

# The Role of Low-Viscosity Oils on the Journey to Decarbonization

The U.S. Environmental Protection Agency (EPA) continues to tighten emission standards for heavyduty commercial vehicles. In April 2024, the agency announced its proposed "Phase 3 Greenhouse Gas" program, enforcing stricter regulations for heavy-duty vehicles including buses, delivery vans and commercial trucks, beginning with the model year 2027 and set new, stricter standards for model years 2028 through 2032. These vehicles contribute disproportionately to the total emissions in the transport sector, the largest planet-warming emissions source in the US. As a result, the American Petroleum Institute (API) has developed a new heavy duty engine oil performance category: PC-12.

Regardless of personal feelings on the validity of "green initiatives," they're here and the transportation industry needs to adhere to these evolving demands. The good news: manufacturers and Original Equipment Manufacturers (OEMs) continue to improve engine and vehicle technology. These improvements include:

- Designing highly efficient combustion systems to minimize exhaust pollution.
- Introducing vapor recovery systems to capture evaporating gasoline.
- Using computer technologies to monitor and control engine performance.
- Developing effective "after treatment" technologies, such as catalytic converters and particulate filters that remove pollutants from the exhaust stream before they can escape into the atmosphere.



# Low Viscosity Oils Continue to Drive Decarbonization Compliance

The main way to lower CO2 levels is to improve fuel economy and new low viscosity heavy duty engine oils (HDEOs) do just that, by burning less diesel.

In the heavy-duty market, SAE 15W-40 had been the workhorse viscosity grade for many years, but it has peaked and is forecasted to decline to nearly 30% by 2029.

To support fuel economy drivers and the introduction of new emissions reduction hardware, the American Petroleum Institute (API) introduced CK-4 and FA-4 (PC-11) on December 1, 2016. These standards were eco-friendly and delivered improved engine aeration performance, wear, and deposit protection, oxidation control and shear stability over API CJ-4. In addition, API FA-4 introduced fuel economy SAE XW-30 grades with high temperature, high shear (HTHS) viscosity range of 2.9cP–3.2cP for fleets' on-highway applications.

**SAE 10W-30 may** 

account for roughly

<image>

To meet government fuel economy specs, a rapid shift towards SAE 10W-30 is expected. By 2029, SAE 10W-30 may account for roughly 40% of the market and SAE 5W-30, although not reaching mainline volumes, could make up about 10% of the market.



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On a positive note, HD fleet owners and operators are becoming increasingly comfortable with API CK-4 SAE 10W-30 fluids, but some are still hesitant to use lower viscosity API FA-4 oils if not explicitly supported across the entire fleet.

It is important to emphasize that the introduction of lower viscosity grades does not compromise the durability of the engine or the compatibility of emissions system. Additives are designed to help ensure lubricants can function at much lower viscosities and retain their protective properties, even properly extending drain intervals.

### **Other Benefits of Low Viscosity Oils**

In addition to improving fuel economy, switching to lower viscosity heavy-duty products can help give your fleet's engines the efficiency to deliver more. The many benefits of low viscosity products include:

- Meaningful cost savings. A commercial truck can easily consume more than \$70,000 (20,500 gallons) of diesel fuel per year. A switch from 15W-40 to a well formulated 10W-30 can result in up to 3% fuel savings through outstanding oxidation performance (where OEM recommended).
- Improved engine durability, extended engine life, performance and protection in old and newer engines.

Flexible formulation for heavy, medium and light duty off-road, and commercial on-road vehicles, as well as stationary diesel engines.

Most products are approved, or suitable, for use in engines by leading heavy-duty engine manufacturers, including Ford, PACCAR, Volvo, Caterpillar, Cummins, Mack, Detroit Diesel and Mercedes-Benz.

Multiple options, such as API CK-4 and FA-4 engine oils to fit your unique fleet and HD operations.



New additive technology helps lubricants function at lower viscosities



#### CITGO<sup>®</sup> CITGARD<sup>®</sup> 700 Synthetic Blend HDEO 10W-30: A Balanced Formula May be a Way to Reduce Carbon Emissions While Enhancing Engine Performance

It's important to continue to comply to the dynamic emission laws without compromising your fleet engine's life. Choosing an HDEO with a balanced formula may be the answer to your HD fleet engine needs. CITGO CITGARD 700 Synthetic Blend Heavy Duty Engine Oil SAE 10W-30 is a premium API CK-4 heavy-duty engine oil that utilizes a balanced approach to protect your engine life and maintain good fuel economy.

#### The Benefits of a Balanced CITGO<sup>®</sup> CITGARD<sup>®</sup> 700 Synthetic Blend Heavy Duty Engine Oil SAE 10W-30 Detergent Package

With its balanced formula, CITGO CITGARD 700 Synthetic Blend Heavy Duty Engine Oil SAE 10W-30 protects the engine and maintains fuel economy through TBN (Total Base Number) and a balanced detergent package, excellent oxidation control and impressive wear performance against industry competitors.

In a 500,000 mile/3-year field trial using 42 2020 *Peterbilt 579* trucks equipped with 2019 Cummins X15 engines, CITGO CITGARD 700 Synthetic Blend 10W-30 had among the highest TBN and TBN retention performance in the industry. TBN retention of CITGO CITGARD 700 Synthetic Blend 10W-30 protects against acid accumulation, leading to reliable engine durability. At 85,000 miles, the nearest competitor TBN was about half of the CITGO CITGARD 700 Synthetic Blend 10W-30 TBN, and the low TBN Technology 10W-30 had zero TBN at this long drain interval.





CITGARD 700, 10W-30	All others: Mid-TBN Technology, 5W-30 & 10W-30	I	Low TBN Technology, 10W-30
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Technology	85K TBN	SOT TBN
CITGARD 700	2.3	7.2
Low TBN Technology	0	3.7
Mid TBN Technology (average)	1.0	5.5

CITGO CITGARD 700 Synthetic Blend Heavy Duty Engine Oil SAE 10W-30 maintains this high TBN through long oil drain intervals due to its balanced detergent additive package (roughly equal amounts of Calcium and Magnesium detergents) versus many competitors that have Calcium-only detergent packages. Magnesium ash tends to be more porous and less dense than Calcium ash, which produces the following benefits:

Reduced exhaust flow resistance

- Reduced back pressure (50%)
- Less workload on engine
- Improved fuel efficiency

The CITGO CITGARD 700 Synthetic Blend 10W-30 detergent package also helps maintain engine cleanliness, protects the engine and maintains good fuel economy through excellent oxidation control. Good oxidation control results in the oil maintaining viscosity throughout the oil drain.

In field trials, CITGO CITGARD 700 Synthetic Blend 10W-30 tested at a 2.1% fuel efficiency savings versus a 15W-40 for the new oil, and after 50,000 miles, the CITGARD 700 10W-30 still showed a 1.8% fuel efficiency savings.

CITGO CITGARD 700 Synthetic Blend Heavy Duty Engine Oil SAE 10W-30 has a successful history with some of the largest fleets in the nation, including J.B. Hunt, Crete Carrier Corporation and Brundage Bone Concrete Pumping.

#### Moving to Low Viscosity Engine Oils Will Help Your Fleet Comply with New Standards While Providing Improved Cost Control, and Streamlined Inventory Management

As emissions standards continue to rise and pressures to curb emissions drive the auto industry to further improve fuel economy, we can safely say that lower viscosity engine oils are here to stay. As we keep learning more details on its requirements, we can expect PC-12 to deliver lubricants with increased wear protection, providing protection for engines working harder under increased operating temperatures. Additionally, since the fuel saving benefits of lower viscosity lubricants are considerable, lower viscosity grades should continue to grow.

Contact your supplier about how choosing heavy-duty engine oils, such as the premium CITGO CITGARD HDEO line, for your fleet operation can help improve the predictability of your repair and maintenance costs. It could also help you streamline and simplify your inventory planning and supply needs.

## The CITGO family of brands:





