



6 May 2004

Clean Fuels and Vehicles Section
Department of the Environment and Heritage
GPO Box 787
CANBERRA ACT 2601

Dear Sir / Madam

Measuring Cetane Number: Options for Diesel and Alternative Diesel Fuels

The Australian Institute of Petroleum (AIP) is pleased to provide comments on the Discussion Paper issued in April 2004 by the Department of the Environment and Heritage (DEH) on *Measuring Cetane Number: options for diesel and alternative diesel fuels* (the Discussion Paper).

AIP wishes to stress that it still believes that the cetane index currently contained in the *Fuel Standard (Automotive Diesel) Determination 2001* – based on ASTM D976 or ASTM D4737-96a (or IP380, with reference to the letter on the issue sent to the Department on 20 April 2004) - is the preferable cetane measure for full hydrocarbon diesel, and so should be retained.

However, AIP agrees that these cetane index calculations do not allow for cetane additives, and are not applicable to biodiesel and other alternative diesel fuels. Given the development of biodiesel, it is necessary to have a useable measure for cetane for fuels to which a cetane index cannot be applied.

The attached paper provides the AIP responses to the questions posed in the Discussion Paper. In summary, AIP supports the use of the Ignition Quality Test (IQT) to determine a Derived Cetane Number, using the test method IP 498 *The Determination of Ignition Delay and Derived Cetane Number of Middle Distillate Fuels by Combustion in a Constant Volume Chamber*. The reasons for this are:

- IQT is in use satisfactorily internationally, and is expected to become the preferred test method to measure diesel cetane number;
- IQT is applicable to both hydrocarbon and non-hydrocarbon distillates;
- IQT is substantially cheaper than a cetane engine;

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- IP 498 is calibrated on European diesels that are more similar to Australian diesels than US diesels, and so is preferable to the US IQT method defined by ASTM D6890.

This would mean that the *Fuel Standard (Automotive Diesel) Determination 2001* would still contain the current specification and defined test methods for the cetane index; however, if the cetane index could not be calculated, an acceptable alternative test method would be the Ignition Quality Test Derived Cetane Number, using test method IP 498.

We would be happy to discuss any aspects of this recommendation further, and would be pleased to provide further input as required on this issue. In this regard, AIP understands that BP Australia has an expert on this topic visiting Melbourne on 18 May, and would be prepared to arrange a meeting between him and DEH personnel if required. Could you please advise either myself or Frank Russell of BP (03 9268 4507) whether you wish this to be arranged.

Yours sincerely



Ewen Macpherson
Deputy Director

ATTACHMENT

MEASURING CETANE NUMBER

Q: *Availability of equipment in Australia that may be used to test diesel/ biodiesel to ASTM D613*

AIP understands that ChevronTexaco Global Lubricants has an old cetane engine at the Kurnell refinery in Sydney. This engine could, in theory, probably be used to test the cetane number of diesel. The engine has not operated for some years and AIP understands that ChevronTexaco does not intend to operate the machine.

In general, a new cetane engine will cost approximately \$0.5 million. There would be substantial additional infrastructure and set-up costs of around \$0.2 million. A new engine would need to be correlated with an existing cetane engine, and the availability of such an engine for correlation would need to be factored in as well. A cetane engine can experience problems in reproducibility, unless it is operated by trained staff with substantial experience on the engine.

AIP does not have sufficient information on the availability of apparatus to test the cetane number of diesohol and diesel emulsions, although AIP understands that cetane engines have difficulty measuring the cetane number of diesel emulsions. In general, AIP cautions that the addition of alcohols or water to diesel does not just affect cetane, but also some other important specifications such as flashpoint and lubricity.

Q *Alternatives to 'traditional' cetane number testing*

AIP believes that a better alternative to the cetane engine test is the new Ignition Quality Test (IQT) which allows the determination of the Derived Cetane Number. There are two test methods for this: the US ASTM D6890; the European IP 498 *The Determination of Ignition Delay and Derived Cetane Number of Middle Distillate Fuels by Combustion in a Constant Volume Chamber*.

AIP understands that the IQT is working satisfactorily in a number of international R&D laboratories and refineries. The IQT can cover both petroleum and non-petroleum distillates.

It should be noted that ASTM D6890 and IP 498 are not yet fully aligned, with an approximate bias of 1 cetane number. There is on-going work to resolve this. However, IP 498 has been developed using European diesels. These are more similar to Australian diesels than US diesels, and AIP believes that IP 498 would therefore be more appropriate for tests on Australian diesels.

Current costs for an IQT are of the order of US\$110,000 and various recommended optional items add another US\$18,000. Air freight would be of the order of US\$2,500.

Q *Appropriate means of determining the cetane number of Australian diesel fuels and alternative diesel fuels or a surrogate in place of the direct measurement of the cetane number.*

AIP wishes to stress that it still believes that the cetane index currently contained in the *Fuel Standard (Automotive Diesel) Determination 2001* – based on ASTM D976 or ASTM D4737-96a (or IP380, with reference to the letter on the issue sent to the Department on 20 April 2004) and using a set of equations derived from petroleum distillates - is the preferable cetane measure for full hydrocarbon diesel, and so should be retained.

However AIP recognizes the merits of adding an alternate method of determining cetane for products for which the cetane index is inappropriate.

Accordingly, AIP recommends the use of IQT for the testing the cetane number of diesel and alternative diesels in Australia, and does not recommend the establishment of a cetane engine. This is for the following reasons:

- The IQT is becoming established as the preferred test method internationally;
- There is sufficient experience internationally in the use of IQT to have confidence that it is workable for Australian diesel fuels;
- IQT can be used for petroleum and non-petroleum diesel fuels;
- A cetane engine would be very costly, compared to the alternative IQT;
- A cetane engine would present on-going staffing and maintenance problems , and initial calibration may present difficulties;
- There are indications that cetane engines may have difficulties measuring the cetane number of diesel emulsions.

If the decision is taken to use IQT, AIP recommends the use of IP 498, rather than ASTM D6890, since the former has been developed on fuels similar to those in Australia.