

THERE FOR THE
LONG HAUL

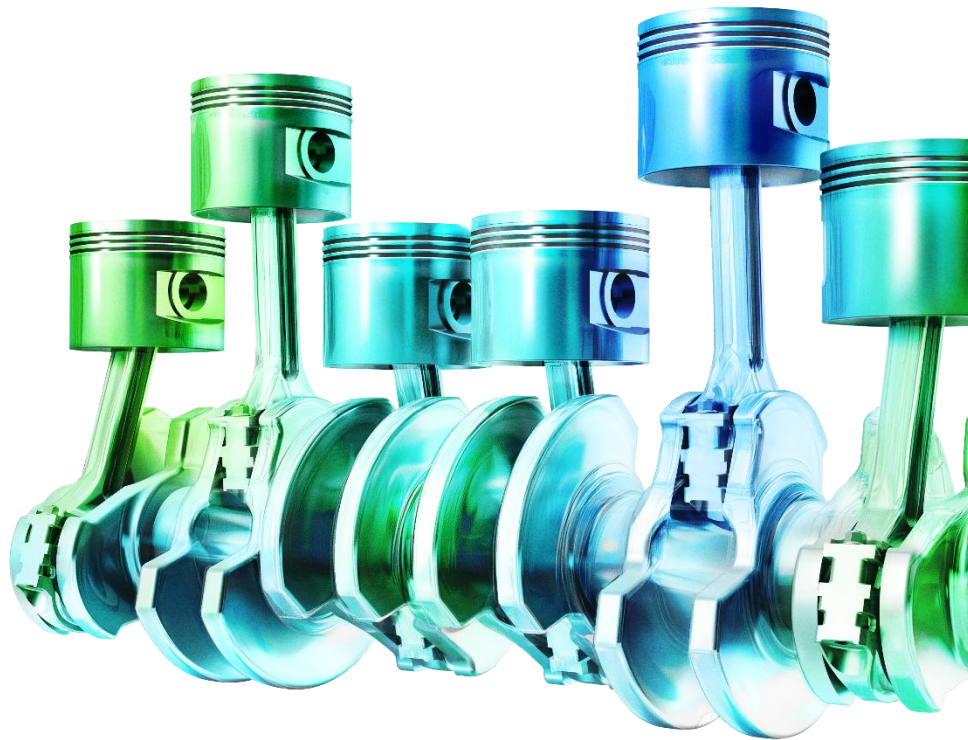
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Deliver more

with every drop

Brazil: The Future of Heavy-Duty Engine Oils



Brazil Market Overview

Lubricants Market Business Environment

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Largest Lubricant Market in Latin America

1.2kMT finished fluid annualized demand

~27% of demand driven by Heavy Duty Lubricants



PROCONVE P8 driving minimum lubricant quality requirements to API CK-4 from 2023 forward



Estimated 100K new vehicles added to the car park every year. New engines estimated to reach 30% of car park by 2030



Higher quality lubricants will be required as changes and of alternative fuels are introduced—B20 and biomethane

Sources: ANP, Afton estimates

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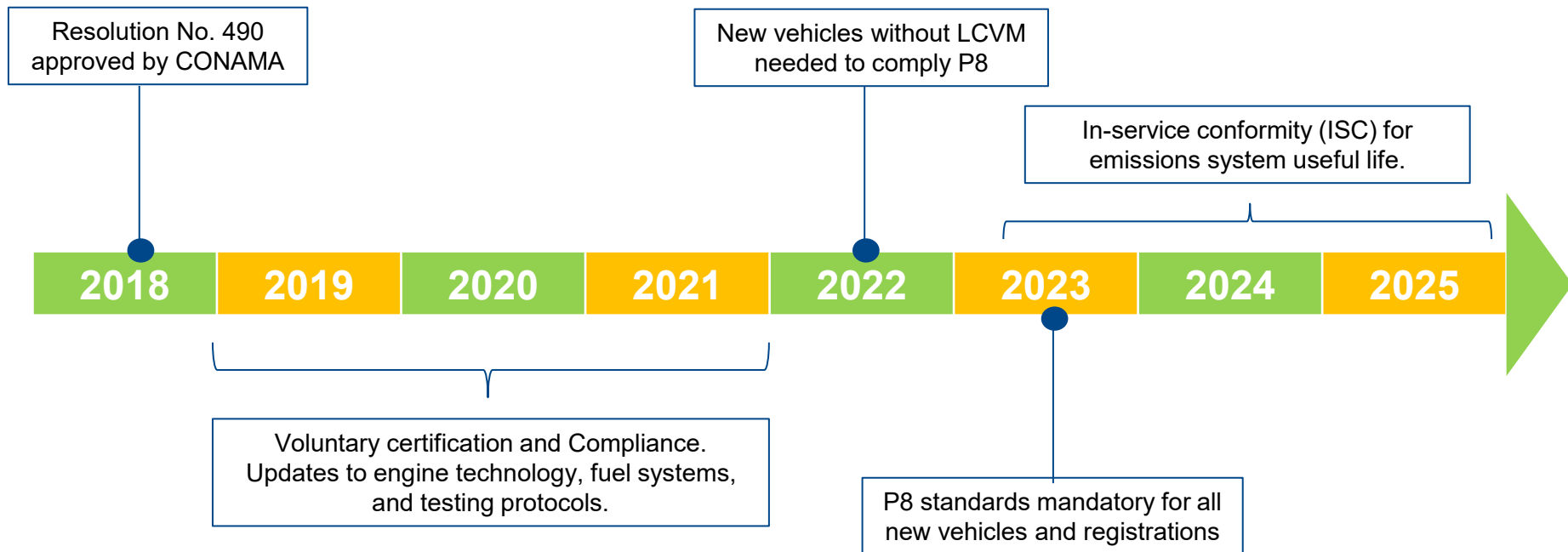
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A Catalyst for Change: PROCONVE P8

Timeline and Compliance with Emissions Requirements

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Independent engine manufactures and large OEMs have successfully integrated new systems (DFP, SCR, OBD) by leveraging existing technologies

Sources: : conama.mma.gov.br/?option=com_sisconama&task=arquivo.download&id=767

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Opportunities in the Horizon: Market Drivers Brazil

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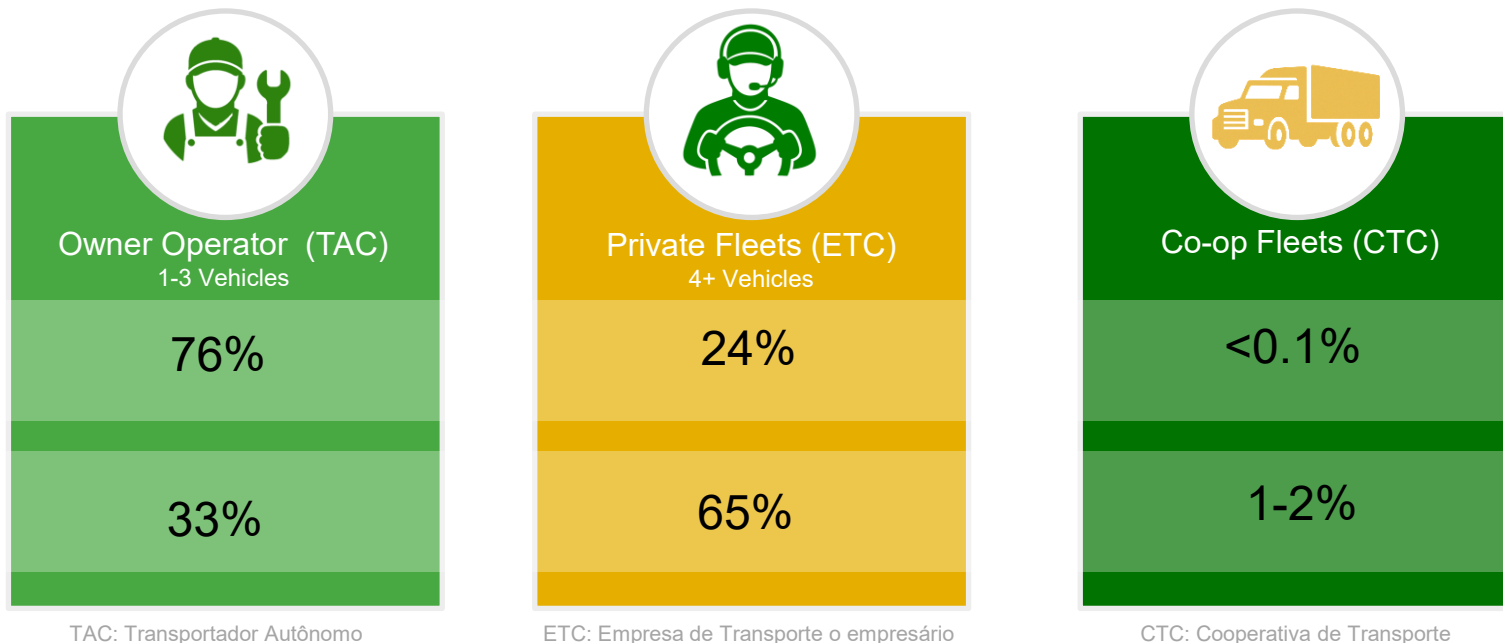



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Brazil Car Park Segmentation

Understanding today's commercial vehicle market

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76% of carriers are self-employed and own one-third of the vehicles on the road, the other two-thirds belong to small and medium fleets

Fuel of the Future

Biofuels farmwork and targets

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- Fuel of the Future Law (No. 14,933/2024) passed on October 9th, 2024.
- Significant piece of legislation setting binding mandates and creating the first dedicated biomethane policy framework
- No mandatory fuel efficiency targets for heavy-duty vehicles

Fuel Type	Historical mandate	2025 Established Target	2030 Goal	Segment	Readiness
Biodiesel in Diesel	13% (B13)	15% (B15)	20% (B20)	Long-haul Agricultural vehicles	Deployed now
Biomethane in nat. gas	0%	1%	Up to 10%	Urban transport Long-haul (supplement)	2027-30 commercial scale



Independent engine manufactures and power train suppliers, not truck brands, will reposition and deploy technology platforms to meet biofuel targets and transition

Sources: ANFAVEA, Fenabrave, Abipeças/Sindipecas

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Growth and Value-added Opportunities in the Horizon

Heavy Duty Engine Oils Lubricants

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Fleet modernization generating incremental demand for better-quality products.
Key to define business strategy based on heavy-duty portfolio needs; today and in the future.

1

New higher performing products required

Significant regulatory and quality shifts from low-quality heavy-duty products.
Drive consumer demand to better higher quality products.

2

Needs for these consumers anticipated to change

Vehicle maintenance becoming increasingly important, owner operators and small/medium fleets driving maintenance trends

3

A strategic focus; one-stop-shop or relevant segments?

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Change is Coming Introducing API CL-4

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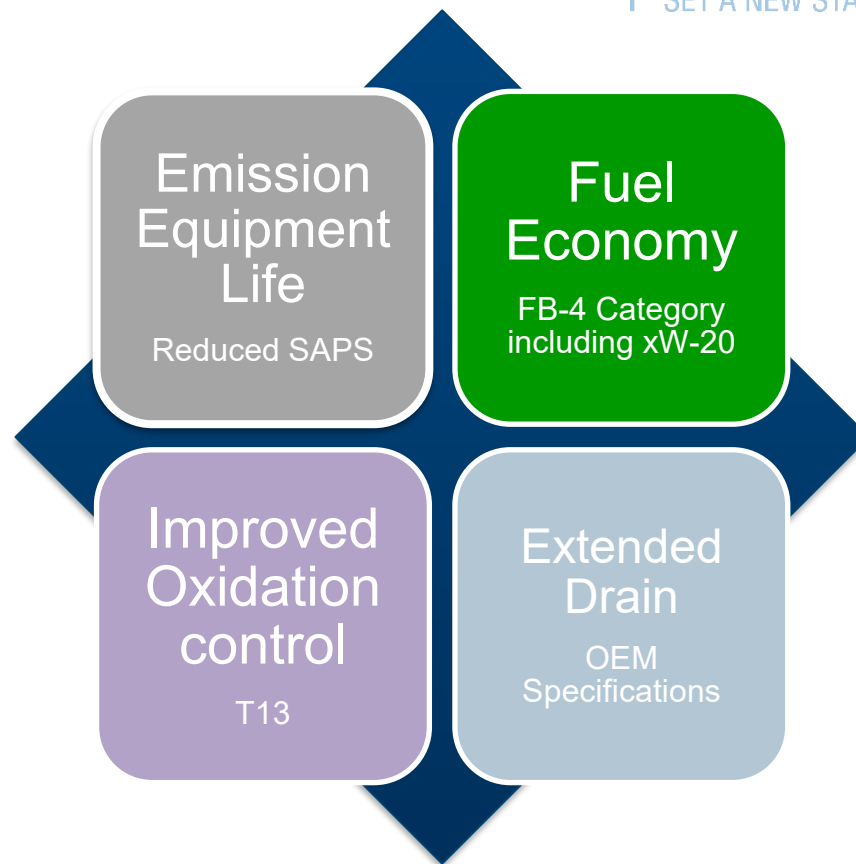
API CL-4 and API FB-4

Highlights

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First License Date:
January 1st, 2027

API CL-4	API FB-4
xW-40 & xW-30	xW-30 & xW-20
Backwards compatible	OEM/Limited backwards compatibility



Diesel C Categories

API CK-4 vs. API CL-4 Highlights

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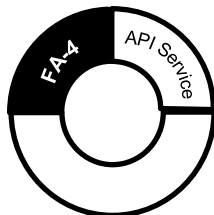


CK-4

- Introduced **2016**
- **Low** SAPS
- **High** dispersancy

Compatible with:

- Fully backwards compatible
- Ultra low sulfur fuels

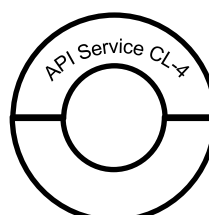


FA-4

- Introduced **2016**
- **Low** SAPS
- **High** dispersancy
- Added low HTHS

Compatible with:

- Specific OEM compatibility
- Ultra low sulfur fuels

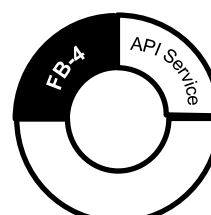


API CL-4

- Introduction Jan 1st, 2027
- **Lower** SAPS
- **High** dispersancy

Compatible with:

- Fully backwards compatible
- Ultra low sulfur fuels



API FB-4

- Introduction Jan 1st, 2027
- **Lower** SAPS
- **High** dispersancy
- Lower HTHS

Compatible with:

- Specific OEM compatibility
- Ultra low sulfur fuels

Test
Sulfated Ash
Phosphorus
Sulfur

PC-11/API CK-4
1 wt% max
0.12% max
0.4% max

PC-12/API CL-4
0.9 wt% max
0.08% max
0.3% max

API PC-12 Specification

New Engine Performance Requirements

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EMA requesting the following engine performance improvements in for API CL-4/FB-4

- ▲ Increased Oxidation stability
- ▲ Wear protection for all engines

Test	Parameter	API CK-4	API CL-4	API FB-4
Volvo T13	Oxidation and vis increase	IR ≤125; KV≤75%	IR≤80; KV≤50%	IR≤80; KV≤50%
DD13	Ring/Liner Scuffing	N/A	≥31hrs to scuff	≥31hrs to scuff
ISB Viscosity	Soot-viscosity increase	≥6.7% soot @15cST vis increase—T-11	≥ 5.6% soot @15cSt vis increase	12cSt max vis inc. at TBD% soot



Two new engine tests, lower SAPS and tighter limits while removing 3 engine requirements from previous categories (1N, T-12, and RFWT)

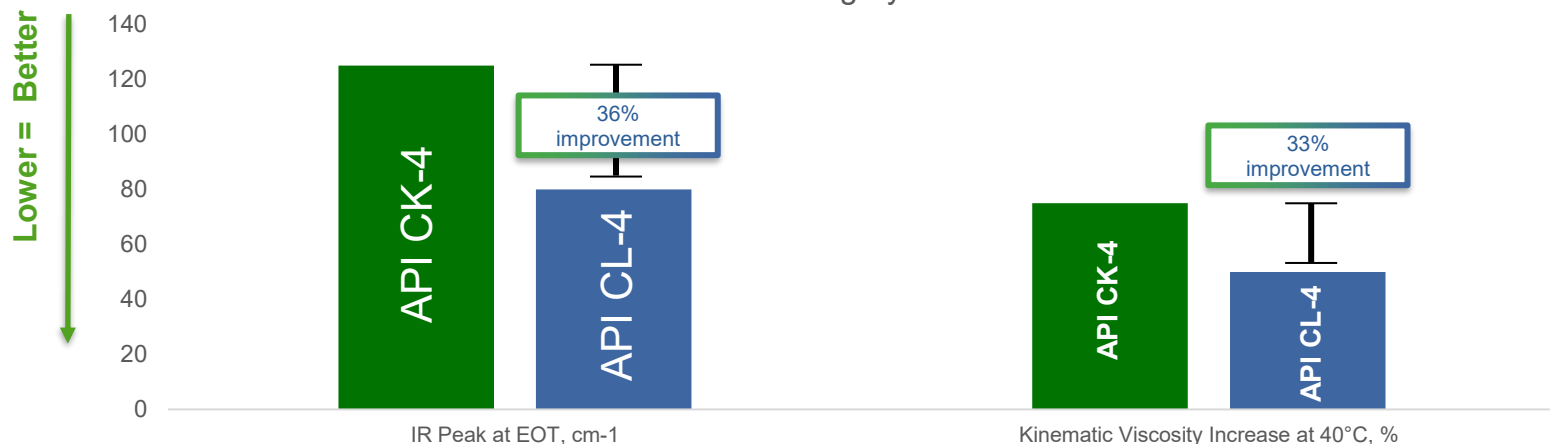
API CL-4 T-13 Oxidative Stability

Significant improvements vs. API CK-4

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- ▲ No specific biodiesel or biofuels engine tests however, API CL-4 emphasises improvements on oxidative control to prevent premature oil degradation

Volvo T-13 oxidation requirements and improvements in comparison to active API CK-4 category



Increased oxidation control contributes to improved oil life and better compatibility with biofuels

OEM and Industry Specifications

Alignment with API CL-4 and FB-4

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OEM Specification	API CL-4	API FB-4	Field trial Req	Additional Requirements/Comments
Detroit DFS 93K232	X		No	Detroit OM471 approval Matrix
¹Detroit DFS 93K233		X	No	Detroit OM471 approval Matrix
Cummins CES20112	X		No	Tighter limits potentially than API
²Cummins CES20113		X	No	Tighter limits potentially than API, SAE xW-30s only
Cummins CES20092	X		Yes	Yes, CNG field testing
Volvo VDS 4.5	X		No	TBD
Volvo VDS 5		X	Yes	Engine testing, approval for SAE 5W-30 low HTHS only
International Motors/PACCAR	X	X	No	Meets API requirement
ACEA E#	X		No	API engines and OM501LA testing, short-term
ACEA F01		X	No	API engines and OM501LA testing, short-term
Daimler DTFR 15C100	X		No	DTAG OM471 approval matrix
SCANIA			Yes	Diverging specification vs. API
MAN 3775	X		No	Diverging specification vs. API

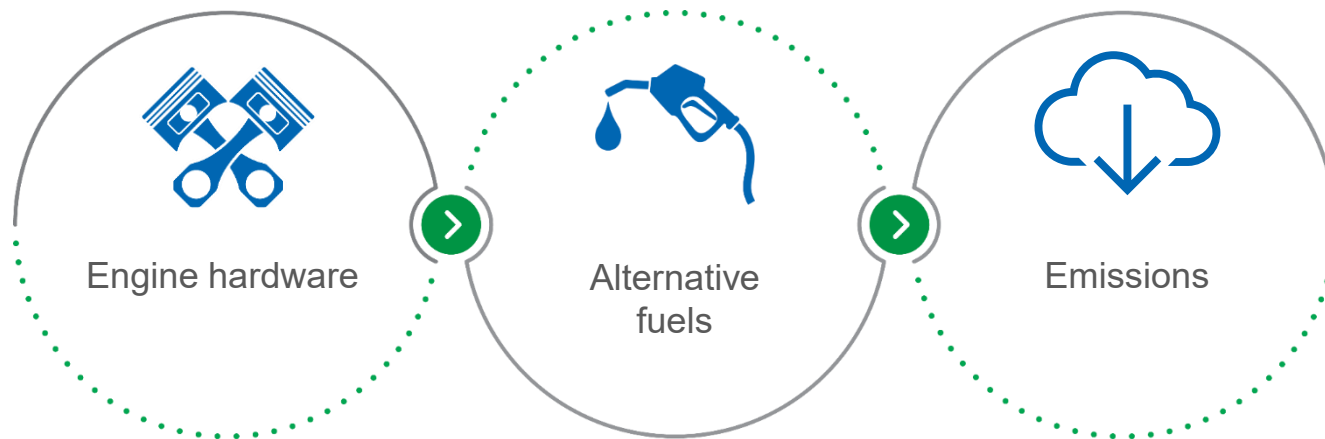
¹ Detroit diesel plan a future extended drain specification in 2028/2029, DFS93K234 and DFS93K235

² Cummins has a gasoline engine oil specification CES20109 aligned to API SP for xW-30's only

Mandates and Industry Fast-tracking Changes

Brazil Heavy Duty Engine Oils

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A future-proof product portfolio for heavy duty engine oils starts with strategic portfolio planning today

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more
with every drop

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