MANDATORY USE OF DETERGENT ADDITIVES IN ROAD FUEL – PROPOSAL

1/. Background

The benefits of the use of fuel detergent additives are acknowledged by both the auto and oil industries. They provide long term benefits, helping to maintain the engines combustion system in good condition. The customer benefits from avoiding premature degradation of performance and driveability, the environment benefits from the vehicle being able to maintain good emissions and fuel economy levels for longer. However, to ensure that these benefits are enjoyed by all vehicle users, the auto industry believes that the use of these additives at an appropriate level must be made mandatory.

This is becoming particularly important with the introduction in-use emissions requirements, and the need for vehicle powertrains to continue to operate in their 'as built' condition to maintain compliance with the increasingly stringent emissions legislation.

The following describes a system to support such a mandatory detergent additive use requirement, followed by a review of existing detergency requirements and performance claims

2/. Proposal for mandatory use of detergent additives in road fuel within the EU.

The mandatory use of detergents requires:
   a) Demonstration of additive package performance.
   b) Verification of general use.
   c) Spot checking of use

a). Demonstration of additive package performance

Using the US EPA and Top-Tier systems (see below) as models, a 'self certification' system would be suitable for use by European fuel marketers. This should include a requirement for verification testing to be performed if necessary in the event of dispute.

Suppliers of industrial materials are familiar with such self-certification procedures as part of modern supplier quality control practices. The mineral oil and additive industries in particular will be familiar with self-certification, as this is an integral aspect of engine oil performance claims such as the ACEA Lubricant Sequences.

Attachment 1 shows the Top-Tier requirements and pro-forma as an example.

b). Verification of use.

To show that the declared additives are being used in a particular suppliers fuel at the required rates, the recommendation is to use an audit trail. The quality control procedures used by all responsible suppliers will quantify both the volume of additive purchased and that of the fuel sold.
A simple calculation will show if the overall additive use has been at the rate declared within the demonstration of additive performance. This should be supported by the relevant documentation, invoices etc, and is the approach used by the US EPA.

In the case of marketers who purchase pre-additised fuel, the onus would remain with them to obtain the relevant additive use documentation from their supplier.

It is proposed that the most efficient route for implementing an audit requirement would be for an amendment to the Fuels Directive, requiring the member states to implement an appropriate audit system, including provision for punitive measures for such companies that persistently fail to comply.

c). Spot checking of use.

Testing for compliance with the original performance claims would require a large sample of fuel and be time consuming, expensive and logistically difficult. To control these costs etc, only some of the samples should be fully tested; a statistically robust selection procedure is recommended to determine which of the samples require the full testing.

To provide additional guidance on the amount of additive being used in petrol, the measurement of existent gum levels, washed and unwashed, will indicate the amount of additive that has been used. A suitable method would be ISO 6246. The unwashed gum level associated with a particular additive treatment rate should be declared as part of the documentation for the performance claims. The level of unwashed gum should meet or exceed the declared value, whilst not being at an excessive level that could encourage combustion chamber deposit formation.

The washed gum level is controlled within the European fuel standard EN228.

In the case of diesel fuel, there is no such simple test. If necessary, IR analysis will show the presence of a particular declared additive, but not the concentration. It would be necessary for the IR trace to be provided as part of the additive performance verification package. If desired, the IR method could also be applied to petrol.

However, it should be emphasised that the verification of general use by audit trail is the most important requirement.

3. Existing detergency requirements and performance claims
(note – this not an exhaustive list of such requirements)

US EPA minimum additive performance standard.

The benefits of deposit control additives were recognized by both the automotive and oil industries. So, in 1985, when the fuel injector deposit problem was recognized in the US, many oil companies adopted the use of deposit control additives.

However, their use was voluntary and no regulatory standards existed by which to gauge their effectiveness.
In California, the California Air Resources Board (CARB) required the use of deposit control additives in motor gasoline effective January 1, 1992.

The US Congress recognized the importance of effective deposit control additives in minimizing vehicle emissions. It required gasoline to contain deposit control additives, effective January 1, 1995, and provided the Environmental Protection Agency (EPA) with the authority to establish specifications for such additives.

The Clean Air Act provided EPA with the authority to implement recordkeeping and reporting requirements. These requirements are needed in order for EPA to certify gasoline additives, to demonstrate effectiveness, to assure that gasoline contains certified additives at the minimum concentration (also known as the lowest additive concentration (LAC) or compliance level) necessary to be effective, and to deter violations.

The end effect of these regulations is that nearly all commercial motor gasolines now contain a deposit control additive.

Unfortunately, those petrol marketers who are only interested in meeting the minimum requirements of the regulations and who are not interested in product quality have chosen to use these minimal performing LAC additives. Taking advantage of test variability coupled to low performance requirements, some commercial use of deposit control additives was not providing the expected performance, the California Air Resources Board (CARB) staff held a series of workshops in 1998.

At the meeting, one participant presented the attached Figure 1, which shows the intake valve deposits for four models of vehicles that were run 15,000 miles on five different fuels. One of the fuels was described as a compliance fuel (LAC fuel).

The results show that the LAC fuel formed significantly more intake valve deposits than the other four fuels in all models of vehicles. The data suggest that there were commercial gasolines on the market that were not providing control of intake valve deposits, even though they were using certified additive packages.

Since the minimum additive performance standards were first established by EPA in 1995, most gasoline marketers have actually reduced the concentration level of detergent additive
in their gasoline by up to 50%. As a result, the ability of a vehicle to maintain stringent Tier 2 emission standards have been hampered, leading to engine deposits which can have a big impact on in-use emissions and driver satisfaction.

This remains an on-going issue and has led some members of the automotive industry to develop the 'Top-Tier' system

**US Top-Tier system.**

The introduction in 2004 of the 'Top-Tier' fuel additive performance claims system in North America provides a model for a complete suite of tests to validate the performance of an additive package, at a level considered appropriate by many auto manufacturers.

Top-Tier is primarily a 'self certification' system, but with provision for verification testing if necessary to support any claims. A similar protocol, suitably adapted to European requirements and for diesel fuel would be a valid approach to the mandatory requirements proposed for Europe.

Attachment 2 shows the content of the 'Top-Tier' website, [http://www.toptiergas.com/index.html](http://www.toptiergas.com/index.html), providing both the background and requirements, and the list of fuel marketers currently selling 'Top-Tier' fuels in the US.

The form to be submitted in support of a claim was mentioned earlier and is shown in Attachment 1

**The World-Wide Fuel Charter.**

The World-Wide Fuel Charter is endorsed by all the major global auto manufacturers, proposes suitable tests and performance levels for fuels with detergents and reviews their benefits for both petrol and diesel fuels. The appropriate fuel quality from this document is Category 4 for both petrol and diesel.

Attachment 3 contains relevant extracts, and the full document can be obtained from [http://www.acea.be](http://www.acea.be)

**Peoples Republic of China - legislation**

The Government of the Peoples Republic of China has issued a national standard for detergent additives for vehicle petrol, GB 19592-2004. To meet this standard, it has been required for petrol to use detergent additives since 1 May 2005.

Attachment 4 contains details and comments.

**Other Approval Systems**

Historically, there have been several voluntary initiatives to encourage the availability of high quality fuels. These have included the French UTAC system and the UK's AA Seal of
Approval. Unfortunately, these were only successful for as long as there was a perceived marketing benefit from making claims to meet their requirements.

**Examples of Additive manufacturers performance claims.**

The brochures from Associated Octel (Attachments 5 and 6) are for two widely used additive packages, one being for petrol, the other for diesel. These are excellent examples of the documentation that additive suppliers typically develop in support of their performance claims when approaching potential customers.

It should be noted that the rate of use of these additives will determine their performance in the standardised tests used, demonstrating the need for the required pass criteria levels to be set at credible levels.

The Associated Octel brochures also include data showing the emissions benefits associated with the use of their additives.

Brochures and material from other additive companies (Attachments 7, 8, 9) discuss similar performance benefits and generally cite the same tests as the above documents from Associated Octel (note – this is not an exhaustive list of such companies).

**4/. Summary and recommendations**

The above document describes a system to implement mandatory use of detergent additives in fuels sold within the European Union.

The test requirements to verify performance are shown, with a recommendation that an audit trail would be an appropriate means to verify use.

ACEA
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