

SETTING NATIONAL FUEL QUALITY STANDARDS

Standardising Diesel/Biodiesel Blends

DISCUSSION PAPER Nov 2006 – EPA Victoria Submission

General Comments

The Victorian Government is currently developing a Biofuels Roadmap and Action Plan, aimed at identifying ways to increase investment and expand the biofuels market in Victoria (http://www.business.vic.gov.au/BUSVIC/STANDARD/1001/PC_61930.html). It is also intended at assisting the biofuels industry overcome barriers to expansion including issues relating to regulations, marketing and distribution.

Developing and encouraging the uptake of alternative transport fuels and technologies has an important part to play in:

- advancing sustainability
- reducing reliance on oil imports and securing Victoria's energy future
- delivering more high quality jobs and thriving, innovative industries across Victoria
- reducing pollution and greenhouse gas emissions

Correspondingly the Victorian Government is supportive of efforts aimed at reducing barriers to the development of a biofuels industry, including:

- increasing consumer confidence
- securing vehicle manufacturer support
- establishing appropriate distribution infrastructure and methods
- stimulating market supply and demand generally

The EPA Victoria response to the discussion paper is constructed taking the points raised above into account.

In addition to this, EPA Victoria would like to note an industry movement towards the use of imported palm oil for biodiesel production. This would not provide obvious benefits for Australian agricultural producers. This trend has consequences for the issues of regional development and conservation of biodiversity that run contrary to conclusions previously reached regarding development of a national biodiesel industry:

Regional Development

- "biodiesel produced from tallow or oilseeds...require(s) substantial and ongoing government assistance to be viable." (pg.17, "Appropriateness of a 350ML Biofuels Target", Report to the Aust Govt Dept of Industry Tourism and Resources, December 2003, http://www.industry.gov.au/assets/documents/itrinternet/BiofuelsStudy_Main%20Report20050404103800.pdf)
- "The refinery... is expected to produce in excess of 140 million litres per year from 123,000 tonnes of palm oil" ("Australia's Largest

Biodiesel Refinery", ABC Rural report, 29/11/2006,
<http://www.abc.net.au/rural/content/2006/s1800099.htm>)

- "The (Axiom) biodiesel production facility will be capable of producing 142,560 tonnes (150 million litres) per annum of biodiesel, predominately using palm oil as feedstock" (Axiom Energy Ltd Works Approval Application, October 2006, <http://www.epa.vic.gov.au/bus/comments/docs/wa61038.pdf>)
- "The biofuels industry depends on Australian agricultural production for its feedstock and builds on expertise in Australia's agricultural industries" (Government Promotes Renewable Energy", media release by the Prime Minister, 12/09/02, http://www.pm.gov.au/news/speeches/2002/media_release1852.htm)

Biodiversity

- "The palm oil tree is native to West Africa but was introduced to plantations in large parts of the tropical world, including Malaysia and Thailand, during the nineteenth century" ("SMEC Malaysia Wins Biomass Production Projects in Asia", SMEC news release, 22/03/06, http://www.smec.com.au/media/latest/2006/malaysia_bpp.htm)
- "In Malaysia alone, there are 4.2 million hectares to oil palm plantations (approximately 12-15 per cent of the land mass)" ("Australia's Largest Biodiesel Refinery", ABC Rural report, 29/11/2006, <http://www.abc.net.au/rural/content/2006/s1800099.htm>)
- "The 'hot spots' (where the disappearance of already-threatened moist tropical forest would cause the greatest losses of biodiversity) include the remaining forests in... peninsular Malaysia" (UNEP Global Environment Outlook 2000, <http://www.grida.no/geo2000/english/0066.htm>)
- "biodiversity impacts, from production, distribution and use of biofuels appear not to be significant" (pg.22, "Appropriateness of a 350ML Biofuels Target", Report to the Aust Govt Dept of Industry Tourism and Resources, December 2003, http://www.industry.gov.au/assets/documents/itrinternet/BiofuelsStudy_Main%20Report20050404103800.pdf)

It may not be possible to address these issues within any proposed fuel quality standard, however EPA Victoria feels that they should be acknowledged in providing this submission to the only current discussion forum relating to development of a biodiesel industry in Australia.

Response to Specific Discussion Points

- ***Should biodiesel blends be capped at B5 and meet the diesel standard?***
- ***Should flexibility be allowed for density (or any other quality parameter)?***
- ***Is Option 1 or Option 2 your preferred management option?***

In 2006 the Australian road transport diesel consumption equated to 61.3 billion litres. Recent analysis by BP Australia suggests a limit in the

amount of feedstock available for biodiesel production in Australia equating to approximately 610 ML annually over the next 3 to 5 years (ref Damian Johnstone, BP Australia Biofuels Marketing Manager, January 2007). This entails a maximum market penetration of 3.8% for the next 5 years not taking into account the overall market growth likely to occur over the same period. Should these figures be accurate, this would support biodiesel blends being capped at 5%.

In mitigation of this argument it can be observed that not all producers are likely to adopt a 5% biodiesel blend for the extent of their diesel sales. That being the case, it may prove a hindrance to market development for higher percentage blends of biodiesel to be discouraged by the lack of a suitable fuel quality standard. Furthermore, the use of imported palm oil has not been factored in, nor are developments in second-generation biofuels (even if unlikely to have significant impact in the short-term). For these reasons, unless there exist insurmountable obstacles to the development of a standard for blends in excess of 5%, it is desirable that biodiesel not be capped at 5%.

Further discussion relating to higher percentage blend standards and density requirements can be found below.

- ***Should a full B20 fuel quality standard be developed as outlined in Option 3?***
- ***If so, which parameters should be included?***
- ***Should a simplified B20 standard be developed as outlined in Option 4?***
- ***If so, which parameters should be included?***

As part of ensuring overall market flexibility, it is preferable that any standard developed be applicable for blends up to and including B20 (rather than strictly for B20 only). This would ensure that fuel suppliers are able to blend to levels that reflect feedstock availability and characteristics.

In addition to this, there exists a significant body of work internationally towards resolving standards for blends up to and including B20. This work has been undertaken in support of development of the biofuels industry despite resistance from the vehicle manufacturing industry. As part of the overall commitment by Australian regulatory bodies, standards should be developed in harmony with those available internationally.

For the reasons provided in the previous paragraph, it is not thought desirable to invest effort in developing a standard for blends above B20 (e.g. B50). This position may be worth reassessing should the international market evolve to place greater emphasis on blends greater than B20 for use as a fuel source in any significant quantities.

Presently resolution of the relevant international standards remains in limbo. Furthermore, the likely range of feedstocks from which biodiesel is likely to be produced in Australia is significantly larger than is generally the case in other markets. These issues complicate the development of a

blend standard for the Australian marketplace, in addition to which the additional cost to producers in the implementation of a full quality standard must be taken into consideration. For these reasons each fuel quality parameter should be considered against the imperative for a control, the availability of a suitable test method and the cost of implementation.

For obvious health and safety reasons, the flash point of the fuel blend should be regulated, tested and certified as for the base fuel stocks.

Regulation of the sulfur content of all diesel fuel is necessary to ensure compatibility with new vehicle/engine technologies. It has been suggested that there is the potential for B100 biodiesel to contain varying levels of sulfur, in addition to which fossil fuel derived diesel is processed to varying levels of sulfur which for cost reasons generally approach the regulated limit. That being the case, supply-chain management necessitates that sulfur content in both components of the blend should be tested and certified (as is presently the case), following which the resultant blend should also be tested and certified to ensure compliance and compatibility with the vehicle fleet. Should it be proven that the sulfur content of the resultant blend is a reliably linear result of that of the blend components, sulfur content testing of the resultant blend may be dispensed with.

Analogous to the situation described above for sulfur content is that of carbon residue, and for these reasons a similar solution is recommended.

Water and sediment content are currently regulated in both the diesel and B100 specifications. However due to the hygroscopic nature of biodiesel this does not entail that the resultant blend will have a predictable water content. Further from this the solvating power of biodiesel (in "pure" or blend form) mobilises sediment wherever evident in the supply-chain. The repercussions of this in terms of the effect on vehicles necessitate that both the water and sediment content of the blend-stocks be minimised at the outset, and handling guidelines be prepared and circulated for all aspects of the supply-chain. It is also desirable that a specification be devised for filtration of the fuel at the point of delivery to the vehicle.

The phosphorus content of B100 biodiesel is regulated due to its association with deposit formation. Diesel fuel phosphorus content is however not regulated, and for this reason it would seem necessary to test and certify biodiesel blend phosphorus content to ensure against introduction of additional phosphorus via the fossil-fuel diesel. Should it be found that no variation between the phosphorus content of the base and blended biodiesel arises over a significant body of test, it may be possible to dispense with the testing/certification of biodiesel blends.

Although glycerol is detrimental to diesel engine components, it is not regulated in conventional diesel due to it not being commonly found within the manufacturing process or supply-chain. That being the case, the

current regulation on glycerol content in the B100 biodiesel standard is thought to be adequate in ensuring against excess glycerol content.

The situation for alkali and alkaline metals is similar to that for glycerol, in that they form part of the biodiesel production process, can be harmful to diesel engine components, and are regulated for biodiesel but not for diesel as they are not commonly found within it. It is more likely however that metals will find their way into the fuel blend through the supply-chain, and for this reason it is recommended that (as for phosphorus) biodiesel blends are tested/certified for metal content, and if not found to deviate from the values of the base B100 blend stock over the course of a significant body of test, dispensed with following review.

Alcohol content in B100 biodiesel is regulated on account of its harmful effects on engines and presence in the production process. Its absence from the conventional diesel production process entails that it is not regulated for conventional diesel. This situation is analogous to that for glycerol, and correspondingly the current regulation on alcohol content in the B100 biodiesel standard is thought to be adequate in ensuring against excess alcohol content.

A minimum density requirement for biodiesel blends should be considered as a means to ensuring guaranteed energy content for the fuel, and corresponding fuel economy for the vehicle operator. However it has been suggested that Australian biodiesel blends are more likely to struggle with maximum density limits, which for diesel fuel in Australia are stipulated in lieu of limits on aromatic contents. Given that B100 biodiesel does not contain aromatics, it is suggested that the 850 kg/m³ density limit on the base blend-stock is sufficient and removes the need for an upper density limit of the final blend.

The distillation point for a diesel fuel is critical to combustion and correspondingly is regulated for both fossil fuel derived and bio-diesel. The separate test methods employed are a reflection of the different characteristics of the fuels, meaning that it is not obvious what test method could or should be applied to the resultant fuel blend. That being the case, it is suggested that conformance of the blend-stocks with the relevant distillation point requirements may be adequate in ensuring the appropriate combustion characteristics of the resultant fuel blend. This issue may be worthy of additional consideration on the strength of further analysis.

Viscosity is not a linear property of a liquid and accordingly blends of liquids of known viscosity will not have a necessarily predictable viscosity themselves. Nevertheless, there is sufficient overlap in the specifications for B100 and fossil fuel diesel to mean that the likely viscosity of a blend will be within their combined limits, i.e. no viscosity specification is required within a biodiesel blend standard.

A satisfactorily low corrosive potential of the fuel blend should be ensured through conformance of the blend stocks with their relevant corrosive potential specifications.

The lubricity of a biodiesel blend is unlikely to be an issue on account of biodiesel having been used traditionally as an additive to address insufficient lubricity within base diesel formulations. Similarly conductivity is property that need not be considered for biodiesel blends.

Taking into account the environmental implications of the various B20 blends, some effort should be made to address the potential for increased NOx emissions within the fuel specification. In justification of this it should be acknowledged that new vehicle emissions standards require increasingly more stringent levels of NOx and PM emissions to be observed. These improvements may be compromised should a biodiesel market evolve that results in a higher level of NOx emissions than what would be the case with conventional fossil-fuel derived diesel that satisfies the relevant fuel quality standard. It has been suggested that this can be achieved through the use of low aromatic diesel for the base blend-stock (i.e. max PAH value), or through the use of cetane enhancers (e.g. as a min cetane number). For the latter some disincentive needs to be incorporated against the use of organometallic additives (e.g. ferrocene), due to the increased PM emissions that result.

The cold-flow properties of biodiesel are a critical consideration for the likely range of Australian feedstocks. It is an undesirable constraint however for the market to have a set of minimum cold-flow properties prescribed. Instead a standard cold-flow property test method and certification convention should be enacted in support of efforts to provide the appropriate level of consumer information.

Testing and certification of the biodiesel blend level is desirable in order to allow vehicle operators to determine the fuel compatibility with their manufacturers specifications.

The current Australian market projections suggest that the range of feedstocks likely to be employed exhibit relatively stable shelf-lives as biodiesel (> 6 months). It is undesirable however to rely on the market maintaining course against projections, and correspondingly some consideration should be made of this issue. International work to define a test standard for stability is described as ongoing, and for this reason a shelf-life of 6 months maximum should be considered for all B100 biodiesel blends to be observed through certification from the date of manufacture. This constraint should be reconsidered should a satisfactory test method be determined.

Finally, although not strictly a fuel quality parameter, it is notable that significant issues arising from inhomogeneity of the fuel blend have been found to result from insufficient mixing (most commonly through splash blending). That being the case, the blend standard should prescribe mechanical mixing/agitation.

SUMMARY

The following parameters are recommended for incorporation into a fuel quality standard for biodiesel blends up to and including B20:

- flash point
- max PAH value and/or max cetane value (to control NOx emissions)
- cold-flow property test method and certification convention
- shelf-life certification convention, incorporating a 6 month maximum (to be reviewed should a satisfactory oxidative stability test method be resolved)
- blend level test method and certification convention

In addition to the above, the following parameters are recommended for incorporation into a fuel quality standard for biodiesel blends along with a "sunset" clause such that the results from testing can be reviewed and the requirements omitted if appropriate at a later date:

- sulfur content
- carbon residue
- phosphorus content
- alkali & alkaline metal content

Additional recommendations for action aside from fuel standard parameters include:

- handling guidelines should be prepared for all aspects of the supply-chain
- a point-of-dispensing filtration requirement
- mechanical mixing/agitation requirement for blending process
- ***Should a 'B5 only' cap be adopted or should both B20 and B5 blends be permitted?***
- ***Are there other management options that should be considered?***

Building upon the responses given previously, it is recommended that the existing diesel standard be maintained such that B5 blends are able to be sold within it, and an additional standard for blends up to and including B20 be devised.

- ***Should B5 blends be labelled?***
- ***If so, is a statement that the fuel "contains 5% biodiesel" or "up to 5% biodiesel sufficient?"***

To facilitate growth in consumer confidence it is thought desirable that diesel fuel formulations containing up to and including 5% biodiesel be labelled accordingly.

- ***Should higher blends and neat biodiesel (B100) be labelled?***
- ***If so, is statement of the biodiesel content (e.g. "this fuel contains 20% vol biodiesel") sufficient?***
- ***Is additional information required?***
- ***If so, what information should be included on a label for higher blends of biodiesel?***

All biodiesel blends should be labelled appropriately to facilitate growth in consumer confidence. Additional information relating to the cold-flow properties, reference to vehicle manufacturers specifications, and the shelf-life of the fuel (as expressed as a use-by date) should be included.

Instructions to refer to handling and use guidelines for all aspects of the supply-chain should also be referenced wherever appropriate.