Liquid Technology

Lubricants

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What's a lubricant?

* The main object for reducing friction, heating and wear between two moving surfaces.

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Do lubricants consists?

* **Base oil** (70% **till** 80%)
* **Additive package** (5% **till** 20%)
* **Viscosity modifier**(5% **till** 10%)
* **Pour point decreaser** (0,1% **till** 0,4%)

Tribology Basics

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Which are the main categories of Petroleum lubricants?

* Engine oils
* Transmission oils
* Hydraulic oils

Tribology Basics

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Engine oils are categorized?

* By specification (API, ACEA & JASO)
* By viscosity (SAE, ISO etc)
* By OEM (MB, VW, Volvo etc)

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What is SAE?

The SAE (Society of Automotive Engineers) was established in 1905 and it is a professional organization for mobility engineering professionals in the aerospace, automotive, and commercial vehicle industries. The Society is a standards development organization for the engineering of powered vehicles of all kinds.

Tribology Basics

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What is the SAE categorization?

All Engine oils and Manual Gear oils are categorized according to SAE viscosity table.

* Example: 10W-40 =

- a.10W- refers the resistance in very low temperatures.
- b. 40 refers the kinematic viscosity grade in 100C.

Tribology Basics

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What is the "W"?

When the oil's grade is closer to "0W", the more resistance to low temperatures (Winter) has.

* 0W, 5W, 10W, 15W, 20W & 25W (for engine oils)
* 75W, 80W & 85W (for gear oils)

Tribology Basics

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SAE J300 Classification Chart for Engine Oils					
SAE	Low Temperature Cracking CCS	Low Temperature Pumping MRV	Kinematic Viscosity @ 100°C		HTHS @ 150°C
	max	min	min	max	min
0W-	<6.200 cP @ -35°C	60.000 cP @ >-40°C	>3,8 cSt		
5W-	<6.600 cP @ -30°C	60.000 cP @ >-35°C	>3,8 cSt		
10W-	<7.000 cP @ -25°C	60.000 cP @ >-30°C	>4,1 cSt		
15W-	<7.000 cP@ -20°C	60.000 cP @ >-25°C	>5,6 cSt		
20W-	<9.500 cP @ -15°C	60.000 cP @ >-20°C	>5,6 cSt		
25W-	<13.000 cP@ -10°C	60.000 cP @ >-15°C	>9,3 cSt		
-8			>4,0 cSt	<6,1 cSt	>1,7 cP
-12			>5,0 cSt	<7,1 cSt	>2,0 cP
-16			>6,1 cSt	<8,2 cSt	>2,3 cP
-20			>6,9 cSt	<9,3 cSt	>2,6 cP
-30			>9,3 cSt	<12,5 cSt	>2,9 cP
-40			>12,5 cSt	<16,3 cSt	>3,5 cP (note 1)
-40			>12,5 cSt	<16,3 cSt	>3,7 cP (note 2)
-50			>16,3 cSt	<21,9 cSt	>3,7 cP
-60			<21,9 cSt	<26,1 cSt	>3,7 cP

note 1: SAE 0W-40 / 5W-40 / 10W-40 note 2: SAE 40 / 15W-40 / 20W-40 / 25W-40

Tribology Basics

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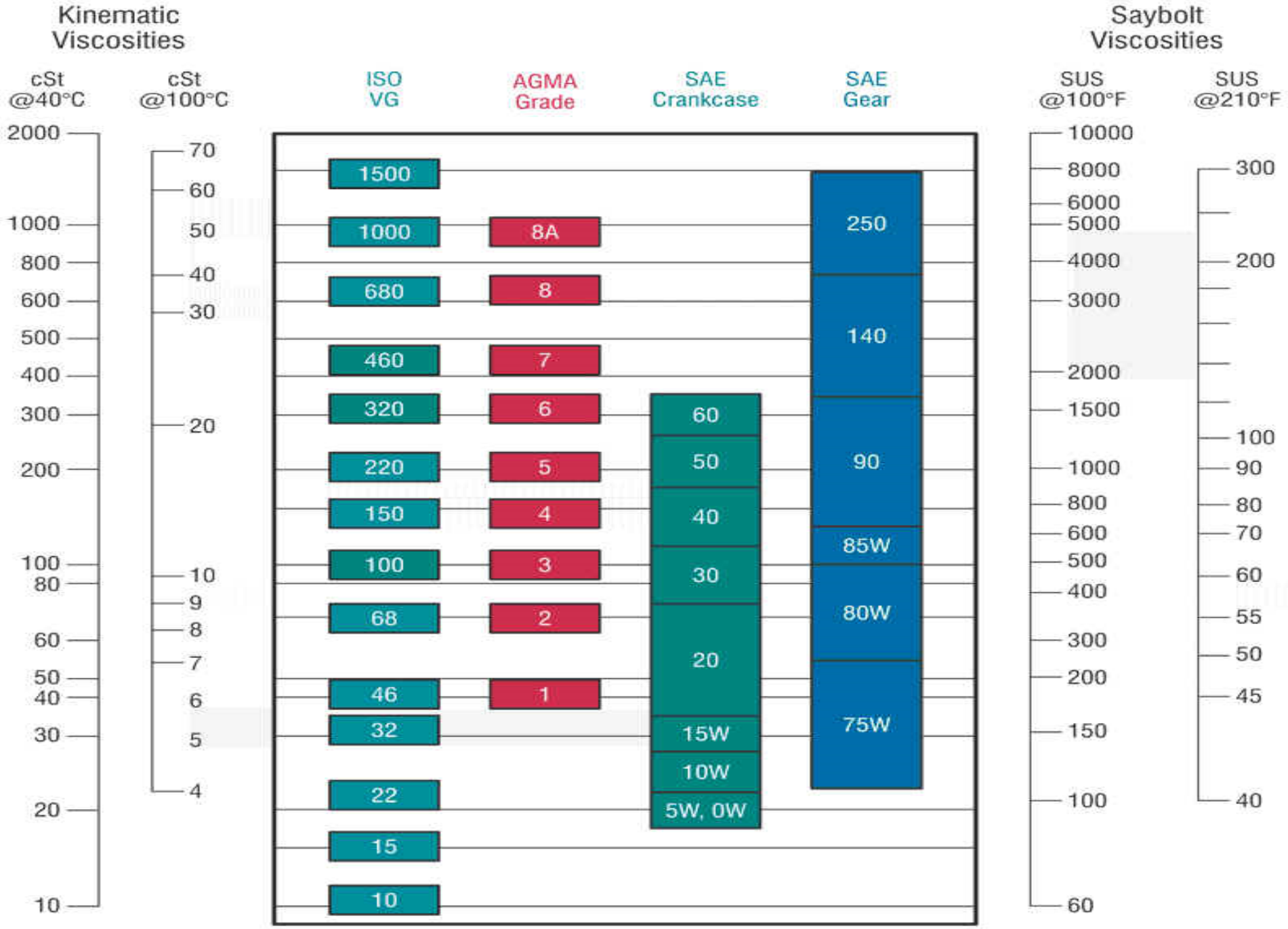
SAE Chart for Transmission Fluid's			
SAE	Maximum Temperature for a Viscosity of 150.000cP	Minimum Kinematic Viscosity at 100°C	Maximum Kinematic Viscosity at 100°C
70W-	-55°C	>4,1 cSt	
75W-	-40°C	>4,1 cSt	
80W-	-26°C	>7,0 cSt	
85W-	-12°C	>11,0 cSt	
-80		>7,0 cSt	<11,0 cSt
-85		>11,0 cSt	<13,5 cSt
-90		<13,5 cSt	<18,5 cSt
-110		<18,5 cSt	<24,0 cSt
-140		<24,0 cSt	<32,5 cSt
-190		<32,5 cSt	<41,0 cSt
-250		<41,0 cSt	

Table 2. Comparative Viscosity Classifications



Tribology Basics

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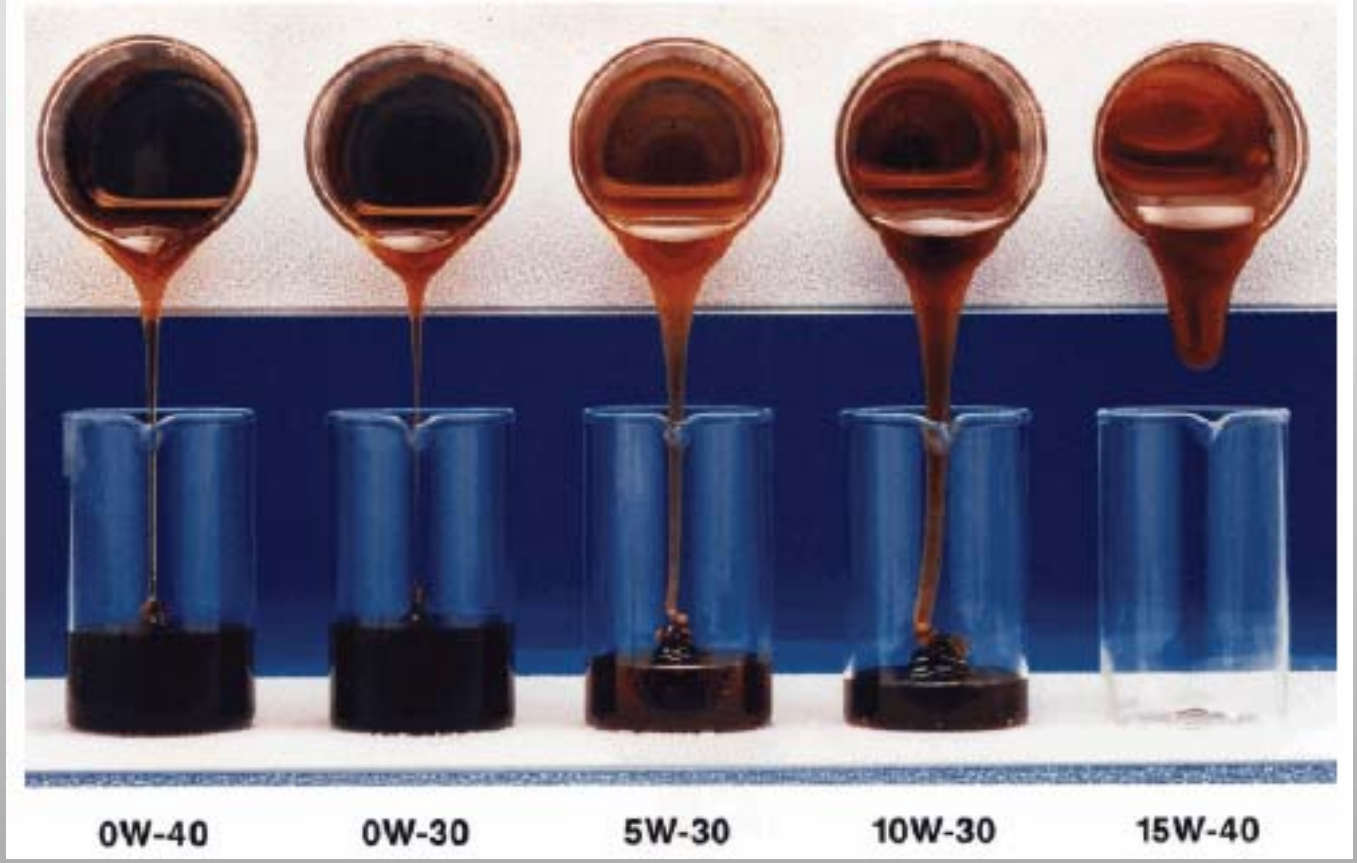
Viscosity in normal temperature (20°C)



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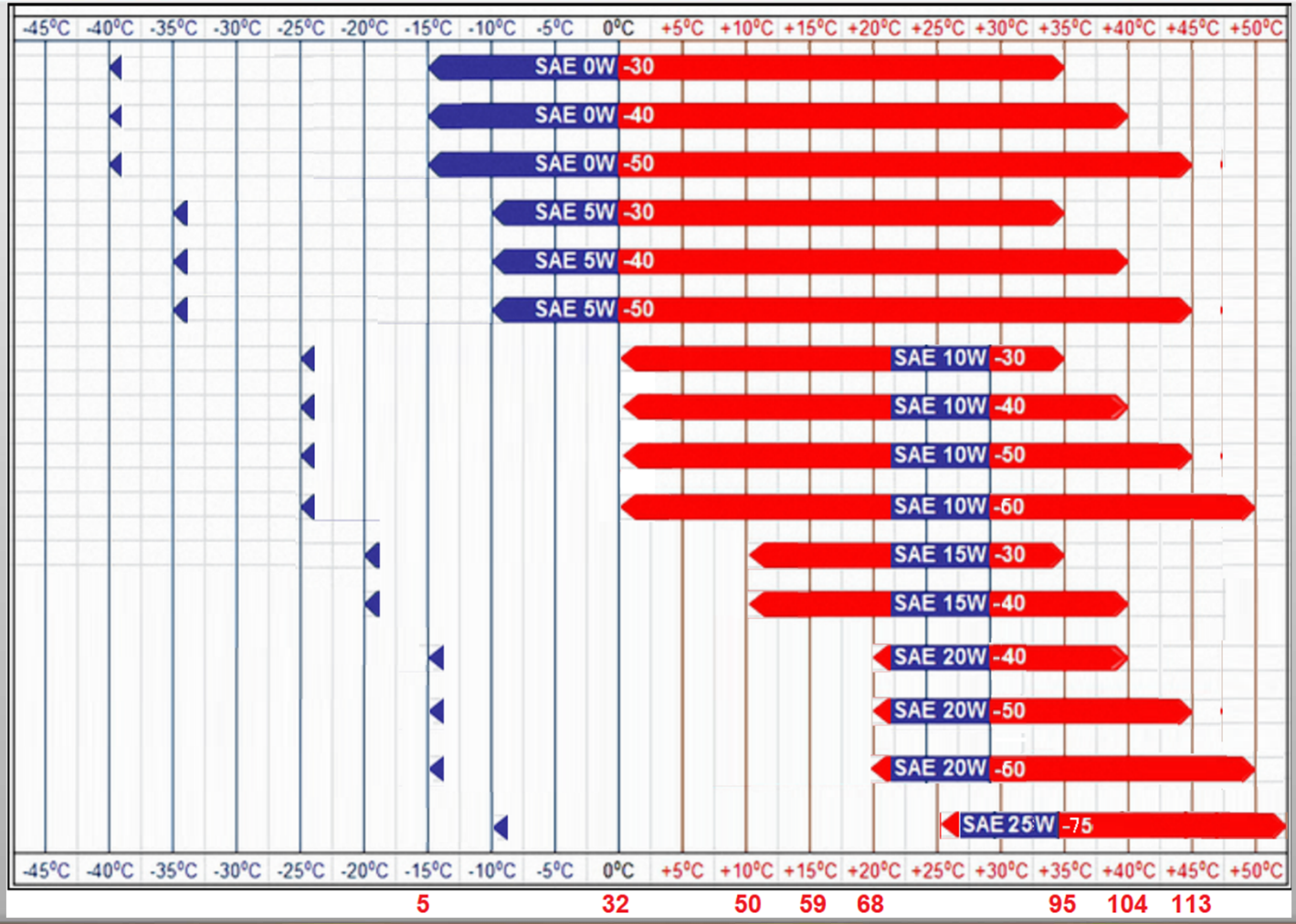

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What is API?

American Petroleum Institute representing about 400 corporations involved in production, refinement, distribution, and many other aspects of the petroleum.

* Members of it, all the US refineries and lubricant plants.

* Issues certificates (EOLCS) for gasoline & diesel engine oils.

What categories API defines?

For engine oils:

* Sx (Service) specification which is referred for gasoline and small diesel-engines.
* Cx (Commercial) specification which is referred for diesel-engines.

Tribology Basics

Liquid Technology

What API categories exists in “S”?

* SA,SB,SC,SD,SE,SF,SG & SH obsolete
* SJ for engines before <2001.
* SL for engines before <2004.
* SM for engines before <2010.
* SN for engines before <2020.
* SP issued on May 2020.

Tribology Basics

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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.
SH	Obsolete	**CAUTION:** Not suitable for use in most gasoline-powered automotive engines built after 1996. May not provide adequate protection against build-up of engine sludge, oxidation, or wear.
SG	Obsolete	**CAUTION:** Not suitable for use in most gasoline-powered automotive engines built after 1993. May not provide adequate protection against build-up of engine sludge, oxidation, or wear.
SF	Obsolete	**CAUTION:** Not suitable for use in most gasoline-powered automotive engines built after 1988. May not provide adequate protection against build-up of engine sludge.
SE	Obsolete	**CAUTION:** Not suitable for use in most gasoline-powered automotive engines built after 1979.
SD	Obsolete	**CAUTION:** Not suitable for use in most gasoline-powered automotive engines built after 1971. Use in more modern engines may cause unsatisfactory performance or equipment harm.
SC	Obsolete	**CAUTION:** Not suitable for use in most gasoline-powered automotive engines built after 1967. Use in more modern engines may cause unsatisfactory performance or equipment harm.
SB	Obsolete	**CAUTION:** Not suitable for use in most gasoline-powered automotive engines built after 1951. Use in more modern engines may cause unsatisfactory performance or equipment harm.
SA	Obsolete	**CAUTION:** Contains no additives. Not suitable for use in most gasoline-powered automotive engines built after 1930. Use in modern engines may cause unsatisfactory performance or equipment harm.

Tribology Basics

Liquid Technology

What API categories exists in “C”?

* CA,CB,CC,CD,CD-II,CE, CF,CF-2, CF-4, CG-4 obsolete.
* CH-4 for DI & (emission level 1998).
* CI-4 for DI +EGR & (emission level 2004).
* CJ-4 for engines with “DPF or TWC & (emission level 2007).
* CK-4 new version (emission level 2017).

Tribology Basics

Liquid Technology

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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What is ACEA?

* Association des Constructeurs Europeens d' Automobiles (ACEA) is the main lobbying and standards group of the automobile industry in the EU.
* Ex (CCMC).
* Members of it all the EU automobile manufacturers + (Ford, GM, Volvo, Saab-Scania).

Liquid Technology

What ACEA categories defines?

* “Ax/Bx” specification for gasoline or light diesel engines.
* “Cx” specification for catalyst compatible oil in vehicles with DPF and TWC in high performance passenger car and commercial vehicle diesel and gasoline engines
* “Ex” specification for Heavy Duty Diesel Engines.

Tribology Basics

Liquid Technology

What ACEA categories exists in “Ax/Bx”?

A1/B1: Stable, stay-in-grade oil intended for use at extended drain intervals in gasoline engines and car & light van diesel engines specifically designed to be capable of using low friction low viscosity oils with a high temperature / high shear rate viscosity of 2.6 mPa*s for xW/20 and 2.9 to 3.5 mPa.s for all other viscosity grades. These oils are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

A3/B3: Stable, stay-in-grade oil intended for use in high performance gasoline engines and car & light van diesel engines and/or for extended drain intervals where specified by the engine manufacturer, and/or for year-round use of low viscosity oils, and/or for severe operating conditions as defined by the engine manufacturer.

What ACEA categories exists in “Ax/Bx”?

A3/B4: Stable, stay-in-grade oil intended for use in high performance gasoline and direct injection diesel engines, but also suitable for applications described under A3/B3.

A5/B5: Stable, stay-in-grade oil intended for use at extended drain intervals in high performance gasoline engines and car & light van diesel engines designed to be capable of using low friction low viscosity oils with a High temperature / High shear rate (HTHS) viscosity of 2.9 to 3.5 mPa.s. These oils are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

Tribology Basics

Liquid Technology

What ACEA categories exists in “Cx”?

C1: Stable, stay-in-grade oil intended for use as catalyst compatible oil in vehicles with DPF and TWC in high performance car and light van diesel and gasoline engines requiring low friction, low viscosity, low SAPS oils with a minimum HTHS viscosity of 2.9 mPa.s. These oils will increase the DPF and TWC life and maintain the vehicles fuel economy. *

C2: Stable, stay-in-grade oil intended for use as catalyst compatible oil in vehicles with DPF and TWC in high performance car and light van diesel and gasoline engines designed to be capable of using low friction, low viscosity oils with a minimum HTHS viscosity of 2.9mPa.s. These oils will increase the DPF and TWC life and maintain the vehicles fuel economy. *

Tribology Basics

Liquid Technology

What ACEA categories exists in “Cx”?

C3: Stable, stay-in-grade oil intended for use as catalyst compatible oil in vehicles with DPF and TWC in high performance car and light van diesel and gasoline engines, with a minimum HTHS viscosity of 3.5mPa.s. These oils will increase the DPF and TWC life.*

C4: Stable, stay-in-grade oil intended for use as catalyst compatible oil in vehicles with DPF and TWC in high performance car and light van diesel and gasoline engines requiring low SAPS oil with a minimum HTHS viscosity of 3.5mPa.s. These oils will increase the DPF and TWC life. *

**(Warning: these oils are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.)*

Tribology Basics

Liquid Technology

What ACEA categories exists in “Ex”?

* E2, E3, E5 & E8 obsolete.

* “E4” for highly rated diesel engines meeting Euro I, II, III, IV & V emission requirements. Suitable for engines without DPF and for some EGR and SCR NOx systems.

* “E6” for highly rated diesel engines meeting Euro I, II, III, IV & V emission requirements. With or without DPF, EGR or SCR.

Tribology Basics

Liquid Technology

What ACEA categories exists in “Ex”?

* “E7” for highly rated diesel engines meeting Euro I, II, III, IV & V emission requirements. Without DPF but with EGR or SCR.

* “E9” for highly rated diesel engines meeting Euro I, II, III, IV & V emission requirements. With DPF, EGR or SCR.

Tribology Basics

RS200 motor oil

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What means the OEM categories?

specification	Status	ACEA *	Engine model	Oil Change km/year	Gasoline	Diesel			comments
						IDI	DI	Long Life	
VW 500.00	Obsolete	A3/B3	<2000	15.000/1	√	√			N/A replaced by 502.00
VW 501.01	Obsolete	A3/B3	<2000	15.000/1	√	√			N/A replaced by 502.00
VW 502.00	Obsolete	A3	<2000	15.000/1	√				engines under arduous cond.
VW 503.00	Obsolete	A1	>2000	30.000/2	√			√	S4, TT & S3 (>180bhp)
VW 503.01	Obsolete	A3	>2000	30.000/2	√			√	RS4/S3/S4/TT (>180bhp)
VW 504.00	Current	-	>2005		√			√	Low SAPS – replaced the 503.00/503.01
VW 505.00	Current	B3	<2000	15.000/1		√			T/C (Turbo Charged)
VW 505.01	Current	B3 & B4	<2000	15.000/1		√	√		T/C + pump jet inject (PD)
VW 506.00	Current	B4	>2000	50.000/2		√	√	√	N/A & T/C Dir. inject.
VW 506.01	Current	B4	>2000	50.000/2		√		√	506.00+pump jet injection
VW 507.00	Current	B4	>2005	-		√	√	√	Euro 4 Low SAPS
VW 508.00	Current	-	>2010	-	√				Low SAPS (2.0 TFSI 140 Kw)
VW 509.00	Current	-	>2010	-			√		Low SAPS (3.0 TDI CR)

(Warning: this column of ACEA is recommended by OEM specs, but this does not means that a single ACEA spec by itself recommends the analogue OEM specs. Always consult owner manual or handbook if in doubt.)

Tribology Basics

RS200 motor oil

Liquid Technology

What means the OEM categories?

specification	Status	ACEA *	Engine model	Oil Change km/year	Gasoline	Diesel			comments
						IDI	DI	Long Life	
BMW LL-98	Obsolete	A3/B3	<2002		√	√		√	API: SJ/CD
BMW LL-01	Obsolete	A3/B3	>2002		√	√	√	√	API: SJ/CD replaced the LL-98
BMW LL-01 FE	Obsolete	A3/B3	>2002		√	√	√	√	Engines: N1x, N2x, N54, N55, N63 & N74
BMW LL-04	Current	A3/B4	>2005		√	√	√	√	Mid SAPS DPF Replaced the LL-01 & -98
BMW LL-12	Current		>2013		√		√	√	Nx7K1, Nx7U1 & Nx701 (NOT 2 Turbos)
BMW LL-14+	Current		>2014		√			√	N20 & Bx8 Not allowed for diesel engines
BMW LL-17 FE	Current	C5	>2014		√	√		√	Fully Synthetic SAE 0W-20
GM LL-A-025	Current	A3/B3	>2002	32.000/2	√			√	SAE 0W-30
GM LL-B-025	Current	A3/B3/B4	>2011	50.000/2		√	√	√	SAE 5W-40
GM DEXOS 1	Current		>2010			√		√	Replaces LL-A-025, GM 6094M & 4718M
GM DEXOS 2	Current	C3	>2011		√	√	√	√	Replaces LL-A-025 & LL-B-025

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Tribology Basics

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What means the OEM categories?

specification	Status	ACEA *	Engine model	Oil Change km/year	Gasoline	Diesel			comments
						IDI	DI	Long Life	
FORD M2C913-A	Obsolete	A1/B1	>1998		√	√	√		SAE 5W-30
FORD M2C913-B	Obsolete	A1/B1			√	√	√		Replaces M2C913-A
FORD M2C913-C	Current		>2009	20.000/1	√	√	√		Fuel Economy – OK for Biodiesel - Replaces M2C913-B
FORD M2C913-D	Current		>2012			√	√		Except Ford Ka TDCi <2009 & Galaxy 1.9 TDi 2000 - 2006
FORD M2C917-A	Current					√	√		SAE 5W-40 Pump injection Diesel Engine
FORD M2C934-A	Current		>2009				√	√	Jaguar & Land Rover - Low SAPS for DPF
FORD M2C937-A	Current				√				SAE 0W-40 for Ford Focus RS
FORD M2C948-B	Current	C2	>2009		√				Low SAPS SAE 0W-40 for 1.0L EcoBoost
FORD M2C950-A	Current		>2014				√		SAE 0W-30 Focus & Mondeo Diesel 2.0L
RENAULT RN0700	Current	A3 & A5	>2007		√				N/A engines
RENAULT RN0710	Current	A3	>2007		√	√	√		N/A engines
RENAULT RN0720	Current	A3	>2007		√	√	√		Mid SAPS for DPF

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Tribology Basics

Liquid Technology

What means the OEM categories?

specification	Status	ACEA *	Engine model	Oil Change km/year	Gasoline	Diesel			comments
						IDI	DI	Long Life	
RENAULT RN0700	Current	A3 & A5	>2007		√				N/A engines
RENAULT RN0710	Current	A3	>2007		√	√	√		N/A engines
RENAULT RN0720	Current	A3	>2007		√	√	√		Mid SAPS for DPF
PSA B71 2290	Current	C2 or C3	>2009				√		Low SAPS for DPF
PSA B71 2294	Current	A3 / B4	>2009		√	√	√		
PSA B71 2295	Current	A2 / B2	<1998		√	√	√		
PSA B71 2296	Current	A3 / B4	>2009		√	√	√		
PSA B71 2312	Current		>2014				√		"BlueHDi" Diesel engines fitted with SCR

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Tribology Basics

Liquid Technology

What means the OEM categories?

specification	Status	ACEA *	Engine model	Oil Change km/year	Gasoline	Diesel			comments
						IDI	DI	Long Life	
MB 226.5	Current				√				Engines supplied by Renault-Nissan
MB 226.51	Current						√		Engines supplied by Renault RN0720
MB 229.1	Current	A2 / B2			√	√	√		
MB 229.3	Current	A3/B3/B4		30.000	√	√	√	√	100 & 600 engines - replaces MB 229.1
MB 229.31	Current				√	√	√		Low SAPS for MB, Smart & Chrysler
MB 229.5	Current	A3/B3/B4		20.000	√	√	√		
MB 229.51	Current			20.000		√	√	√	Low SAPS & Mid SAPS – EURO 4
MB 229.52	Current				√	√	√	√	Low SAPS & Mid SAPS

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Tribology Basics

RS200 motor oil

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What means the OEM categories?

specification	Status	ACEA *	Engine model	Oil Change km/year	Gasoline	Diesel			comments
						IDI	DI	Long Life	
Fiat 9.55535-G1					√			√	fuel economy and extended drain.
Fiat 9.55535-G2					√				
Fiat 9.55535-H2		A3/B3			√				high performances at high temperatures..
Fiat 9.55535-H3					√				very high performance
Fiat 9.55535-D2							√		standard characteristics
Fiat 9.55535-M2		A3/B3/B4						√	also meets GM-LL-B-025
Fiat 9.55535-N2		A3/B3/B4			√	√	√	√	turbocharged engines with extended drain
Fiat 9.55535-S1		C2			√	√	√		with exhaust treatment system
Fiat 9.55535-S2		C3			√	√	√		also meets: MB 229.51 & API: SM/CF.
Fiat 9.55535-GS1		C2			√				0W30 viscosity, mid-SAPS engine oil for the latest (Fiat, Alfa-Romeo, Lancia).
Fiat 9.55535-DS1		C2				√	√		0W30 viscosity, mid-SAPS engine oil for the latest (Fiat, Alfa-Romeo, Lancia).

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Tribology Basics

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What other OEM categories exists?

OEM	Spec	Engine Type	Oil Change km	Notices
MAN	M 3477	EURO IV	80.000	
MAN	M 3377	EURO III	120.000	
MAN	M 3271	CNG & LPG Engines	30.000	
MAN	M 3277	EURO II & III	80.000	Equal to MB 228.5 – ACEA E3
MAN	M 3275	EURO II & III	60.000	ACEA E3
MAN	M 271	EURO I & II	20.000 - 45.000	ACEA E2
Mercedes Benz	p228.51	EURO IV	100.000 - 150.000	UHPD with DPF
Mercedes Benz	p228.5	-	Light Duty 45.000 / HD 160.000	UHPD / Highly Turbo Charged
Mercedes Benz	p228.3	-	45.000 - 60.000	SHPD / Turbo Charged
Mercedes Benz	p228.1	-	30.000 - 45.000	Turbo Charged
Mercedes Benz	p227.1	-	20.000 - 30.000	
Volvo	VDS-3	-	100.000	
Volvo	VDS-2	-	45.000	
Volvo	VDS	-	30.000	
Scania	LDF-2	EURO IV	-	
Scania	LDF	-	120.000	

(Warning: this column of ACEA is recommended by OEM specs, but this does not means that a single ACEA spec by itself recommends the analogue OEM specs. Always consult owner manual or handbook if in doubt.)

RS200 motor oil

Liquid Technology

Which oil is appropriate?

Always follow the manufacturer's manual, where it is referred:

* the appropriate specifications.
* the appropriate viscosity grades according the climate temperature.
* the oil volume (Lt), the period in months and the kilometers or miles for the oil change intervals.

Liquid Technology

What RS200 motor oil offers?

* Large product range for any kind of application.
* Variety of lubricant's viscosities for machines operating in different climate temperatures.
* High quality products.
* Attractive packaging.
* Competitive prices.

Tribology Basics

Liquid Technology

How is ensured RS200 motor oil's high quality?

* We purchase only high quality raw materials.
* We analyze in our laboratories all the raw materials before unloading.
* We analyze in our laboratories all the finished products before packing and we store samples per production for 2 years.
* Our production is conformed with the EELQMS.
* We are certified by ISO 9001& ISO 14001 for **design, development & production** of lubricants and automotive chemicals.

Tribology Basics

Liquid Technology

How is ensured RS200 motor oil's high specifications?

* We cooperate with the leading additive companies, which provides the latest technology in lubricant section.
* We always search for new sources of raw materials with advanced quality for developing our product's quality.
* We operate our production facilities under the ISO 9001 industrial procedures.
* All our packings are produced in European factories by certified organizations for securing our product quality.

Tribology Basics

Liquid Technology

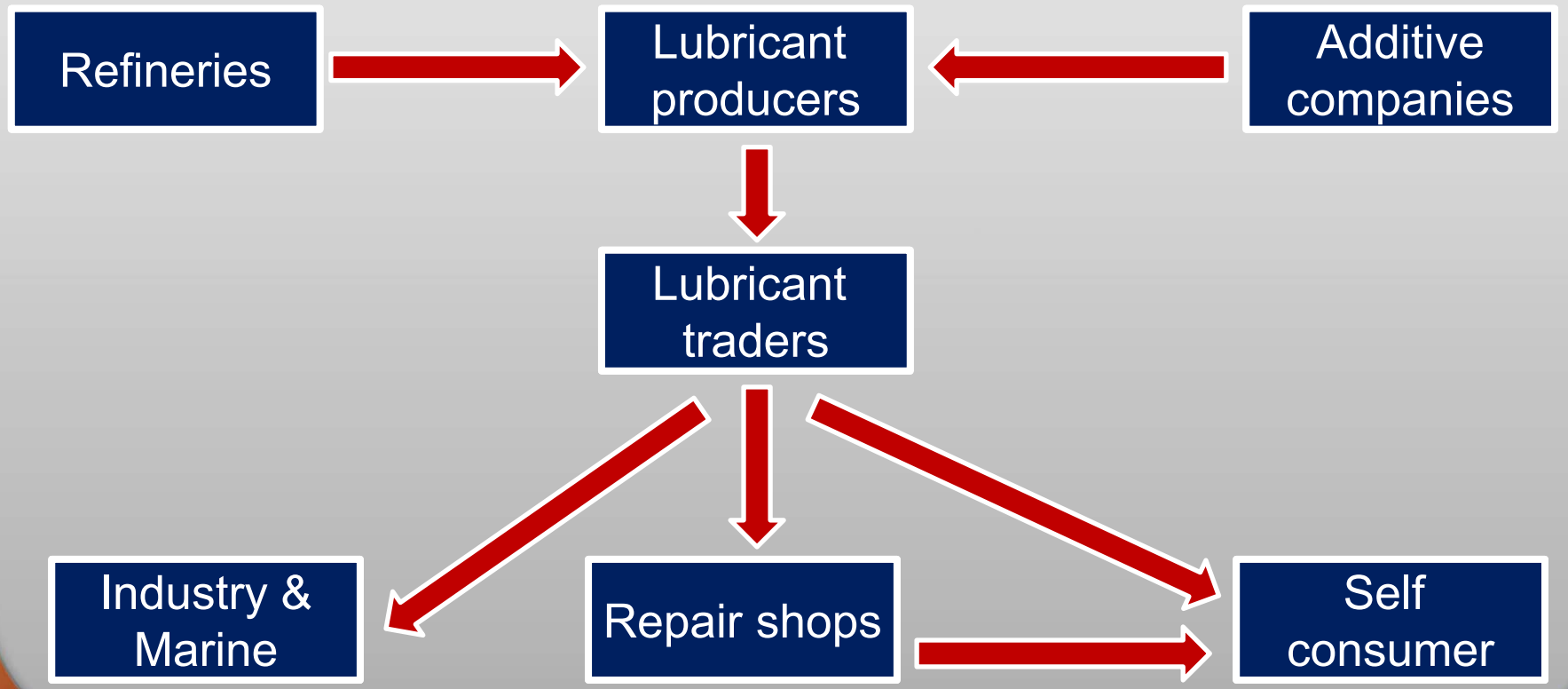
How is ensured RS200 motor oil's large range of products?

* We built a flexible and fast production facility.
* We offering to our customers the ability to purchase special oils out of our main product range after their request.
* We produce developed lubricants for areas that has extreme country climate conditions.

Tribology Basics

Liquid Technology

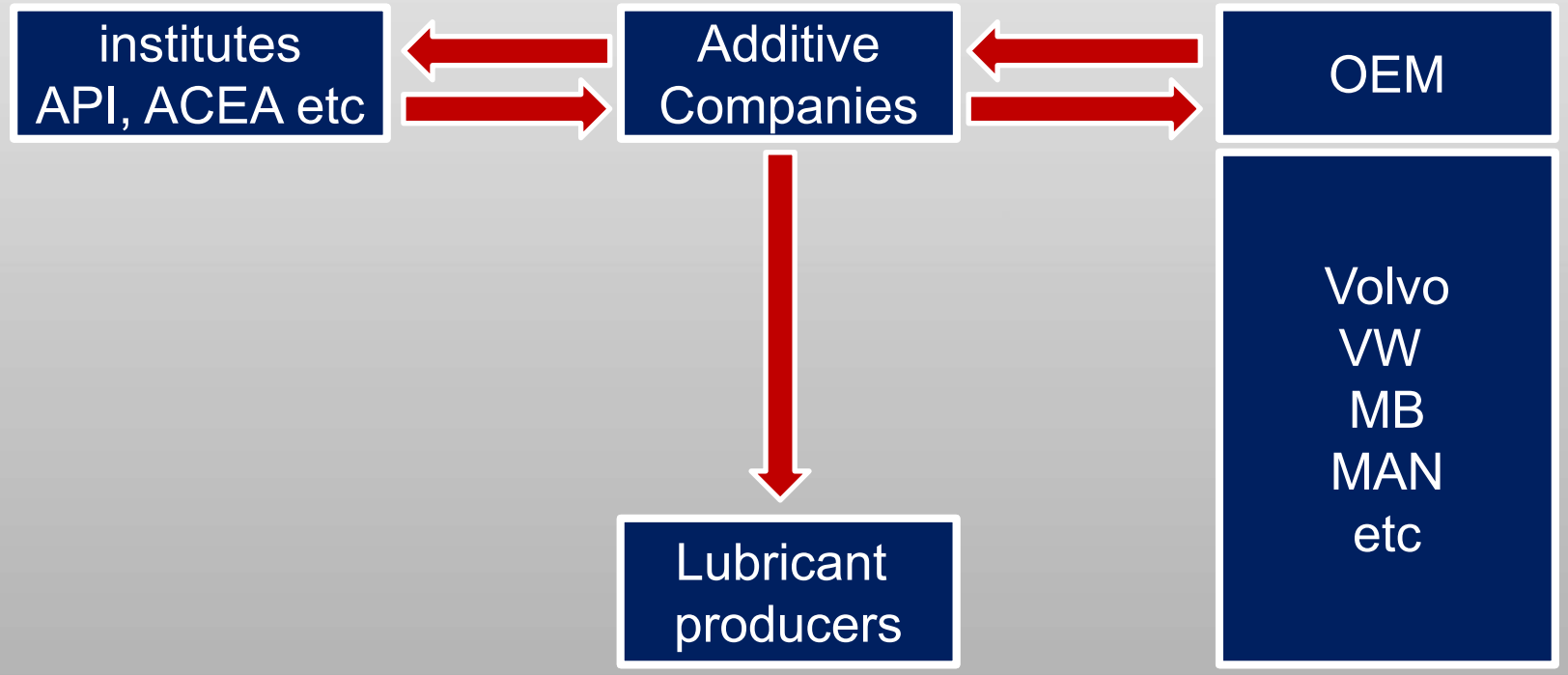
How works the lubricant market?



Tribology Basics

Liquid Technology

How is distributed the technology?



Tribology Basics

Liquid Technology

How the OEM approvals issued?