# European Engine Oils

## The role of engine oils in improving fuel economy

## Introduction

The Western European engine oil market continues to undergo a period of dramatic change as the result of three factors: changing emissions legislation, increased fuel economy requirements and the need to maintain durability under severe operating conditions.

Changes in these market drivers has resulted in the development of new engine oil technology, designed to operate in vehicles with the latest aftertreatment systems, while delivering ever greater durability and fuel economy improvement.

It is expected that the need for engine oils to deliver even greater levels of fuel economy improvement could have the single greatest impact on the type of engine oil that is used over the next five years.

## Improving fuel economy

The need to increase the fuel efficiency of vehicles is driven by a number of factors including:

- reducing carbon dioxide ($CO_2$) emissions
- lowering operating costs
- reducing fossil fuel consumption

At the end of 2006 there were over 250 million vehicles in use (on-road) in the European Union (EU) and these were responsible for 26% of EU man-made $CO_2$ emissions[1]. With legislators continuing to look at taxation, fines and different incentive schemes to achieve a reduction in $CO_2$ emissions it is expected that OEMs will be required to further improve the fuel efficiency of their vehicles.

As OEMs continue to make changes to both vehicle and engine design to improve the fuel efficiency of their vehicles they will also look to the engine oil to provide a measure of fuel economy improvement too.

### Passenger car engine oils

The evaluation of fuel economy has been a requirement for some passenger car engine oils for many years. Tests to evaluate fuel economy improvement are embedded in the ACEA passenger car and light duty diesel engine oil sequences and many passenger car OEM specifications. This has led to the move to lighter viscosity grades, the use of "low HTHS"[2] passenger car engine oils and the introduction of new friction modifier technologies.

However, the EU proposes to begin phasing in a system of fines from 2012 for OEMs based on the $CO_2$ emissions of their vehicles. This will lead to an increased demand for engine oils to deliver greater fuel economy improvement than today.

### Heavy duty diesel engine oils

The drive to increase fuel efficiency for heavy duty vehicles is primarily to lower operating costs and this is leading to a shift in the typical viscosity grades used from 15W-40 and higher to 10W-40 and 5W-30.

However, unlike for passenger cars, there are no standard tests for the evaluation of heavy duty diesel engine oil fuel economy improvement. Therefore, it is essential that any claims of fuel economy improvement are carefully evaluated to ensure that they will be measurable in the field.

This will become even more important over the next few years as although current legislation does not consider the reduction of carbon dioxide ($CO_2$) emissions, it is likely that this will become a future requirement.

## The role of engine oils

Engine oils can contribute to improvements in fuel economy in two ways:

- as an Enabler by providing high performance robustness that allows changes to engine design and aftertreatment technology without impacting fuel economy;
- as a Direct Contributor through formulating changes which maximise fuel economy.

Both of these roles are interlinked and ensuring the right balance of components (additive chemistry, viscosity modifier and base oils) are selected and tailored for each application will be essential to achieve optimum fuel economy improvement.

NOTES 1 ANFAC European Car Parc Study, 2007 and ACEA

2 The term "Low HTHS" is commonly used to refer to engine oils with a high temperature high shear rate of less than 3.5cP by CEC L-036-90.

3 AA Roadwatch report on diesel fuel retail pricing across the EU15, January 2009

## The value in fuel economy

As engine oils are developed which provide greater levels of fuel economy improvement they will be enabling cost savings for OEMs and vehicle operators. Since Euro 4, new aftertreatment compatible engine oil technology has delivered greater value by helping ensure emissions compliance through the protection of advanced aftertreatment systems. The next generation of fuel efficient engine oil technology will provide greater value, often directly quantifiable as cost savings or the avoidance of fines as illustrated in the examples below.

### Example 1: $CO_2$ emissions legislation for passenger cars

In 2007 the EU reported the average $CO_2$ emissions of the European passenger car fleet had reduced from 186 g/km in 1995 to 158 g/km (figure 1). From 2012 to 2015, it is proposed that a system of fines is phased in. These will range from €5 to €95 per gram of $CO_2$ a vehicle emits above 130 g/km. It is also proposed that the $CO_2$ limit above which fines are payable is reduced further, to 105 g/km, from 2020. As an example, if the fines payable in 2015 were applied to the cars sold in 2006, the total fines payable would have exceed €34 billion.

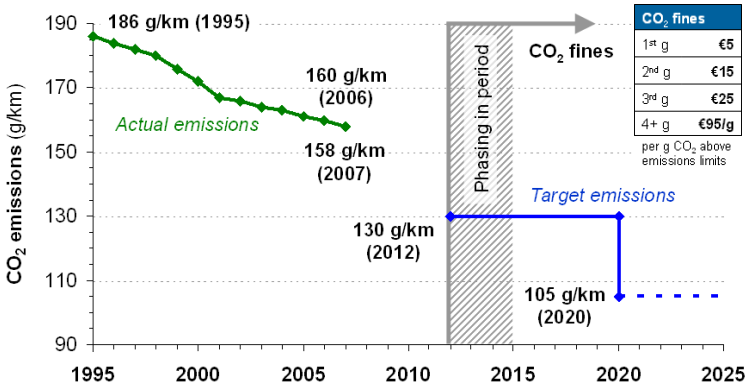


Figure 1 – Changes in passenger car $CO_2$ emissions and proposed future limits

Many passenger car engine oils are already formulated to improve fuel economy. However, if new engine oil technology were developed that provided an additional 1% improvement in fuel economy this would save an average of 1.5 g/km of $CO_2$, avoiding €143 per vehicle in $CO_2$ fines, based on 2006 $CO_2$ levels.

### Example 2: Cost of operation for heavy duty diesel trucks and buses

The use of an engine oil which provides an improvement in fuel economy compared to the engine oils in use today can deliver significant savings for a fleet operator. A 1% improvement in fuel economy alone would result in over €1.2 billion[3] in fuel cost savings and a reduction of over 3 million MT of $CO_2$ emissions per year for the EU bus and truck fleet. The potential savings differ by application (figure 2).

| | Heavy Duty Truck | Bus |
|---|---|---|
| **Typical annual mileage** | 150,000km | 70,000km |
| **Fuel consumption rate** | 35 litres/100km | 40 litres/100km |
| **Fuel used per year** | 55,000 litres | 28,000 litres |
| **$CO_2$ emitted per year** | 140 MT | 75 MT |
| **Saving ($CO_2$ / fuel cost)** | **1.4 MT / €540 per truck** | **0.75 MT / €280 per bus** |

Figure 2 – Potential reductions in $CO_2$ emissions and fuel cost savings

For a heavy duty truck covering 150,000km per year this could result in fuel savings of up to €540[3] and a reduction in $CO_2$ emissions of up to 1.4 MT per truck per year. For a bus covering 70,000km per year this could result in fuel savings of up to €280[3] and a reduction in $CO_2$ emissions of up to 0.75 MT per bus per year.

## A new generation of engine oil technology

To achieve this level of fuel economy improvement will require a new generation of engine oil technology that is designed to maximize fuel economy whilst maintaining durability and aftertreatment system protection.

For further information on changes in the European engine oil market see www.lubrizol.com\ACEA2008

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