BIOREMA

Questionnaire Results

Summary Enquiry Results

BIOREMA Project (EU Grant 219081)

Version: Final_v_2, dated 2010-11-03

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Summary

The EC 7th Framework project BIOREMA (Reference Materials for Biofuel Specifications) has the overall objective to develop biofuel test samples with well characterised reference values. Prepared test materials were used in a worldwide intercomparison study (May – October 2010) in which obtained laboratory results were evaluated against well established reference values. Thereby possible relationships between measurement results and applied methods could be identified and later on be used for the development of harmonized standard methods.

In January 2010, 68 laboratories active in the field of biofuel analyses (58 accredited laboratories in Europe, 4 labs in South America, 4 labs in North America, and 2 labs in Asia) were approached to take part in the BIOREMA's Biofuel intercomparison mentioned above, that started May 2010. Later on another 21 laboratories were approached with the same message (11 in Europe, 7 in North America, and 3 in Asia) to further support a worldwide coverage of the potential ILC participation candidates.

Each of the laboratories was asked to answer their willingness in participation in BIOREMA's bio-ethanol and/or biodiesel ILC, together with their interest in the BIOREMA workshop that would deal with the ILC measurement results. Furthermore each laboratory was asked to fill out the BIOREMA questionnaire, which aimed to establish current measurement practices for biofuels and the problems commonly encountered.

The response to the questionnaire was 35% (31 laboratories). Thanks to this high return rate the BIOREMA questionnaire has produced a very detailed overview, presenting a lot of information about the types of biofuels most commonly analysed worldwide, the measurement methodologies used for these analyses, whether reference materials are employed, and whether laboratories participate in intercomparison exercises.

Contents

1 Introduction - BIOREMA project

The EC 7th Framework project BIOREMA (Reference Materials for Biofuel Specifications) has the overall objective to develop biofuel test samples with well characterised reference values. Prepared test materials were used in a worldwide intercomparison study (May – October 2010) in which obtained laboratory results were evaluated against well established reference values. Thereby possible relationships between measurement results and applied methods could be identified and later on be used for the development of harmonized standard methods.

2 Questionnaire

The 14th of January 2010 an e-mail, with as subject “Biofuel intercomparison organized by BIOREMA”, was sent by Annarita Baldan, chair of the Biorema project, to laboratories active in the field of biofuel analyses. The e-mail was sent to 68 laboratories in total:

- 58 accredited labs in Europe
- 4 labs in South America
- 4 labs in North America
- 2 labs in Asia

The e-mail and attachment contained the following information:

- In attachment [Note: see Chapter 10 “Annex B Questionnaire”], you receive a questionnaire regarding the characterization of biofuels. The questionnaire is part of the EC 7th Framework project BIOREMA (Reference Materials for Biofuel Specifications) and aims to establish current measurement practices for biofuels and the problems commonly encountered.
- As a result, an overview will be produced detailing the types of biofuels most commonly analysed worldwide, the measurement methodologies used for these analyses, whether reference materials are employed, and whether laboratories participate in intercomparison exercises.
- Based upon the returned questionnaires we will invite 60 (geographically spread) organisations to join an interlaboratory comparison analysing either bio-ethanol (30 labs) or biodiesel (30 labs) samples. These bio-ethanol and biodiesel samples, characterized by national metrology institutes participating in the Biorema project, will be offered for free thanks to the support of the European Commission for the Biorema project. The same applies to the distribution of the samples and the data treatment, which will be performed by the Biorema partners (IRMM – European Commission, NPL - UK, INMETRO - Brazil, NIST - USA, LGC - UK and VSL – The Netherlands). Of course all other costs, e.g. for analysis and reporting (man-hours, consumables, and so on), would be the responsibility of the analysis laboratory.
- As such we hope this Biorema exercise might be very interesting to you. Probably even more so, when you know that the 60 selected laboratories will be invited to participate in the Biorema workshop, where all results will be presented (entirely anonymously) and compared against (SI traceable) reference values. We expect lively discussions and high levels of information exchange about analysis methods used, relationships between measurement results and methods applied, practical problems and how to deal with them, and recommendations for the development of reference materials, measurement methods, written standards, regulations and/or law enforcement. The Biorema workshop will be held Wednesday the 27th of October, 2010, in Belgium. Participation will be free for one representative per Biorema interlaboratory comparison participating laboratory, whereas a small amount of money will be available to cover part of the travelling and/or subsistence costs.

- Please fill out the attached questionnaire and inform us about your interest in participating in the Biorema interlaboratory comparison and the Biorema workshop.
- Because of the strict time schedule only completed questionnaires, received at the latest by February 19th 2010, will be eligible for possible participation in the intercomparison exercise. Place on the intercomparison exercise will be distributed on a first come, first served basis.

During the period January – April 2010 contact persons from national metrology institutes were approached to also send the questionnaire to other labs. As such NMIs in South Africa, Singapore, India, Thailand, Australia, China, Mexico and Japan were asked to distribute the questionnaire within their country. Furthermore the Dutch Standardisation Institute (NEN) was contacted in February 2010 as they are very active in the biofuel standardisation field. NEN distributed the questionnaire by e-mail to their biofuel contacts. Furthermore the questionnaire was advertised during presentations given by the BIOREMA partners, whereas the BIOREMA partners themselves also approached more potential candidates.

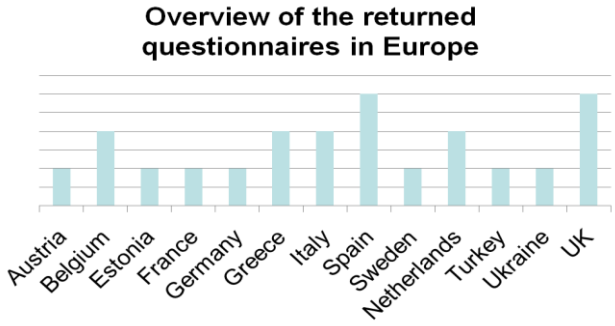
Based upon these efforts considerably more labs could be contacted. As such the (known) total number of laboratories involved became 89 (originally: 68):

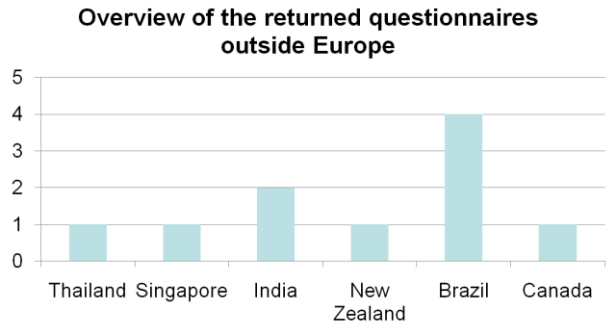
- Europe: 68 (originally: 58)
- South America: 4 (originally: 4)
- North America: 11 (originally: 4)
- Asia: 6 (originally: 2)

Although Europe still dominates a lot, the coverage in North America and Asia improved by a factor of almost three, due to the efforts mentioned above.

3 Questionnaires returned

A total of 31 questionnaires was returned (35%), most of them “spontaneous” (= without sending a reminder) and the others by sending one or two reminder e-mails. Based upon this number and percentage a very good insight has been gained, by using the BIOREMA questionnaire, with respect to the use of written standards, reference materials and interlaboratory comparisons in the field of biofuels, in Brazil and Europe, and to a minor extent also in Asia. Unfortunately the questionnaire participation in North America stayed very low, despite many attempts to change this situation.





The names of the organisations that filled out and returned the questionnaire (in alphabetical order) are:

- Abengoa — Spain
- Agência Nacional do Petróleo — Brazil
- Agenzia Dogane – Laboratorio Chimico di Livorno — Italy
- Agenzia Dogane – Laboratorio Chimico di Venezia — Italy
- ASG Analytik-Service GmbH — Germany
- Centro de Tecnologia Canavieira — Brazil
- Department of National Defence, Canada — Canada
- Estonian Environmental Research Centre — Estonia
- Fundación Cetena-Cemitec — Spain
- Hellenic Petroleum S.A. — Greece
- I.M.U. ZT-GesmbH — Austria
- Intertek Belgium N.V. — Belgium

• Intertek-BTC	Spain
• Intertek – Teesside	United Kingdom
• Intertek Testing Services (S) Pte Ltd.	Singapore
• IPT / Laboratório de Combustíveis e Lubrificantes	Brazil
• Indian Institute of Petroleum	India
• Indian Oil Corporation Ltd.	India
• IPL Ltd.	New Zealand
• Karlshamn Kraft AB	Sweden
• Laboratory of Customs and Excises	Belgium
• Mass Spec Analytical Ltd.	United Kingdom
• National Metals and Material Technology Center	Thailand
• National Technical University of Athens	Greece
• Petróleo Brasileiro S.A. – Cenpes	Brazil
• Saybolt Nederland B.V.	The Netherlands
• Sevastopol laboratory Nº1	Ukraine
• TES Bretby	United Kingdom
• T.L.R. International Laboratories	The Netherlands
• TÜBİTAK-BUTAL	Turkey
• U.N.G.D.A.	France

4 Type of organisations

Each organisation, submitting the questionnaire, was asked to select a description that applied most to their organisation. In all but five cases only one description was selected. In four cases two descriptions were selected and in one case three descriptions. As such the following information was collected:

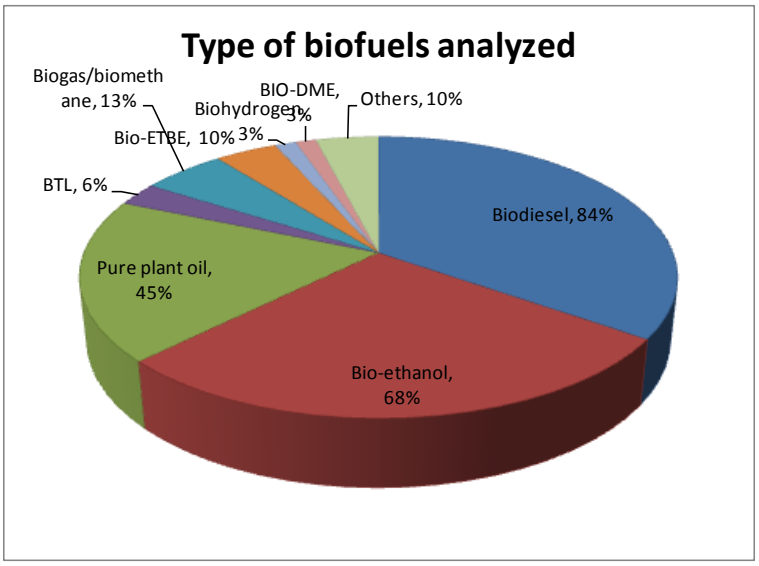
Description	**Number of organisations**	
Biofuel producer	2	
Oil company	1	
Test laboratory	18	
Trade organisation	1	
Research institute	8	
Governmental organisation	6	
Interest group		
Other	Number	Specification
	1	Refinery (Petroleum oil company)

More than half of the questionnaires were filled out by test laboratories (18), whereas other main groups presented are research institutes (8) and governmental organisations like customs laboratories (6).

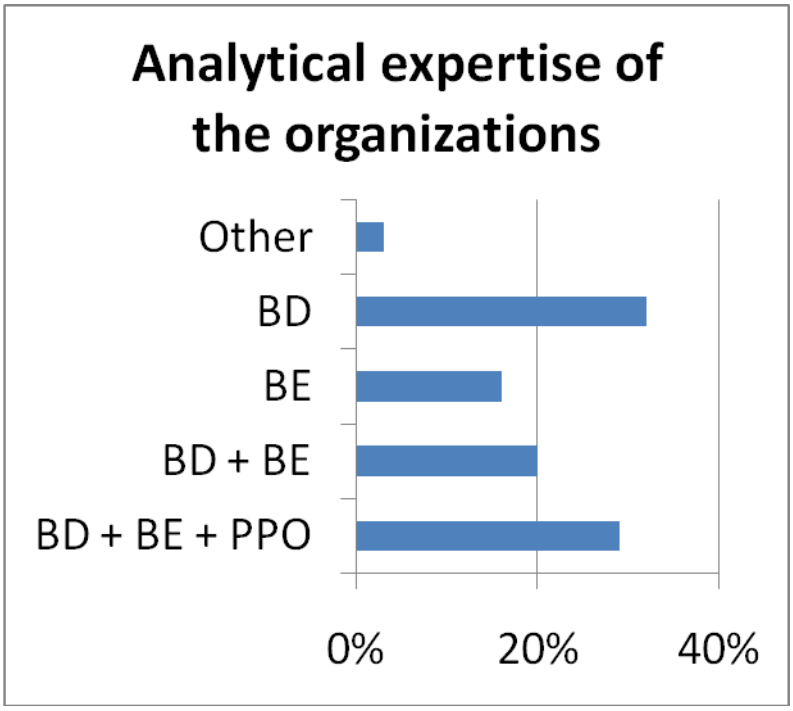
5 Biofuels characterised

In the next table the answers are summarised concerning the types of biofuel characterised, including their feedstocks. With respect to the 31 questionnaires returned, the number of organisations involved in biodiesel was highest (26 or 84 % of the laboratories), followed by bio-ethanol (21, 68 %) and pure plant oil (14, 45 %), whereas the involvement in other biofuels was considerably lower:

- Biodiesel 26
- Bio-ethanol 21
- Pure plant oil (PPO) 14
- BTL 2
- Biogas/biomethane 4
- Bio-ETBE 3
- Biohydrogen 1
- BIO-DME 1
- Others 3



Based on the 31 returned questionnaires, the distribution of the analytical capabilities of the various organizations is presented in the following graphic. Clearly, the most interesting bio-material analysed is



Biodiesel (BD; 32 %). Biodiesel is analysed also in combination with (at least) PPO/bio-ethanol (29 %) or in combination with (at least) bio-ethanol (BE; 20 %). Organizations measuring (at least) bio-ethanol represent the 16 %. It must be said that this overview is most probably influenced by the predominance of European organizations.

For the biodiesel characterised the feedstocks most used are rapeseed (17; out of 26 laboratories), soybean (16), palm oil (15) and cooking/frying waste (14). For bioethanol the feedstocks mostly used are sugar cane (12, out of 21 laboratories), sugar beet (6) and wheat straw (5). For pure plant oil the feedstocks sugarcane (8; out of 14 laboratories), sunflower (8), soybean (7) and palm oil (7) are mentioned almost the same number of times. As such it may be noted that the variety of feedstocks for each type of biofuel is rather diverse.

Type of biofuel	**Number of organisations**	**Feedstock**	**Number**	
Biodiesel	26	Rapeseed	17	
		Soybean	16	
		Sunflower	11	
		Palm oil	15	
		Animal fat	12	
		Cooking/Frying waste	14	
		Unknown	14	
		Others	Number	Specification
			7	Jatropha (4x), Castor oil (2x), Peanut (1x), Macauba (1x), Babaçu (1x), Coconut (1x), Algae (1x), Oil and vegetable fat mixtures (1x)
Bio-ethanol	21	Feedstock	Number	
		Sugarcane	12	
		Sugar beet	6	
		Wheat	3	

		Wheat straw	5	
		Corn (maize)	4	
		Wood	3	
		Waste wood	2	
		Farmed wood	1	
		Unknown	10	
		Others	Number	Specification
			1	Wine
Pure plant oil	14	Feedstock	Number	
		Rapeseed	8	
		Soybean	7	
		Sunflower	8	
		Palm oil	7	
		Unknown	6	
		Others	Number	Specification
			4	Jatropha (2x), Oil and vegetable fat mixtures (1x), Olive oil (1x)
BTL	2	Feedstock	Number	
		Straw	-	
		Waste wood	-	
		Algae	1	
		Unknown	1	
		Others	Number	Specification
			-	-

Biogas/biomethane	4	
Bio-ETBE	3	
Biohydrogen	1	
Bio-DME	1	
Others	3	Fischer-Tropsch jet fuel (1x), Hydroprocessed Renewable Jet based on algae and Jatropha oil (1x), Mixtures of biofuels with mineral oils: FAME in diesel, PPO in diesel and ethanol, ETBE in petrol (1x) Solid fuels: coal, peat, solid biofuels and solid recovered fuels (1x)

6 Participation in Biorema's Interlaboratory comparison and workshop

From the laboratories expressing their interest in taking part in the BIOREMA interlaboratory comparison (ILC) the interest for the biodiesel ILC was highest (26 out of 31; 84%), with European interest in participation (16 out of 26; 62%) at a very high level. The interest in taking part in the bio-ethanol ILC was 52%, with an equal interest coming from Europe (50%) vs. Asia (25%) and South America (25%) together.

Geographic origin	**Bio-ethanol ILC**	**Biodiesel ILC**	**Workshop**
South America	4	3	4
Europe	8	16	20
North America	-	1	1
Asia & Pacific	4	6	4

Except for two laboratories each questionnaire submitter expressed their interest in taking part in the BIOREMA workshop. Reasons mentioned for not participating in the BIOREMA workshop were of a logistical nature (travel distance/time).

7 Parameter questions and answers

In annex A, the reply to the questionnaire is shown by an overview per parameter of the reported answers. For each parameter a lot of specific measurement information was submitted.

For almost all parameters, used for the characterisation of biofuels, the following information is presented:

a) Measurement frequency in relative numbers (“never”, “occasionally” or “frequently”)

b) Measurement method description

c) Participation in Interlaboratory Comparisons (other than the BIOREMA ILCs)

d) Reference materials used (name, level and producer)

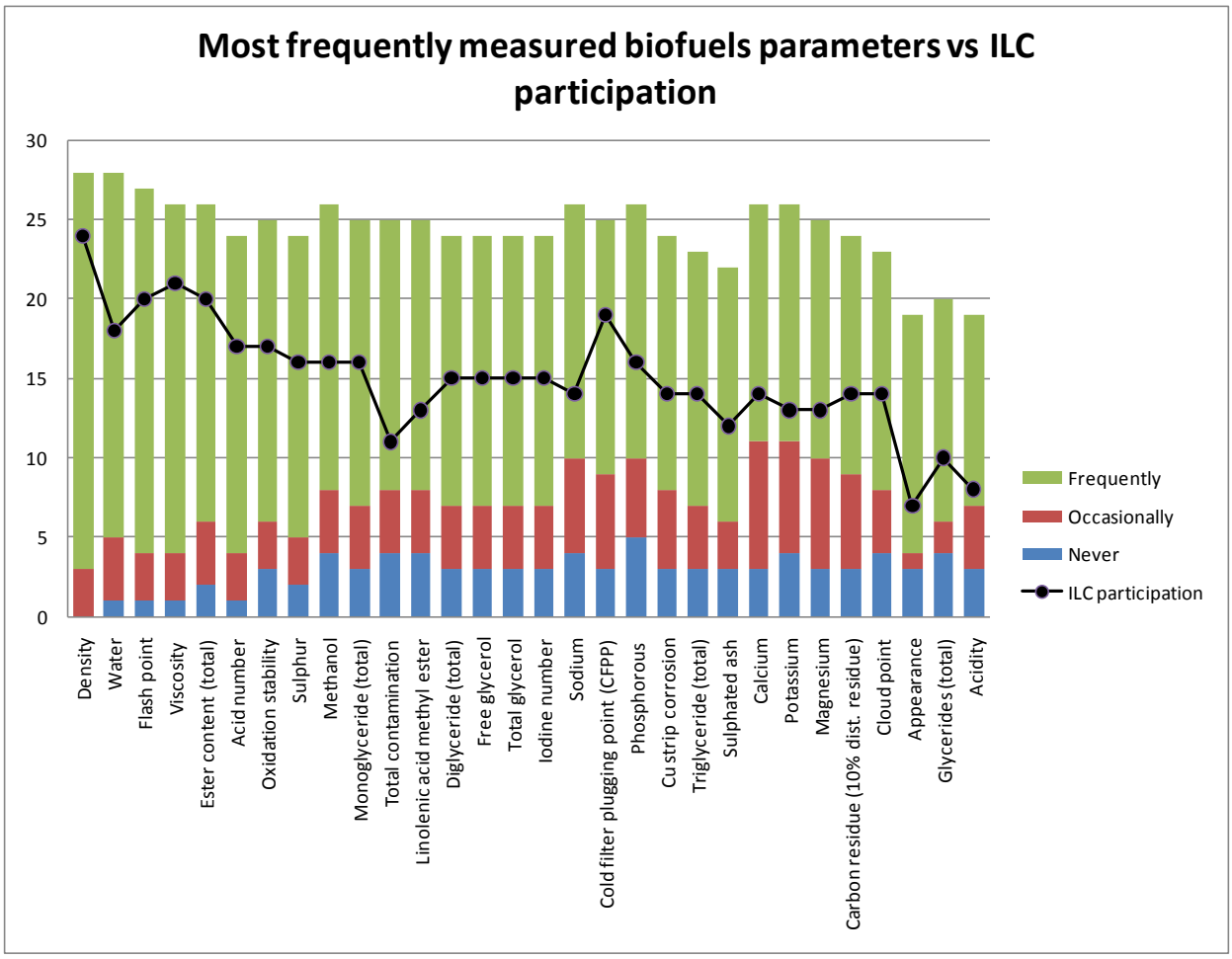
e) Problems encountered

f) Suggestions

Furthermore, some general comments can be made:

- In two responses it was noted that for the calibration of GC and HPLC equipment the required standards are being prepared by gravimetrically mixing pure individual FAMEs (produced by Sigma Aldrich and others) in a solvent.
- The following general problems were noted in one of the questionnaires returned:

  (i) Bleeding of the GC column at high temperature in biodiesel analysis.
  (ii) Reconditioning of the GC column is needed after each injection of biodiesel sample, in order to avoid ghost peaks.
  (iii) The lacking of a standard HPLC method for the characterization of biodiesel blend stocks and biodiesel-in-diesel blends.
  (iv) The analysis of biodiesel-in-diesel blends is problematic.
- Furthermore the lack of Certified Reference Materials, for measuring biofuels, is reported repeatedly and for many parameters
- At the end of the table several parameters, that were not part of the questionnaire, were added under the heading “Others” by the questionnaire submitters.
- A graph with the 30 most frequently measured biofuel parameters vs ILC participation is shown below. There is a good correlation between the specifications that are analysed most frequently and the participation in Interlaboratory comparisons (ILCs).



- As expected, the most frequently measured parameters are “biodiesel” parameters. This is due to the questionnaires reported by European organizations (the majority) that are mainly involved in the analysis of biodiesel. However, it can be noted that from the list of required specifications included in the EN 14212 and ASTM D6751 for biodiesel (B100), laboratory’s most frequently analysed parameters are density, water, flash point, viscosity and total ester content.

- The parameter “density” is the most popular parameter as it is being analyzed frequently by 25 labs and occasionally by 3 labs. The measurement of density is obviously important for all sorts of biofuels and this explains why it is at the top of the list of the most frequently measured parameters. For the measurement method description 8 different choices are given, from which the choices for EN ISO 12185 (13x) and ASTM 4052 (9x) are made most often.

- The parameter “water” is the 2nd most popular parameter as it is being analyzed frequently by 23 labs and occasionally by 4 labs. As for density, the measurement of water is requested for all types of biofuels and this explains why it is almost at the top of the list of the most frequently measured parameters. For the measurement method description 10 different choices are given (for all types of biofuels measured), from which the choices for EN ISO 12937 (12x) and ASTM D2709 (5x) are made most often.

- The choice for the parameter “sulphur”, 8th in the list of the most frequently measured parameters, is a difficult one. In total 13 different measurement method descriptions are mentioned, from which EN ISO

20846 (7x) and ASTM D5453 (4x) are chosen most often. The other different measurement method descriptions are each chosen once, with the exception of EN ISO 20884 (2x). For the sulphur parameter 11 different reference materials are being used.

- For the parameter “methanol”, only 9th in the top list, most often EN 14110 is chosen as measurement method: 14 times out of 22.
- Other parameters with a clear preference for one measurement method include:
    - Linolenic acid methyl ester — EN 14103 (19 times out of 19; 100%)
    - Ester content (total) — EN 14103 (21 times out of 24; 88%)
    - Iodine number — EN 14111 (18 times out of 21; 86%)
    - Total contamination — EN 12662 (16 times out of 20; 80%)
    - Monolein — EN 14105 (8 times out of 10; 80%)
    - Diolein and Triolein — EN 14105 (7 times out of 9; 78%)
    - Monoglyceride — EN 14105 (16 times out of 22; 73%)
    - Oxidation stability — EN 14112 (15 times out of 21; 71%)
    - Diglyceride — EN 14105 (15 times out of 21; 71%)
    - Total glycerol — EN 14105 (15 times out of 21; 71%)
    - Glycerin — EN 14105 (10 times out of 14; 71%)

EN 14103 is also mostly chosen as the measurement method for the analysis of C16:0 Ester content (67%), C18:0 ester content (63%), the sum of C18:1 esters (67%), C18:2 esters (67%), C18:3 esters (69%).

- For bio-ethanol, it is difficult to provide a list of the most frequently measured specifications, due to the large response on biodiesel. However, it can be said that “density” and “water” are the parameters analysed most frequently, followed by “ethanol content”, “chloride content”, “electrolytical conductivity” and “pHe”.
- As most of the questionnaire submitters are based in Europe the questionnaire results may be biased, especially so because hardly any questionnaires were returned from North America. As such the shown preference for European standards has to be taken with some precaution.
- With exception of “acidity” and “gum-evaporation residue”, the measurement of the other most common biofuel parameters is controlled by using reference materials. In general, the submitted questionnaires report the use of commercial reference materials (mostly under the form of the analysed parameter in a

matrix comparable to the biofuel analysed) or the use of a biofuel from an interlaboratory comparison whose specifications are known.

8 Conclusions

The BIOREMA questionnaire has produced a very detailed overview, presenting a lot of information about the types of biofuels most commonly analysed worldwide, the measurement methodologies used for these analyses, whether reference materials are employed, and whether laboratories participate in intercomparison exercises.

As reported in chapter 7, the majority of the measurement methods used is EN standard methods. However, because most of the questionnaire submitters are based in Europe, the questionnaire results may be biased.

From the questionnaire results it appears that the participation in Interlaboratory Comparisons (ILCs) is good practice and there is a good correlation between ILC participation and measurement frequency of the various specifications.

As it regards the use of SI traceable (Certified) Reference Materials (CRMs), there is a clear request for suitable CRMs for biodiesel for most of the measured specifications and for bio-ethanol for some of them. In general, laboratories use different commercial reference materials or biofuel from previous interlaboratory comparisons whose specifications are known.

9 Annex A – Summary of the answers to the questionnaire

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
Density	-	3x	25x	EN ISO 12185 (13x)	24x	Liquid Density Standard (3x)	15° juures 0,99910 g/cm^3	SH Calibration Service GmbH	No Certified Reference Biodiesel available for this parameter (2x)	n.a.
				ASTM D4052 (9x)		Dodecane (2x)	±752 kg/m^3	H&D Fitzgerald		
				ABNT (1x)						
				ASTM D5002 (1x)		Water (2x)	1 g/mL	H&D Fitzgerald		
				EC 2870/2000 (1x)		Deionised water (1x)	0,99821 g/cm^3	KEM		
				EN ISO 3104 (1x)						
				IP 365 (1x)		FAME from ILC (1x)	0,882 g/cm^3	CEMITEC		
				ISO 3675, ISO 12185 (1x)		MTVM (1x)	0,83 g/mL	Stanhope-Seta		
Viscosity	1x	3x	22x	EN ISO 3104 (15x)	21x	Oils from Cannon (3x)	1,756 – 3356 cSt	Cannon	No Certified Reference Biodiesel available for this	n.a.

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ASTM D445 (7x)		1-Decanol (1x)	8,5 (40 ^{o}C)	Merck	parameter (2x)	
				IP 71 (2x)		FAME from ILC (1x)	4,27 cSt	CEMITEC		
				ASTM D445 and EN ISO 3104 (1x)		MRC IPT 76 (1x)	3,0 - 6,0	IPT		
						S3 - S6 (1x)	Various	Paragon Scientific Ltd		
						S6, S600 (1x)	-	PAC GmbH, Paragon Scientific Ltd		
						Visc. Dens. RM (1x)	S6/S60/N350	Koehler		
Flash point	1x	3x	23x	ASTM D93 (9x)	20x	Gas oil (2x)	64,6	Stanhope-Seta	No Certified Reference Biodiesel available for this parameter (2x)	
				ISO 3679 (6x)		Diesel fuel (1x)	85	-		

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				EN ISO 2719 (5x)		FAME from ILC (1x)	174 °C	CEMITEC	Problems detecting the flash point of some types of samples (1x)	Calibration with high flash point reference material and manually observe flash point (1x)
				EN ISO 2719/3679 (2x)		Flash Point RMs (1x)	FPRM11	Cannon Instrument		
				ASTM D93, EN ISO 3679/2719 (1x)		Hexa-decane, 1-Pentanol (1x)	135 °C, 49 °C	Sigma-Aldrich	Problem with inconsistency of automatic flash detection of flash point of biodiesel with high Flash point (1x)	
				IP 34 (1x)		n-Hexa-decane (1x)	134 °C	Merck		
				IS 1448, P-21 (1x)		MRC IPT 119B (1x)	55,6	IPT		
				ISO 3679, ASTM D93 (1x)		RM (1x)	66,1 °C	PAC GmbH		
Cloud point	4x	4x	15x	ASTM D2500 (8x)	14x	CRM -5,1 (2x)	-5,1	PAC GmbH	n.a.	n.a.
				EN ISO 23015 (7x)		Gas oil (1x)	-10	Stanhope-Seta		
				ASTM D5771 (1x)						
				ASTM D5773 (1x)		Diesel fuel (1x)	-10	-		

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				IP 444 (1x)						
Cold filter plugging point (CFPP)	3x	6x	16x	EN ISO 116 (15x)	19x	CRM CFPP (2x)	-20°C	PAC GmbH	No Certified Reference Biodiesel available for this parameter (3x)	n.a.
				ASTM D6371 (3x)		CRM CFPP -29,4 (1x)	-29,4	PAC GmbH		
				IP 309 (3x)		Diesel fuel (1x)	-11	-		
				ASTM D7501 (1x)		FAME from ILC (1x)	-5°C	CEMITEC		
						Gas oil (1x)	-20	Stanhope-Seta		
Carbon residue (10% dist. residue)	3x	6x	15x	EN ISO 10370 (7x)	14x	Micro Carbon Residue of Petroleum Products (2x)	0,35% (m/m), 2,0% (m/m), 8,48% (m/m), 24,5% (m/m)	PAC GmbH	The reference material is a hydrocarbon mixture. Only used for diesel fuel (1x)	n.a.
				ASTM D4530 (5x)						
				ASTM D4530, EN ISO 10370 (4x)					Lack of CRM (1x)	
				ASTM D189 (1x)						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ASTM D524 (1x)					100% sample (1x)	
				ASTM D1160, EN 10370 (1x)						
				IP 398 (1x)						
Sulphated ash	3x	3x	16x	ISO 3987 (8x)	12x	FAME from ILC	< 0,005 % (m/m)	CEMITEC	No Certified Reference Biodiesel available for this parameter (1x)	n.a.
				ASTM D874 (6x)						
				ASTM D874, ISO 3987 (2x)						
				ASTM D482 (1x)						
				IP 163 (1x)						
				ISO 6245 (1x)						
Water (and sediment)	1x	4x	23x	EN ISO 12937 (12x)	18x	Apura (2x)	100	Merck	No Certified Reference Biodiesel available for this parameter (2x)	Type II water is used to check the equipment (1x)
				ASTM D2709 (5x)						
				ASTM D1796 (2x)		Aqua-micron (1x)	0,206 mg H_2O/g	Mitsubishi Chemical Group-API Corporation		
				IP 438 (2x)						
				ABNT (1x)						
				ASTM D6304						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				(1x)						
				ASTM D95, D1744, D473 (1x)		Deionised water (1x)	100-1000 ppm	Riedel de Haën		
				ASTM D2709, ISO 3733, ISO 6296 (1x)						
				EN-15489 (1x)		Gas oil (1x)	40	Stanhope-Seta		
				EN 15692 (1x)						
Total contamination	4x	4x	17x	EN 12662 (16x)	11x	FAME from ILC (1x)	2,4 mg/kg	CEMITEC	Lack of CRM (2x)	CRM needed (1x)
				In house (2x)						
				ASTM D4807 (1x)						
				IP 440 (1x)						
Cu strip corrosion	3x	5x	16x	EN ISO 2160 (12x)	14x	FAME from ILC (1x)	1A	CEMITEC	No Certified Reference Biodiesel available for this parameter (2x)	n.a.
				ASTM D130 (6x)						
				IP 154 (2x)						
				EN ISO 2160, ASTM D130 (1x)						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
Oxidation stability	3x	3x	19x	EN 14112 (15x)	17x	Biodiesel (1x)	7	ASG	No Certified Reference Biodiesel available for this parameter (2x)	n.a.
				EN 14112, EN 15751 (2x)						
				ASTM D525, EN 14112, EN ISO 7536 (1x)						
				ASTM D7462 (1x)						
				EN ISO 12205, EN 14112, EN 15751 (1x)						
				ISO 7536 (1x)						
Cetane number	6x	3x	10x	EN ISO 5165 (4x)	7x	Biodiesel (1x)	52	-	n.a.	Cetane index vice number (1x)
				ASTM D613 (2x)						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ASTM D6890 (2x)						
				EN 15195 (2x)		Diesel Sec Cetane RF – T24, RF- U17 (1x)	-	Chevron Phillips		
				ASTM D613, EN ISO 5165 (1x)						
				ASTM D4737 (1x)		n-Heptane (1x)	≥99,5%	Aldrich		
				ASTM D4737, D976 (1x)						
Acid number	1x	3x	20x	EN 14104 (14x)	17x	Biodiesel (1x)	0,4	-	No Certified Reference Biodiesel available for this parameter (2x)	n.a.
				ASTM D664 (7x)						
				ASTM D1448 P1/S1 (1x)		FAME from ILC (1x)	0,41 mg KOH/g	CEMITEC		
				IP139 (1x)						
Methanol	4x	4x	18x	EN 14110 (14x)	16x	Biodiesel (1x	0,06	ASG	No Certified Reference Biodiesel available for	A Brazilian chromato-graphic method is
				ABNT NBR 15343 (2x)						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				In house (2x)					this parameter (3x)	used that doesn't require headspace (1x)
				ABNT (1x)						
				ASTM D5501 (1x)		Methanol PAI-ACS (1x)	99%	PANREAC		
				EN 15721 (1x)						
				EN 14110, EN 15721 (1x)						
Ethanol	9x	3x	11x	ASTM D-5501 (4x)	8x	Gasoline N (1x)	1% vol. Ethanol in petrol	PAC	No Certified Reference Biodiesel available for this parameter (2x)	A Brazilian chromato-graphic method is used that doesn't require headspace (1x)
				EN 14110 (4x)						
				ABNT NBR 15343 (2x)						
				EN 15721 (2x)						Estimate presence through flash point ASTM D93 (1x)
				ABNT (1x)						
				GC-FID or densimetry or EN 14517 (1x)						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				GC (1x)						
Ester content (total)	2x	4x	20x	EN 14103 (21x)	20x	FAME mix rapeseed oil, FAME mix NHI-F (3x)	-	Supelco	No Certified Reference Biodiesel available for this parameter (3x)	EN 14078 (FAME in diesel), EN 14103 (FAME in biodiesel) (1x)
				ASTM D6584 (1x)		Methyl-heptadeca-noate (2x)	-	Sigma-Aldrich	IS interferences (1x)	
				CEEL-130 (1x)		Biodiesel (1x)	99	ASG	Using the FTIR method for the determination of total ester in biodiesel-diesel blends, the calibration is only valid for a narrow range of concentra-tions at very low concentration	
				EN 14078, EN 14103 (1x)		FAME from ILC (1x)	98,4 % (m/m)	CEMITEC		
						Methyl-heptade-canoate (1x)	1-10 mg/mL	Fluka		

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*	(about B02) (1x)	
C16:0 Ester content	3x	4x	13x	EN 14103 (10x) ISO 5508 (2x) EN 14105 mod. (1x) EN 14331 (1x) In house (1x)	9x	FAME mix rapeseed oil, FAME mix NHI-F (1x)	-	Supelco	n.a.	For PPO preparation: ISO 5509. For FAME in diesel preparation: EN 14331 (1x)
C18:0 Ester content	3x	4x	13x	EN 14103 (10x) ISO 5508 (2x) ASTM D6584 (1x) EN 14105 mod. (1x) EN 14331 (1x) In house (1x)	9x	FAME mix rapeseed oil, FAME mix NHI-F (1x)	-	Supelco	n.a.	For PPO preparation: ISO 5509. For FAME in diesel preparation: EN 14331 (1x)
C18:1 Esters (sum of)	4x	4x	12x	EN 14103 (10x) ISO 5508 (2x) ASTM D6584 (1x)	8x	FAME mix rapeseed oil, FAME mix NHI-F (1x)	-	Supelco	n.a.	For PPO preparation: ISO 5509. For FAME in diesel preparation:

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				EN 14331 (1x)						EN 14331 (1x)
				In house (1x)						
C18:2 Esters (sum of)	4x	4x	12x	EN 14103 (10x)	8x	FAME mix rapeseed oil, FAME mix NHI-F (1x)	-	Supelco	n.a.	For PPO preparation: ISO 5509. For FAME in diesel preparation: EN 14331 (1x)
				ISO 5508 (2x)						
				ASTM D6584 (1x)						
				EN 14331 (1x)						
				In house (1x)						
C18:3 Esters (sum of)	4x	3x	12x	EN 14103 (9x)	9x	FAME mix rapeseed oil, FAME mix NHI-F (1x)	-	Supelco	Lack of CRM (1x)	For PPO preparation: ISO 5509. For FAME in diesel preparation: EN 14331 (1x)
				ISO 5508 (2x)						
				EN 14331 (1x)		FAME from ILC (1x)	0,6 % (m/m)	CEMITEC		
				In house (1x)						
Glycerin	6x	4x	11x	EN 14105 (10x)	10x	Biodiesel (1x)	0,01	ASG	Lack of CRM (2x)	CRM needed (1x)
						Glycerol ultra (1x)	99%	Sigma-Aldrich		

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ASTM D6584 (4x)		FAME from ILC	0,02 % (m/m)	CEMITEC		
Monolein	8x	3x	9x	EN 14105 (8x)	6x	Biodiesel (1x)	0,6	ASG	Lack of CRM (1x)	n.a.
				ASTM D6584 (1x)		1-Mono-oleoylgly-cerol (1x)	5 mg/mL	Chiron AS		
				In house (1x)		1-Oleoyl-rac-glycerol (1x)	99%	Sigma-Aldrich		
Diolein	9x	3x	8x	EN 14105 (7x)	6x	Biodiesel (1x)	0,2	ASG	n.a.	n.a.
				ASTM D6584 (1x)		1,3-Di-oleoylgly-cerol (1x)	5 mg/mL	Chiron AS		
				In house (1x)						
Triolein	9x	3x	8x	EN 14105 (7x)	6x	Biodiesel (1x)	0,1	ASG	n.a.	n.a.
				ASTM D6584 (1x)		1,2,3-Tri-oleoylgly-cerol (1x)	5 mg/mL	Chiron AS		
				In house (1x)						
Monoglyceride (total)	3x	4x	18x	EN 14105 (16x)	16x	Biodiesel (1x)	0,6	ASG	No Certified Reference Biodiesel	n.a.

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
						1-Mono-oleoylgly-cerol (1x)	5 mg/mL	Chiron AS	available for this parameter (3x)	
				ASTM D6584 (6x)		1-Oleoyl-rac-glycerol	99%	Sigma-Aldrich		
						Several FAMEs from ILC (1x)	Several	CEMITEC		
Diglyceride (total)	3x	4x	17x	EN 14105 (15x)	15x	Biodiesel (1x)	0,2	ASG	No Certified Reference Biodiesel available for this parameter (3x)	n.a.
						1,3-Di-oleoylgly-cerol (1x)	5 mg/mL	Chiron AS		
				ASTM D6584 (6x)		1,3-Diolein (1x)	99%	Sigma-Aldrich	Unidentified peaks after elution of diglycerides in GC (1x)	
						Several FAMEs from ILC (1x)	Several	CEMITEC		
Triglyceride (total)	3x	4x	16x	EN 14105 (14x)	14x	Biodiesel (1x)	0,1	ASG	No Certified Reference Biodiesel	n.a.

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
						1,2,3-Tri-oleoylgly-cerol (1x)	5 mg/mL	Chiron AS	available for this parameter (3x)	
				ASTM D6584 (6x)		Glyceryl trioleate (1x)	99%	Sigma-Aldrich	Response variations (1x)	
						Several FAMEs from ILC (1x)	Several	CEMITEC		
Glycerides (total)	4x	2x	14x	EN 14105 (11x)	10x	Biodiesel (1x)	-	-	No Certified Reference Biodiesel available for this parameter (1x)	n.a.
				ASTM D6584 (5x)						
Free glycerol	3x	4x	17x	EN 14105 (14x)	15x	Glycerol ultra (2x)	99%	Sigma-Aldrich	No Certified Reference Biodiesel available for this parameter (3x)	n.a.
				ASTM D6584 (5x)						
				ASTM D6584 + ABNT NBR 15344 (1x)		Biodiesel (1x)	0,01	ASG		
				EN 14105, EN 14106 (1x)		FAME from ILC (1x)	0,02 % (m/m)	CEMITEC		

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
Total glycerol	3x	4x	17x	EN 14105 (15x)	15x	Biodiesel (1x)	-	-	No Certified Reference Biodiesel available for this parameter (3x)	n.a.
				ASTM D6584 (6x)		FAME from ILC (1x)	-	CEMITEC		
Iodine number	3x	4x	17x	EN 14111 (18x)	15x	Biodiesel (1x)	115	ASG	No Certified Reference Biodiesel available for this parameter (2x)	n.a.
				EN 14111, EN ISO 3961 (1x)						
				ASTM D1959 (1x)		FAME from ILC (1x)	106 g I_2/g	CEMITEC		
				EN14104 (1x)						
Linolenic acid methyl ester	4x	4x	17x	EN 14103 (19x)	13x	FAME mix rapeseed oil, FAME mix NHI-F (2x)	-	Supelco	Lack of CRM (1x)	n.a.
						Biodiesel (1x)	6	ASG		

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
						FAME from ILC (1x)	0,6 % (m/m)	CEMITEC		
Unsaturated esters ≥ C_4	8x	-	9x	pr EN 15779 (5x)	4x	Biodiesel (1x)	-	-	No Certified Reference Biodiesel available for this parameter (2x)	n.a.
				EN 14103 (2x)		FAME from ILC (1x)	< 1,0 % (m/m)	CEMITEC		
				GC (2x)						
Phosphorous	5x	5x	16x	EN 14107 (13x)	16x	P in oil (2x)	100 ppm	Conostan Division	No Certified Reference Biodiesel available for this parameter (2x)	A Brazilian ICP method is used with small differences to EN14538 (1x)
				ABNT NBR 15553 (1x)						
				ASTM D874 (1x)		Conostan S21 (2x)	-	Conostan Division		
				ASTM D4951 (1x)						
				ABNT NBR 15553 + ASTM D4951 (1x)		P standard in oil (1x)	1013 mg/kg	Merck		
				ASTM D5185 (1x)						
				EN 15487 (1x)						
				EN 15487, ASTM D5185 (1x),		Single element standard	1000 mg/kg	Specs		

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				EN 15487, EN 15837 (1x)		(1x)				
				ICP (1x)						
Sodium	4x	6x	16x	EN 14108 (8x)	14x	Na in oil (3x)	5000 µg/g	Conostan Division	No Certified Reference Biodiesel available for this parameter (2x)	n.a.
				EN 14538 (7x)						
				ABNT NBR 15553 (1x)						
				ABNT NBR 15554 + NBR 15553 + NBR 15556 + EN 14108 + EN 14538 (1x)		Conostan S21 (2x)	-	Conostan Division		
				ABNT (1x)		Na in oil (1x)	1000 µg/g	Conostan Division	Poor background (1x)	
				ASTM D874 (1x)						
				ASTM D5185 (1x)						
				ASTM D5863 (1x)		Na standard in oil (1x)	999 mg/kg	Merck		
				AAS/ICP (1x)						
				ICP (1x)						
Potassium	4x	7x	15x	EN 14538 (7x)	13x	K in oil	5000 µg/g	Conostan	No Certified	n.a.

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				EN 14109 (6x)		(3x)		Division	Reference Biodiesel available for this parameter (2x)	
				EN 14108 (2x)						
				ABNT NBR 15553 (1x)		K in oil (1x)	1000 µg/g	Conostan Division		
				ABNT NBR 15555 + NBR 15553 + NBR 15556 + EN 14109 + EN 14538 (1x)		K standard in oil (1x)	1000 mg/kg	Merck	Poor background (1x)	
				ASTM D874 (1x)						
				ASTM D5185 (1x)						
				AAS/ICP (1x)		Conostan S21 (1x)	-	Conostan Division		
				ICP (1x)						
				In house (1x)						
Calcium	3x	8x	15x	EN 14538 (12x)	14x	Conostan S21 (2x)	-	Conostan Division	No Certified Reference Biodiesel available for	n.a.
				EN 14108 (2x)						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ABNT NBR 15553 (1x)		Ca in oil (1x)	1000 ppm	Conostan Division	this parameter (2x)	
				ABNT NBR 15553 + NBR 15556 + EN 14538 (1x)		Ca in oil (1x)	0,5	Conostan Division		
				ASTM D874 (1x)		Ca standard in oil (1x)	990 mg/kg	Merck		
				ASTM D5185 (1x)						
				AAS/ICP (1x)		Multi element standard (1x)	500 mg/kg	Merck		
				ICP (1x)						
				In house (1x)						
Magnesium	3x	7x	15x	EN 14538 (13x)	13x	Mg in oil (2x)	1000 ppm	Conostan Division	No Certified Reference Biodiesel available for this parameter (2x)	n.a.
				ABNT NBR 15553 (1x)						
				ABNT NBR 15553 + NBR 15556 + EN 14538 (1x)		Conostan S21 (2x)	-	Conostan Division		

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ASTM D874 (1x)		Mg in oil (1x)	0,5	Conostan Division		
				ASTM D5185 (1x)						
				EN 14108 (1x)						
				AAS/ICP (1x)		Multi element standard (1x)	500 mg/kg	Merck		
				ICP (1x)						
				In house (1x)						
Sulphate	9x	3x	6x	ASTM D7328 (2x)	2x	Conostan S21 (1x)	-	Conostan Division	Lack of available reference material (1x)	A Brazilian ion chromato-graphic method is used (1x)
				EN 15492 (2x)						
				ABNT NBR 10894 (1x)						
				ABNT NBR 10894 + ASTM D 7319 (1x)						
				ABNT (1x)						
				Ion chromato-graphy (1x)						
Sulphur	2x	3x	19x	EN ISO 20846 (7x)	16x	Antek standard (1x)	10 mg/kg	Antek	No Certified Reference Biodiesel	ASTM D5453 (low level), ISO

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ASTM D 5453 (4x)		BCR 105 (1x)	0,363 ppm	IRMM	available for this parameter (3x)	20884 (low level), ISO 14596 (high level) (1x)
				EN ISO 20884 (2x)		Biodiesel (1x)	9	RR sample		
				ASTM D1552 (1x)		Conostan S21 (1x)	-	Conostan Division		
				ASTM D5453, ISO 20884, ISO 14596 (1x)		FAME from ILC (1x)	2,4 mg/kg	CEMITEC		
				EN-15486 (1x)		ERM EF213 (1x)	9,1 ppm	BAM		
				EN 15492 (1x)						
				EN 15837, EN 15486 (1x)		ERM EF673A (1x)	52,4 ppm	LGC		
				EN 20846, EN 15486 (1x)		SRM 1848 (1x)	2,3%	NIST		CRM needed (1x)
				EN ISO 20846/ 20884/8754/208 47, ASTM D4294/4952		Sulfur in isooctane calibration standards	0,1 – 10,0 ng/µl	Analytical Services		

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				(1x)		(1x)				
				IP 490 (1x)		Sulfur in light mineral oil standard (1x)	10000 µg/g	Specpure		
				IP 497 (1x)						
				In house / EDXRF (1x)		Sulfur in Mineral Oil calibration standard (1x)	0,0 – 0,0050 % (m/m)	Analytical Services		
Copper	6x	5x	7x	EN 15488 (2x)	3x	Cu in oil (1x)	100	Conostan	n.a.	n.a.
				AAS (2x)						
				ICP (2x)						
				ABNT NBR 10893 (1x)						
				ASTM D1688 (1x)		Conostan S21 (1x)	-	Conostan Division		
				ASTM D5185 (1x)						
				ABNT (1x)						
Iron	7x	4x	5x	ICP (2x)	2x	Fe in oil (1x)	100	Conostan Division	n.a.	n.a.
				ABNT NBR 11331 (1x)						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ABNT (1x)						
				ASTM D5185 (1x)		Conostan S21 (1x)	-	Conostan Division		
				AAS/ICP (1x)						
Sodium	4x	4x	8x	ABNT NBR 10422 (2x)	3x	Na in oil (1x)	0,5	Conostan Division	Lack of available reference material (1x)	A Brazilian flame photometric method is used, of which an English version exists (1x)
				EN 14538 (2x)						
				ASTM D874 (1x)						
				ASTM D5185 (1x)						
				ASTM D5863B (1x)		Conostan S21 (1x)	-	Conostan Division		
				EN 14108 (1x)						
				ABNT (1x)						
				AAS/ICP (1x)						
				ICP (1x)						
Electrolytic conductivity	7x	3x	9x	ABNT NBR 10547 (2x)	4x	S51M013 (1x)	25,0	Radiometer Analytical	Lack of available reference material (1x)	A Brazilian method is used, of which an English version exists (1x)
				DIN 51627-4 (2x)						
				ABNT NBR 10547 + ASTM D1125						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				(1x)						
				ASTM D1125 (1x)						
				ASTM D2709 (1x)						
				ABNT (1x)						
				pr EN 51627-4 (1x)						
				pr EN 15938 (1x)						
Chloride	6x	4x	9x	EN 15492 (3x)	3x	-	-	-	Lack of available reference material (1x)	A Brazilian ion chromato-graphic method is used (1x)
				ABNT NBR 10894 (1x)						
				ABNT NBR 10894 + ASTM D7319 (1x)						
				ASTM D512 mod. (1x)						
				ASTM D4929 (1x)						
				ABNT (1x)						
				Ion chromate-graphy (1x)						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				Turbidi-metry (1x)						
Appearance	3x	1x	15x	Visual method (5x) EN 15769 (2x) ASTM D4176 (1x) ASTM D1500, ISO 2049 (1x) ABNT (1x)	7x	ASTM Värvus < 0,5 ASTM Värvus 1,0 ASTM D 3,0 (1x)	1	The Tintometer Limited	n.a.	n.a.
Acidity	3x	4x	12x	EN 15491 (4x) ASTM D664 (3x) ASTM D1613 (3x) ABNT NBR 9866 (2x) EN 15491, CE 6252003 (1x) ABNT (1x)	8x	-	-	-	Lack of available reference material (1x)	A Brazilian method is used, of which an English version exists (1x)
pHe	5x	4x	8x	ASTM D 6423 (4x) pr EN-15490 (3x)	1x	Buffer Solution (1x)	8 and 9,23	Panreac	n.a.	n.a.

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ABNT/ASTM (1x)						
Gum/Evaporation residue	5x	4x	9x	ASTM D381 (3x)	3x	-	-	-	No Certified Reference Bio-ethanol available for this parameter (1x)	ASTM D381 for jet fuel, but can adopt for biodiesel (1x)
				ABNT NBR 8644 (2x)						
				EN ISO 6246 (2x)						
				ASTM D1353 (1x)						
				EN ISO 7536, ASTM D525 (1x)						
				EN 15691, EN 6246 (1x)						
				IP 131 (1x)						
Total aromatics	5x	4x	7x	ASTM D1319 (2x)	4x	Gasoline K (1x)	35% vol	PAC	Unable to separate the di- and triaromatics well (1x)	n.a.
				EN 12916 (2x)		Gasoline N (1x)	30% vol	PAC		
				IP 391 (2x)						
				ASTM D6591 NMR (1x)		EN 12916 calibration standards (1x)	-	Chiron AS		
				EN 14517 (1x)						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				UV & SFC (1x)		Diesel fuel (1x)	26	RR Test		
Polycyclic Aromatic Hydrocarbons	6x	5x	5x	EN 12916 (4x)	2x	Diesel fuel (1x)	5,5	RR Test	n.a.	ASTM D1840 Naphthalenes in Jet Fuel (1x)
				IP 391 (2x)						
				ASTM D1840 (1x)		EN 12916 system calibration standards 1 and 2 (1x)	-	Chiron AS AccuStandard Inc.		
				ASTM D6591 (1x)						
				UV (1x)						
Total olefin	7x	2x	6x	ASTM D1319 (3x)	4x	Gasoline K (1x)	35% vol	PAC	n.a.	n.a.
				ASTM D1983/2800/NMR (1x)						
				EN 14517, ASTM D6839 (1x)		Gasoline N (1x)	30% vol	PAC		
				EN 14517 (1x)						
Lubricity, corrected wear scar diameter (wsd 1,4) at 60 °C	5x	4x	10x	EN ISO 12156-1 (4x)	6x	DF-92-02, DF-70-00 (2x)	420±35, 633±55	Haltermann Products	The reference materials are hydrocarbon mixtures. Only used for	n.a.
				IP 450 (3x)						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ASTM D6709 (2x)					diesel fuel (1x)	
				ASTM D6079 and/or ISO (1x)						
				CEC F-06-A-96 (1x)						
				CEC F-06-A-96, ASTM D6079 (1x)						
				EN ISO 12156-1, ASTM D6079 (1x)						
Distillation 95 % (*V/V*) recovered at	4x	3x	10x	ASTM D86 (5x)	7x	Destilla-tion CRM (1x)	95% 354,9±7,0 °C	PAC GmbH	No Certified Reference Biodiesel available for this parameter (1x)	n.a.
				EN ISO 3405 (3x)						
				ASTM D1160 (1x)		MTVM (1x)	340 °C	Stanhope-Seta		
				EN ISO 3405, ASTM D86 (1x)		RM (1x)	IBP-FBP	PAC		
				IP 123 (1x)		Diesel fuel (1x)	325	RR sample		
Methane	8x	2x	5x	ASTM D1945 (2x)	1x	Ref. Gas (1x)	5	Scott Specialty	n.a.	n.a.

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				UOP 539 (2x)				Gases		
				EN ISO 6975 (1x)		Ref. Gas (1x)	-	BOC		
				Fast RGA (1x)						
C2+ hydrocarbons	7x	2x	6x	ASTM D1945 (2x)	2x	Ref. Gas (1x)	40	Scott Specialty Gases	n.a.	n.a.
				UOP 539 (2x)						
				EN ISO 6975 (1x)						
				EN 27941 GPL (1x)		Ref. Gas (1x)	0-10%	BOC		
				Fast RGA (1x)						
Hydrogen	7x	2x	6x	ASTM D1945 (2x)	1x	Ref. Gas (1x)	12	Scott Specialty Gases	n.a.	n.a.
				UOP 539 (2x)						
				ASTM D5291 (1x)						
				EN ISO 6975 (1x)		Ref. Gas (1x)	0-10%	BOC		
				Fast RGA (1x)						
Carbon monoxide	8x	2x	5x	ASTM D1945 (2x)	1x	Ref. Gas (1x)	1	Scott Specialty Gases	n.a.	n.a.
				UOP 539 (2x)						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				EN ISO 6975 (1x)		Ref. Gas (1x)	0-5%	BOC		
				Fast RGA (1x)						
Nitrogen	7x	3x	6x	ASTM D1945 (2x)	1x	Ref. Gas (1x)	39	Scott Specialty Gases	n.a.	n.a.
				ASTM D-4629 (2x)						
				ASTM D5291 (1x)						
				EN ISO 6975 (1x)		Ref. Gas (1x)	0-5%	BOC		
				UOP 539 (1x)						
				Fast RGA (1x)						
Oxygen	6x	2x	6x	ASTM D1945 (2x)	2x	Ref. Gas (1x)	1	Scott Specialty Gases	n.a.	n.a.
				EN ISO 6975 (1x)						
				EN 14517 (1x)						
				UOP 539 (1x)		Ref. Gas (1x)	0-5%	BOC		
				Fast RGA (1x)						
				Calculated (1x)						
Hydrogen sulphide	7x	2x	6x	ASTM D1945 (1x)	1x	Ref. Gas (1x)	1	Scott Specialty	n.a.	Measuring tube (1x)

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ASTM D5504 (1x)				Gases		
				EN ISO 6975 (1x)						
				IP103 & RGA (1x)						
				IP 399/BP (1x)						
Ammonia	10x	2x	2x	MDA (1x)	-	-	-	-	n.a.	Measuring tube (1x)
Total chlorine	7x	2x	4x	ASTM D808 (1x)	1x	-	-	-	n.a.	Measuring tube (1x)
				DIN 51408-1 (1x)						
				UOP 779 (1x)						
				“Several” (1x)						
Total fluorine	9x	1x	4x	DIN 51408-1 (1x)	-	-	-	-	n.a.	Measuring tube (1x)
				Combustion IC (1x)						
Siloxanes	12x	1x	1x	-	-	-	-	-	n.a.	n.a.
Tar	12x	-	-	-	-	-	-	-	n.a.	n.a.
Gross calorific value	4x	4x	10x	ASTM D240 (4x)	4x	Vegetable oil (1x)	39	ASG	n.a.	n.a.
				ISO 1928 (2x)						

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ISO 6976 (2x)						
				ASTM D4868 (1x)						
				DIN 51900 (1x)						
				ISO 1928, ASTM D240 (1x)		Benzoic acid (1x)	6319 cal/g	Leco		
				TS 1740 (1x)						
Net calorific value	4x	2x	8x	ASTM D240 (3x)	4x	Vegetable oil (1x)	37	ASG	n.a.	n.a.
				ISO 6976 (2x)						
				ASTM D4868 (1x)						
				DIN 51900 (1x)		Benzoic acid (1x)	6319 cal/g	Leco		
				ISO 1928 (1x)						
				TS 1740 (1x)						
Wobbe number	9x	2x	1x	ISO 6976 (2x)	1x	Ref. Gas (1x)	40	Scott Specialty Gases	n.a.	n.a.
				DIN 51857 (1x)						
Relative density	4x	4x	4x	ISO 6976 (2x)	3x	Dodecane (1x)	0,75	H&D Fitzgerald	n.a.	EN ISO 12185 (1x)

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ASTM D4052 (1x)		MTVM (1x)	0,83	Stanhope-Seta		
				ISO 12185 (1x)						
				"Several" (1x)		Water (1x)	1	-		
Methane number	9x	2x	1x	ASTM D1945 (1x)	1x	Ref. Gas (1x)		Scott Specialty Gases	n.a.	n.a.
				DIN 51624/B (1x)						
				ISO TC193 (1x)						
Micro-organisms	10x	1x	1x	IP 385 (1x)	-	-	-	-	n.a.	n.a.
Radioactivity	11x	-	1x	C14 activity by Liquid Scintillation (1x)	1x	C14 standard (1x)	133000 DPM	Packard	OK for ethanol and ETBE, but FAME gives problems due to its colour (1x)	n.a.
Hydrocarbon dew point	11x	1x	-	-	-	-	-	-	n.a.	Internal Calculation (1x)
Water dew point	10x	2x	-	MCM (1x)	-	-	-	-	n.a.	Shawmeter equipment (1x)
Mercaptanes	8x	2x	6x	ISO 3012, ASTM D3227 (2x)	1x	-	-	-	n.a.	Measuring tube (1x)

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				ASTM D5504 (1x)						
				IP 103 (1x)						
				"Several" (1x)						
COS	11x	2x	1x	ASTM D5504 (1x)	-	-	-	-	n.a.	n.a.
Odorant	11x	-	1x	-	-	-	-	-	n.a.	Measuring tube (1x)
Carbonyl metals	12x	1x	-	-	-	-	-	-	n.a.	n.a.
Impurities (liquids, solids)	10x	-	1x	GC (1x)	-	-	-	-	n.a.	n.a.
Mercury	8x	2x	3x	AAS (2x)	2x	Hg in oil (1x)	100	Conostan	n.a.	n.a.
				JLPGA-S-07 (1x)						
				DMA (1x)						
				ICP-OES (1x)						
Benzene	6x	2x	7x	CG-In house (2x)	2x	Gasoline K (1x)	1% vol	PAC	n.a.	Below bp 210 ^{o}C only (1x), Measuring tube (1x)
				ASTM D6730 (1x)						
				EN 14517 (1x)		Gasoline N (1x)	0,8% vol	PAC		
				EN 15721 (1x)						
				EN ISO 22854 (1x)		Gasoline (1x)	0,9	RR Test		

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				IP 344 (1x)						
Organo halides	9x	2x	1x	Combustion IC (1x) ICP-MS (1x) "Several" (1x)	-	-	-	-	n.a.	n.a.
Others:										
Water Content			2x	ASTM D6304 + ASTM E 203 + ASTM E1064 (1x) EN ISO 12937 (1x)	1x	-	-	-	n.a.	n.a.
pH		1x	1x	ABNT NBR 10891 (2x)	1x	-	-	-	Lack of available reference material (1x)	A Brazilian potentio-metric method is used (1x)
Ethanol Content		1x		In house (1x)	-	-	-	-	n.a.	n.a.
Hydrocarbons Content			1x	ABNT NBR 13993 (1x)	-	-	-	-	n.a.	n.a.
Alcoholic Content			1x	ABNT NBR	-	-	-	-	n.a.	n.a.

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				5992 (1x)						
Specific Gravity			1x	ABNT NBR 5792 + ASTM D 4052 (1x)	-	-	-	-	n.a.	n.a.
Density and alcoholic strength (manual method)			1x	ABNT NBR 5992 (1x)	1x	-	-	-	Lack of available reference material (1x)	A Brazilian Glass Densimeter method is used, of which an English version exists (1x)
Density and alcoholic strength (automatic method)			1x	ABNT NBR 15639 (1x)	1x	-	-	-	Lack of available reference material (1x)	A Brazilian Digital Densimeter method is used, of which an English version exists (1x)
Gasoline Content			1x	ABNT NBR 13993 (1x)	1x	-	-	-	Lack of available reference material (1x)	A Brazilian method is used (1x)
Gross calorific value		1x		ASTM D240 (1x)	1x	-	-	-	n.a.	n.a.
Net calorific value		1x		ASTM D240	1x	-	-	-	n.a.	n.a.

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
				(1x)						
Pour point		2x	1x	ASTM D97 (2x) ISO 3016 (1x)	1x	Gas oil	-27	Stanhope-Seta	n.a.	n.a.
Elemental analysis (C, H, N, S)			1x	C 41,93%, H 5,54%, N 9,87% (1x)	-	EDTA	-	LECCO	n.a.	n.a.
Filter Plugging Tendency			1x	IP 387, IP PM EA-08, ASTM D7501 (1x)	-	-	-	-	n.a.	n.a.
FAME content in JET			1x	IP PM DY (1x)	1x	-	-	-	n.a.	n.a.
FAME Characterisation			1x	EN 14331 (1x)	-	-	-	-	n.a.	n.a.
Ash content		1x	2x	ASTM D482 (3x)	-	-	-	-	n.a.	n.a.
Carbon			1x	ASTM D5291 (1x)	-	-	-	-	n.a.	n.a.
Conradson			1x	ASTM D189 (1x)	-	-	-	-	n.a.	n.a.
Solvent yellow marker			1x	HPLC (1x)	1x	ERM EF 317 + 318 (1x)	7 ppm, 0,141 ppm	IRMM	n.a.	n.a.
Atmospheric			1x	ASTM D86 (1x)	1x	MTVM	gasoil	Stanhope-	n.a.	n.a.

Parameter	***Measurement frequency***			***Measurement method description***	***Participa-tion in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasio-nally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
distillation								Seta		
ETBE content in petrol			1x	EN 14517 (1x)	1x	Gasoline N (1x)	10%	PAC	n.a.	n.a.
MTBE content in petrol			1x	EN 14517 (1x)	1x	Gasoline K (1x)	10%	PAC	n.a.	n.a.
Bio-origin of ethanol or ETBE (percentage of bioethanol/bioETBE in ethanol/ETBE)			1x	C14 activity by Liquid Scintillation (1x)	1x	-	-	-	n.a.	n.a.
$\delta\ ^{13}C$ content			1x	IRMS (1x)	-	-	-	-	n.a.	n.a.
$\delta\ ^{2}H$ content			1x	IRMS (1x)	-	-	-	-	n.a.	n.a.
API Gravity		1x		ASTM D4052 (1x)	-	-	-	-	n.a.	n.a.
ASTM Colour		1x		ASTM D1500 (1x)	-	ASTM Color (1x)	1, 3, 5	Lovibond	n.a.	n.a.
Saybolt Colour		1x		ASTM D156 (1x)	-	Saybolt Colour (1x)	-10, 0, +12	Lovibond	n.a.	n.a.
Specific Gravity			1x	ASTM D1298 (1x)	-	-	-	-	n.a.	n.a.

*Inter laboratory comparisons, proficiency testing schemes, correlation schemes (other than the Biorema interlaboratory comparison)

10 Annex B - Questionnaire

QUESTIONNAIRE

1. Please select the description that applies most to your organization:
   - ☐ Biofuel producer
   - ☐ Oil company
   - ☐ Test laboratory
   - ☐ Trade organization
   - ☐ Research institute
   - ☐ Governmental organization
   - ☐ Interest group
   - ☐ Other, please specify

2. Which type of biofuels does your organization characterize? Please also specify the feedstock.

   ☐ Biodiesel
   Feed stock: ☐ Rapeseed ☐ Soybean ☐ Sunflower ☐ Palm oil ☐ Animal fat ☐ Cooking/Frying waste
   ☐ Unknown ☐ Others, please specify:

   ☐ Bio-ethanol
   Feedstock: ☐ Sugarcane ☐ Sugar beet ☐ Wheat ☐ Wheat straw ☐ Corn (maize) ☐ Wood ☐ Waste wood ☐ Farmed wood ☐ Unknown ☐ Others, please specify:

   ☐ Pure plant oil

Feedstock: ☐ Rapeseed ☐ Soybean ☐ Sunflower ☐ Palm oil ☐ Unknown ☐ Others, please specify:

☐ BTL
Feedstock: ☐ Straw ☐ Waste wood ☐ Algae ☐ Unknown ☐ Others, please specify:

☐ Biogas/biomethane
☐ Bio-ETBE
☐ Biohydrogen
☐ Bio-DME
☐ Others, please specify:

3. Name of organization:
   Address:
   Country:
   Contact person:
   E-mail address:
   Our organization is interested in taking part in the Biorema interlaboratory comparison:
   - Yes ☐ , No ☐
   - For Bio-ethanol: Yes ☐ , No ☐
   - For Biodiesel: Yes ☐ , No ☐

   Our organization is interested in taking part in the Biorema workshop:
   - Yes ☐ , No ☐

   Date:
   Signature:

4. Please fill out the table on the next pages for all the parameters that are measured by your institute. If the parameters are not listed you may add these at the bottom rows of the table.
   Notes to the table:
   - Please mention the written standard (EN, ISO, ASTM) and/or the measurement technique in the column "measurement method description".
   - Please tick √ in the box below "Participation in ILCs" if you participate in biofuel Interlaboratory comparisons/proficiency testing schemes/ correlation schemes (other than the Biorema interlaboratory comparison)
   - If you use reference materials, please give the name of the (C)RM and specify in the column "level" the concentration (range) or any other property value.
   - If you encounter problems for certain parameters, *e.g.*, the lack of suitable reference materials, the lack of suitable measurement techniques, or any other measurement problem you can specify this in the column "problems".
   - If you have any suggestions or remarks, please put these in the last column.
   - Please use additional sheets if your information does not fit in the boxes
   - Please feel free to approach Hugo Ent, Coordinator of the Biorema project, in case of any questions and/or suggestions. Filled out questionnaires may also be returned to him:
     VSL

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Parameter	***Measurement frequency***			***Measurement method description***	***Participation in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasionally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
Density	☐	☐	☐		☐					
Viscosity	☐	☐	☐		☐					
Flash point	☐	☐	☐		☐					
Cloud point	☐	☐	☐		☐					
Cold filter plugging point (CFPP)	☐	☐	☐		☐					
Carbon residue (10% dist. residue)	☐	☐	☐		☐					
Sulphated ash	☐	☐	☐		☐					
Water (and sediment)	☐	☐	☐		☐					
Total contamination	☐	☐	☐		☐					
Cu strip corrosion	☐	☐	☐		☐					
Oxidation stability	☐	☐	☐		☐					
Cetane number	☐	☐	☐		☐					
Acid number	☐	☐	☐		☐					
Methanol	☐	☐	☐		☐					
Ethanol	☐	☐	☐		☐					
Ester content (total)	☐	☐	☐		☐					
C16:0 Ester content	☐	☐	☐		☐					
C18:0 Ester content	☐	☐	☐		☐					
C18:1 Esters (sum of)	☐	☐	☐		☐					
C18:2 Esters (sum	☐	☐	☐		☐					

Parameter	***Measurement frequency***			***Measurement method description***	***Participation in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasionally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
of)										
C18:3 Esters (sum of)	☐	☐	☐		☐					
Glycerin	☐	☐	☐		☐					
Monolein	☐	☐	☐		☐					
Diolein	☐	☐	☐		☐					
Triolein	☐	☐	☐		☐					
Monoglyceride (total)	☐	☐	☐		☐					
Diglyceride (total)	☐	☐	☐		☐					
Triglyceride (total)	☐	☐	☐		☐					
Glycerides (total)	☐	☐	☐		☐					
Free glycerol	☐	☐	☐		☐					
Total glycerol	☐	☐	☐		☐					
Iodine number	☐	☐	☐		☐					
Linolenic acid methyl ester	☐	☐	☐		☐					
Unsaturated esters $\geq C_4$	☐	☐	☐		☐					
Phosphorous	☐	☐	☐		☐					
Sodium	☐	☐	☐		☐					
Potassium	☐	☐	☐		☐					
Calcium	☐	☐	☐		☐					
Magnesium	☐	☐	☐		☐					
Sulphate	☐	☐	☐		☐					
Sulphur	☐	☐	☐		☐					

Parameter	***Measurement frequency***			***Measurement method description***	***Participation in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasionally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
Copper	☐	☐	☐		☐					
Iron	☐	☐	☐		☐					
Sodium	☐	☐	☐		☐					
Electrolytic conductivity	☐	☐	☐		☐					
Chloride	☐	☐	☐		☐					
Appearance	☐	☐	☐		☐					
Acidity	☐	☐	☐		☐					
pHe	☐	☐	☐		☐					
Gum/Evaporation residue	☐	☐	☐		☐					
Total aromatics	☐	☐	☐		☐					
Polycyclic aromatic Hydrocarbons	☐	☐	☐		☐					
Total olefin	☐	☐	☐		☐					
Lubricity, corrected wear scar diameter (wsd 1,4) at 60 °C	☐	☐	☐		☐					
Distillation 95 % (*V/V*) recovered at	☐	☐	☐		☐					
Methane	☐	☐	☐		☐					
C2+ hydrocarbons	☐	☐	☐		☐					
Hydrogen	☐	☐	☐		☐					
Carbon monoxide	☐	☐	☐		☐					
Nitrogen	☐	☐	☐		☐					

Parameter	***Measurement frequency***			***Measurement method description***	***Participation in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasionally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
Oxygen	☐	☐	☐		☐					
Hydrogen sulphide	☐	☐	☐		☐					
Ammonia	☐	☐	☐		☐					
Total chlorine	☐	☐	☐		☐					
Total fluorine	☐	☐	☐		☐					
Siloxanes	☐	☐	☐		☐					
Tar	☐	☐	☐		☐					
Gross calorific value	☐	☐	☐		☐					
Net calorific value	☐	☐	☐		☐					
Wobbe number	☐	☐	☐		☐					
Relative density	☐	☐	☐		☐					
Methane number	☐	☐	☐		☐					
Micro-organisms	☐	☐	☐		☐					
Radioactivity	☐	☐	☐		☐					
Hydrocarbon dew point	☐	☐	☐		☐					
Water dew point	☐	☐	☐		☐					
Mercaptanes	☐	☐	☐		☐					
COS	☐	☐	☐		☐					
Odorant	☐	☐	☐		☐					
Carbonyl metals	☐	☐	☐		☐					
Impurities (liquids, solids)	☐	☐	☐		☐					
Mercury	☐	☐	☐		☐					

Parameter	***Measurement frequency***			***Measurement method description***	***Participation in ILCs****	***Reference materials***			***Problems***	***Suggestions***
	Never	*Occasionally*	*Frequently*			*(C)RM name*	*Level*	*Producer*		
Benzene	☐	☐	☐		☐					
Organo halides	☐	☐	☐		☐					
Others:										
		☐	☐		☐					
		☐	☐		☐					
		☐	☐		☐					
		☐	☐		☐					
		☐	☐		☐					
		☐	☐		☐					
		☐	☐		☐					
		☐	☐		☐					

*Inter laboratory comparisons, proficiency testing schemes, correlation schemes (other than the Biorema interlaboratory comparison)