Overview of API engine oil standards development and licensing

West African Petroleum Standards Training

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American Petroleum Institute

The American Petroleum Institute

Who We Are

API represents all segments of America's natural gas and oil industry, which supports more than 11 million U.S. jobs and is backed by a growing grassroots movement of millions of Americans.

Our nearly 600 members produce, process and distribute the majority of the nation's energy, and participate in API Energy Excellence®, which is accelerating environmental and safety progress by fostering new technologies and transparent reporting.

API was formed in 1919 as a standards-setting organization and has developed more than 700 standards to enhance operational and environmental safety, efficiency and sustainability.

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Who We Are

Although our focus is primarily domestic, in recent years our work has expanded to include a growing international dimension, and today API is recognized around the world for its broad range of programs:

Mission

API's mission is to promote safety across the industry globally and to influence public policy in support of a strong, viable U.S. oil and natural gas industry.

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Over 100 years serving oil and gas

The American Petroleum Institute (API) was established on March 20, 1919 to:

- afford a means of cooperation with the government in all matters of national concern
- foster foreign and domestic trade in American petroleum products
- promote in general the interests of the petroleum industry in all its branches
- promote the mutual improvement of its members and the study of the arts and sciences connected with the oil and natural gas industry.

The Organization Focused On Specific Areas

- Advocacy
- Statistics
- Standardization
- Taxation

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Engine Oil Licensing and Certification

75 years setting API oil standards

35+ years licensing oils against standards

35+ years testing oils

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History of Engine Oil Licensing

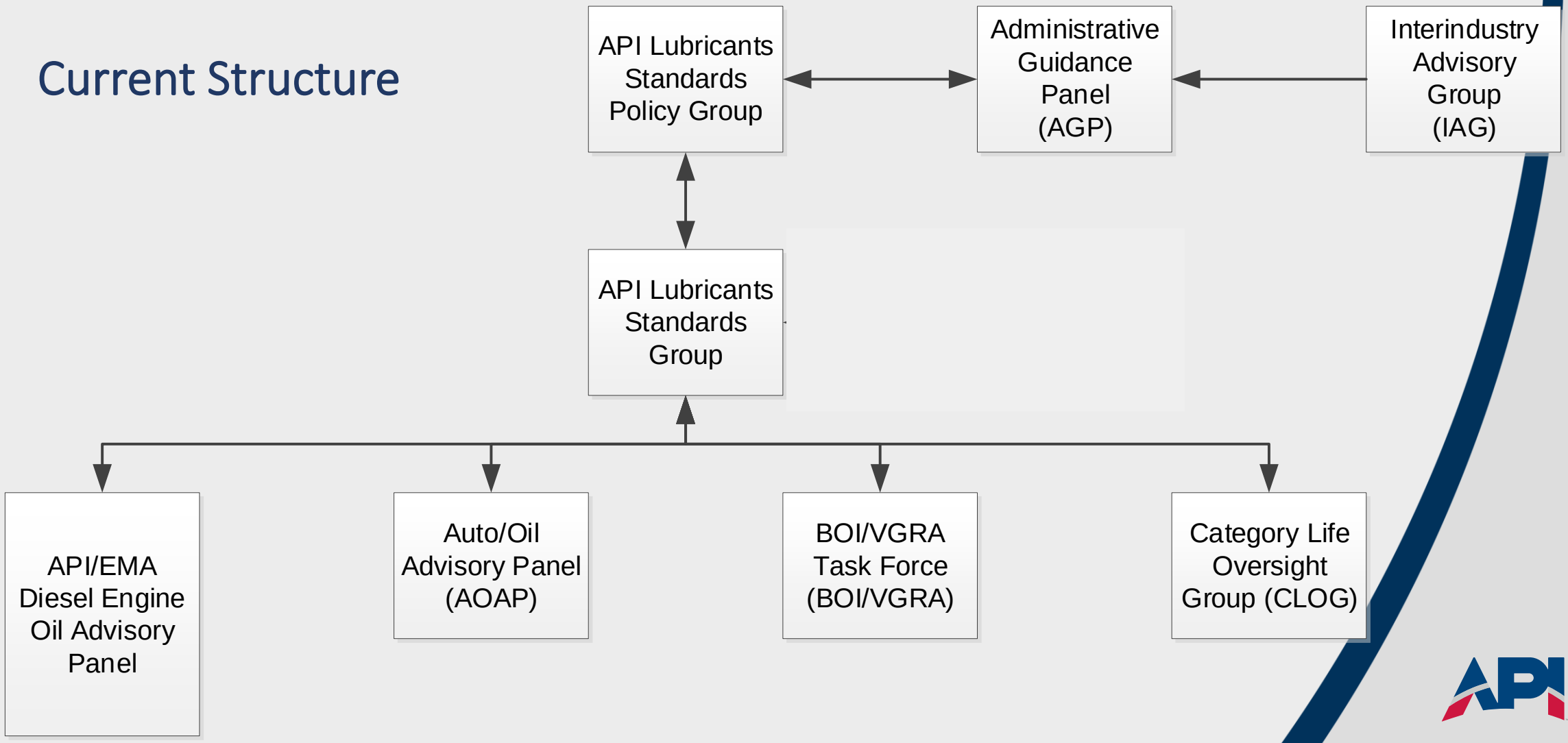
Pre 1947:	**Oils classified by SAE J300 viscosity grade**
1947:	**API Defined Three Categories** Regular — Straight mineral oil Premium — Mineral oil with oxidation inhibitors Heavy Duty — Mineral oil with oxidation inhibitors and detergent/dispersants
1952:	**API defined categories for gasoline and diesel** ML, MM, MS for gasoline engines DG, DM, DS for diesel engines

History of Engine Oil Licensing

1960:	**Basic Parts of a Standard Classification** • Still no precise definitions of performance • API added Sequence Testing to requirements • Company & US Military (Mil) specifications used
1970:	**API, ASTM, SAE developed classification system** • S Category for Service Gasoline • C Categories for Commercial Diesel
1993:	**Engine Oil Licensing and Certification System** • API Engine Oil Performance Standard • Advent of ILSAC standards by USAA & Japanese OEMs • ACC Code of Practice instituted

Lubricants Standards Group

Current Structure



Lubricants Standard Group

- **Develop**, approve, and maintain standards and recommended practices on lubricants (API 1509, 1525, 1525A, 1560) through collaboration with oil marketers, additive suppliers, OEMs
- Maintain **liaison** with ASTM, SAE, ACC, EMA, ACEA, Auto Alliance, ILMA, ATEIL, NLGI, and other technical or professional groups involved in lubricant activities
- Sponsor and manage **cooperative** lubricants research projects as required by government regulations, trends in lubricants technology and marketing practices, lubricants standards development, and licensing and certification requirements

API's role in Lubricants Standard Group

- Develop **consumer-focused informational materials** related to quality, performance, and application of lubricants and disseminate through campaigns, events, and various forms of media
- Review summary reports on **API Aftermarket Audit Program** and offer advice on changes to program

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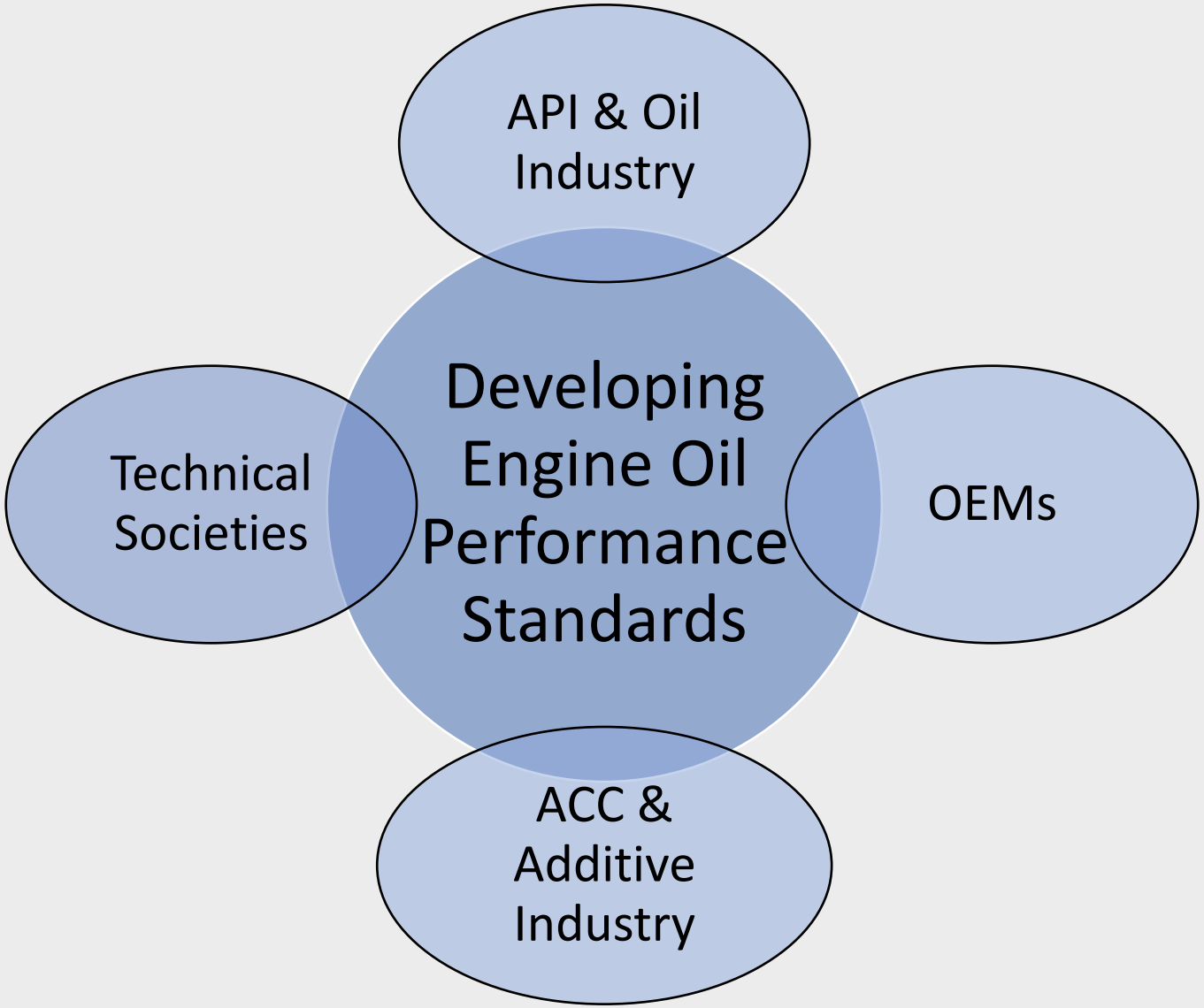
Process of Developing Engine Oil Standards



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Developing Gasoline Engine Oil Standards

- Auto Oil Advisory Panel (AOAP) consists of:
  - Gasoline engine manufacturers (ILSAC) – Co-chair
  - Oil marketers (API) – Co-chair
  - Additive suppliers
- AOAP receives request for new specification
- Validates the need
- Determines test development requirements and alternatives

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Developing Gasoline Engine Oil Standards

- OEMS develop the performance tests
  - Specification limits
  - Test precision
  - Tests reviewed draft standard developed (AOAP)
- Tests formalized (ASTM)
- Standard is finalized (AOAP)
- API Lubricants Group adopts standard
- EOLCS licenses and tests in the aftermarket

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Developing Diesel Engine Oil Standards

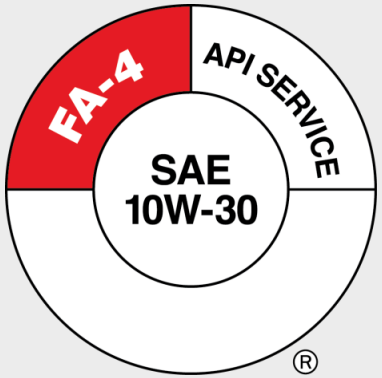
Diesel Engine Oil Advisory Panel (DEOAP):

- Engine Manufacturers (EMA) – Co-chair
- Oil marketers (API) – Co-chair
- Liaison members (ACC, ASTM, SAE, etc.)

DEOAP receives request for new specification

New Category Evaluation Team (NCET) assembled:

NCET provides need, language, timing and funding strategy to API Lubricants Group



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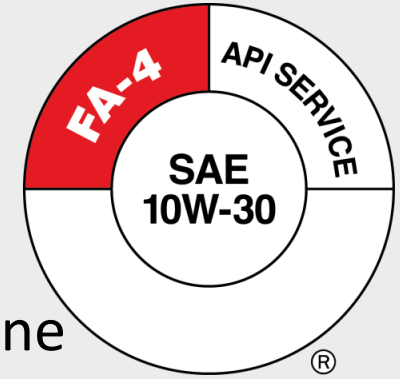
Diesel Engine Oil Standard

New Category Development Team (NCDT) created

- Draft user language and develop BOI/VGRA (API)
- Propose tests, provide hardware, etc. (EMA)
- Develop tests and establish limits (ASTM)
- Monitor process and timetable (API/DEOAP)

API Lubricants Group formally approves the new diesel engine oil category



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Base Oil Interchange (BOI)

- Engine oil manufacturers and marketers have needs for flexibility in base oil usage
- BOI Guidelines developed API SG and later
- Ensure the performance of engine oils not affected by use of different base oils
- Defines minimum testing necessary to allow base oil substitution

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Base Oil Interchange

API “S” Category base oil interchange

Table E-2—Tests for API S Category Base Oil Interchange

Test Name	ASTM	Annex E Reference	SJ	SL	SM	SN	Resource Conserving	SN PLUS	ILSAC GF-5
Sequence IIIE	D5533	E.2.2.4.1	X						
Sequence IIIF	D6984	E.2.2.4.1	X	X					
Sequence IIIG/IIIGA/IIIGB	D7320	E.2.2.4.1	X	X	X	X	X		X
Sequence IIIH/IIIHA/IIIHB	D8111	E.2.2.4.1			X	X	X		X
Sequence IVA	D6891	E.2.2.4.2	X	X	X	X			X
Sequence VE	D5302	E.2.2.4.3	X	X					
Sequence VG	D6593	E.2.2.4.3	X	X	X	X			X
Sequence VID	D8114	E.2.2.4.4					X		X
Sequence VIF	D8226	E.2.2.4.5				X			
CRC L-38	D5119	E.2.2.4.6	X						
Sequence VIII	D6709	E.2.2.4.6	X	X	X	X			X
Sequence IX		E.2.2.4.7						X	
Sequence X		E.2.2.4.8							
Ball Rust Test	D6557	E.4.6	X	X	X	X			X
EOFT	D6795	E.4.4	X	X	X	X			X
Filterability - EOWTT	D6794	E.4.5	X	X	X	X			X
Homogeneity & Miscibility	D6922	E.4.4	X	X	X	X			X
TEOST 33/33C	D6335	E.4.2	X						X
TEOST MHT	D7097	E.4.3		X	X	X			X
Aged Oil Low Temp. Vis. ROBO	D7528	E.2.1.7				X			X
Elastomer Compatibility Std. Ref. Elastomers	D7216	E.4.13					X		X

Note: X = Test methods where BOI is defined. Testing requirements can be found in API 1509 Annexes G and Q and/or ASTM D4485.

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Base Oil Interchange

API “C” Category base oil interchange

Table E-13—Tests for API C Category Base Oil Interchange

Test Name	ASTM	Annex E Reference	CH-4	CI-4	CI-4 w/CI-4 PLUS	CJ-4	CK-4/ FA-4
Sequence IIIF/IIIFHD	D6984	E.2.2.4.1	X	X	X	X	
Sequence IIIG	D7320	E.2.2.4.1	X	X	X	X	
CRC L-38	D5119	E.2.2.4.6					
Sequence VIII	D6709	E.2.2.4.6					
Caterpillar 1K	D6750 (1K)	E.3.2.5.1	X	X	X		
Caterpillar 1N	D6750 (1N)	E.3.2.5.2		X	X	X	X
Caterpillar 1P	D6681	E.3.2.5.4	X	X	X		
Caterpillar 1R	D6923	E.3.2.5.3		X	X		
Caterpillar Oil Aeration Test	D8047	E.3.2.5.16					X
Engine Oil Aeration Test	D6894	E.3.2.5.9	X	X	X	X	
Cummins ISM	D7468	E.3.2.5.11		X	X	X	X
Cummins ISB	D7484	E.3.2.5.11				X	X
Cummins M11	D6838	E.3.2.5.10	X				
Cummins M11 EGR	D6975	E.3.2.5.10		X	X		
Mack T-8	D5967	E.3.2.5.6					
Mack T-8E	D5967	E.3.2.5.6	X	X	X		
Mack T-9	D6483	E.3.2.5.5	X				
Mack T-10	D6987/ D6987M	E.3.2.5.7	X	X	X		
Mack T-10A	75 hr. used oil in D4684	E.4.7		X	X		
Mack T-11	D7156	E.3.2.5.13			X	X	X
Mack T-11A	D6896	E.4.10			X	X	X
Mack T-12	D7422	E.3.2.5.12		X	X	X	X
Volvo T-13	D8048	E.3.2.5.15					X
Roller Follower Wear Test	D5966	E.3.2.5.8	X	X	X	X	X
Cummins HTCBT	D6594	E.4.11	X	X	X	X	X
Elastomer Compatibility CI-4	D7216	E.4.8		X	X		
Elastomer Compatibility CJ-4	D7216	E.4.9				X	

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Viscosity Grade Read Across (VGRA)

- Formulation development is an expensive process
- In some cases, data can be extrapolated from one viscosity grade to another
- Viscosity-Grade Engine Testing Guidelines developed
- Developed to improve testing efficiency
- Read—across developed from most difficult grades to less difficult grades
- Difficult grades have more viscosity modifier and higher volatility
- Most bench tests excluded from VGRA

Viscosity Grade Read Across (VGRA)

VGRA example

Table F-5—Groups I, II, III and IV Viscosity Read-Across: Sequence IIIGA and ROBO Test

	Can Be "Read-Across" to:				
Test Run on	5W-20	5W-30	10W	10W-30	10W-40
5W-20	NA	—	X	X	—
5W-30	X	NA	X	X	X
10W-30	—	—	X	NA	X
10W-40	—	—	X	X	NA

Notes:

1. X = read-across is permitted for the viscosity grades identified based on data and some applications of the technical principles approved by API BOI/VGRA Task Force and API Lubricants Committee. Viscosity modifier content must be no more than 1.5 times higher than the viscosity modifier content in the oil on which the test was run.
2. A dash (—) means that read-across is not permitted; NA = not applicable.
3. Tested formulations containing Group V stocks must contain an equal amount of the same Group V base stock (e.g., ester) in the finished oil blend for application of viscosity grade read-across.

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Category Life Oversight Group

- Category Life Oversight Group
- Monitor tests used in categories and recommend replacement tests if necessary
- Tests included in any category are subject to a life cycle
- Hardware becomes unavailable
- Engine test effectiveness can diminish
- If replacements tests unavailable, alerts API and Lubricants Group
- API can determine if a category should become obsolete

Additional Engine Oil Standards

API 1525 - *Bulk Oil Testing, Handling, and Storage Guidelines*

- Second Edition published March 2021
- Recommended practices for:
  - Facility and equipment standards
  - Sampling and testing
  - Bulk oil storage
  - Loading/Unloading procedures
  - Packaging
  - Record Keeping

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Additional Engine Oil Standards

API 1525**A** - *Bulk Engine Oil Chain of Custody and Quality Documentation*

- Second Edition published November 2021
- Provides general principles
- Chain-of-custody requirements for the entire finished lubes supply chain:
  - Marketers/Blenders supplying distributors
  - Distributors of bulk oils
  - Installer ordering, receipt and installation of bulk oils

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Additional Engine Oil Standards

API 1560 - *Lubricant Service Designations for Automotive Manual Transmissions, Manual Transaxles, and Axles*

- Lubricant Service Designations for Automotive Manual Transmissions, Manual Transaxles, and Axles
- Latest version is 2013 and free to download (will be updated 2022)
- Intended to assist manufacturers and users in selection of appropriate lubricants for purpose
- Describes service designations in current use
- Also list older designations no longer in use

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On the horizon…

API developing a new Recommended Practice

- Work group assembled in late 2021
  - The established goals of the Work Group are as follows:
  - Define terminology and identify the best practices for assessing life cycle emissions of lubricants and specialty products in the marketplace to promote consistency across the industry,
  - Produce an API Recommended Practice (RP) and make it available to the broader industry and regulators for reference or citation,
  - Coordinate and liaise with industry groups regarding global sustainability efforts underway with ILMA, ATIEL, UEIL and others.
- Publication Target: 2022

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Questions before lunch?

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Current API Gasoline Engine Oil Categories

SJ 1996
- Lower Phosphorus
- Lower Volatility

SL 2001
- Lower Wear
- Lower Volatility
- More Oxidation Control

SM 2004
- Improved oxidation resistance & deposit protection
- Better Wear Protection
- Better Low-Temperature Performance

SN 2010
- Improved High-Temperature Deposit Protection
- More Stringent Sludge Control
- Elastomer Seal Compatibility

SP 2020
- LSPI (Low Spark Pre-Ignition and timing chain protection
- Fuel economy and fuel economy retention
- Better engine durability and wear protection

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Current Standards

STANDARD FOR GASOLINE ENGINE OILS (Follow your vehicle manufacturer's recommendations on oil performance levels)

Category	Status	Service
SP	Current	Introduced in May 2020, designed to provide protection against low-speed pre-ignition (LSPI), timing chain wear protection, improved high temperature deposit protection for pistons and turbochargers, and more stringent sludge and varnish control. API SP with Resource Conserving matches ILSAC GF-6A by combining API SP performance with improved fuel economy, emission control system protection and protection of engines operating on ethanol-containing fuels up to E85.
SN	Current	For 2020 and older automotive engines.
SM	Current	For 2010 and older automotive engines.
SL	Current	For 2004 and older automotive engines.
SJ	Current	For 2001 and older automotive engines.

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Current ILSAC Oil Categories

GF-1 1994	• API EOLCS • ACC Code of Practice
GF-2 1996	• Lower phosphorus • Lower volatility • Better fuel economy
GF-3 2001	• Lower wear & volatility • Increased oxidation control • Improved Fuel Economy
GF-4 2004	• Improved oxidation resistance & deposit protection • Improved wear protection • Low-temperature performance & Better *fuel economy*
GF-5 2010	• Improved High-Temperature Deposit Protection & Sludge Control • Seal Compatibility, Improved fuel economy, Turbo Protection, • Emission Control System Compatibility, • Protection of engines operating on fuel up to E85
GF-6A GF-6B 2020	• LSPI (Low Spark Pre-Ignition and timing chain protection • Fuel economy and fuel economy retention • Better engine durability and wear protection

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Current Standards

ILSAC STANDARDS FOR PASSENGER CAR GASOLINE ENGINE OILS		
Name	**Status**	**Service**
GF-6A	**Current**	Introduced in May 2020, designed to provide protection against low-speed pre-ignition (LSPI), timing chain wear protection, improved high temperature deposit protection for pistons and turbochargers, more stringent sludge and varnish control, improved fuel economy, enhanced emission control system protection and protection of engines operating on ethanol-containing fuels up to E85.
GF-6B	**Current**	**Applies only to oils having an SAE viscosity grade of 0W-16.** Introduced in May 2020, designed to provide protection against low-speed pre-ignition (LSPI), timing chain wear protection, high temperature deposit protection for pistons and turbochargers, stringent sludge and varnish control, improved fuel economy, emission control system protection and protection of engines operating on ethanol-containing fuels up to E85.
GF-5	**Obsolete***	Use GF-6A where GF-5 is recommended.

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Engine Oil Categories are Performance Based

Passenger Car Engine Oil Laboratory/Bench Test and Engine Test Requirements For API SN-RC/ILSAC GF-5 Categories

Requirements	Test Method	Properties	Unit	Limits SN-RC/GF-5
1. LABORATORY/BENCH TESTS				
Viscosity Grades	SAE J300	All those that apply, typically SAE 0W-20, 0W-30, 5W-20, 5W-30 and 10W-30	Manufacturer sets targets within SAE J300 specification	
Foam Tests	ASTM D892, Option A ASTM D6082, Option A	Sequence I, tendency/stability [11], [12] Sequence II, tendency/stability [11], [12] Sequence III, tendency/stability [11], [12] Sequence IV, tendency/stability [11]	ml ml ml ml	10/0 max 50/0 max 10/0 max 100/0 max
EOFT	ASTM D6795	Filterability	% flow reduction	50 max
EOWTT	ASTM D6794	Filterability with 0.6% Water Filterability with 1.0% Water Filterability with 2.0% Water Filterability with 3.0% Water	% flow reduction % flow reduction % flow reduction % flow reduction	50 max 50 max 50 max 50 max
Aged Oil Low-Temperature Pumpability	ASTM D4684	MRV TP-1 Apparent Viscosity and Yield Stress	cP and Pa	<60,000 cP with no yield stress [16] [17]
TEOST 33C	ASTM D6335	High temperature deposits	total deposit weight, mg	30 max [1], [2], [15]
TEOST MHT [9]	ASTM D7097	High temperature deposits	deposit weight, mg	35 max [3]
Emulsion retention	ASTM D7563	Oil mixed with 10% Water and 10% E85	0°C and 25°C @ 24 hours	No water separation [2], [15]
Homogeneity & Miscibility	ASTM D6922	Oil Compatibilty	None	Pass [13]
Gelation Index [5]	ASTM D5133	Scanning Brookfield Viscosity, Yield Stress	Calculated	12 max [2], [14]
Volatility	ASTM D5800 ASTM D6417	Evaporation Loss (Noack) Simulated distillation (GCD)	% off @ 250°C % off @ 371°C	15 max [8] 10 max
Ball Rust Test [5]	ASTM D6557	Rust rating	Average Gray Value	100 min
Elastomer compatibility	ASTM D7216, Annex A2			
Polyacrylate Rubber ACM-1 (SAE J2643)	ASTM D471 ASTM D2240 ASTM D412	Volume Hardness Tensile strength	% change pts % change	-5,9 -10,10 -40,40
Hydrogenated Nitrile HNBR-1 (SAE J2643)	ASTM D471 ASTM D2240 ASTM D412	Volume Hardness Tensile strength	% change pts % change	-5,10 -10,5 -20,15
Silicone Rubber VMQ-1 (SAE J2643)	ASTM D471 ASTM D2240 ASTM D412	Volume Hardness Tensile strength	% change pts % change	-5,40 -30,10 -50,5
Fluorocarbon Rubber FKM-1 (SAE J2643)	ASTM D471 ASTM D2240 ASTM D412	Volume Hardness Tensile strength	% change pts % change	-2,3 -6,6 -65,10
Ethylene Acrylic Rubber AEM-1 (SAE J2643)	ASTM D471 ASTM D2240 ASTM D412	Volume Hardness Tensile strength	% change pts % change	-5,30 -20,10 -30,30
Phosphorus [9]	ASTM D4951	Phosphorus content	%	0.06 min [10]
Phosphorus [9]	ASTM D4951	Phosphorus content	%	0.08 max [4], [10]
Sulfur [9]	ASTM D4951 or	Sulfur content of SAE 0W and 5W multigrades	%	0.5 max [4], [10]
Sulfur [9]	ASTM D2622	Sulfur content of SAE 10W multigrades	%	0.6 max [4], [10]
2. ENGINE TESTS				
Sequence IIIG	ASTM D7320	Kinematic Viscosity increase Average weighted piston deposits Average cam plus lifter wear Hot stuck rings	% @ 40°C after 100 hours merits microns #	150 max 4.0 min 60 max none
Sequence IIIGB	ASTM D7320	Phosphorus retention	%	79 min [2], [15]
Sequence IVA	ASTM D6891	Average Cam wear (7 position avg.)	microns	90 max
Sequence VG [5]	ASTM D6593	Average engine sludge Average rocker cover sludge Average piston skirt varnish Average engine varnish Oil screen sludge Hot stuck compression rings Cold stuck rings Oil ring clogging Oil screen debris	merits merits merits merits % area # # % area % area	8.0 min 8.3 min 7.5 min 8.9 min 15 max none rate & report rate & report rate & report
Sequence VIII	ASTM D6709	Bearing weight loss 10-hour stripped Kinematic Viscosity	mg cSt @ 100°C	26 max Stay in original viscosity grade
Sequence VID [2], [6], [15] (Required for ILSAC GF-5 and SN-RC only)	ASTM D7589 SAE 0W-20 and 5W-20 viscosity grades	FEI SUM min / FEI2 min	% FEI SUM / % FEI2	2.6 min / 1.2 min
	SAE 0W-30 and 5W-30 viscosity grades	FEI SUM min / FEI2 min	% FEI SUM / % FEI2	1.9 min / 0.9 min
	SAE 10W-30 and all other viscosity grades	FEI SUM min / FEI2 min	% FEI SUM / % FEI2	1.5 min / 0.6 min

API Engine Oil Classification Summary Courtesy of Infineum

https://www.infineuminsight.com/en-gb/resources/brochures/api-engine-oil-classifications-brochure/

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Obsolete Gasoline Engine Oil Standards

SA	• Pre 1930
SB	• 1930–1963
SC	• 1964–1967
SD	• 1968–1971
SE	• 1972–1979
SF	• 1980–1988
SG	• 1989–1993
SH	• 1993–1996

ILSAC GF-5 and earlier

OBSOLETE!!

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Current Heavy-Duty Engine Oil Categories

CH-4 1998
- On Highway, High-Speed
- 1998 Emissions Standard Limits

CI-4 2002
- On Highway, High-Speed, 4-Stroke Engines
- Oil Sheer Stability / Protection Soot Vis. Increase
- 2004 Emissions Standard Limits

CJ-4 2006
- On Highway, High-Speed, 4-Stroke Engines
- Ultra-Low Sulfur Diesel Fuel (15 PPM max. Sulfur)
- 2010 Emissions Standard Limits

CK-4 2015
- On Highway, High-Speed
- Two Subcategories: Heavy Duty and Low Viscosity
- Reduced Green House Gas Emissions

? 2027
- Increased wear protection?
- Improved oxidation performance?
- Addition of lower viscosities?

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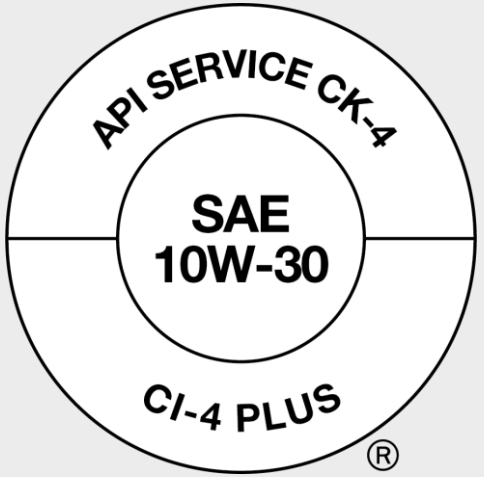
Current Standards

DIESEL ENGINES (Follow your vehicle manufacturer's recommendations on oil performance levels)		
Category	**Status**	**Service**
CK-4	**Current**	API Service Category CK-4 describes oils for use in high-speed four-stroke cycle diesel engines designed to meet 2017 model year on-highway and Tier 4 non-road exhaust emission standards as well as for previous model year diesel engines. These oils are formulated for use in all applications with diesel fuels ranging in sulfur content up to 500 ppm (0.05% by weight). However, the use of these oils with greater than 15 ppm (0.0015% by weight) sulfur fuel may impact exhaust aftertreatment system durability and/or oil drain interval. These oils are especially effective at sustaining emission control system durability where particulate filters and other advanced aftertreatment systems are used. API CK-4 oils are designed to provide enhanced protection against oil oxidation, viscosity loss due to shear, and oil aeration as well as protection against catalyst poisoning, particulate filter blocking, engine wear, piston deposits, degradation of low- and high-temperature properties, and soot-related viscosity increase. API CK-4 oils exceed the performance criteria of API CJ-4, CI-4 with CI-4 PLUS, CI-4, and CH-4 and can effectively lubricate engines calling for those API Service Categories. When using CK-4 oil with higher than 15 ppm sulfur fuel, consult the engine manufacturer for service interval recommendations.
CJ-4	**Current**	Introduced in 2010. For high-speed four-stroke cycle diesel engines designed to meet 2010 model year on-highway and Tier 4 non-road exhaust emission standards as well as for previous model year diesel engines. These oils are formulated for use in all applications with diesel fuels ranging in sulfur content up to 500 ppm (0.05% by weight). However, the use of these oils with greater than 15 ppm (0.0015% by weight) sulfur fuel may impact exhaust aftertreatment system durability and/or drain interval. API CJ-4 oils exceed the performance criteria of API CI-4 with CI-4 PLUS, CI-4, CH-4, CG-4, and CF-4 and can effectively lubricate engines calling for those API Service Categories. When using CJ-4 oil with higher than 15 ppm sulfur fuel, consult the engine manufacturer for service interval.
CI-4	**Current**	Introduced in 2002. For high-speed, four-stroke engines designed to meet 2004 exhaust emission standards implemented in 2002. CI-4 oils are formulated to sustain engine durability where exhaust gas recirculation (EGR) is used and are intended for use with diesel fuels ranging in sulfur content up to 0.5% weight. Can be used in place of CD, CE, CF-4, CG-4, and CH-4 oils. Some CI-4 oils may also qualify for the CI-4 PLUS designation.
CH-4	**Current**	Introduced in 1998. For high-speed, four-stroke engines designed to meet 1998 exhaust emission standards. CH-4 oils are specifically compounded for use with diesel fuels ranging in sulfur content up to 0.5% weight. Can be used in place of CD, CE, CF-4, and CG-4 oils.



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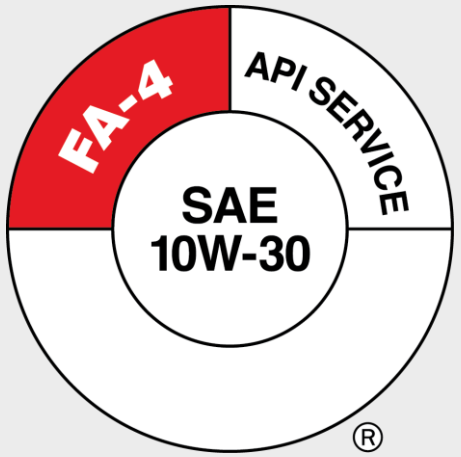
Current Standards

DIESEL ENGINES (Follow your vehicle manufacturer's recommendations on oil performance levels)		
Category	**Status**	**Service**
FA-4	**Current**	API Service Category FA-4 describes certain XW-30 oils specifically formulated for use in select high-speed four-stroke cycle diesel engines designed to meet 2017 model year on-highway greenhouse gas (GHG) emission standards. These oils are formulated for use in on-highway applications with diesel fuel sulfur content up to 15 ppm (0.0015% by weight). Refer to individual engine manufacturer recommendations regarding compatibility with API FA-4 oils. These oils are blended to a high temperature high shear (HTHS) viscosity range of 2.9cP–3.2cP to assist in reducing GHG emissions. These oils are especially effective at sustaining emission control system durability where particulate filters and other advanced aftertreatment systems are used. API FA-4 oils are designed to provide enhanced protection against oil oxidation, viscosity loss due to shear, and oil aeration as well as protection against catalyst poisoning, particulate filter blocking, engine wear, piston deposits, degradation of low- and high-temperature properties, and soot-related viscosity increase. API FA-4 oils are not interchangeable or backward compatible with API CK-4, CJ-4, CI-4 with CI-4 PLUS, CI-4, and CH-4 oils. Refer to engine manufacturer recommendations to determine if API FA-4 oils are suitable for use. API FA-4 oils are not recommended for use with fuels having greater than 15 ppm sulfur. For fuels with sulfur content greater than 15 ppm, refer to engine manufacturer recommendations.



American Petroleum Institute

Engine Oil Categories are Performance Based

Heavy-Duty Diesel Engine Oil Requirements For API CK-4 and API FA-4 Categories

Requirements	Test Method	Properties		Unit	Limits CK-4	Limits FA-4
1. LABORATORY TESTS FOR API CK-4 and API FA-4						
1.1 Viscosity Grades		SAE J300			xW-30, xW-40	xW-30
1.2 High Temperature/ High Shear	ASTM D4683 or ASTM D4171 or ASTM D5481	Viscosity @ 150° C xW-30 Grades xW-30 Grades xW-40 Grades		cP cP cP	3.5 min n/a Meets SAE J300	2.9 min 3.2 max n/a
1.3 Shear Stability	ASTM D7109	KV after 90 pass, shearing, @ 100° C xW-30 0W-40 Other xW-40 HTHS Viscosity @150° C min xW-30 grades		cSt cSt cSt cP	9.3 min 12.5 min 12.8 min 3.4 min	9.3 min n/a n/a 2.8 min
1.4 Chemical Limits [10]	ASTM D4951 ASTM D4951 ASTM D874	Mass fraction phosphorous [26] Mass fraction sulfur Mass fraction sulfated ash		% % %	0.12 max 0.4 max 1.0 max	
1.5 Noack Volatility	ASTM D5800	Evaporative loss @ 250° C		%	13 max	
1.6 Foaming	ASTM D892	Sequence I Sequence II Sequence III		tend/stab ml	10/0 max 20/0 max 10/0 max	
1.7 High Temperature Corrosion Bench Test, 135° C.	ASTM D6594	Copper, used oil increase Lead, used oil increase Copper Strip Rating		ppm ppm –	20 max 120 max 3 max	
1.8 Seal Compatibility	ASTM D7216	Volume Change, %	Hardness, pts	Tensile strength, %	Elongation, %	
	Nitrile (NBR) Silicone (VMQ) Polyacrylate (ACM) Fluoroelastomer (FKM) Vamac G	+5/-3 +TMC 1006/-3 +5/-3 +5/-2 +TMC 1006/-3	+7/-5 +5/-TMC 1006 +8/-5 +7/-5 +5/-TMC 1006	+10/-TMC 1006 +10/-45 +18/-15 +10/-TMC 1006 +10/-TMC 1006	+10/-TMC 1006 +20/-30 +10/-35 +10/-TMC 1006 +10/-TMC 1006	
2. ENGINE TESTS FOR API CK-4 and API FA-4		Rated or Measured Parameter		Unit	Primary Performance Criteria 1 Test	2 Tests / 3 Tests
2.1 Mack T-11	ASTM D7156	TGA % Soot @ 4.0 cSt TGA % Soot @ 12.0 cSt TGA % Soot @ 15.0 cSt		% % %	3.5 min 6.0 min 6.7 min	3.4 min / 3.3 min 5.9 min / 5.9 min 6.6 min / 6.5 min
2.1a Sooted Oil MRV	ASTM D6896	Viscosity, 180 hour sample from Mack T-11 or T-11A Viscosity @-20° C Yield Stress		cP Pa	25,000 max </= 35 max	
2.2 Mack T-12	ASTM D7422	Top Ring Mass Loss Cylinder Liner Wear		mg µm	<35 max	105 max / 105 max 24.0 max / 24.0 max
2.3 Cummins ISB	ASTM D7484	Slider tappet mass loss, average Cam lobe wear, average Crosshead mass loss, average		mg µm mg	100 max 55 max Report	108 max / 112 max 59 max / 61 max Report / Report
2.4 Cummins ISM	ASTM D7468	Merit rating Top Ring Mass Loss		Merits mg	1000 min [27] 100 max	1000 min [27] / 1000 min [27] 100 max / 100 max
2.5 Caterpillar 1N	ASTM D6750	Weighted demerits (WDN) Top groove fill (TGF) Top land heavy carbon (TLHC) Oil consumption, (0 h – 252 h) Piston, ring, and liner scuffing Piston ring sticking		Demerits % % g/kWh	286.2 max 20 max 3 max 0.54 max None None	311.7 max / 323.0 max 23 max / 25 max 4 max / 5 max 0.54 max / 0.54 max None / None None / None
2.6 Caterpillar C13	ASTM D7549	Merit rating Hot stuck piston rings		Merit	1000 min [27] None	1000 min [27] / 1000 min [27] None / None
2.7 COAT	ASTM D8047	Average Aeration, 40 h to 50 h		%	11.8 max	11.8 max / 11.8 max
2.8 Roller Follower Wear Test	ASTM D5966	Average pin wear		mils (µm)	0.30 max (7.6 max)	0.33 max / 0.36 max (8.4 max) / (9.1 max)
2.9 Volvo T-13	ASTM D8048	T-13 FTIR Peak Height Oxidation at EOT, Abs. Kinematic Viscosity Increase at 40° C (300 h-360 h) max Avg. Oil Consumption, 48 h to 192 h, max		cm^{-1} % g/h	125 75 Report	130 / 133 85 / 90 Report / Report

5

API Engine Oil Classification Summary Courtesy of Infineum

https://www.infineuminsight.com/en-gb/resources/brochures/api-engine-oil-classifications-brochure/

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Obsolete Heavy Duty Engine Oil Standards

CD	• 1955–1990
CE	• 1987–1995
CD-II	• 1987–1995
CF-4	• 1990–2008
CF	• 1994–2010
CF-2	• 1994–2010
CG-4	• 1995–2009

American Petroleum Institute

API Quality Marks

Capacities and Specifications

E276075

We recommend Motorcraft® motor oil for your vehicle. If Motorcraft® oil is not available, use motor oils of the recommended viscosity grade that meet API SN requirements and display the API Certification Mark for gasoline engines. Do not use oil labeled with API SN service category unless the label also displays the API certification mark.

E142732

An oil that displays this symbol conforms to current engine, emission system and fuel economy performance standards of ILSAC.

Do not use supplemental engine oil additives because they are unnecessary and could lead to engine damage that may not be covered by your vehicle warranty.

Note: *We recommend using DOT 4 Low Viscosity (LV) High Performance Brake Fluid or equivalent meeting WSS-M6C65-A2. Use of any fluid other than the recommended fluid may cause degraded brake performance and not meet our performance standards. Keep brake fluid clean and dry. Contamination with dirt, water, petroleum products or other materials may result in brake system damage and possible failure.*

Note: *Automatic transmissions that require MERCON ULV transmission fluid should only use MERCON ULV transmission fluid. The use of any other fluid may cause transmission damage.*

Alternative Engine Oil for Extremely Cold Climates

To improve engine cold start performance, we recommend that you use the following alternative engine oil in extremely cold climates, where the ambient temperature reaches -22.0°F (-30°C) or below.

Materials

Name	Specification
Engine Oil - SAE 0W-30	WSS-M2C953-B1

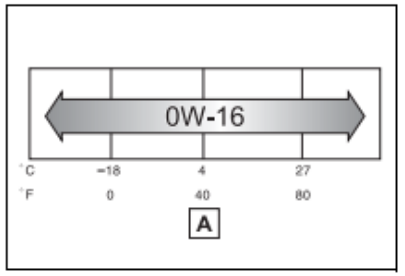
ine Motor Oil" or equivalent to satisfy the following grade and viscosity.

Oil grade:
API SN/RC multigrade engine oil

Recommended viscosity:
SAE 0W-16

SAE 0W-16 is the best choice for good fuel economy and good starting in cold weather.

If SAE 0W-16 is not available, SAE 0W-20 oil may be used. However, it must be replaced with SAE 0W-16 at the next oil change.



viscosity (one with a higher value) may be better suited if the vehicle is operated at high speeds, or under extreme load conditions.

How to read oil container labels:

API registered marks is added to some oil containers to help you select the oil you should use.

American Petroleum Institute

API Quality Marks

Engine Oil — Gas Engine

Change Engine Oil

The oil change indicator system will remind you that it is time to take your vehicle in for scheduled maintenance. Refer to the "Maintenance Plan" for further information.

NOTE:
Under no circumstances should oil change intervals exceed 10,000 miles (16,000 km), twelve months or 350 hours of engine run time, whichever comes first. The 350 hours of engine run or idle time is generally only a concern for fleet customers.

Gasoline Engine Oil Selection

For best performance and maximum protection under all types of operating conditions, the manufacturer only recommends engine oils that are API Certified and meet the requirements of FCA Material Standard MS-6395.

American Petroleum Institute (API) Engine Oil Identification Symbol

This symbol means that the oil has been certified by the American Petroleum Institute (API). The manufacturer only recommends API Certified engine oils.

This symbol certifies 0W-20, 5W-20, 0W-30, 5W-30 and 10W-30 engine oils.

CAUTION!
Do not use chemical flushes in your engine oil as the chemicals can damage your engine. Such damage is not covered by the New Vehicle Limited Warranty.

Engine Oil Viscosity — 3.6L Engine

Mopar SAE 0W-20 engine oil approved to FCA Material Standard MS-6395 is recommended for all operating temperatures. This engine oil improves low temperature starting and vehicle fuel economy.

The engine oil filler cap also shows the recommended engine oil viscosity for your engine. For information on engine oil filler cap location, refer to the "Engine Compartment" illustration in this section.

Lubricants which do not have both the engine oil certification mark and the correct SAE viscosity grade number should not be used.

Engine Oil Viscosity (SAE Grade) — 5.7L Engine

Mopar SAE 5W-20 engine oil approved to FCA Material Standard MS-6395 such as Pennzoil, Shell Helix or equiva-

American Petroleum Institute

API Quality Marks

2 Lubricating Oil Requirements

2.1 Lubricating Oil Requirements

In general, lubricating oil selection for Detroit™ engines is based on viscosity grade and service category as defined by industry standards and is displayed in the API symbol shown in the following section. Oils identified by this system and licensed by API provide adequate service in most applications. In 2002, Detroit™ initiated additional criteria to these requirements through the use of Detroit Fluids Specifications which resulted in a listing of preferred oils for Detroit™ engines.

NOTE: For 2-cycle and all Off-Highway engine lubricating oil, fuel, and coolant requirements, refer to MTU Technical Publication, Fluids and Lubricants, Specification Bulletin, A001061/35E (or most recent). This bulletin is available from authorized MTU distributors.

2.2 Identification of API Service Classification

Below are examples of American Petroleum Institute (API) certification donuts for the most current diesel engine oil categories.

Figure 1. Examples of API Symbols

2.3 API FA-4 Versus API CK-4 and API CJ-4 Versus API CI-4 Plus

API Service Category FA-4 oils are designed primarily for use with EPA10, GHG14, and GHG17 compliant engines equipped with cooled EGR and exhaust aftertreatment devices operating on Ultra-Low Sulfur Diesel (ULSD) fuel (below 15 ppm). These oils are designed with reduced ash and phosphorous content to minimize degradation of aftertreatment devices while providing complete wear, deposit, and soot control.

API Service Category CK-4 and CJ-4 oils are designed primarily for use with EPA07, EPA10, GHG14, and GHG17 compliant engines equipped with cooled EGR and exhaust aftertreatment devices operating on Ultra-Low Sulfur Diesel (ULSD) fuel (below 15 ppm). These oils are designed with reduced ash and phosphorous content to minimize degradation of aftertreatment devices while providing complete wear, deposit, and soot control. API CK-4 and CJ-4 oils may also be used in all diesel engines operating with ULSD fuel.

API Service category CI-4 PLUS oils were designed primarily for use with 2002 EPA emission compliant engines equipped with cooled EGR operating on Low Sulfur Diesel (LSD) fuel (below 500 ppm). These oils are formulated with higher ash and phosphorus content and were not intended for use in engines with aftertreatment devices. Their use in EPA07 engines may cause premature aftertreatment filter plugging.

There is a subtle but important difference between oils meeting the API CI-4 and the API CI-4 PLUS service category. Shortly after their inception, the API CI-4 category requirements were modified for improved soot handling and shear stability. An engine oil formulation that meets the modified requirements would qualify for API CI-4 PLUS. Due to their

American Petroleum Institute

New Standards

Latest in line of Independent Lubricant Specification Advisory Committee (ILSAC) standards

- **GF-5** replacement
- **Backward** compatible
- **SAE** 0W-20, 0W-30, 5W-20, 5W-30, 10W-30
- API Certification Mark **"Starburst"** worthy

American Petroleum Institute

New Standards

Basically GF-6A, but **SAE 0W-16** oils only

- Limits **same** as GF-6A
- **Different** fuel economy test (VIF)
- **Backward** compatible to 0W-16 SN

New **"Shield"** Mark

- **ILSAC** concerned about misapplication
- New Shield and viscosity grade should prevent misapplication and ensure use where **recommended**

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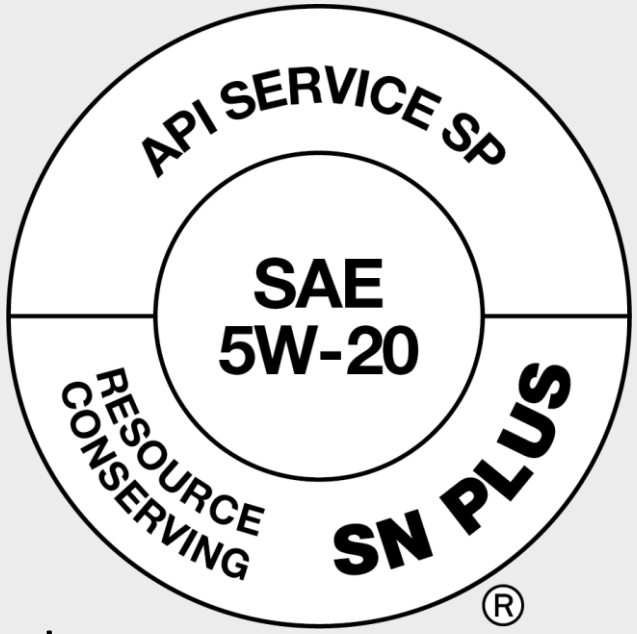
New Standards



Overarching standard

Generally **same requirements** and limits as ILSAC GF-6A and GF-6B

Not all API SP oils meet **fuel economy** requirements

ILSAC GF-6A and GF-6B fit **within API SP**

All licensed oils **eligible** to display API Service Symbol **"Donut"**

American Petroleum Institute

New Standards

1. Sequence **IIIH**

   Oxidation and deposits

   Fiat Chrysler 3.6L Port Fuel Injection (PFI)

2. Sequence **IVB**

   Wear

   Toyota **1.5L** PFI

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New Standards

3. Sequence **VH**
   Sludge and varnish
   Ford **4.6L** PFI
4. Sequence **VIE / VIF**
   Fuel **economy**
   GM **3.6L** PFI
5. Sequence **VIII**
   Corrosion
   CLR test **0.7L** carbureted, single cylinder

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New Standards

6. Sequence IX
   - Low-speed **pre-ignition**
   - Ford **2.0L** Gasoline Direct Injection (GDI)
7. Sequence X
   - Chain **wear**
   - Ford **2.0L** GDI

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New gasoline engine oil standards

- **Improved** engine oils
- Seven new engine tests **more representative** of current and future vehicles
- **More stringent** limits so more robust oil
- **Better** wear protection
- Low-speed preignition and chain wear **protection**
- **Fuel economy** improvement (GF-6A and GF-6B)

American Petroleum Institute

New gasoline engine oil standards

- ILSAC GF-6: First time ILSAC specification has experienced a **“split”**
- Educating **customers and consumers** is imperative
- OEMs now **must recommend very explicit viscosities** for their applications
- **Oil change locations** will need to understand OEM recommendations
- OEMS may request even **lighter viscosity grades** be included in GF-6B
- Development of **new and replacement engine tests** that support API standards

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API's Roles and Responsibilities

- Manage API committees responsible for setting globally-recognized API diesel and gasoline engine oil standards
- Maintain API 1509 standard and provide the standard free of charge
- License marketers and locations meeting relevant standards to use registered API trademarks on products and marketing materials (participation voluntary)
- Operate monitoring and enforcement programs to ensure integrity of marks

American Petroleum Institute

Program Basics

- Voluntary program that defines, certifies, and monitors engine oil performance
- Performance requirements, test methods, and limits cooperatively established by vehicle/engine manufacturers, technical societies, and trade associations
- Licenses use of API Marks on engine oils that meet performance standards

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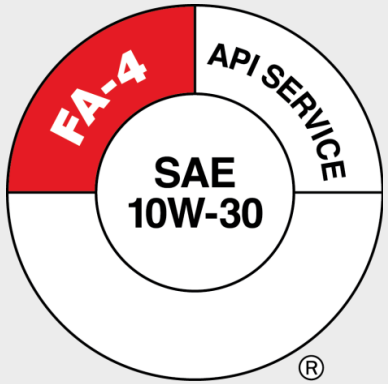
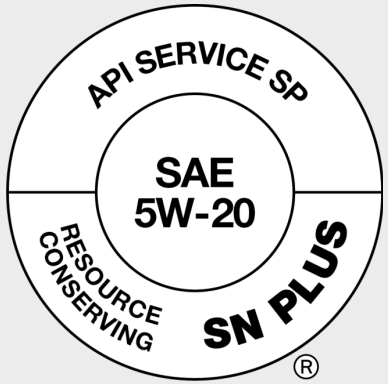
API Quality Marks





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Online EOLCS License Application

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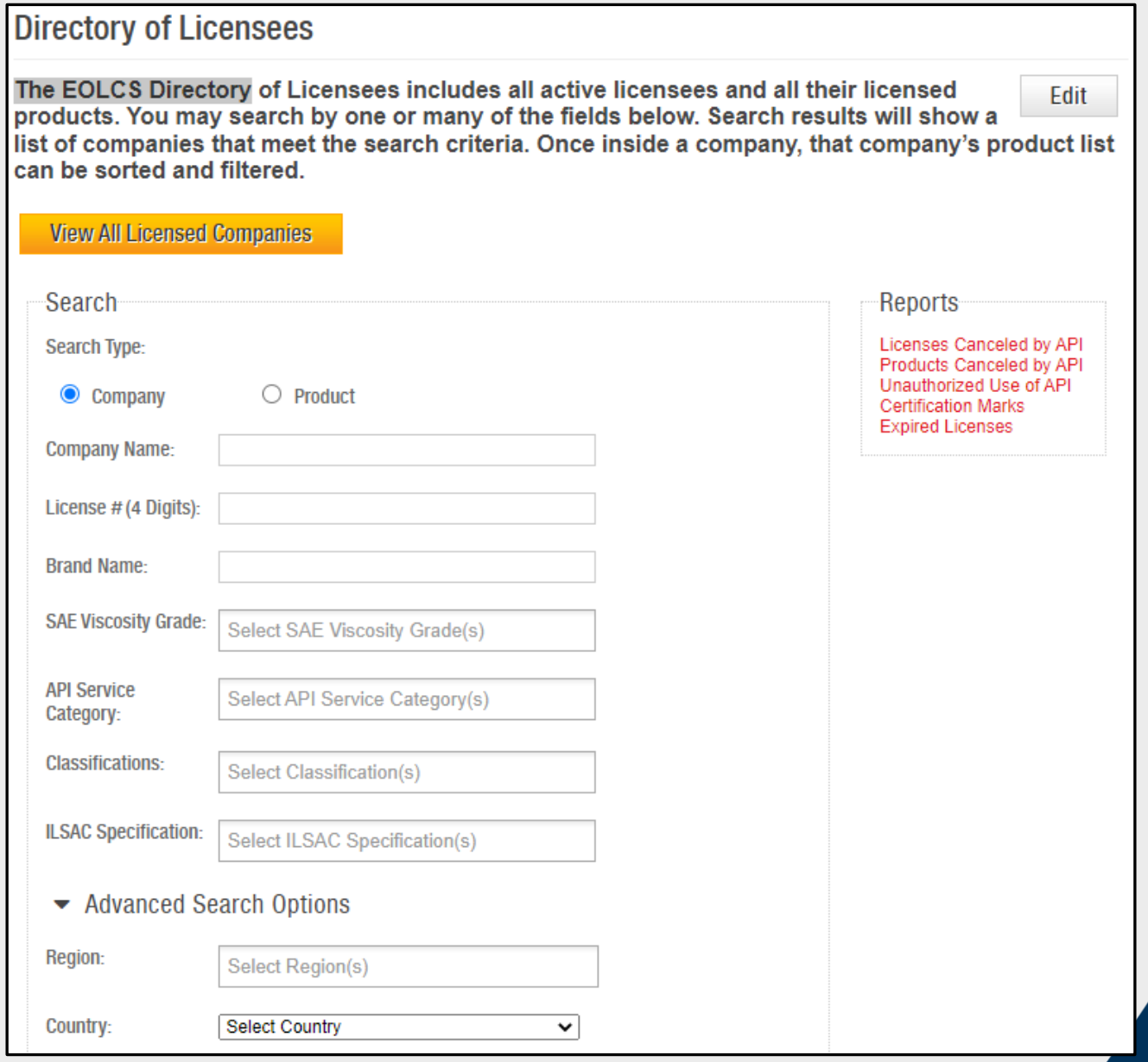
License Requirements

- Company is licensed only after desired product(s) approved
- Product information required:
  - Brand information as it will appear in market
  - Viscosity grade and API categories claimed
  - All individual formulations intended to fill the product:
  - Physical and chemical properties
    - Base oil and additive package specifics
    - Candidate data and more
- Upon approval, this becomes “licensed fingerprint”

EOLCS Directory of Licensees



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Real-time directory listings

Results Detail

Back To Results | Back To Search

Print

Company Information

Company Name:	ABC Oil Company
Corporate Address:	123 Street Anywhere, DC, 11111, South Africa
License Status:	Active
License Number:	100000
Original License Issue Date:	04-May-2017
License Effective Date:	04-May-2019
License Expiration Date:	31-Mar-2020

Products

BRAND NAME	SAE VISCOSITY GRADE	SERVICE CATEGORY	PERFORMANCE DESIGNATION	ILSAC DESIGNATION
ABC Synthetic	15W-40	CI-4/SL	CI-4 PLUS	
ABC Conventional	15W-40	CI-4		
ABC High Mileage	15W-40	SL		
ABC Super	20W-50	SL		

1

Displaying items 1 - 4 of 4

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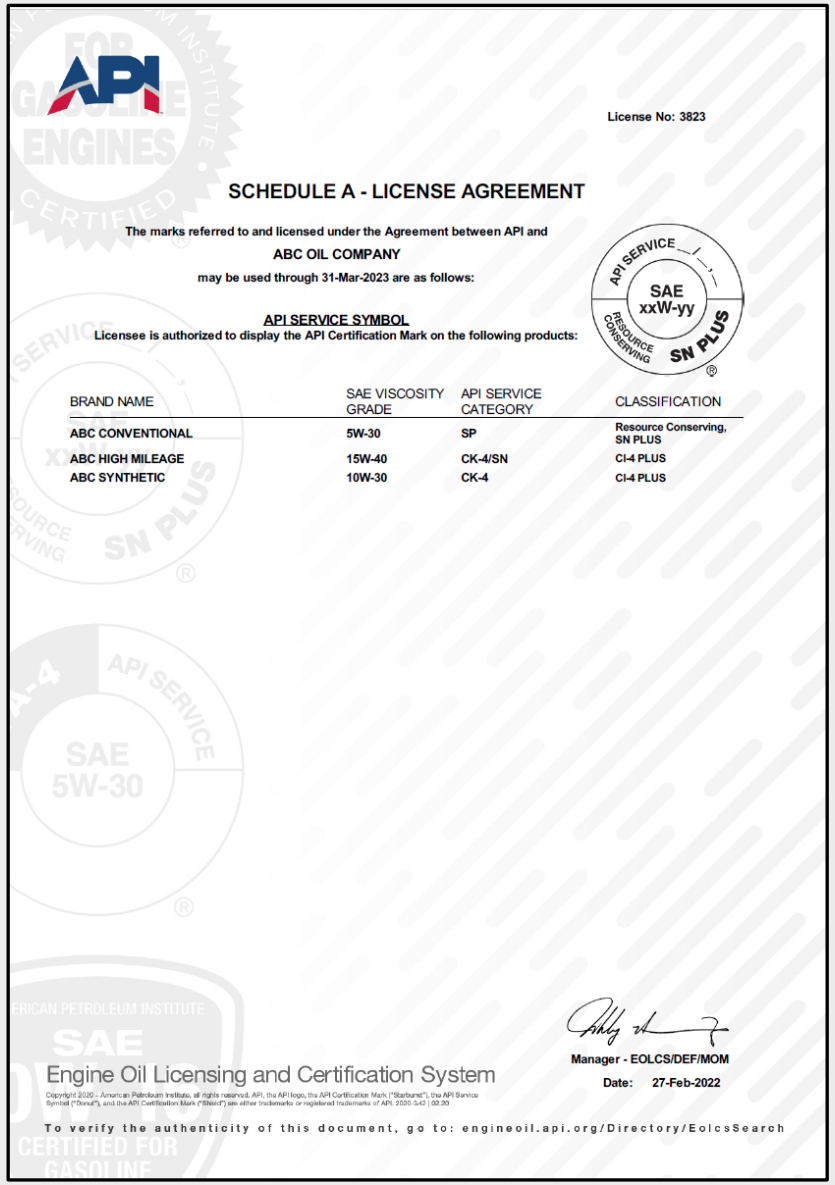
API Certificate



License No: 3823

SCHEDULE A - LICENSE AGREEMENT

The marks referred to and licensed under the Agreement between API and

ABC OIL COMPANY

may be used through 31-Mar-2023 are as follows:

API SERVICE SYMBOL

Licensee is authorized to display the API Certification Mark on the following products:

BRAND NAME	SAE VISCOSITY GRADE	API SERVICE CATEGORY	CLASSIFICATION
ABC CONVENTIONAL	5W-30	SP	Resource Conserving, SN PLUS
ABC HIGH MILEAGE	15W-40	CK-4/SN	CI-4 PLUS
ABC SYNTHETIC	10W-30	CK-4	CI-4 PLUS

Manager - EOLCS/DEF/MOM

Date: 27-Feb-2022

Engine Oil Licensing and Certification System

To verify the authenticity of this document, go to: engineoil.api.org/Directory/EolcsSearch

License No: 3823

SCHEDULE A - LICENSE AGREEMENT

The marks referred to and licensed under the Agreement between API and

ABC OIL COMPANY

may be used through 31-Mar-2023 are as follows:

API CERTIFICATION MARK

Licensee is authorized to display the API Certification Mark on the following products:

BRAND NAME	SAE VISCOSITY GRADE	ILSAC SPECIFICATION
ABC CONVENTIONAL	5W-30	GF-6A

Manager - EOLCS/DEF/MOM

Date: 27-Feb-2022

Engine Oil Licensing and Certification System

To verify the authenticity of this document, go to: engineoil.api.org/Directory/EolcsSearch

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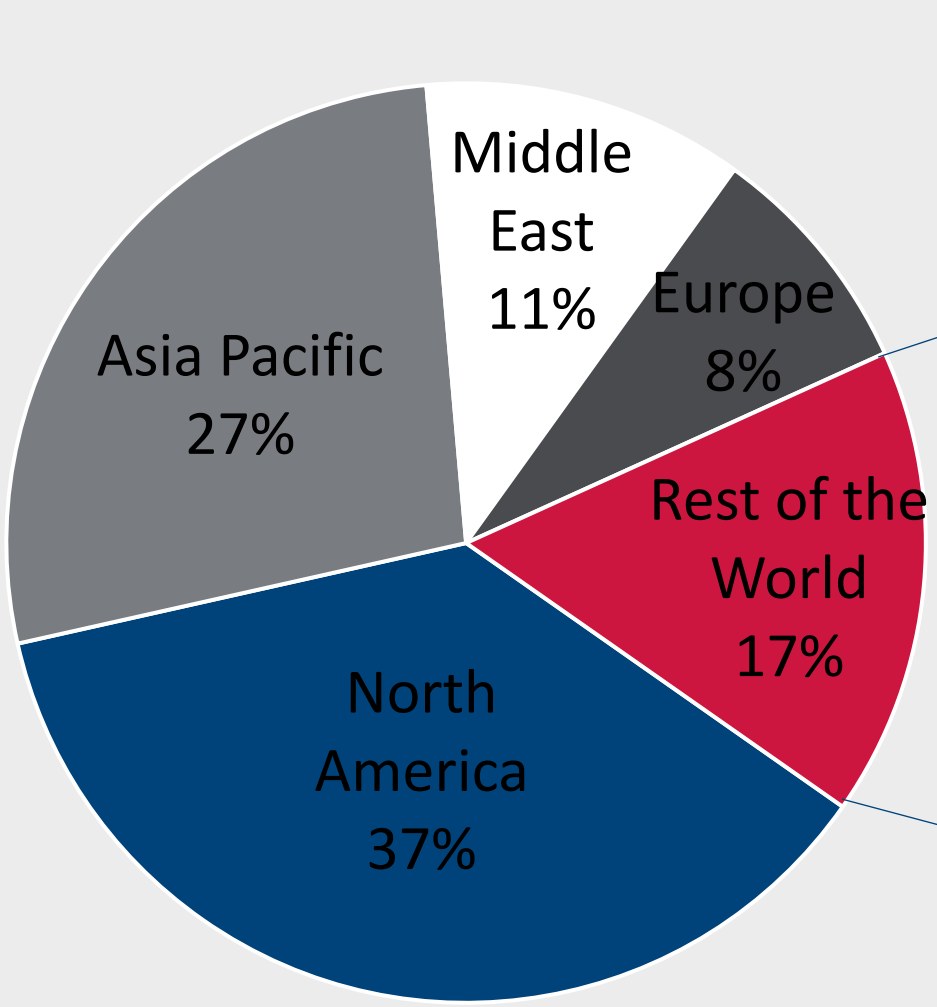
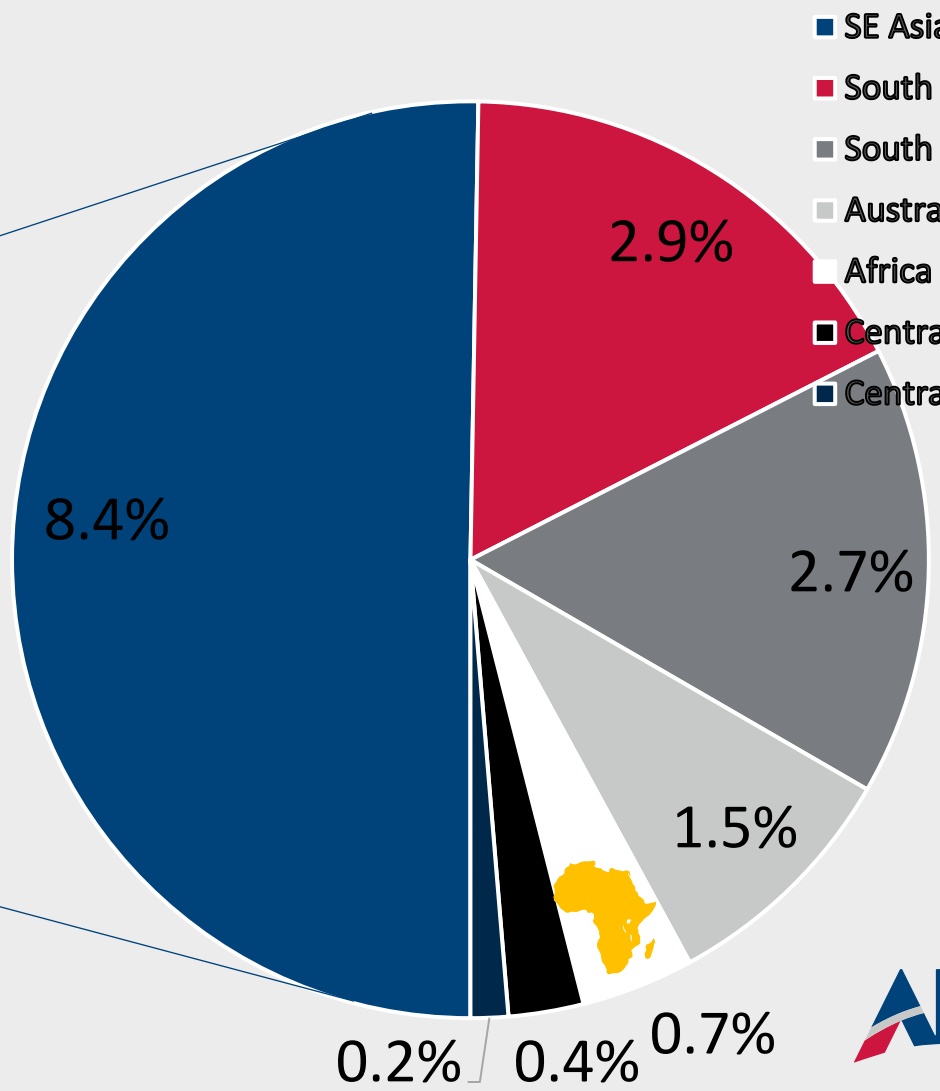
EOLCS – Summary of Licensees

EOLCS Licensees:	903
EOLCS Products:	> 24,000
EOLCS Active Formulations:	> 29,500





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African Statistics

	Licenses
South Africa	2
Uganda	2
Zambia	1
Republic of Angola	1

- 24 licensed products
- Predominantly API CH-4 or CI-4 for diesel engines and API SL for gasoline engines.

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Backed by Aftermarket Audit Program (AMAP)

Primary Goal: Test as many API-licensed products as possible from the broadest geographic area possible

- Packaged and Bulk samples drawn from marketplace annually
- Randomly sampled (some targeted sampling is necessary)
- Receipts obtained to initiate chain of custody
- Products sampled around the world

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AMAP Auditing Methods – Sampling and Testing

- Samples blind-coded and shipped to separate testing lab
- Chain of custody maintained throughout process
- Tested at independent primary lab
  - retested if failure
- Critical failures retested by second independent laboratory for assurance

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Aftermarket Audit-Battery of tests

ASTM Method	Property	PCMO	HDEO	Eligible Viscosities/Categories
D445	Viscosity @ 100°C	X	X	Every oil
D4683	High Shear Viscosity	X	X	Every oil except single W grades, including 90-Pass sheared oils for FA-4
D5293	Cold Crank	X	X	Every oil except single, non-W grades
D4684	Pumping	X	X	Every oil except single, non-W grades
D5800	Volatility	X	X	Every Oil
D892	Foaming	X	X	Every 3rd sample, Option A" Yes for PCMO; Optional for CK-4, CJ-4; No Option A when run for CI-4
D6082	High Temp Foam	X		Every 3rd Oil
D6557	Ball Rust Test	X		For API SJ, SL, SM & SN Oils - Every 10th
D6594	High Temp Corrosion		X	For CH-4, CI-4, CI-4 PLUS, CJ-4, CK-4 & FA-4 Oils - Every 10th
D6278	30 Pass Shear Stability	X	X	For API SL, SM, SN, CH-4, CI-4 Oils - Every 10th
D7109	90 Pass Shear Stability		X	For API CJ-4, CK-4, FA-4 & CI-4 PLUS Oils - Every 10th
D7528	ROBO - MRV	X		For API SM & SN, GF-5 Grades only - Every 10th
D2896	Total Base Number	X	X	For SN/RC, GF-5 & HDEO Oils - Every Oil
D4951	Additive Elements by ICP	X	X	Every oil

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Aftermarket Audit – Evaluation Methods

- Evaluated against specification limits + Reproducibility
- Results compared to formulations on file
- Non-compliances judged for level of criticality
- Package labels audited for conformance
  - Proper use of API trademarks
  - Product Traceability code
- Bulk oil receipts may be reviewed for required information

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Aftermarket Audit - Reporting

- Report issued to marketer (if known)
- Licensees notified of results via online audit system
- In-depth test results share and compared to specification limits
- Retailer may be notified of pass / fail
- Emphasis placed on confidentiality of test results

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Aftermarket Audit - Resolution

- Response loop with marketer until API satisfied issue has been resolved
- Enforcement action taken as needed:
  - Cancellation of product
  - Cancellation of entire license
  - Recall of product
  - Legal actions may be taken

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Aftermarket Audit Program - Summary

	2020	2021
Products analysed	1350	903*
Bottles / Bulk	78% / 22%	76% / 24%
PCMO / HDEO	81% / 19%	85% / 15%
North America / ROW	59% / 41%	75% / 25%
0W-20	14%	10%
5W-20	17%	17%
5W-30	23%	29%
10W-30	11%	12%
10W-40	6%	7%
15W-40	11%	14%
All other grades	18%	11%

* 1080 total products sampled and in testing

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Counterfeiting – A widespread industry issue

- Hurts the consumer
- Can compromise engine performance
- Harms the integrity of the industry
- Not limited to any single region or country
- No lubricant marketer or brand name is immune
- No format is safe
- Chain of custody and testing = prevention

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Counterfeiting – Trademark infringement examples

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Counterfeiting – Exposing the problems

- Collectors trained to look for counterfeit oils in the field
- API receives tips routinely
- API may dispatch collector to secure samples
- Chain of custody ensured
- Samples tested and evaluated as normal
- If you see something, say something! Email eolcs@api.org

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Counterfeiting - Finding solutions

- API works with licensed oil marketers when their products suspected of counterfeiting
  - Test results and source info provided
  - Samples sent when requested
  - Marketer to investigate further
- If unlicensed company, demands issued:
  - Cease use of the marks or claims
  - Recall product
  - Alert customers and provide public notification

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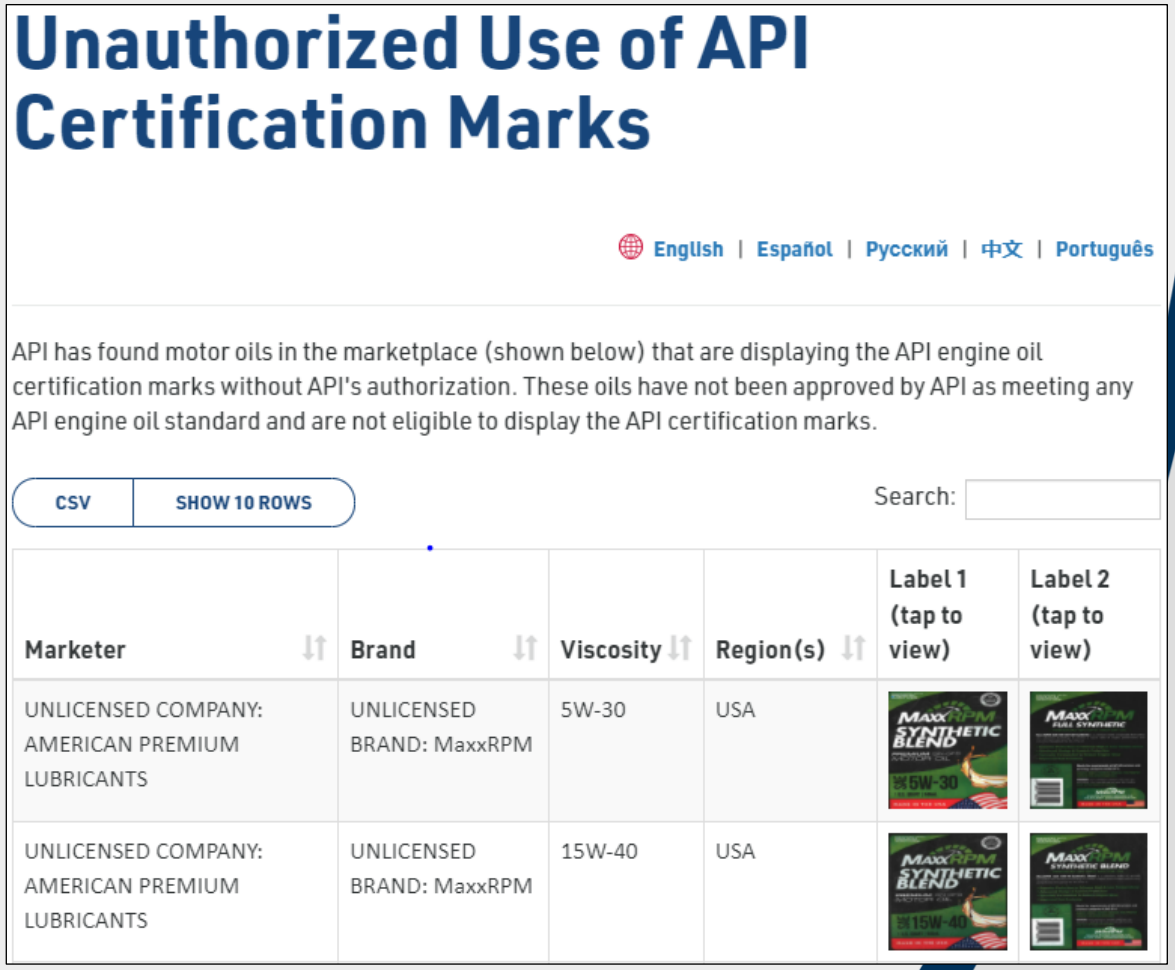
API's Unauthorized oils page

- Developed a public posting of unauthorized usage of engine oil trademarks
- Accompanied by social media postings
- Entries remain until marketer meets API demands
- Has been successful in reducing the number of trademark violations encountered



Unauthorized Use of API Certification Marks

English | Español | Русский | 中文 | Português

API has found motor oils in the marketplace (shown below) that are displaying the API engine oil certification marks without API's authorization. These oils have not been approved by API as meeting any API engine oil standard and are not eligible to display the API certification marks.

CSV | SHOW 10 ROWS

Search:

Marketer	Brand	Viscosity	Region(s)	Label 1 (tap to view)	Label 2 (tap to view)
UNLICENSED COMPANY: AMERICAN PREMIUM LUBRICANTS	UNLICENSED BRAND: MaxxRPM	5W-30	USA		
UNLICENSED COMPANY: AMERICAN PREMIUM LUBRICANTS	UNLICENSED BRAND: MaxxRPM	15W-40	USA		

American Petroleum Institute

Diesel Exhaust Fluid Certification Program

Primary goal: To ensure that API-certified diesel exhaust fluids meet industry-established performance requirements and are easily recognized by consumers.

- **Certify** brands of diesel exhaust fluid that meet the performance requirements developed by diesel engine manufacturers.
- **License** the use of API quality marks on diesel exhaust fluid meeting the performance requirements in ISO 22241 or ISO 18611.
- **Monitor** DEF quality by sampling and testing certified products purchased in marketplace.

American Petroleum Institute

Diesel Exhaust Fluid Certification Program

API DEF Certification Mark

Registered trademark issued to marketers only if diesel exhaust fluid satisfies requirements of most recent and applicable edition of ISO 22241-1.

API American Petroleum Institute

Diesel Exhaust Fluid Certification Program

API Marine DEF Certification Mark

Registered trademark issued to marketers only if diesel exhaust fluid satisfies requirements of most recent and applicable edition of ISO 18611-1.

American Petroleum Institute

Diesel Exhaust Fluid Certification Program

- First License issued March 2009
- 97 API-certified diesel exhaust fluid marketers
  - 84 in North America
  - 3 in China (includes Taiwan)
  - 3 in South America (Chile/Argentina/Columbia)
  - 2 in Europe (France and Spain)
- 179 licensed AUS 32 brands
- 10 licensed AUS 40 brands

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Summary - Consensus Standards and Global Recognition

API **engine oil** standards are:

- Developed **in cooperation** with OEMs, oil marketers, additive suppliers;
- Identified for consumers by **globally recognized marks;**
- Cited in regulations by **nations and states;** and
- Backed by **aftermarket audit** program

American Petroleum Institute

Questions?

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Thank you for the opportunity!

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