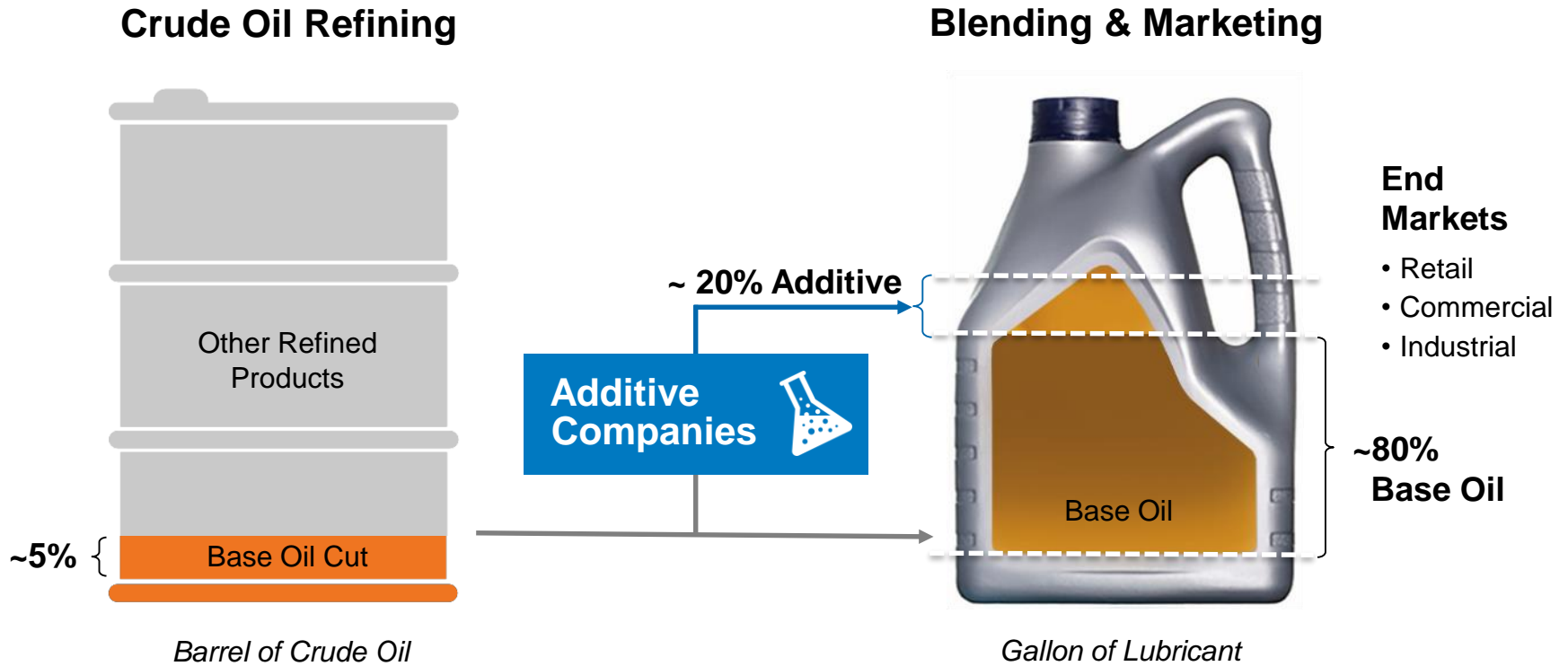


Using the Right Oil for the Right Vehicles to Protect Engines, Reduce Fuel Costs and Cut Emissions

Africa Clean Mobility Week

Siva Konar
March 15, 2018

The Source of Lubricant and Additives

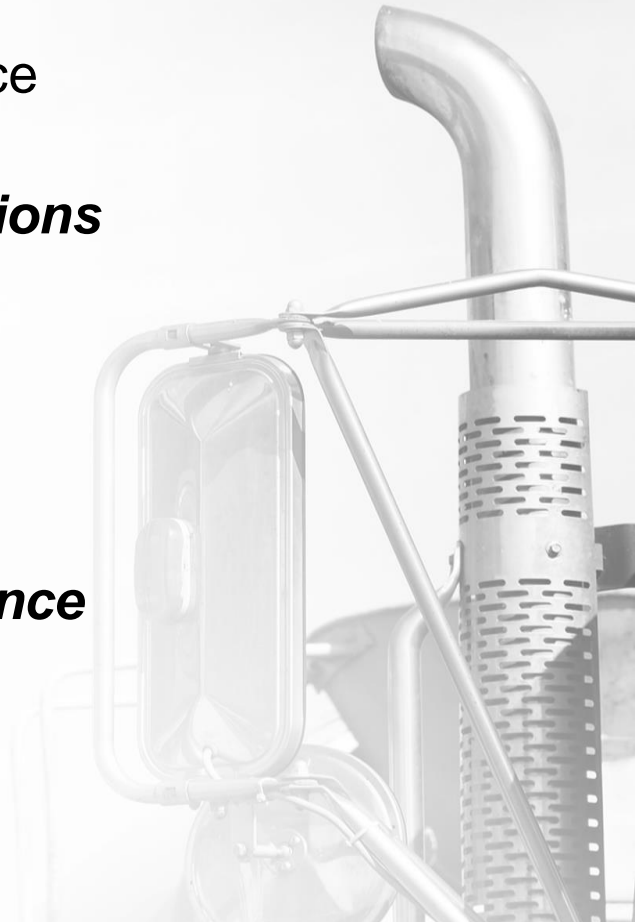


The Additive Industry spends ~\$750 MM/YR on Product Development and Proof of Performance Testing

Higher Performance Lubricants Reduce Vehicle CO₂ Emissions + Fuel Consumption



- Engine + driveline lubricants already help reduce fuel consumption + CO₂ emissions
 - ***Protect systems that help reduce emissions***
 - ***Direct delivery of fuel savings and CO₂***
- New generation of lubricants are entering the market to help meet new emissions standards
 - ***Even greater fuel savings + CO₂, without compromising engine performance + durability***

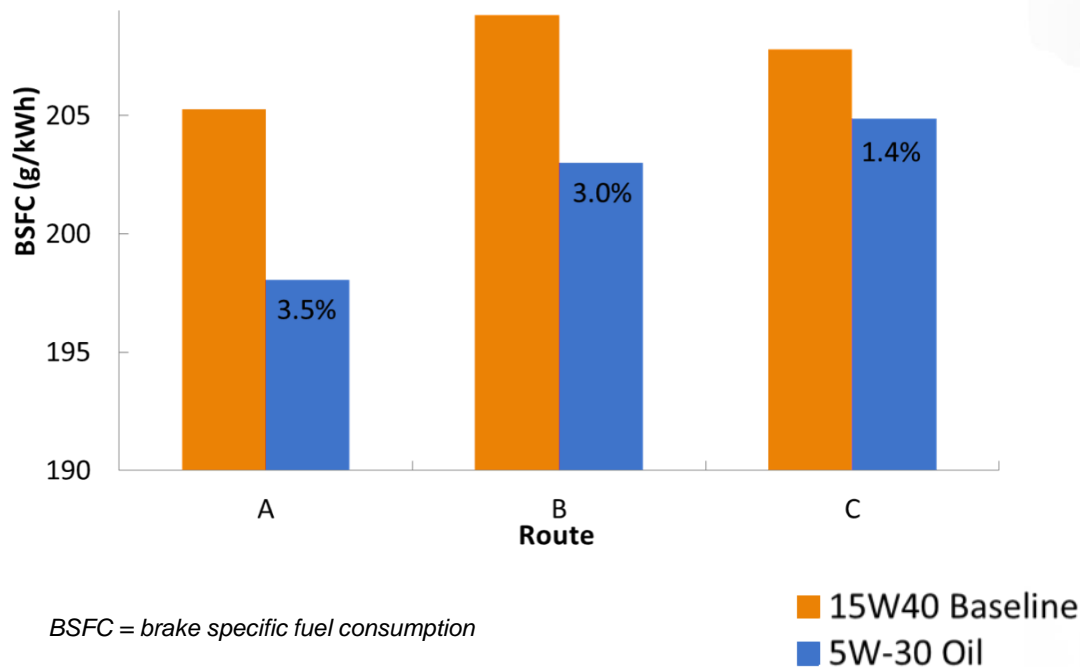


Next Step: Find ways to encourage higher performing lubricant use throughout the life of the vehicle

Lubrizol Testing Has Shown Fuel Economy Benefits



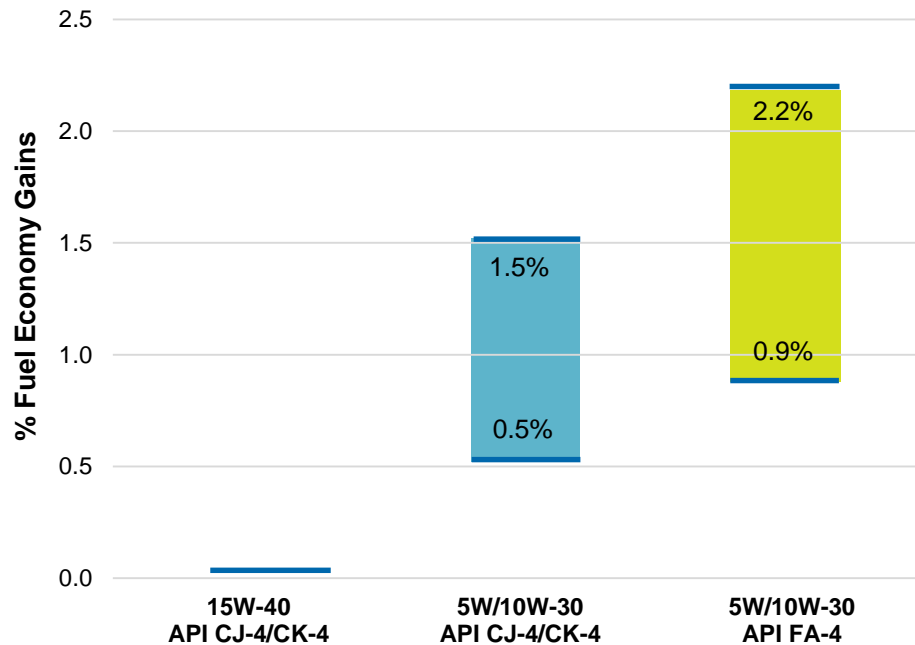
- Lorry driven by single driver in standard on-road conditions in Denmark, Norway, Sweden and Finland
 - ***Real customer, doing real work***
 - ***Over one month per oil***



Independent Studies Have Shown the Benefits of Fuel Efficient Lubricants



The expected savings when moving from SAE 15W-40 to lower viscosity lubricants should be significant



“ Class 8 over-the-road fleets can realistically expect **fuel savings in the range of 0.5% to 1.5%** by switching from 15W-40 to 5W/10W-30 engine oil, either CJ-4 or CK-4.

The savings from switching to the fuel-efficient FA-4 variant, available after December 2016, **can be expected to add a further 0.4–0.7%** of increased fuel efficiency. ”



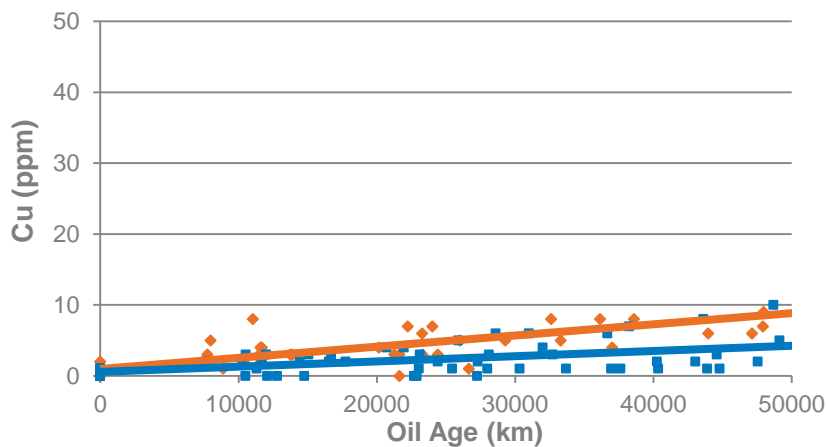
Source: Trucking Efficiency Confidence Report: Low-Viscosity Lubricants

“This is one of the rare instances where an efficiency technology can be implemented across the entire fleet very quickly, does not require an upfront investment and does not require any changes in operating or maintenance practices following implementation.”

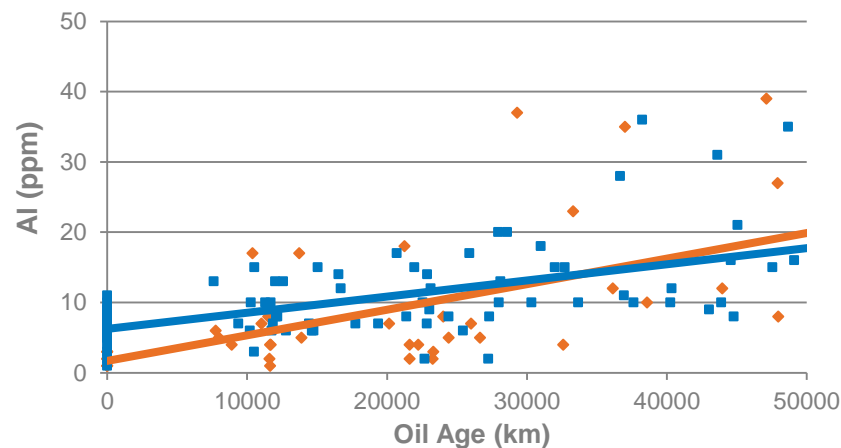
Extensive Field Testing Demonstrates That Higher Performing Fuel Economy Lubricants Maintain Engine Protection



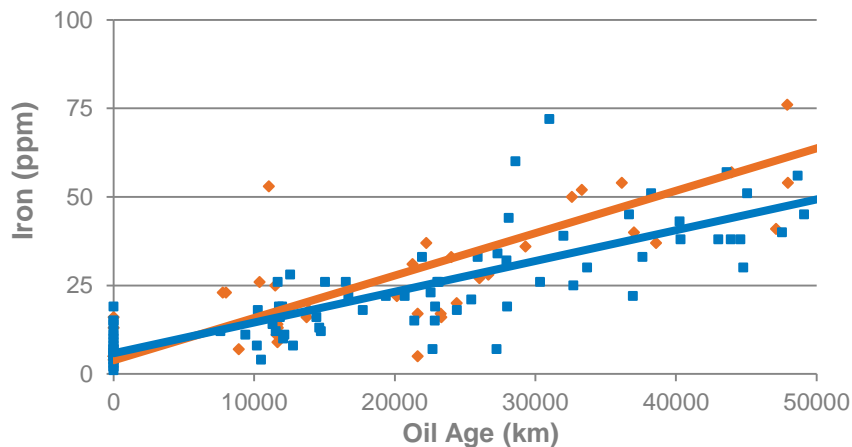
Copper



Aluminum



Iron



Wear metal content of engine oil samples from on-road vehicle tests.

◆ 15W-40 ■ 5W-30
— Linear (15W-40) — Linear (5W-30)



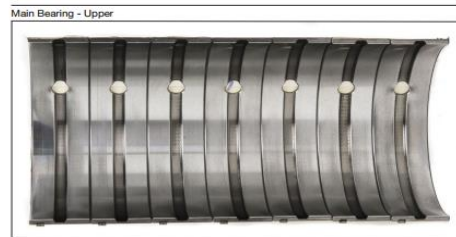
Durability Cannot Be Compromised



SUCCESS
TOGETHER

Critical engine parts with over 500,000 miles usage.

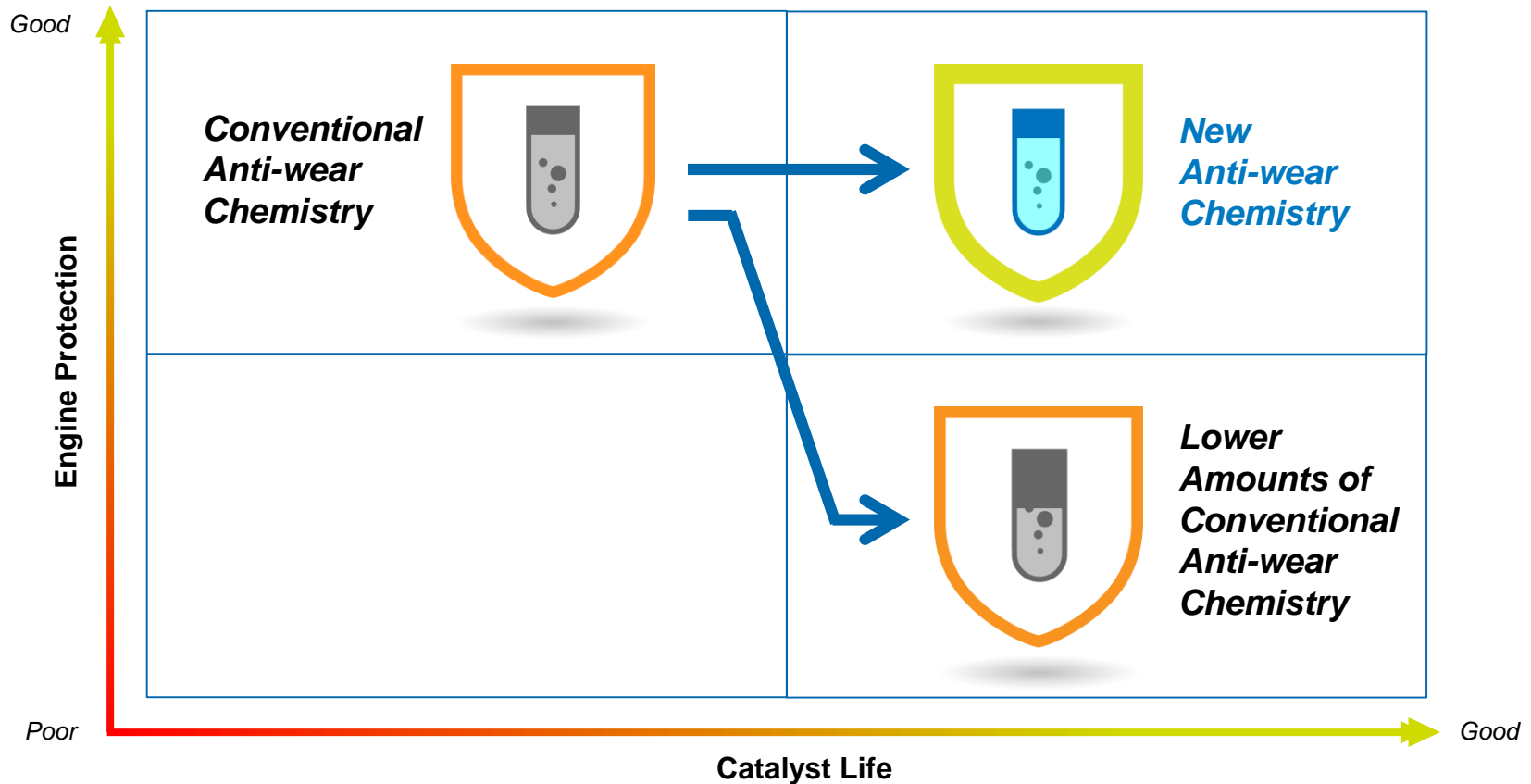
TEST MILEAGE:
511,836 mi



API FA-4 oils protect the engine well



Higher Performance Lubricants Extend the Life of Three-way Catalysts



A new generation of higher performing lubricants will protect three-way catalysts



Frequent Oil/filter Changes Create Many Opportunities to Maximize Fuel Savings and GHG Reductions



Heavy Duty Diesel Example

Engine Overhaul: 1,000,000 - 1,500,000 miles



Gear Oil Replaced: 500,000 miles



Tires Replaced / DPF Cleaning: 100,000 – 300,000 miles



Oil and Filter Replaced: 20,000 – 30,000 miles



DEF Tank Filled: 3,000 – 6,000 miles



Point-of-sale transactions create frequent opportunities to encourage consumers and fleets to use the right oil for the right vehicle



Summary



SUCCESS
TOGETHER

- Lubricants provide a significant contribution to maintenance, emission control and GHG reductions
- As new technologies and combustion strategies are developed to meet new emission standards, the lubricant industry responds with higher-performing lubricants
- Maximizing the maintenance, fuel economy and GHG benefits of light-duty and heavy-duty vehicles will require the right lubricant for the particular vehicle – and with advanced emissions standards, this becomes more important than ever
- **Programs to educate and encourage consumers and fleets to use the right lubricant and oil for their vehicles will improve maintenance, fuel economy and GHGs through out the useful life of the vehicle**





Working together, achieving great things

When your company and ours combine energies, great things can happen. You bring ideas, challenges and opportunities. We'll bring powerful additive and market expertise, unmatched testing capabilities, integrated global supply and an independent approach to help you differentiate and succeed.