

Summary of Submissions - Regulating Biofuel Quality Discussion Document (October 2007)

Biodiesel (B100) Specifications

Property	NZS 7500 requirements	Proposed requirements in Discussion Document	Submissions	Ministry comment	Final Recommendation
Ester Content	96.5% m/m EN 14103	96.5% m/m EN 14103	All submissions supported. The ester content method has limitations, particularly when used on tallow or palm based biodiesel. The result is an underestimation of the ester content, which would make most samples fail the required minimum of 96.5°C.	Although the limitations of EN 14103 are recognised, there are no alternative appropriate test methods at this time. Modifications are possible, but the detail involved makes them unsuitable to include in the regulations. The regulations already provide the power for the Chief Executive to approve alternative test methods.	96.5% mass min EN 14103
Density at 15°C	860 – 900 kg/m ³ ASTM D1298 ASTM D4052 ISO 3675	860 – 900 kg/m ³ ASTM D1298	All but one submission supported the limit. Two submitters requested the use of ASTM D4052 as an alternative test method.	ASTM D4052 is not suitable for B100 made from tallow.	860 – 900 kg/m³ ASTM D1298
Viscosity at 40°C	2.0 – 6.0 mm ² /s, but allows up to 7.5 mm ² /s if required. ASTM D445 ISO 3104	3.5 - 5.0 mm ² /s to align with EN14214 ASTM D445	Four submitters disagree with the proposed specifications as they discriminate against some feedstocks, namely lauric oils such as coconut. Viscosity in B100 is related to the feedstock rather than the production process, and it is controlled in the blend specifications (the end use). Several biodiesel manufacturers consider 5.0	The European Diesel Standard (EN 590) requires a viscosity of 2.0 – 4.5 mm ² /s. Thus, there should not be any issue with vehicles using good quality biodiesel that has a viscosity down to 2.0 mm ² /s. An upper limit of 6.0 mm ² /s will allow additional	2.0 – 5.0 mm²/s for final fuel 2.0 – 6.0 mm²/s for blending component ASTM D445

			<p>maximum too stringent for waste cooking oil and tallow feedstocks.</p> <p>All others agreed with the proposed requirement as this is consistent with the European Biodiesel Standard (EN14214).</p>	<p>flexibility for biodiesel intended for blending. ASTM D6751 has a viscosity range of 1.9 – 6.0 mm²/s.</p>	
Flash Point	<p>100°C min</p> <p>ASTM D93</p> <p>ASTM D3828</p>	<p>100°C min</p> <p>ASTM D93</p>	<p>All but one submission supported.</p>		<p>100°C min</p> <p>ASTM D93</p>
Sulphur	<p>Max 50 mg/kg, reduced to 10 from Jan 2009.</p> <p>ASTM D 5453</p> <p>ISO 20846</p> <p>ISO 20884</p>	<p>Max 50 mg/kg, reduced to 10 from Jan 2009.</p> <p>IP 497 or ASTM D 5453 (to align with test methods in PPSR)</p>	<p>Some submitters supported having a sulphur limit of 10 mg/kg at the outset. This would align with EN 14214 and the Australian Biodiesel Determination.</p> <p>In the second round of consultation, no submitters objected to a limit of 10 mg/kg at the outset.</p>	<p>This is not a controversial parameter as biodiesel naturally has a low level of sulphur.</p>	<p>10 mg/kg max</p> <p>IP 497 or ASTM D5453</p>
Carbon residue (on 100% distillation residue) or	<p>0.050% m/m</p> <p>ASTM D4530</p>	<p>0.050% m/m</p> <p>ASTM D4530</p>	<p>All but one submission supported.</p>		<p>0.05% mass max</p> <p>ASTM D4530</p>
Carbon residue (on 10% distillation residue)	<p>0.30% m/m</p> <p>ISO 10370</p>	<p>0.30% m/m</p> <p>ISO 10370</p>			<p>0.30% mass max</p> <p>ISO 10370</p>
Cetane Number	<p>51.0 min</p>	<p>51.0 min</p>	<p>Several submitters are of the view that B100 as a blending component should have a less stringent cetane number requirement. Cetane in B100 is related to the feedstock rather than the production process, and it is controlled in the blend specifications (the end use).</p>		<p>B100 as a final fuel: 51 min</p> <p>B100 as a blending component: 47 min</p>

			Several biodiesel manufacturers do not support relaxing cetane number as this will allow for imports of soybean based biodiesel to meet the specifications.	
	ASTM D6890 ISO 5165 ASTM D613	ASTM D613	A number of submissions requested that the regulations also allow the use of the ASTM D6890 (Ignition Quality Tester - IQT) for testing cetane in biodiesel and biodiesel blends. ASTM D613 measures the cetane number using a cetane engine, which is expensive and archaic technology.	The ASTM D6890 is a modern, practical and precise test method, which correlates well with ASTM D613. Cetane Number: ASTM D613 or ASTM D6890.
Sulphated Ash Content	0.02% m/m ASTM D874 ISO 3987	0.02% m/m ASTM D874	All submissions supported.	0.020% mass max ASTM D874
Water Content	500 mg/kg max ASTM D6304 ISO 12937	500 mg/kg max ASTM D6304	One submitter noted that in the UK some oil companies have had issues with blending that have been ascribed to the water content of on-spec fuel. They suggest that if the industry imposes a water content limit of 200 mg/kg that this be considered for the regulations. In the second round of consultation it was noted by several submitters that the test method ASTM D6304 has very poor precision. IP 438 uses the same equipment but has much better precision.	New Zealand would review the water content parameter if the maximum allowable content was tightened in other jurisdictions. 500 mg/kg max IP 438
Total Contamination	24.0 mg/kg max EN 12662	24.0 mg/kg max EN 12662	All but one submission supported the limit. IP440 is equivalent to EN 12662. In general submitters prefer IP tests over EN tests.	24 mg/kg max IP 440
Copper Strip Corrosion (3 h at	Class 1	Class 1 ASTM D 130 (to	All submissions supported.	Class 1

50°C)	ISO 2160	align with PPSR)			ASTM D130
Oxidation Stability, 110°C	6.0 hours min EN 14112	Options discussed	<p>Submissions are divergent on the appropriate requirements for oxidation stability.</p> <p>The Japanese Automobile Manufacturers Association (JAMA) strongly advocate 10 hours for B5 blends. The Motor Industry Association (MIA) endorse JAMA's stance. NZRC and the Oil Companies generally support 10 hours. This support is to acknowledge JAMA's concerns.</p> <p>Biodiesel manufacturers namely support 6 hours.</p>	<p>Vehicles represented by JAMA make up approximately 75-80% of the diesel fleet, or approximately 15% of the entire vehicle fleet.</p> <p>The nature of the retail market requires more rigorous fuel quality regulations than when fuel is being sold via a written contract or supply agreement.</p> <p>A requirement of 10 hours minimum should have minimal cost implications. Rapeseed biodiesel may require up to 1100 mg/kg antioxidant, but this should cost less than \$0.014 per litre (or \$0.0007 per litre for B5 blends). Tallow based biodiesel should only require approximately 200-250 mg/kg antioxidant, which should cost less than \$0.003 per litre.</p>	<p>6.0 hours min, 10.0 hours min for blending component for retail biodiesel blends.</p> <p>EN 14112</p>
Acid Value	0.5 mg KOH/g max ASTM D664 EN 14104	0.5 mg KOH/g max ASTM D664	All but one submission supported.		<p>0.50 mg KOH/g max</p> <p>ASTM D664</p>
Iodine Value	120 max EN 14111	140 max EN 14111	Most submitters agreed to a 140 max iodine value. The exceptions to this were JAMA who supported a 130 limit, and those submitters who support alignment with EN14214 (120 max). A stepped increase was also suggested by one biodiesel company (e.g. increase to 130 before going	Iodine value is a coarse measure of oxidation stability. As a more stringent oxidation stability requirements is proposed (i.e. 10 hours minimum IP), the iodine value loses significance.	<p>140 max</p> <p>EN 14111</p>

			to 140). Two biodiesel manufacturers supported no specified iodine value, on the basis that it is not necessary to control fuel stability. As with cetane number, two biodiesel manufacturers do not support a relaxation of the iodine value as this will allow imported soybean based biodiesel to meet the specifications.	
Linolenic acid methyl ester	12.0% m/m EN 14103	12.0% m/m EN 14103	All but one submission supported.	12.0% mass max EN 14103
Polyunsaturated Alkyl Esters	Should be limited to 1% m/m Suitable test method to be developed	Not Specified, wait for test method to be developed.	Submitters generally supportive of not specifying. One submitter proposes that the regulations specifically exclude certain high polyunsaturated fats and oils. Another recommended that a placeholder be included to provide guidance of future requirements.	Including this parameter will give a signal to industry that biodiesel should not include fish oil as a feedstock. This is considered important given some recent interest in domestic production using fish oil.
Methanol content	0.20% m/m mono alcohols content EN 14110	0.20% m/m EN 14110	All submissions supported.	0.20% mass max EN 14110
Monoglycerides	0.80% m/m ASTM D6584 EN14105	0.80% m/m ASTM D6584	All but one submission supported.	0.80% mass max ASTM D6584
Diglycerides Triglycerides	Not Specified.	Not Specified.	Submissions are evenly split between whether diglycerides and triglycerides should be specified or not. The reasoning for those who support inclusion of limits is for alignment with EN 14214, and the impacts that excess di and triglycerides have on vehicles (namely injector deposits). The	Inclusion of diglyceride and triglyceride specifications are not going to impact on compliance costs as they are obtained in the same test that produces results for monoglycerides, total glycerol and free glycerol (all of which are

			arguments against inclusion are that glycerides are adequately controlled by the inclusion of total glycerol and monoglyceride specs.	specified). In addition, there should be no impact on feedstocks as glycerides are related to the production process. Including di and triglycerides will align the NZ spec further with EN14214.	
Free glycerol	0.02% m/m ASTM D6584 EN 14105 EN 14106	0.02% m/m ASTM D6584	All submissions supported.		0.02% mass max ASTM D6584
Total glycerol	0.24% m/m ASTM D6584 EN 14105	0.24% m/m ASTM D6584	All but one submission supported.	Change to 0.25% because now proposing to individually specify diglycerides and triglycerides.	0.25% mass max ASTM D6584
Group I metals (Na+K)	5.0 mg/kg max EN 14108 or EN 14109	5.0 mg/kg max EN 14108 or EN 14109	All submissions supported.		5.0 mg/kg max EN 14108 or EN 14109
Group II metals (Ca+Mg)	5.0 mg/kg max EN 14538	5.0 mg/kg max EN 14538	All submissions supported.		5.0 mg/kg max EN 14538
Phosphorus content	10 mg/kg max ASTM D4951 EN 14107	10 mg/kg max ASTM D4951	All but one submission supported.		10.0 mg/kg max ASTM D4951
Cold Flow Performance	Need to be measured and recorded	Not Specified	All but one submission agreed with no specified requirements. One submitter proposed that cold flow performance be specified for B100 for retail sale.	It is not proposed that B100 be available for retail sale at this time.	Not specified
Different grades	Not covered	Not discussed	One submitter would like to see three grades	In Europe, there is a standard for	Not covered

<p>of B100 and B100 for retail sale.</p>	<p>of biodiesel – a ‘premium’ (EN 14214, retail and non-retail sale), ‘regular’ (less stringent specs, non-retail), and ‘low specification’, non-retail, aimed at less spec-sensitive applications’.</p>	<p>biodiesel for heating purposes, but this does not differ significantly from the automotive standard (i.e. EN14214). All biodiesel should be able to meet the specifications proposed for non-retail B100 if the production process has been undertaken properly. When public confidence and awareness in biodiesel has improved, there may be value in providing limited waivers to the B100 specifications for use in less sensitive applications.</p>			
<p>Filter Blocking Tendency (FBT)</p>	<p>Not specified</p>	<p>Not specified</p>	<p>Two submitters requested that B100 be required to pass an FBT test.</p>	<p>No other jurisdiction specifies a filterability test for B100. Filterability is controlled in the retail diesel (& B5) specifications</p>	<p>Not specified</p>

Non-Retail Biodiesel Blends

Property	NZS 7500 requirements	Proposed requirements in Discussion Document	Submissions	Ministry comment	Final Recommendation
Blend level	No limit	No limit	All but one submitter agreed to the proposed limits. The one submitter felt that the blend requirements were too prescriptive.		No limit
Cetane Number	51.0 min	51.0 min			51 min
Colour (ASTM)	3.0 max	3.0 max			3.0 max
Lubricity	460 microns max	460 microns max			460 microns max
Viscosity	2 – 4.5 mm ² /s	2 – 4.5 mm ² /s			2.0 – 4.5 mm²/s
Acid value	0.1 + X / 250 mg KOH/g max (X = % biodiesel in blend)	0.1 + X / 250 mg KOH/g max			0.1 + X / 250 mg KOH/g max (X = % biodiesel in blend)
Filter Blocking Tendency (FBT)	Fuel shall be of acceptable filterability so that it is fit for common purposes.	Not specified	All submitters agreed that FBT should not be specified for non-retail biodiesel blends.		Not specified
Flash Point	Not specified	61.0°C min	All but one submission supported.		61°C min
Total Glycerol	0.05 + X/500 %m/m (X = % biodiesel in blend)	0.05 + X/500 %m/m	One submitter pointed out that it is unnecessary to specify total glycerol for biodiesel blends, if the biodiesel component is also required to meet a limit of 0.25% m/m. In the second round of consultation, all submitters supported no requirement for total glycerol.		Not specified

Sulphur	50, 10 max from Jan 2009	50, 10 max from Jan 2009	All but one submission supported.		50, 10 mg/kg max from Jan 2009
Water & Sediment	Water and Sediment 0.015% volume max	Water and Sediment 0.015% volume max	Two submitters supported separate requirements for water content and total contamination, rather than one limit for water and sediment. In the second round of consultation, the majority of submitters supported this approach.		Water Content: 200 + 3*X mg/kg max (X = % biodiesel in blend) Total Contamination: 24 mg/kg max
Cetane Number Test Method	ASTM D6890 ISO 5165 ASTM D613	ASTM D613	Comments as for B100.	Comments as for B100.	Cetane Number: ASTM D613 or ASTM D6890.

Schedule 3 of the PPSR (retail diesel and B5 blends)

Property	NZS 7500 requirements	Proposed amendments to PPSR as in Discussion Document	Submissions	Ministry comment	Final Recommendation – Amendments to Schedule 3 of the PPSR
Biodiesel content	5% by volume biodiesel max	5% by volume FAME max	Several submitters do not support a limit of 5% by volume biodiesel being placed on blends for retail sale, as they would like the flexibility to sell higher blends via retail sale (but recognise that these would need to be labelled). The arguments for this are largely based around consumer choice and supporting the domestic biodiesel industry.	There is a lack of vehicle manufacturers who will support biodiesel blends above 5% by volume. It is also unlikely that the majority of biodiesel blends of higher than 5% by volume would be compliant with the diesel specifications. Specifications for retail sale of higher level biodiesel blends will need to be developed when the demand and supply for these fuels increase. In the interim, higher blends can be supplied to	5% by volume Fatty Acid Methyl Ester max, which meets the B100 specifications. EN 14078

				compatible fleets via non-retail sale.	
Total contamination test method	EN 12662 but PPSR ASTM D6217	EN 12662	Majority of submitters support the PPSR being amended from testing particulates with ASTM D6217 to testing total contamination with EN 12662 or IP 440 which is equivalent (same limit for both applies).		IP 440
Cold flow performance	Winter +2°C CP max, -6°C CFPP max Summer +4°C CP max	Option for relaxing specs in Auckland / Northland (petroleum diesel and B5 blends)	<p>Submitters generally supported a relaxation of the CP requirements in summer provided that this is justified by climate data.</p> <p>Gull New Zealand Ltd do not support having geographically different cold flow requirements. as they believe that it will place them at a disadvantage against the four major oil companies.</p> <p>Gull only draws fuel from one source (i.e. Mt Maunganui), and to continue to supply areas north and south of Auckland all fuel will need to meet the more stringent requirements. Whereas the four major oil companies will have the option to supply separate stock to Auckland/Northland. The higher the cloud point, the lower the cost of the diesel.</p>	<p>A review of the climate data showed that the current requirement is more stringent than necessary for Auckland/Northland in summer.</p> <p>Climate data also indicates that there is a risk of waxing in the central volcanic plateau with diesel that meets the current regulated CP for summer. The purpose of the regulations is to specify absolute minimums and set an overriding 'fit for common purposes' requirement.</p> <p>Relaxing the CP specification in this region will facilitate the blending of biodiesel into existing diesel stocks, reducing the need for a separate diesel blendstock. In general, blending biodiesel into diesel at the 5% by volume level increases the CP of the fuel by 2 to 3°C.</p>	<p>Winter no change</p> <p>Summer: Auckland/ Northland CP +6°C max; rest of country CP +4°C max</p>
Filter Blocking Tendency	Fuel shall be of acceptable filterability	No amendment to Schedule 3 of the	Several submitters are of the view that the FBT requirement should	There is not enough evidence to suggest that an FBT limit above	No amendment to Schedule 3, i.e. 2.5 max;

(FBT)	so that it is fit for common purposes (acceptable filterability can be expected if the result is less than 2.5)	PPSR, i.e. 2.5 max; fuel must be of acceptable filterability so that it is fit for common purposes.	not apply to biodiesel blends due to the sensitivity of the test and the problems fuel made from tallow is experiencing in meeting the 2.5 limit.	2.5 would not have a negative impact on vehicle operability. It would be prudent to require biodiesel blends to meet the current FBT requirement until it is better known what the affects of a higher limit are on vehicle operability.	fuel must be of acceptable filterability so that it is fit for common purposes.
Formic, Acetic and Propionic Acids	No spec	No spec	All but one submission supported.	JAMA and MIA concerns should be addressed if IP for B100 oxidation stability is minimum 10 hours.	No amendment to Schedule 3, i.e. not specified.
Carbon Residue (on 10% distillation)	0.25% m/m	0.20% m/m	Two submitters are of the view that the carbon residue (on 10% distillation) should be 0.3% m/m.	Cabinet considered the carbon residue limit for petroleum diesel in December 2006 and approved a limit of 0.20% m/m.	No amendment to Schedule 3, i.e. 0.20% mass max
Cetane Number Test Method	ASTM D6890 ISO 5165 ASTM D613	ASTM D613	Comments as for B100.	Comments as for B100. Cetane index (ASTM D976) is not applicable for blends containing biodiesel.	Cetane Number: ASTM D613 or ASTM D6890. Cetane Index: ASTM D976 (not suitable for biodiesel blends)

Ethanol Specifications for Blending

Property	Proposed requirements in Discussion Document	Submissions	Ministry comment	Final Recommendation
Ethanol	95.6 % volume min ASTM D5501	Three oil companies proposed that a limit for higher alcohols be included. JAMA advocated a higher minimum ethanol percentage of 97.5%.	A limit of higher than 95.6% (including higher alcohols) would be preferable but appropriate test methods for measuring higher alcohols in denatured fuel ethanol are not available. 95.6% will align with the proposed Australian specification.	95.6 % volume min ASTM D5501
Methanol	0.5 % volume max ASTM D5501	All but one submission supported.		0.5 % volume max ASTM D5501
Denaturant Type	New Zealand Spec Petrol	Two oil companies suggested that any petrol of reasonable quality be able to be used to facilitate importation. One oil company requested that the use of bitrex (a denaturing agent) be approved.	Petrol is the preferred denaturant so as to avoid any vehicle operability issues. Petrol (at 1% by volume) is approved as a denaturant by both the New Zealand Customs Service and under the Hazardous Substances and New Organisms Act by way of the Denatured Ethanol Group Standard. Petrol is not required to meet the full New Zealand specification to facilitate denaturing overseas.	The denaturant contained in ethanol must be unleaded regular grade or premium grade petrol with the following minimum characteristics: i. End point - 210°C max ii. Sulphur - 50 mg/kg max iii. Clear and bright
Denaturant	1 to 1.5 % volume ASTM D5501	All submissions supported.		Ethanol must contain denaturant and the type and volume of the denaturant must be declared. 1 to 1.5 % volume ASTM D5501

Water content	1 % volume max ASTM E203	All but two submissions supported the proposed limit. These two submitters wanted a limit of 0.5 % volume limit	Lower water content is preferable. 1 % is an absolute limit and is consistent with most international specifications.	1.0 % volume max ASTM E203
Solvent-washed gum	5 mg/100 ml max ASTM D381	All submissions supported.		5 mg/100 ml max ASTM D381
Inorganic Chloride content	32 mg/L max ASTM D512-81 (1985), Method C (as modified in ASTM D4806)	All but one submission supported.		32 mg/L max ASTM D512-81 (1985), Method C (as modified in ASTM D4806)
Copper content	0.1 mg/kg max ASTM D1688A (as modified in ASTM D4806)	All submissions supported.		0.1 mg/kg max ASTM D1688A (as modified in ASTM D4806)
Sulphate	4 mg/kg max ASTM D7318, ASTM D7319, and ASTM D7328	All submissions supported.		4 mg/kg max ASTM D7318, ASTM D7319, and ASTM D7328
Sulphur	30 mg/kg max IP 497 or ASTM D5453	All but one submission supported 30 mg/kg. JAMA proposed a limit of 10 mg/kg.	30 mg/kg is below the sulphur limit for petrol and considered sufficient. The limit for ethanol would be reduced to 10 mg/kg when the petrol spec is reduced to 10 mg/kg.	30 mg/kg max IP 497 or ASTM D5453
Acidity (as acetic acid CH₃COOH)	0.007 % mass max ASTM D1613	All submissions supported.		0.007 % mass max ASTM D1613
pHe	6.5 – 9.0 ASTM D6423	All submissions supported.		6.5 – 9.0 ASTM D6423

Appearance	Clear and bright without particles ASTM D4806	All submissions supported.	Clear and bright without particles ASTM D4806
Corrosion Inhibitor	Corrosion inhibitor must be added.	Majority of submissions supported the requirement to add corrosion inhibitor. Two oil companies questioned whether this requirement was necessary. Only one submission suggested that it was necessary to specify a list of approved inhibitors.	The use of corrosion inhibitor is considered good practice internationally and to minimise the likelihood of any corrosion issues it is proposed that corrosion inhibitor be required in all cases. It is considered appropriate for industry to determine the most suitable additive type, as is the current approach for other fuel additives.

Ethanol must contain a corrosion inhibitor and the type and dose rate of the corrosion inhibitor must be declared.

Labelling Requirements

Property	Proposed requirements in Discussion Document	Submissions	Ministry comment	Final Recommendation
Ethanol blends up to E10	“Contains up to X% (bio- or non-renewable) ethanol. May not be suitable for all vehicles/engines. Check with the manufacturer”	<p>The differentiation between bioethanol and non-renewable ethanol was not supported by several submitters.</p> <p>Two submitters support the labelling reflecting as close to the percentage of ethanol as possible (rather than ‘up to’). This is to address the differing compatibility levels of vehicles (e.g. E3, E5, E10).</p> <p>Two submitters do not support the wording ‘May not be suitable for all vehicles/engines. Check with the manufacturer’. One view is that this will potentially undermine consumer confidence, and that incompatibility has not been proven with New Zealand ethanol blends (using corrosion inhibitor).</p>	<p>Differentiating bioethanol and non-renewable ethanol is not necessary from a fuel performance and vehicle compatibility point of view.</p> <p>It is in the interests of the fuel suppliers to label as close to the exact amount as possible to capture more of the market given varying levels of compatibility. Ethanol levels will vary, so it is not practical to require exact labelling. From a vehicle compatibility point of view, the maximum percentage of ethanol is the most important piece of information.</p> <p>It is considered necessary to take a cautious approach with labelling to reduce the risk of unsuitable use of petrol/ethanol blends leading to vehicle operability problems, which would significantly affect public confidence in biofuels.</p>	<ul style="list-style-type: none"> - Maximum percentage of ethanol by volume must be clearly displayed; and - The words “May not be suitable for all vehicles/engines. Check with the manufacturer before use” must be displayed.
Non-retail biodiesel and ethanol blends	No labelling requirements			No labelling requirements.