



**Biodiesel Industries Australia Pty Ltd**  
1<sup>st</sup> May 2003

**Response to:**  
**Environment Australia**

**National Standard for Biodiesel**  
**Discussion Paper No. 6 March 2003**

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**BIA test Biodiesel at Maitland Diesel Service test cell and Fuel Injection Lab**

## Forward

Biodiesel Industries Australia Pty Ltd (BIA) are pleased that the **National Standard for Biodiesel-Discussion Paper No. 6** is such a positive document. BIA has always held the position that for Biodiesel to be accepted by the Australian market, quality standards need to be set, adhered to and wherever possible, exceeded.

BIA has constructed Australia's first purpose - built Biodiesel production facility in Maitland, NSW. The Hon Ian Macfarlane MP Federal Minister for Industry, Tourism and Resources opened the plant on March 12, 2003.



The Hon Mr. Ian Macfarlane, Senator John Tierney  
The Hon Mr. Bob Baldwin, Mr. Russ Teall & Mr. Andrew Hill  
Inspect internal workings of the plant.  
12<sup>th</sup> March 2003



The Hon Mr. Ian Macfarlane, Senator John Tierney  
The Hon Mr. Bob Baldwin & Mr. Mark Squires MCC  
Pictured with Newcastle City Councils' Biodiesel Fueled "Flower Power" VW Kombi. 12<sup>th</sup> March 2003

Biodiesel is a proven fuel with a favorable emissions profile. Biodiesel also has a positive energy balance 390% greater than petroleum distillate: i.e. 3.24 units of energy are gained for every unit of input energy compared with petroleum distillate (however clean), with a net loss at 0.83 units of energy per unit of input energy.

BIA believes that market demand for cleaner and renewable fuels will inevitably drive all diesel engine vehicle marketers to fully investigate and accept Biodiesel and Biodiesel blends. Further research and development into all aspects of Biodiesel production and use will lead to general efficiencies such as has been the case with petroleum distillates and lubricating oils over the past decades. Research & Development have enabled BIA to reduce NOx emissions simply by utilizing state of the art latest filter technology.

Because Biodiesel is currently in limited supply in Australia we believe the best application for Biodiesel use in road vehicles in metropolitan areas is via a blend with

petroleum distillate i.e. B20 (20%Biodiesel 80% Petrodiesel). Our own research has confirmed what is already known overseas;

- Per litre of Biodiesel, 5 vehicles using B20 produce greater environmental outcomes than 1 vehicle using B100.

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Results of our research and continued use of B20 have shown no reductions in horse power or fuel economy. Also drivers are happy to use the blended fuel and report that it minimizes pinging ("diesel rattle").

*NB Attached mpeg contains user testimony on Diesel Rattle.*

BIA favours the adoption of **ASTM D 6751** as the model for an Australian Standard. Our reasons for this position are as follows,

1. Commonality of testing protocol for both Biodiesel and automotive diesel fuel (petroleum distillate). Australian Standard™ AS 3570-1998, the automotive diesel fuel standard primarily prescribes ASTM standards and test methods.
2. Australian mining regulators recognise only ASTM fuels and additives as well as US EPA data. *See attached.* Significant opportunities exist for Biodiesel to be used as a BACT (Best Available Control Technology) for use in confined space uses such as mining, tunneling, warehousing etc.
3. By its' design the ASTM standard encourages further research and development by not limiting feedstock's or alcohol's.
4. Ability to utilise a variety of feedstock's.
5. Testing methods are simplified. *For example.*
  - *Flashpoint only, not flashpoint and residual alcohol.*
  - *Viscosity indicates ester content therefore viscosity only.*
6. BIA has in place arrangements with a local laboratory that can perform the ASTM D 6751 tests. This arrangement will expedite analysis as well as maintaining control of compliance costs.

BIA has as an equity partner in Biodiesel Industries Inc. of the USA. As such we are geared for production of Biodiesel compliant with ASTM D 6751. This relationship brings with it significant intellectual property that provides advantages in dealing with issues such as;

- Cold flow
- Microbial growth
- Stability
- Storage and handling

These issues have been resolved through a combination of many years of experience and research resulting in the development of a proprietary additive package.

### **Omissions**

BIA has identified points that were not raised as issues in National Standard for Biodiesel-Discussion Paper No. 6. The points omitted are listed as issues in AS 3570 - 1998

- a) **Additives** - chemical substances added to Biodiesel, usually in small quantities to impart desirable properties to, or prevent deterioration of the Biodiesel.
- b) **Composition.**
  - 1. Biodiesel shall consist of esters either methyl or ethyl derived from renewable sources such as vegetable or animal fats and oils.
  - 2. Biodiesel shall not include any suspended material (e.g. undissolved water or sediment) that is visible to a person of normal vision: and
  - 3. Biodiesel may include additives.

### **The case for a national Biodiesel standard in Australia**

BIA recognises the need for appropriate Biodiesel standards to guarantee consumer confidence for a product new to the Australian fuel market.

The case for the development of a biodiesel industry is beyond argument given a recent statement from the Australian Department of Tourism Industry & Resources, "Based on current estimates, global coal supplies are going to last 216 years compared with only 40 for oil and 61 for natural gas." (1)

BIA believes that cleaner engines and ULSD (ultra low sulphur diesel) are necessary initiatives that should run in parallel with sustainable and renewable energy development.

BIAs' view is that fuel made to ASTM D 6751 is the most beneficial for Australia. Therefore our favored position is to use the ASTM as a model for an Australian Standard. Using the US standard as a model will also accommodate the European specifications.

## **3.2 Feedstocks**

BIA do not consider that an Australian Standard for Biodiesel should include limitations on the types feedstocks or production technologies. BIA is firmly of the belief that in imposing those sorts of limitations Australia would be stifling research & development of "fuel only" crops and process technologies.

### **4.1 Emissions**

### **4.2 Toxicity**

Both 4.1 & 4.2 make mention of particulate matter (PM). Biodiesel does reduce the % of PM, however the pertinent fact is that Biodiesel emissions & PM have been proven by the US EPA in the Tier 1&2 health effects study to be much less toxic than petroleum distillate.

Ref Tier 1 & 2

### **4.6 Energy Balance**

With an energy balance of + 3.24 BIA believe that Biodiesel will one day, not only be less expensive, but will also be the diesel fuel of informed choice.

### **4.8 Storage, Handling and Distribution**

4.8 Recommends good housekeeping, BIA agrees that housekeeping is the single best control available. US experience has shown that Biodiesel pumped into an old tank having previously stored petroleum distillate will inevitably have water and microbial growth. The tanks should be drained / pumped free of water and a biocide should be added prior to storing biodiesel or blends.

*N: B care should be taken selecting additives, US experience has seen additives cause problems such as destroying seals etc, problems that were wrongly attributed to Biodiesel.*

## **Chapter 5. Biodiesel Blends**

The BIA position on the allowable percentage of Biodiesel to be blended in Australia is that it is consistent with the US EPA in so far as the US EPA recognise Biodiesel as both a fuel and a fuel additive.

BIA believe that the B% need to be evaluated on a per case basis.

BIA supports a standard B20 blend for all city and metropolitan applications, this would provide the greatest benefit for the Australian community in general need. Distribution issues are easily solved in the same manner winter mix diesels are blended into tanker trucks in terminals.

*E.g. 20%-50% Heating Oil to 80% - 50% Petroleum Distillate, the blending is generally performed by the tanker driver under the loading rack depending on the customer location as per the cloud point matrix of AS 3570- 1998.*

## Chapter 6. Biodiesel Parameters

**Table 6. Australian Biodiesel Standard**

			Australia	USA	EU	Recommended Test Method	Reference
<b>Specification / Standard</b>		<b>Units</b>	<b>AS 000?</b>	<b>ASTM D 6751</b>	<b>prEN 14214</b>		
Application					FAME		
Density	15° c	Kg/m	860 - 900		860 -900	ASTM D 1298	6.24
Kinematic Viscosity	20° c	mm <sup>2</sup> /s	-	-	-		
	40° c	mm <sup>2</sup> /s	1.9-5.0	1.9-5.0	3.5-5.0	ASTM D 445	6.5
Distillation	95 %	°c	≤ 360	≤ 360		ASTM D 1160	6.2
Flashpoint		°c	≥ 130	≥ 1 20	≥ 130	STM D 93	6.25
CFPP	Summer	°c	≤ 6 /Ω 0	-	≤ 5 / ≤0	ASTM D 4539	If Required
	Spr / Aut	°c	≤ 6 /≤ 0	-	≤ -5 /≤ -10	ASTM D 4539	If Required
	Winter	°c	≤ 6 /≤ 0	-	≤ -15 /≤ -20	ASTM D 4539	If Required
Cloud Point		°c	-	-	-		
Total Sulphur		%Mass	≤ 0.01	≤ 0.05	≤ 0.01	ASTM D 5453	6.1
CCR	100%	%Mass	≤ 0.05	≤ 0.05		ASTM D 5430	
	10%	%Mass			≤ 0.30		
Sulphated Ash		%Mass	≤ 0.02	≤ 0.02	≤ 0.02	ASTM D 874	6.7
Ash (oxid ash)		%Mass	-	-	-	None	
Water Content		mg/kg	≤ 300	-	≤ 500		6.26
Total Contamination		mg/kg	≤24	-	≤ 24	ASTM D 5452	If Required
Water and Sediment		% vol	≤ 0.05	≤ 0.05	-	ASTM D 2709	6.27
Corrosion (cu)	3h @ 50°c		≤ No.3	≤ No.3	Class 1	ASTM D 130	
Cetane No.			≥ 47	≥ 47	≥ 51	ASTM D 613	6.6
Acid No.		Mg KOH/g	≤ 0.8	≤ 0.8	≤ 0.5	ASTM D 664	
Oxidation Stability	110°c	hours			≥ 6	—	
Methanol Content		%Mass			≤ 0.2	—	
			<b>Australia</b>	<b>USA</b>	<b>EU</b>	<b>Test Method</b>	<b>Reference</b>

Saponification No.		Mg KOH/g	-	-	-	—	
Ester Content		%Mass	-	-	≥ 96.5	—	
Triglycerides		%Mass	-	-	≤ 0.20	—	
Diglycerides		%Mass	-	-	≤ 0.20	—	
Monoglyceride		%Mass	-	-	≤ 0.80	—	
Free Glycerol		%Mass	≤ 0.02	≤ 0.02	≤ 0.02	ASTM D 6584	6.12 - 6.15
Total Glycerol		%Mass	≤ 0.24	≤ 0.24	≤ 0.25	ASTM D 6584	6.12 - 6.15
Iodine Value					≤ 120	—	
Phosphorous		mg/kg	≤ 10	≤ 10	≤ 10	ASTM D 4951	6.3
Alkaline Metals		mg/kg			≤ 5	—	6.16
Calorific Value (net)		KJ/kg	-	-	-	—	
Linolenic acid methyl ester		%Mass			≤ 12	—	
Polyunsaturated Methyl esters		%Mass			≤ 1	—	

## 6.1 Sulfur

BIA supports the EU limit for Biodiesel at % Mass ≤ 0.01

BIA supports the use of the ASTM 5453 test method.

## 6.2 Carbon Residue

BIA supports the US standard of % Mass ≤ 0.05.

BIA supports the use of ASTM D 4530 as the appropriate test method.

## 6.3 Phosphorous

As the US and European standards share the same limit < 10ppm we see no need to review this limit.

BIA considers ASTM D 4951 as the appropriate test method.

## 6.4 Ester Content

BIA supports the ASTM methodology of not performing a specific test for Ester content.

## **6.5 Kinematic viscosity**

BIA Support the ASTM D 6751, as a major OEM (Caterpillar Machinery) set this standard.

BIA Support the use of ASTM D 445.

## **6.6 Cetane**

BIA supports the ASTM @  $\geq 47$ .

BIA recommends ASTM D 613 as the test method.

Attached MPEG contains testimony from a user that Biodiesel reduces "the Diesel Rattle" i.e. knocking or pinging.

## **6.7 Sulphated Ash Content**

As the US and European standards share the same limit  $< 10\text{ppm}$  we see no need to review this limit.

BIA considers ASTM D 874 as an appropriate test method.

## **6.8 Total contamination**

BIA supports the EU Standard where necessary.

BIA recommends ASTM D 5452 as the test method.

## **6.9 Acid Value**

BIA supports the ASTM standard.

BIA recommends ASTM D 664 as the test method.

## **6.10 Iodine Number**

BIA supports the ASTM in not using an Iodine No.

BIA sees the EU Iodine No. as a restrictive measure and BIA has addressed issues of stability by means of an additive package.

## **6.11 Linoleic acid methyl esters and polyunsaturated methyl esters (<4 double bonds)**

**6.12** BIA support the ASTM with regard to Linoleic acid methyl esters and polyunsaturated methyl esters (<4 double bonds)

### **6.12 to 6.15 Glycerin**

As the US and EU standard for free glycerin are very similar, BIA has no issue with the level set.

BIA regards the ASTM method of testing for free & total glycerin only as the most efficient as Mon, Di & Tri glycerides will show up as total glycerin.

Therefore test method ASTM D 6584 is appropriate. BIA is aware of a simplified test in development using enzyme technology that may replace Gas Chromatography.

### **6.16 Alkaline Metals**

BIA is of the opinion that the Sulphated Ash test as per the ASTM is sufficient indication of the presence of alkaline metals.

The EU and US standard for Sulphated Ash is equivalent.

### **6.17 Thermal Stability**

Both the EU & US set no limit for Thermal Stability, Therefore BIA sees no need for an Australian standard or limit.

If in future a test regime is deemed necessary BIA would recommend ASTM D 6468 as the test method.

### **6.18 Oxidation Stability**

BIA regards data on Oxidation Stability as beneficial.

BIA intends to test using both the BSI IP 306 and the ASTM D 4625 tests.

BIA intends to test pure Biodiesel against BIA Biodiesel with its proprietary additive package.

BIA recommends that Oxidation Stability not be tested on a regular basis but to simply establish a profile of behaviour patterns.

### **6.19 Alcohol Content**

BIA Support the ASTM methodology of not performing a specific test. Our reason is that residual alcohol will lower the flash point.

Therefore the ASTM D 93 test for flash point will identify any residual alcohol.

## **6.20 Cloud Point**

BIA feels a specific test for Cloud Point is not necessary.

If required BIA would recommend ASTM D 2500.

*N.B BIA doubts that normal petroleum diesel fuel has a cloud point of - 15°C. AS 3570 - 1998 have as a cloud Point of -3°C in Tasmania in July.*

## **6.21 Cold Filter Plugging Point**

BIA considers the US position simple and therefore desirable. BIA has as part of its additive package a cold flow additive that will dosed all year round. We have seen many cases of summer petroleum distillate freezing in lines and filters in winter as it has been in storage for some months.

BIA consider the Caterpillar Machinery recommendation of a seasonal range of between 6°C - 0°C as reasonable for Australian conditions.

If required BIA recommends ASTM D 4539 as the appropriate test method.

## **6.22 Distillation Temperature**

BIA recommends that Distillation Temperature be treated similarly to **6.18** in accumulating Data on the typical properties.

## **6.23 Calorific Value**

Biodiesel is almost 11% oxygen. This accounts for the lower calorific value.

Conversely this oxygen is component that makes the fuel burn more completely and produce lower and less toxic emissions & PM.

Research indicates that B100 produces 7% less power than Petroleum Distillate. The conclusion BIA reach is that the fuel used is providing more power per calorie.

Our research on B20 has shown that in some applications B20 provides more power. B100 easily outperforms diesel in stall tests compared to other varieties of clean diesel such as Eromanga, Shell Purinox, and underground mining diesel fuel.

## **6.24 Density**

The density for both the European and US standards are the same therefore we see no reason for an Australian standard to differ.

BIA supports the use of ASTM D 1298 as the appropriate test method.

### **6.25 Flash Point**

BIA support the US specification @ 130°C.

BIA supports the use of ASTM D93 as the appropriate test method.

NB. Point **6.19**.

### **6.26 Dissolved Water Content**

Water of any kind is the enemy of fuel quality. If Biodiesel with a high dissolved water content is blended with petroleum distillate the B% will become cloudy and a threat to engine components and filters.

### **6.27 Free Water and Sediment Content**

As EU and US standards are common BIA have no issue with the set level.

BIA recommends ASTM D 2709 as the test method.

### **6.28 Corrosion**

BIA believes the ASTM standard of No.3 max is appropriate.

BIA recommends ASTM D 130 as the appropriate test method.

## **7.0 Alcohol**

BIA has no experience with ethanol and is therefore unqualified to comment.

BIA intends to investigate ethanol use as part of an ongoing Research & Development program.

BIA does not support the EU in specifying alcohol, in doing so we believe future advancements in process or chemistry may be limited.

## **8.0 Technical Analysis of the Impacts of Blending Biodiesel with Petroleum Diesel**

BIA recommends that Biodiesel Blends adopt both the impending Biodiesel Standard and the existing AS 3570-1998 ADF standard to run concurrently. BIA believes that to have a standard for each % blend would be too cumbersome as issues of flash point, CFPP or density will vary depending on the % of either fuel.

In the interim BIA recommend that low blends of Biodiesel between 0 - 10 % be accommodated in **AS 3570 - 1998 ADF Section 4 part 4.1 Additives**; *chemical substances added to automotive diesel fuel, usually in small quantities to impart desirable properties to...*

Having said that it is the responsibility of the supplier of a blended product to provide an MSDS with typical data including flash point, density etc.

ASTM D 6751 standard is for Biodiesel as a blend stock for petroleum distillate so the US standard does accommodate blends.

BIA believe that blending petroleum diesel with Biodiesel is a positive situation, as stated earlier in our response we are supporters of a B20 blend for wider metropolitan as our research has confirmed what is already known in the United States and Europe;

- Per litre of Biodiesel, 5 vehicles using B20 produce greater environmental outcomes than 1 vehicle using B100.

Biodiesel, being an oxygenated fuel aids combustion of petroleum distillate and burns much of the gaseous particulate matter.

BIA has seen increased HP at B20 depending on the duty cycle. At B20 the biodiesel fraction is maximised in all areas e.g. Power, economy & emissions reductions.

### **8.1.1 Ester Content**

BIA believes this paragraph to be irrelevant as ASTM D 6751 Biodiesel will be fully reacted.

### **8.1.2 Kinematic Viscosity**

BIA recommends that no specific limit be set if both Biodiesel & Petroleum Diesel meet their respective standards.

### **8.1.3 Cetane Number**

BIA believes that in regard to Cetane Number petroleum distillate will be improved.

### **8.1.4 Sulphated Ash**

BIA believe that Biodiesel meeting either the US or EU standard will have no effect on a diesel engine. Therefore BIA have no issue.

#### **8.1.5 Total Contaminants**

BIA has no issue.

#### **8.1.6 Acid Value**

BIA Support the ASTM in regard to acid number.

An increase in acidity is linked to stability BIA have an additive package that will minimise this probability.

#### **8.1.7 Iodine Number.**

Refer to both 8.1.7 and 9.0

#### **8.1.8 Linoleic Acid Methyl Ester**

Refere 8.1.6 & 9. 0

#### **8.1.9 Mono and Diglyceride Content**

#### **8.1.10 Triglyceride Content**

#### **8.1.11 Free Glycerin**

Any Glycerin Mono, Di or Tri over set limits mean that the product is not fully reacted and therefore not Biodiesel.

#### **8.1.12 Alkaline Metals**

BIA has no issue.

### **8.2 Impacts on Emission**

BIA is of the opinion that the impact on petroleum diesel emissions by the blending of a % of Biodiesel is a positive for the environment as well as extending the life of a finite resource.

BIA has measured a reduction of all toxic emissions are reduced including NOx. BIA has managed to reduce NOx emissions with use of modern filter technology.

### **9.0 Effect of Biodiesel on Engine Oil**

Over the last decade diesel engines have reduced tail pipe emissions, a result of this has been an increased demand or load placed on engine oils.

In the mid 1990's soot was a major problem in engine oils. Engine oil development soon overcame this problem with the development of the CH4 Oils replacing the CH3.

One German specialty Oil Company Fuchs has already developed an ester based synthetic oil **Fuchs GT1™**, This product is available in Australia. Synthetic lubricants are manufactured to have molecular chains without variation or without weak links. These products can be modified to suit a particular demand.

Glycerol is used in specialist lubrication where oxidation stability is required such as in air compressors.

The point being that lubrication technology exists to work together with engine & fuel developments including ULSD and Euro 6 engines.

## **10. Vehicle Warranties and labeling**

This section is largely self explanatory however it is worthwhile mentioning that in April 2003 our US partner Biodiesel Industries Inc co-hosted with Haycock Petroleum (America's Oldest Chevron Distributor) a Biodiesel update and info session with US OEM's in Las Vegas. Haycock Petroleum & Biodiesel Industries supply many fleets and government utilities in Nevada with B20.

Their primary concerns were that of standards and reputable suppliers. In Australia just as it is in the US Biodiesel has been manufactured by a small number of enthusiasts in back yards using "Bucket Chemistry" providing no guarantee or quality assurance.

The consensus of the meeting in Las Vegas was that the US OEM's want is a guarantee of consistent quality Biodiesel from certified or licensed producers.

### **10.3 The Australian Situation**

This section highlights the lack of knowledge and experience of Australian distributors and representatives. More work needs to be done from the Biodiesel Industry and Government to inform the local dealers and representatives of the practical applications of Biodiesel as well as advising local companies of their parent companies position and experience.

Examples of the lack of knowledge and the first response being "It will void your warranty" is Peugeot, a French company. Their Australian representative answering an enquiry from a lady who wanted to purchase a diesel car so she could use Biodiesel was "*it will void your warranty*". This position is contrary to Appendix B of the discussions, page 90 **France** states "*existing guarantees being extended to cover Biodiesel by PAS Peugeot, Citroen and Renault IV*".

Mitsubishi Australia has no data on Biodiesel so they simply void warranty. Caterpillar & Mitsubishi have strong links Mitsubishi manufacture Biodiesel warranted equipment being Caterpillar tractors (Bulldozers) up to the D6 model in Japan.

#### **10.4 ADR compliance**

This industry needs to work more closely with ADR and CSIRO as more Biodiesel is produced in preparation for the impending standards.

#### **10.5 Labeling**

BIA support retail labeling particularly blend levels above 10%. BIA believes informed consumers make informed choices. Therefore labeling higher % blends would allow retailers to advertise the differentiation and satisfy demand for renewable & less toxic fuels.

Therefore, we recommend that the common term of Biodiesel B% be marked on each dispensing pump. For example...

#### **Conclusion**

- Chapter 6. BIA specifies limits and recommends test protocols using ASTM D 6751 as a model. Our primary reason being the commonality of testing protocol for both Biodiesel and automotive diesel fuel (petroleum distillate). Australian Standard™ AS 3570-1998, Automotive diesel fuel primarily prescribe ASTM standards and test methods.
- Standards are required that guarantee confidence of both OEM's and fuel consumers.
- A high standard should be set with the flexibility to allow and encourage further research & development.
- A registered producer scheme would give assurance to OEMs', Government Fleets Operators, retailers and the general public alike.
- A registered producer scheme would limit backyard producers that invariably break laws and regulations e.g.
  - . Storage and Handling of Dangerous Goods AS 1941
  - . Collection, transportation, storage and the use of waste i.e. used cooking oils & fats.
  - . Disposal of wastes in particular glycerol containing methanol and wash water.

- The industry and government must inform and educate the marketplace to the benefits of Biodiesel for the environment and our domestic economy.

## References

1. Speech Notes for The Honourable Ian Macfarlane MP Minister for Industry, Tourism and Resources Minerals Council of Australia Inaugural Sustainable Development Conference Newcastle, 12 November 2002.

2. US EPA Tier 1 & Tier 2 health effects study.

<http://www.nbb.org/resources/reportsdatabase/reports/gen/gen-278.pdf>

3. National Standard for Biodiesel Discussion Paper No. 6

[www.ea.gov.au/atmosphere/transport/biodiesel/index.html](http://www.ea.gov.au/atmosphere/transport/biodiesel/index.html)

4. Department of Mineral Resources. Mine Safety & Environment Division, Legislation update 16 June 2000

## Glossary of Terms

- B Biodiesel
- % The percentage of Biodiesel in a blend with Petroleum Diesel
- OEM Original Equipment Manufacturer
- R&D Research and Development
- ADR Australian Design Rules
- NO<sub>x</sub> Nitrous Oxide
- ULSD Ultra Low Sulphur Diesel
- PM Particulate Matter
- AS 3570 - 1998 The Australian Standard for Automotive Diesel Fuel
- MSDS Material Safety Data Sheet