obsolete categories as long as all requirements defined in the latest version of the category are met and documented (E.g.: reference to E6-16, E9-16, A1/B1-12, A3/B3-16, C1-16)

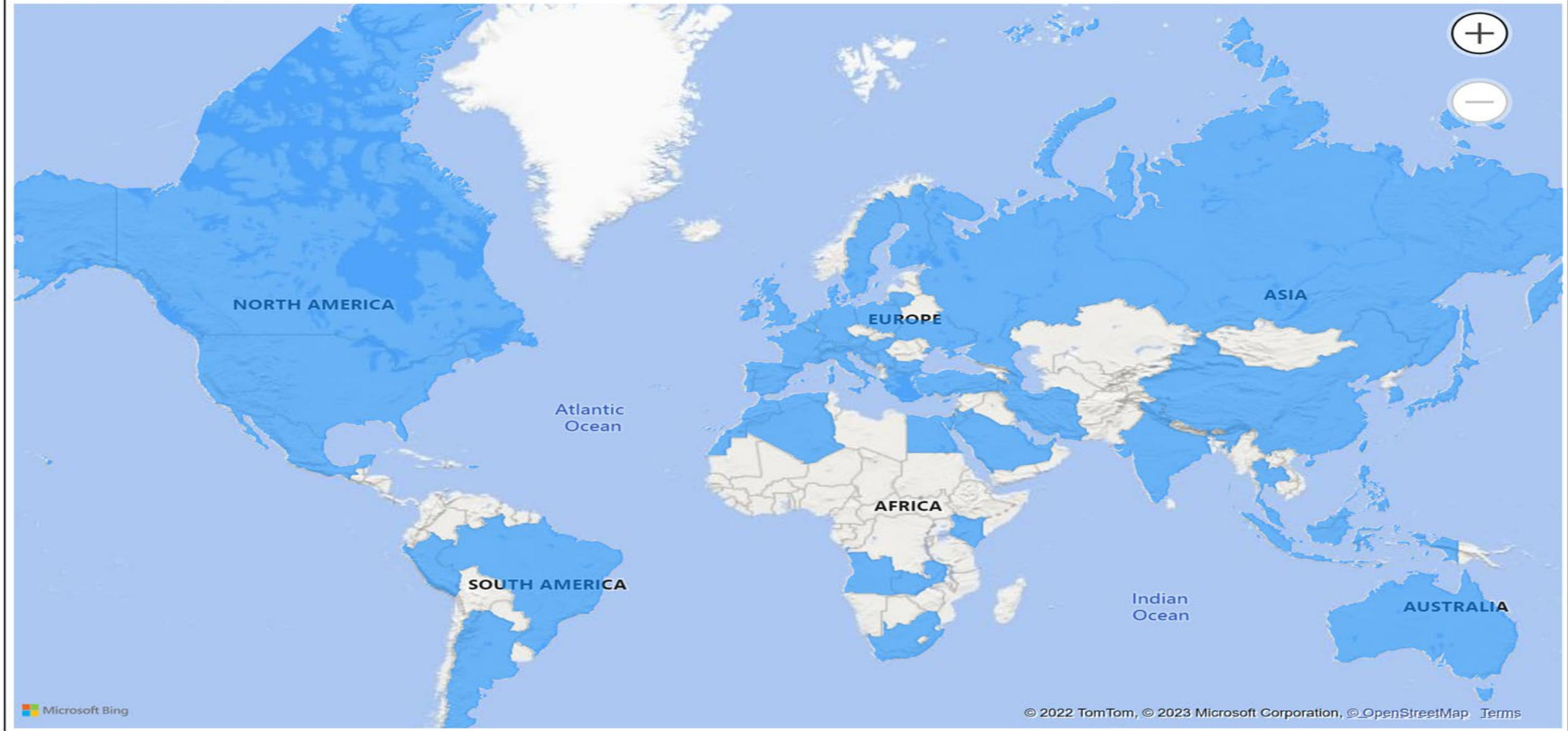


3. SAIL - Number of Participants listed on website

Date Refreshed = 15-Mar-23



Countries Participants listed on website



EELQMS NEWSLETTER

2024

- Additive packs without supporting performance data
- Retired and Obsolete Category Claims (Heavy Duty)

2025

- Making Claims against the ACEA sequences
- Introducing two new tools _ Checklist and Flowchart



EELQMS

EELQMS QUALITY MANAGEMENT SYSTEM

Bulletin no 8

ACEA European Oil Sequences cover light duty passenger cars & heavy-duty trucks. The ACEA Oil Sequences are updated regularly.

All lubricant marketers are responsible for all aspects of product conformity and liability when making ACEA claims.

ATIEL Compliance Policy encourages greater compliance across the industry through continuous monitoring of lubricant quality in the market and exchange of information and technical data that supports education of lubricant marketers. This product compliance monitoring programme is implemented by SAIL.

SAIL's quality surveys have become an ongoing activity and a core part of ATIEL's Quality Management Committee's initiatives.

The present Newsletter highlights findings from the quality surveys and is aimed at preventing failures cases in the future.

CASE STUDY

Problem

- An additive package supplier offers additives with performance level data described as *performance indication only without data supporting ACEA performance claims*
- Can I use those additive packages to blend ACEA performance engine oils?

Explanation

- Performance claims against the ACEA engine oil sequences are the responsibility of the Lubricant Marketer who is legally liable for the finished product.
- The Lubricant Marketer needs to satisfy themselves that relevant performance claims they have specified to their technology provider in the development of the finished lubricant, are supported by robust and reliable technical evidence setting out details of the testing that the additives have been subject to, and the results obtained.
- This testing by laboratory, bench and engine tests and the results obtained is contained in a Performance Test Data set and the Candidate Data Pack (CDP) for each formulation, both of which should be made available upon request to the technology provider by the Lubricant Marketer.
- If the technology provider is unwilling or unable to provide Performance Test Data or a CDP, then it is the responsibility of the Lubricant Marketer to ensure all



EELQMS

CORRECTION

EELQMS QUALITY MANAGEMENT SYSTEM

Bulletin No. 7 version 2 - 19th March 2024

ACEA Engine Oils - Retired and Obsolete Category Claims (Heavy Duty)

Claims for non-continuing class/categories, such as ACEA E6, remain valid if the claim is from the most recent ACEA issue when the category was valid, even though the category does not appear in the current issue of the ACEA heavy duty engine oil sequences.

More than one release of the ACEA engine oil sequences may be valid at the same time. From 1 May 2022 oils may be marketed against the ACEA 2016 heavy duty engine oil sequences until 1 May 2024 although new claims are only allowable until 1 May 2023 after which, ACEA 2022 heavy duty engine oil sequences are mandatory for all new claims.

Similarly, ACEA E7 is still a valid category in the latest edition of the ACEA 2022 heavy duty engine oil sequences but ACEA E6 and E9 categories have been superseded by new ACEA E8 and ACEA E11 categories.

It is still possible to claim ACEA E6 or ACEA E9 until 1st May 2024 against the 2016 sequences (see table below) and, even after this date, it can be claimed as it is a retired or obsolete category, but you must have a copy of the supporting data for the last available version of the sequences (in this case 2016) for audit. The lubricant marketer must also be able to meet the ACEA engine oil sequence claimed in full, even if it is obsolete.

Heavy duty engine oil sequences claim validity dates are set out in the ACEA heavy duty engine oil sequences 2022, revision 1.0, as shown below.

Sequences issue	First allowable use	Mandatory for new claims	Oils with this claim may be marketed until
2004	1 November 2004	1 November 2005	31 December 2009
2007	1 February 2007	1 February 2008	23 December 2010
2008	22 December 2008	22 December 2009	22 December 2012
2010	22 December 2010	22 December 2011	22 December 2014
2012	14 December 2012	14 December 2013	1 December 2018
2016	1 December 2016	1 December 2017	1 May 2024*
2022	1 May 2022*	1 May 2023*	

* ACEA Oil Sequences for Heavy-Duty Engines only

AUDITOR CHECKLIST

Improves compliance with Code of Practice

- Meets requirements under section 102 Auditing and Assessment.
- Self-help tool for Lubricant Marketers.
- Supports external ISO accreditation visits.
- Available on demand on SAIL website

QMS Auditor Checklist



1. Check allocated internal code for the Product Brand Name (PBN).
2. Search for formulation linked to internal code stored in database.
3. Request Candidate Data Pack (CDP) and/or ACEA (association of European Automotive Manufacturers) Performance Data Set for listed formulation.
4. The auditor should check that the CDP meets the current valid iteration(s) of the ACEA European Engine Oil Sequences.
5. Check formulation in CDP and/or ACEA Performance Data Set matches the product formulation from blend records.
6. Check the Quality Controls listed for PBN are aligned to characteristics shown in the CDP and/or ACEA Performance Data Set.
 - a. The CDP and/or ACEA Performance Data Set will not necessarily list Production Tolerances but there will be typical values of key characteristics.
 - b. The Quality Control (QC) protocol must be derived from CDP and/or ACEA Performance Data Set, material specifications from additive producers, SAE (Society of Automotive Engineers) J300 and ACEA European Engine Oil Sequences.
7. Check specification claims for PBN in labels and technical data sheets match those listed in CDP and/or ACEA Performance Data Set.
 - a. If a claim for a formal OEM approval is being made, check the blender has corresponding approval letters for PBN from Original Equipment Manufacturers (OEMs) whose specifications are claimed.
 - b. Check the formulation code in the OEM approval letter matches the code in the CDP and/or ACEA Performance Data Set etc.
 - c. It is not unusual that some CDP and/or ACEA Performance Data Set specifications are not used for PBN for marketing reasons.

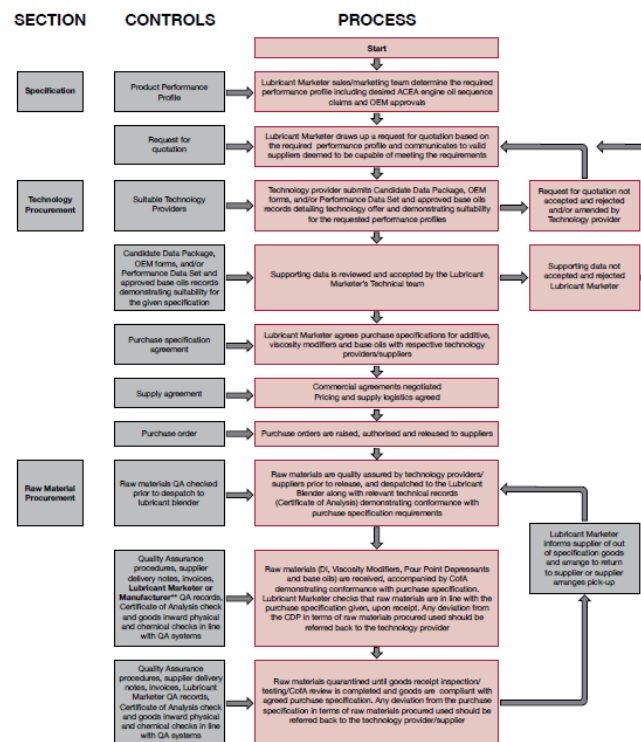
FLOWCHART

Lubricant Marketer is the Blender



Improves compliance with Code of Practice

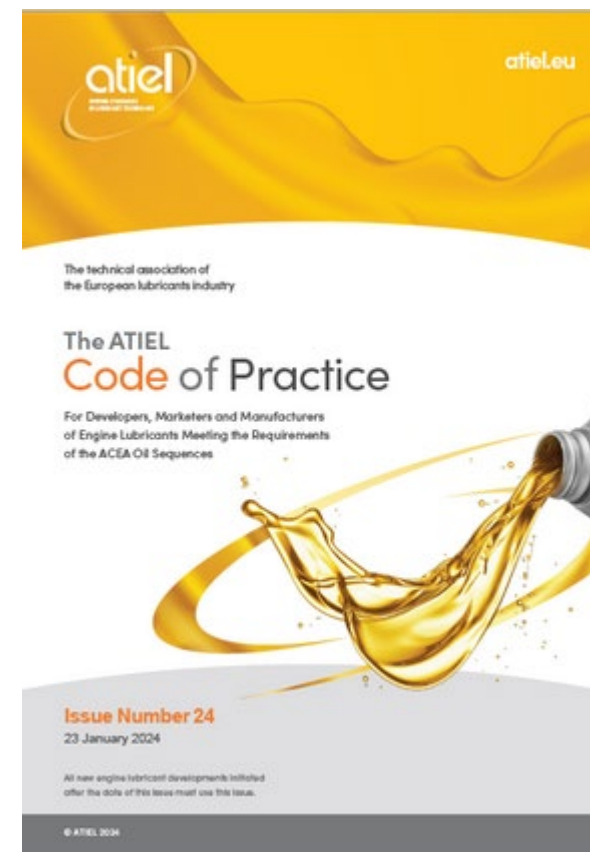
- Supports greater knowledge and understanding of the application of the Code at different steps in the manufacturing process.
- Self-help tool for Lubricant Marketers.
- Available on demand on SAIL website



NEW CODE OF PRACTICE

Code of Practice 2025

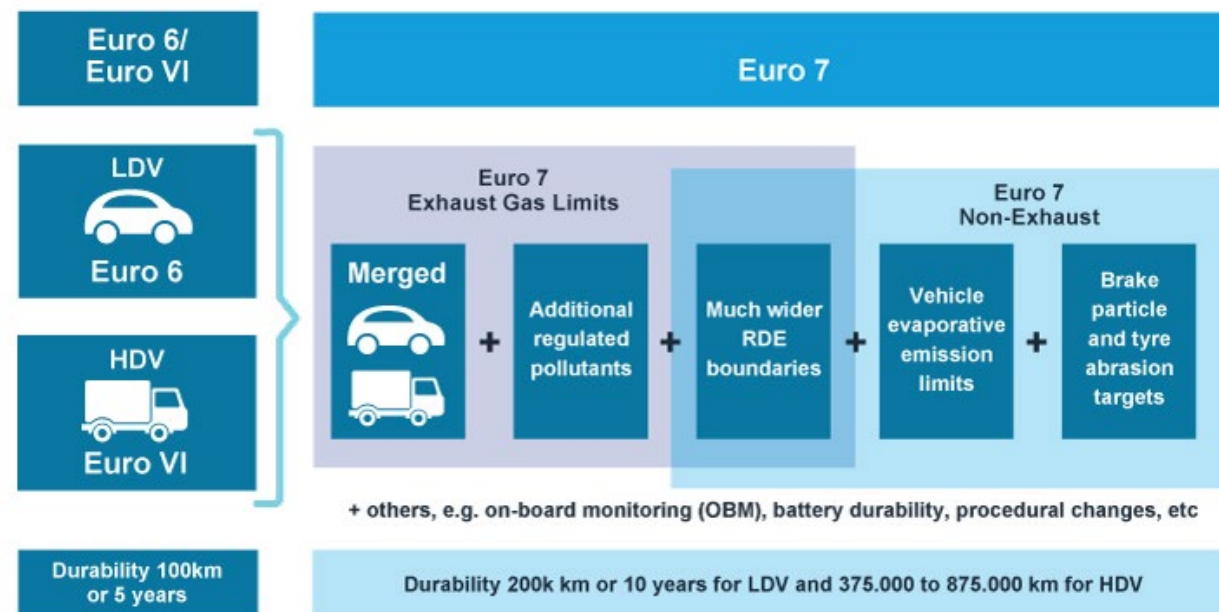
- Updates ACEA 2024 HD sequences
- Embeds certificated quality management system in Lubricant Developer, Manufacturer and Marketer responsibilities
- Strengthens auditing and assessment requirements Section 10.2



EU CO₂ emissions regulations for heavy-duty vehicles

Euro 7

- Merges HDVs and LDVs regulations
- Takes account of total vehicle emissions
- Extends durability requirement

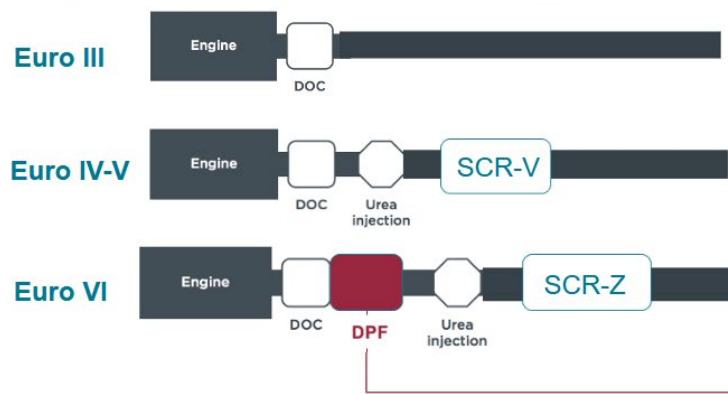


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Source : <https://www.infineuminsight.com/en-gb/articles/euro-7-emission-standards/>

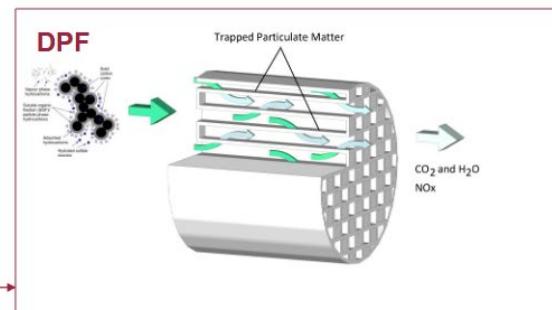
What future policy can we expect that will continue to drive technological advancement in the base oils and lubricants sector?

Diesel technology evolution according to emission standards



Aftertreatment emissions control

- Diesel oxidation catalyst (DOC)
 - CO (90%), HC (70%)
 - SOF, a component of PM (10-30%)
- Selective catalytic reduction (SCR)
 - NOx (85-95%)
- **Diesel particulate filter (DPF)**
 - PM (+98 %)
 - PN (+99 %)
 - CN (+99 %)



Source : https://theicct.org/wp-content/uploads/2021/12/F_Posada_CCAC-Soot-Free-HDVI-Working-Group-Opportunities-Euro-VI-and-eHDVs.pdf

Engine Oil Specifications **driven by Emission Legislation**

Initially focus on SO₂, NO_x and PM emission reduction

Now more focus on CO₂ Emission Reduction

Evolution main Viscosity Grades

15W-40

10W-40

5W-30

0W-20

Implications for base oil requirements

Group I

Group I
Group II
Group III

Group III
Group IV

Group III/III +
Group IV

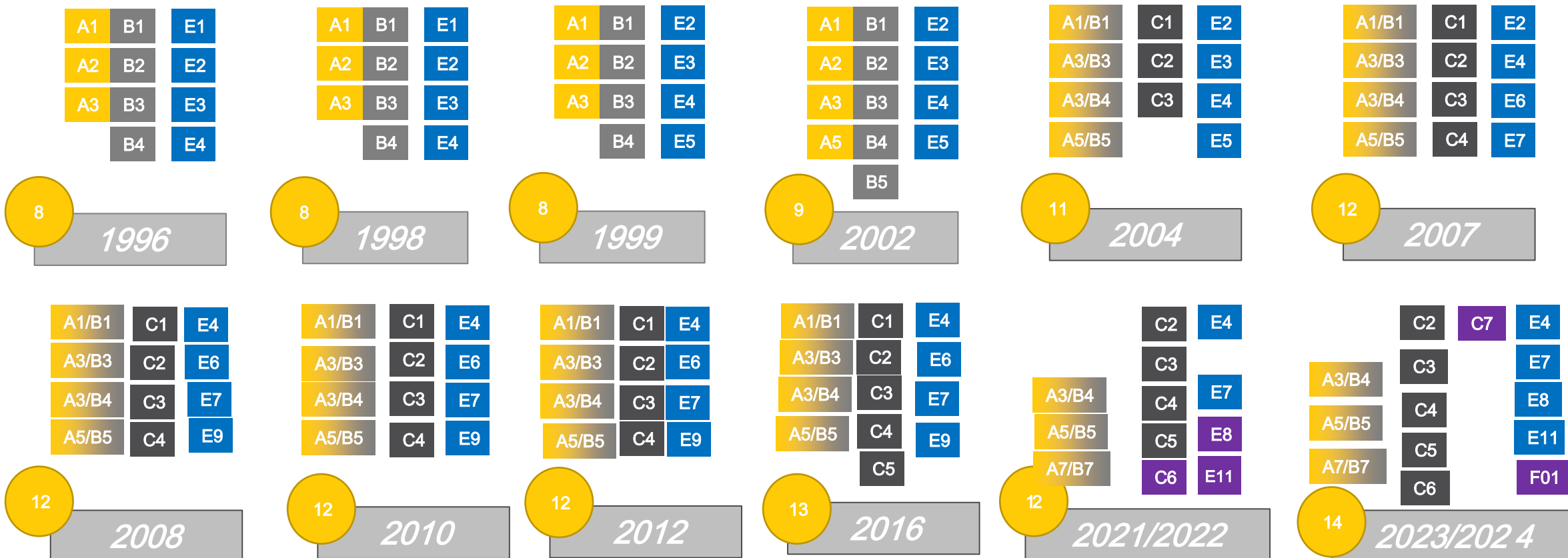
Increased use of Group II and III base oils in Light and Heavy Duty

- Very limited BOI interchange guidelines for Grp II and III
- Current guidelines focused around group I base stocks

Interchange Guidelines did not hold pace with specification evolution

The Complexity Challenge

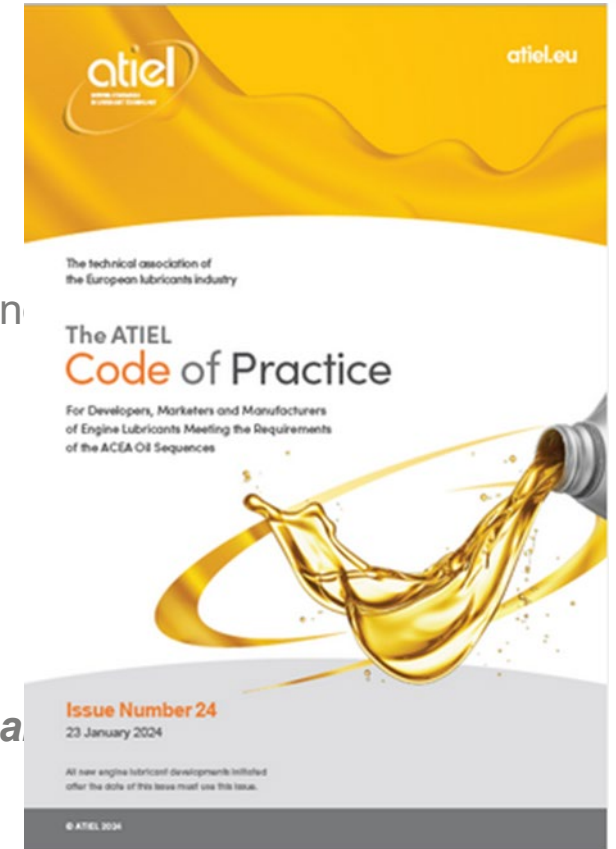
From 8 to 14 categories



Summary

- ❑ Engine oil specifications have evolved with emissions legislation
- ❑ Today the level of bench and engine testing ensures we have robust oils in the marketplace
- ❑ Viscosity Grade Read Across allows some testing waivers, based on statistically design matrix of testing of current engine oils
- ❑ Some level of BOI is permitted but guidelines need to be followed carefully
- ❑ Performance data sets define the level of testing conducted on the finished lubricant
- ❑ Base oil quality assurance requirements ensure that base oils are produced to a consistent quality
- ❑ ***Adherence to these guidelines help oil marketers ensure that robust quality oils are provided for the engine oil market***

ATIEL Code of Practice ISSUE 24 was released in January 2024



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