Results of Proficiency Test
Transformer Oil
October 2012

Organised by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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CONTENTS

1 INTRODUCTION

Since 2001, the Institute for Interlaboratory Studies organized a proficiency test for the analysis of Transformer Oil every year. It was decided to continue this interlaboratory study during the annual program 2012/2013. In this interlaboratory study, 60 laboratories from 28 different countries have participated. See appendix 2 for a list of number of participants per country order. In this report, the results of the 2012 interlaboratory study on unused transformer oil are presented and discussed.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organiser of this proficiency test. Analyses for fit-for-use and homogeneity testing were subcontracted. In this proficiency test, two different samples were used. The participants received a bottle of 1 litre of an unused Transformer Oil (labelled #12145) and a bottle of 100 mL of used oil (labelled #12146) especially for the analysis of Furanic compounds.
Participants were requested to report rounded and unrounded results. The unrounded results were preferably used for statistical evaluation.

2.1 ACCREDITATION

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, is accredited in agreement with ISO/IEC 17043:2010 (R007), since January 2000, by the Dutch Accreditation Council (Raad voor Accreditatie). This ensures strict adherence to protocols for sample preparation and statistical evaluation and 100% confidentially of participant's data. Feedback from the participants on the reported data is encouraged and customer's satisfaction is measured on regular basis by sending out questionnaires.

2.2 PROTOCOL

The protocol followed in the organisation of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: 'Protocol for the Organisation, Statistics and Evaluation' of January 2010 (iis-protocol, version 3.2).

2.3 CONFIDENTIALITY STATEMENT

All data presented in this report must be regarded as confidential and for use by the participating companies only. Disclosure of the information in this report is only allowed by means of the entire report. Use of the contents of this report for third parties is only allowed by written permission for the Institute for Interlaboratory Studies. Disclosure of the identity of one or more of the participating companies will be done only after receipt of a written agreement of the companies involved.

2.4 SAMPLES

The necessary bulk material (DIALA S2 ZU-I) for the unused oil sample #12145 was obtained from a local supplier. The approximately 80 litre bulk material was homogenised. After homogenisation, 70 subsamples were transferred to 1 litre amber glass bottles and labelled #12145. The homogeneity of the subsamples #12145 was checked by determination Density and Water on 8 stratified randomly selected samples.

	Water in mg/kg	Density @ 15°C in kg/m^3
Sample #12145-1	20	881.98
Sample #12145-2	22	881.97
Sample #12145-3	15	881.97
Sample #12145-4	14	881.97
Sample #12145-5	19	881.97
Sample #12145-6	16	881.97
Sample #12145-7	17	881.98
Sample #12145-8	15	881.98

Table 1: homogeneity test results of subsamples #12145

From the above test results the repeatabilities were calculated and compared with 0.3 times the corresponding reproducibilities of the reference methods in agreement with the procedure of ISO 13528, Annex B2 in the next table.

	Water in mg/kg	Density @ 15°C in kg/m^3
r (Observed)	2	0.01
reference method	EN60814:98	ISO3675:98
0.3 * R (ref. method)	2	0.36

Table 2: repeatabilities of subsamples #12145

The necessary bulk material for additional sample #12146, was also obtained from a participating laboratory. This sample was spiked with a solution of furanic components up to a concentration of approx. one mg/kg for Furfurylalkohol as well as for 5-Methylfurfural. After homogenisation, the bulk material was transferred to 48 amber glass bottles of 100 mL and labelled #12146.

Each of the calculated repeatabilities was equal or less than 0.3 times the corresponding reproducibility of the reference method. Therefore, homogeneity of the subsamples was assumed.

To each of the participating laboratories depending on the registration, 1*1 litre bottle (labelled #12145) and/or 1*100mL bottle (labelled #12146) was sent on October 24, 2012.

2.5 STABILITY OF THE SAMPLES

The stability of Transformer Oil, packed in the amber glass bottles, was checked. The material was found sufficiently stable for the period of the proficiency test.

2.6 ANALYSES

The participants were asked to determine on sample #12145: Acid Number (Neutralization Number), Breakdown Voltage, Colour, Density @ 20 ^{o}C, Di-electric loss 90 ^{o}C (Di-electric Dissipation Factor and Specific Resistance), Interfacial Surface Tension and Water.
On sample #12146 was asked to determine: Furanic Compounds (2-acetylfuran, 2-furfural, 2-furfurylalcohol, 5-hydroxymethyl-2-furfural and 5-methyl-2-furfural).

To get comparable results a detailed report form, on which the units were prescribed as well as some of the required standards and a letter of instructions were prepared and made available for download on the iis website (www.iisnl.com).
A SDS and a form to confirm receipt of the samples were added to the sample package

3 RESULTS

During four weeks after sample despatch, the results of the individual laboratories were gathered. The original data are tabulated per determination in appendix 1 of this report. The laboratories are presented by their code numbers.

Directly after the deadline, a reminder fax was sent to the laboratories that had not reported results at that moment. Shortly after the deadline, the available results were screened for suspect data. A result was called suspect in case the Huber Elimination Rule (a robust outlier test) found it to be an outlier. The laboratories that produced these suspect data were asked to check the results. Additional or corrected results are used for data analysis and original results are placed under 'Remarks' in the result tables in appendix 1.

3.1 STATISTICS

Statistical calculations were performed as described in the report ‘iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation’ of January 2010 (iis-protocol, version 3.2).

For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded results. Results reported as ‘<…’ or ‘>…’ were not used in the statistical evaluation.

First, the normality of the distribution of the various data sets per determination was checked by means of the Lilliefors-test. After removal of outliers, this check was repeated. Not all data sets proved to have a normal distribution, in which cases the statistical evaluation of the results should be used with due care.

In accordance to ISO 5725 (1986 and 1994) the original results per determination were submitted subsequently to Dixon and Grubbs outlier tests. Outliers are marked by D(0.01) for the Dixon test, by G(0.01) or DG(0.01) for the Grubbs test. Stragglers are marked by D(0.05) for the Dixon test, by G(0.05) or DG(0.05) for the Grubbs test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.

For each assigned value the uncertainty was determined in accordance with ISO13528. Subsequently the calculated uncertainty was evaluated against the respective requirement based on the target reproducibility in accordance with ISO13528. When the uncertainty passed the evaluation no remarks are made in the report. However, when the uncertainty failed the evaluation it is mentioned in the report and it will have consequences for the evaluation of the test results.

Finally, the reproducibilities were calculated from the standard deviations by multiplying them with a factor of 2.8.

3.2 GRAPHICS

In order to visualise the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for each determination (see appendix 1). On the Y-axis the reported analysis results are plotted. The corresponding laboratory numbers are under the X-axis. The straight horizontal line presents the consensus value (a trimmed mean). The four striped lines, parallel to the consensus value line, are the +3s, +2s, -2s and -3s target reproducibility limits of the selected standard. Outliers and other data, which were excluded from the calculations, are represented as a cross. Accepted data are represented as a triangle. Furthermore, Kernel Density Graphs were made. This is a method for producing a smooth density approximation, to a set of data that avoids some problems associated with histograms (see appendix 3; nos.14 and 15).

3.3 Z-SCORES

To evaluate the performance of the participating laboratories the z-scores were calculated. As it was decided to evaluate the performance of the participants in this proficiency test (PT) against the literature requirements, e.g. ASTM reproducibilities, the z-scores were calculated using a target standard deviation. The target standard deviation was calculated from the literature reproducibility by division with 2.8. The z-scores were calculated in accordance with:

$z_{(target)}$ = (result - average of PT) / target standard deviation

The $z_{(target)}$ scores are listed in the result tables in appendix 1.

When a laboratory did use a test method with a reproducibility that is significantly different from the reproducibility of the reference test method used in this report, it is strongly advised to recalculate the z-score, while using the reproducibility of the actual test method used, this in order to evaluate the fit-for-useness of the reported test result.

Absolute values for z<2 are very common and absolute values for z>3 are very rare. Therefore, the usual interpretation of z-scores is as follows:

| z | < 1good
1 < | z | < 2satisfactory
2 < | z | < 3questionable
3 < | z | unsatisfactory

4 EVALUATION

Some problems were encountered during the dispatch of the sample unused transformer oil sample #12145 and the sample #12146 “for furanics only” to Brasil, Saudi Arabia and Vietnam. In total twelve participants,reported results after the final reporting date and one participant did not report any results at all. Not all participants were able to report results for all tests. In total 59 participants reported 427 numerical results. Observed were 30 outlying results, which is 7.0% of the numerical results. In proficiency studies, outlier percentages of 3% - 7.5% are quite normal.

4.1 EVALUATION PER TEST

Not all original data sets proved to have a normal distribution. Not normal distributions were found for the following determinations on sample #12145: Density, Di-electric Dissipation Factor and Water. And on sample #12146 a not normal distribution was found on the determination 2-Furfurylalcohol. In these cases the statistical evaluations should be used with due care.
For the Furanic compounds the observed spreads were compared against the (strict) spreads estimated from the Horwitz equation. It is remarkable that the precision requirements of IEC 61198:94 are much smaller than precision data calculated using the Horwitz equation.
In this section, the results are discussed per test.
The methods, which are used by the various laboratories, are taken into account for explaining the observed differences when possible and applicable. These methods are also in the tables together with the original data. The abbreviations, used in these tables, are listed in appendix 3.

Acid Number: (ASTM D974) — This determination was not problematic. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in good agreement with the requirements of ASTM D974:12.

Acid Number: EN62021-1 — No significant conclusions were drawn as the Acid Number was below the quantification limit (0.014 g KOH/kg) of the test method EN62021-1:03. Two statistical outliers were observed.

Acid Number: EN62021-2 No significant conclusions were drawn as the Acid Number was below the quantification limit (0.01 g KOH/kg) of the test method EN62021-2:07.

Breakdown Voltage: This determination was very problematic. One statistical outlier was observed. The calculated reproducibility, after rejection of the statistical outlier is not at all in agreement with the requirements of EN60156:98. The results may be divided in three groups (see the Kernel Density plot). Possible causes for this trimodal distribution may be one or more of the following: maybe the test was not performed on the sample as received (drying or degassing is not allowed); maybe contamination by water or particulate matters did take place and/or maybe the electrodes were not properly maintained.

Colour: The majority of the laboratories agreed that the Colour is < 0.5 in accordance with ASTM D1500:07.

Density @ 20°C: This determination was problematic for a number of laboratories. Six statistical outliers were observed. The calculated reproducibility, after rejection of the statistical outliers is in full agreement with the requirements of ISO3675:98.

DD-Factor: This determination was not problematic. Two statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in good agreement with the requirements of EN60247:04.

Interf. Surf. Tension: This determination was problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D971:12 and/or ISO6295:83. One should be aware that ISO6295 is obsolete since February 2005.

Spec. Resistance: This determination was problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the estimated requirements of EN60247:04.

Water: This determination was problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of EN60814:98.

2-Furfural: This determination was problematic. One statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is not in agreement with the estimated requirements calculated using the Horwitz equation.

The test result of laboratory 398 was excluded prior to the statistical evaluation because the other three reported test results (for the other furanic components) of this laboratory appeared to be statistical outliers.

2-Furfurylalcohol: This determination was very problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not at all in agreement with the estimated requirements calculated using the Horwitz equation.

5-Methyl-2-furfural: This determination was not problematic. Two statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the estimated requirements calculated using the Horwitz equation.

Other Furanics : The concentrations of 2-Acetylfuran and 5-Hydroxymethyl-2-furfural were near or below the detection limit. Therefore no significant conclusions were drawn.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the relevant standard and the reproducibility as found for the group of participating laboratories. The average results per sample, calculated reproducibilities and reproducibilities, derived from literature standards (in casu ASTM, ISO, EN and IEC standards) are compared in the next table.

Parameter	unit	n	average	2.8 * sd	R(lit)
Acid Number (ASTM D974)	g KOH/kg	27	0.007	0.013	0.040
Acid Number (EN62021-1)	g KOH/kg	21	0.006	0.008	(0.002)
Acid Number (EN62021-2)	g KOH/kg	6	0.003	0.005	(0.001)
Breakdown Voltage	kV/2.5 mm	53	50.02	28.47	16.51
Colour		33	< 0.5	n.a.	n.a.
Density @ 20 ^{o}C	kg/m^{3}	39	878.43	1.12	1.20
Di-electric Dissipation Factor		40	0.0025	0.0026	0.0043
Interfacial Surface Tension	mN/m	37	46.72	7.61	4.67
Specific Resistance	GΩm	29	324.8	518.5	341.1
Water	mg/kg	50	19.2	9.5	6.6

table 3: Performance of the group on sample #12145

() = Results between brackets were near or below detection limit, these results should be used with care

Parameter	unit	n	average	2.8 * sd	R(lit)
* 2-furfural	mg/kg	19	0.021	0.028	0.017
* 2-furfurylalcohol	mg/kg	21	0.58	0.41	0.28
* 5-methyl-2-furfural	mg/kg	21	0.80	0.24	0.37
* 2-acetylfuran	mg/kg	24	<0.05	n.a.	n.a.
* 5-hydroxy-2-furfural	mg/kg	24	<0.05	n.a.	n.a.

table 4: Performance of the group on sample #12146

Without further statistical calculations, it can be concluded that for several tests there is a good compliance of the group of participating laboratories with the relevant standards or the rather strict calculated estimates using Horwitz. The problematic tests have been discussed in paragraph 4.1.

4.3 COMPARISON OF THE OCTOBER 2012 PROFICIENCY TEST WITH PREVIOUS PTS.

	October 2012	November 2011	November 2010	November 2009
Number of reporting labs	59	56	46	36
Number of results reported	427	378	289	348
Statistical outliers	30	27	18	21
Percentage outliers	7.0%	7.1%	6.2%	6.0%

table 5: comparison with previous proficiency tests

In proficiency tests, outlier percentages of 3% - 7.5% are quite normal.

The performance of the determinations of the proficiency tests was compared against the target requirements. The conclusions are given the following table:

Parameter	October 2012	November 2011	November 2010	November 2009
Acid number (ASTM D974)	++	+	++	+
Acid number (EN62021-1)	(--)	n.e.	n.e.	n.e.
Acid number (EN62021-2)	(--)	n.e.	n.e.	n.e.
Breakdown Voltage	--	--	--	--
Colour	n.e.	++	++	++
Density @ 20^{o}C	+	-	+/-	++
Di-electric Dissipation Factor	++	++	++	++
Interfacial Surface Tension	--	--	--	--
Specific Resistance	-	--	--	-- / ++
Water	-	+	--	++
2-acetylfuran	n.e.	n.e.	n.e.	n.e.
2-furfural	--	+/-	+/-	--
2-furfurylalcohol	--	n.e.	n.e.	n.e.
5-hydroxy-2-furfural	n.e.	n.e.	n.e.	n.e.
5-methyl-2-furfural	++	n.e.	n.e.	n.e.

table 6: comparison determinations against the standard

() = Results between brackets were near or below detection limit, these results should be used with care

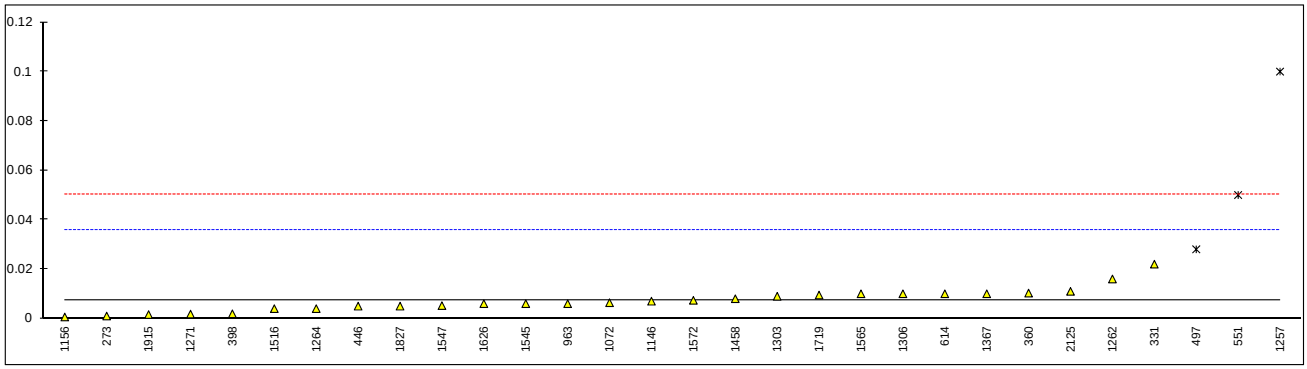
The performance of the determinations against the requirements of the respective standards is listed in the above table. The following performance categories were used:

++: group performed much better than the standard
+ : group performed better than the standard
+/-: group performance equals the standard
- : group performed worse than the standard
-- : group performed much worse than the standard
n.e: not evaluated

APPENDIX 1

Determination of Acid Number (ASTM D974) on sample #12145; results in g KOH/kg

lab	method	value	mark	z(targ)	Remarks
273	D974	0.001		-0.43	
331	D664	0.022		1.04	
360	D974	0.0103		0.22	
398	D974	0.0019		-0.37	
445		-----		-----	
446	D974	0.005		-0.15	
497	D974	0.028	G(0.01)	1.46	
551	D974	0.05	G(0.01)	3.00	
614	IEC60422	0.01		0.20	
963	D974	0.006		-0.08	
1056		-----		-----	
1072	INH-04	0.0064		-0.06	
1146	D664	0.007		-0.01	
1156	D974	0.0006		-0.46	
1178		-----		-----	
1257	D974	0.1	G(0.01)	6.50	
1262	D974	0.016		0.62	
1264	D974	0.004		-0.22	
1271	D974	0.0018		-0.38	
1303	D974	0.009		0.13	
1304	INH-122	<0.01		-----	
1306	in house	0.01		0.20	
1352		-----		-----	
1361		-----		-----	
1367	D974	0.01		0.20	
1373	D974	<0.02		-----	
1374		-----		-----	
1375		-----		-----	
1440		-----		-----	
1442		-----		-----	
1458	D974	0.008		0.06	
1460		-----		-----	
1461		-----		-----	
1463	D974	<0.01		-----	
1471		-----		-----	
1473		-----		-----	
1478		-----		-----	
1513		-----		-----	
1516	D974	0.004		-0.22	
1529		-----		-----	
1545	D974	0.006		-0.08	
1547	D974	0.0052		-0.14	
1548		-----		-----	
1560		-----		-----	
1565	INH-2102	0.01		0.20	
1572	D664	0.00735		0.01	
1576		-----		-----	
1626	D974	0.006		-0.08	
1628		-----		-----	
1660		-----		-----	
1702		-----		-----	
1719	D664	0.0095		0.16	
1801		-----		-----	
1827	D664	0.005		-0.15	
1863	D974	<0.01		-----	
1915	D974	0.0016		-0.39	
1923		-----		-----	
1924		-----		-----	
1925		-----		-----	
2125	ISO6619	0.011		0.27	
	normality	OK			
	n	27			
	outliers	3			
	mean (n)	0.00721			
	st.dev. (n)	0.004686			
	R(calc.)	0.01312			
	R(D974:12)	0.04000			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0.1
0.08
0.06
0.04
0.02
0
1156
273
1915
1271
398
1516
1264
446
1827
1547
1626
1545
963
1072
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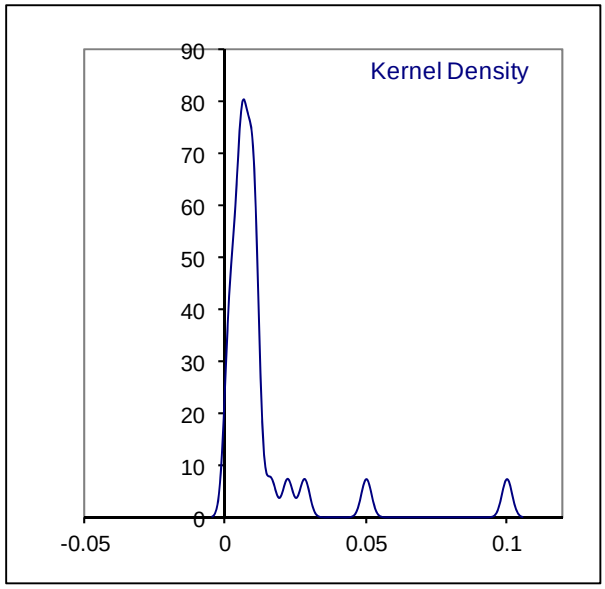
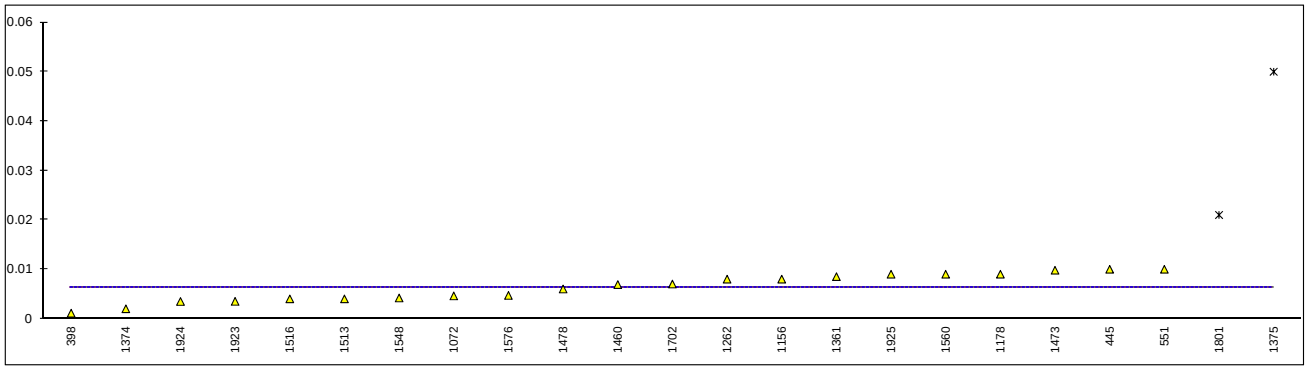
1306
614
1367
360
2125
1262
331
497
551
1257


Kernel Density
90
80
70
60
50
40
30
20
10
0
-0.05
0
0.05
0.1

Determination of Acid Number (EN62021-1) on sample #12145; results in g KOH/kg

lab	method	value	mark	z(targ)	remarks
273		-----		-----	
331		-----		-----	
360		-----		-----	
398	EN62021-1	0.0011		-----	
445	EN62021-1	0.01		-----	
446		-----		-----	
497		-----		-----	
551	D664	0.01		-----	
614		-----		-----	
963		-----		-----	
1056		-----		-----	
1072	EN62021-1	0.0046		-----	
1146		-----		-----	
1156	EN62021-1	0.008		-----	
1178	EN62021-1	0.009		-----	
1257		-----		-----	
1262	EN62021-1	0.008		-----	
1264		-----		-----	
1271		-----		-----	
1303		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1361	EN62021-1	0.0085		-----	
1367		-----		-----	
1373		-----		-----	
1374	IEC62021-1	0.002		-----	
1375	EN62021-1	0.05	G(0.01)	-----	false positive?
1440	IEC62021-1	<0.01		-----	
1442		-----		-----	
1458		-----		-----	
1460	D664	0.0069		-----	
1461		-----		-----	
1463		-----		-----	
1471		-----		-----	
1473	IEC62021-1	0.0098		-----	
1478	IEC62021-1	0.0060		-----	
1513	IEC62021-1	0.004		-----	
1516	IEC62021-1	0.004		-----	
1529	IEC62021-1	<0.01		-----	
1545		-----		-----	
1547		-----		-----	
1548	IEC62021-1	0.00418		-----	
1560	IEC62021-1	0.009		-----	
1565		-----		-----	
1572		-----		-----	
1576	IEC62021-1	0.0047		-----	
1626		-----		-----	
1628		-----		-----	
1660	IEC62021-1	<0.01		-----	
1702	IEC62021-1	0.007		-----	
1719		-----		-----	
1801	EN62021-1	0.021	G(0.01)	-----	false positive?
1827		-----		-----	
1863	EN62021-1	<0.01		-----	
1915		-----		-----	
1923	IEC62021-1	0.00350		-----	
1924	EN62021-1	0.00347		-----	
1925	EN62021-1	0.009		-----	
2125		-----		-----	
	normality	OK			
	n	21			
	outliers	2			
	mean (n)	0.0063			
	st.dev. (n)	0.00278			
	R(calc.)	0.0078			
	R(EN62021-1:03)	(0.0018)			Quantification limit > 0.014 g KOH/kg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0.05
0.04
0.03
0.02
0.01
0
398
1374
1924
1923
1516
1513
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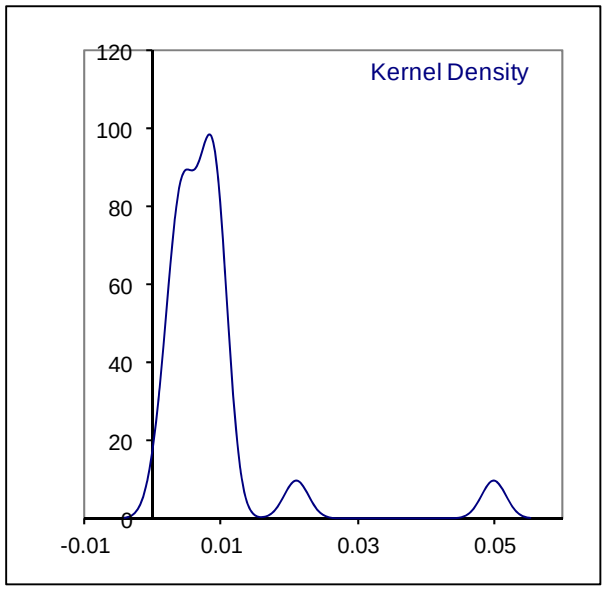
551
1801
1375


Kernel Density
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100
80
60
40
20
0
-0.01
0.01
0.03
0.05

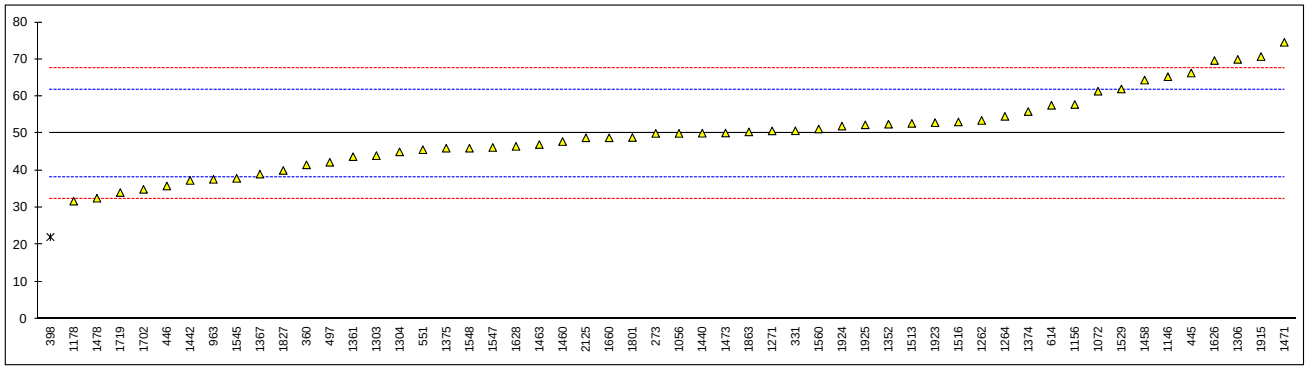
Determination of Acid Number (EN62021-2) on sample #12145; results in g KOH/kg

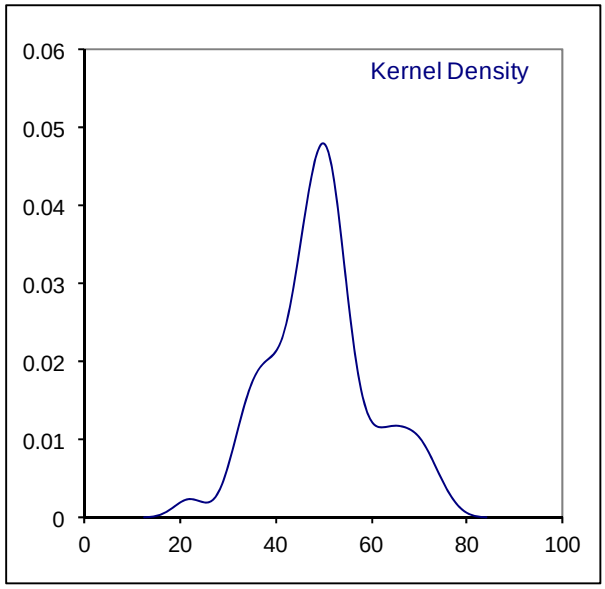
lab	method	Value	mark	z(targ)	remarks
273		-----		-----	
331		-----		-----	
360		-----		-----	
398	EN62021-2	0.0009		-----	
445		-----		-----	
446		-----		-----	
497		-----		-----	
551		-----		-----	
614		-----		-----	
963		-----		-----	
1056		-----		-----	
1072	EN62021-2	<0.01		-----	
1146		-----		-----	
1156		-----		-----	
1178		-----		-----	
1257		-----		-----	
1262		-----		-----	
1264		-----		-----	
1271		-----		-----	
1303		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352	IEC62021-2	0.00526		-----	
1361		-----		-----	
1367		-----		-----	
1373		-----		-----	
1374		-----		-----	
1375	EN62021-2	0.005		-----	
1440		-----		-----	
1442	IEC62021-2	0.001		-----	
1458		-----		-----	
1460		-----		-----	
1461		-----		-----	
1463		-----		-----	
1471		-----		-----	
1473		-----		-----	
1478		-----		-----	
1513	IEC62021-2	0.004		-----	
1516	IEC62021-2	0.004		-----	
1529		-----		-----	
1545		-----		-----	
1547		-----		-----	
1548	IEC62021-2	<0.01		-----	
1560		-----		-----	
1565		-----		-----	
1572		-----		-----	
1576		-----		-----	
1626		-----		-----	
1628		-----		-----	
1660		-----		-----	
1702		-----		-----	
1719		-----		-----	
1801		-----		-----	
1827		-----		-----	
1863	EN62021-2	<0.01		-----	
1915		-----		-----	
1923		-----		-----	
1924		-----		-----	
1925		-----		-----	
2125		-----		-----	
	normality	OK			
	n	6			
	outliers	0			
	mean (n)	0.0034			
	st.dev. (n)	0.00194			
	R(calc.)	0.0054			
	R(EN62021-2:07)	(0.0012)			Quantification limit > 0.01 g KOH/kg

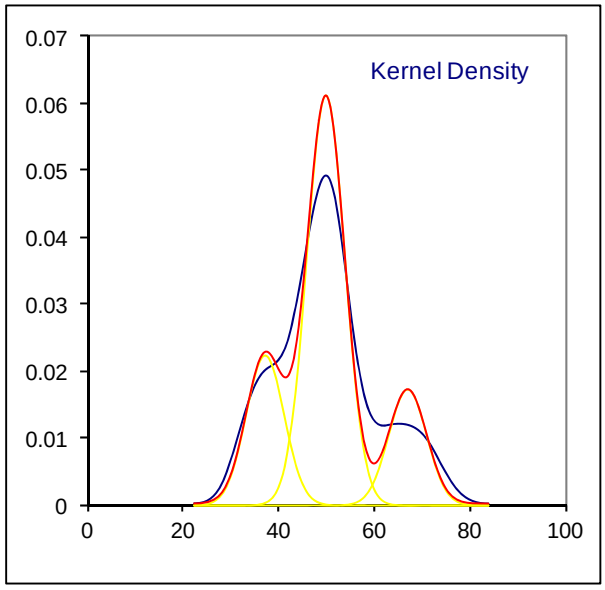
Determination of Breakdown Voltage on sample #12145, results in kV/2.5 mm

lab	method	value	mark	z(targ)	remarks
273	EN60156	50.0		0.00	
331	EN60156	50.7		0.12	
360	EN60156	41.5		-1.45	
398	EN60156	22.0	G(0.05)	-4.75	
445	EN60156	66.3		2.76	
446	EN60156	35.8		-2.41	
497	EN60156	42.2		-1.33	
551	EN60156	45.6		-0.75	
614	IEC60156	57.6		1.29	
963	D877	37.6		-2.11	
1056	IP295	50		0.00	
1072	EN60156	61.4		1.93	
1146	IEC60156	65.3		2.59	
1156	EN60156	57.8		1.32	
1178	EN60156	31.7		-3.11	
1257		-----		-----	
1262	EN60156	53.5		0.59	
1264	EN60156	54.6		0.78	
1271	EN60156	50.67		0.11	
1303	IEC60156	44.0		-1.02	
1304	INH-124	45		-0.85	
1306	IEC60156	70		3.39	
1352	IEC60156	52.5		0.42	
1361	EN60156	43.7		-1.07	
1367	EN60156	39		-1.87	
1373		-----		-----	
1374	IEC60156	55.9		1.00	
1375	EN60156	46		-0.68	
1440	EN60156	50.05		0.00	
1442	IEC60156	37.3		-2.16	
1458	IEC60156	64.4		2.44	
1460	EN60156	47.8		-0.38	
1461		-----		-----	
1463	D1816	47		-0.51	
1471	IEC60156	74.6		4.17	
1473	IEC60156	50.1		0.01	
1478	EN60156	32.5		-2.97	
1513	IEC60156	52.7		0.45	
1516	IEC60156	53.1		0.52	
1529	IEC60156	62		2.03	
1545	IEC60156	37.86		-2.06	
1547	EN60156	46.2		-0.65	
1548	IEC60156	46		-0.68	
1560	IEC60156	51.2		0.20	
1565		-----		-----	
1572		-----		-----	
1576		-----		-----	
1626	IEC60156	69.7		3.34	
1628	IEC60156	46.5		-0.60	
1660	IEC60156	48.8		-0.21	
1702	IEC60156	34.9		-2.56	
1719	IEC60156	34.02		-2.71	
1801	EN60156	48.9		-0.19	
1827	IEC60156	40		-1.70	
1863	EN60156	50.4		0.06	
1915	IEC60156	70.75		3.52	
1923	EN60156	52.9		0.49	
1924	IEC60156	51.98		0.33	
1925	EN60156	52.3		0.39	
2125	EN60156	48.8		-0.21	

normality	OK
n	53
outliers	1
mean (n)	50.02
st.dev. (n)	10.166
R(calc.)	28.47
R(EN60156:98)	16.51


80
70
60
50
40
30
20
10
0
398 1178 1478 1719 1702 446 1442 963 1545 1367 1827 360 497 1361 1303 1304 551 1375 1548 1547 1628 1463 1460 2125 1660 1801 273 1056 1440 1473 1863 1271 331 1560 1924 1925 1352 1513 1923 1516 1262 1264 1374 614 1156 1072 1529 1458 1146 445 1626 1306 1915 1471


Kernel Density
0.06
0.05
0.04
0.03
0.02
0.01
0
0 20 40 60 80 100


Kernel Density
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0 20 40 60 80 100

Determination of Colour on sample #12145;

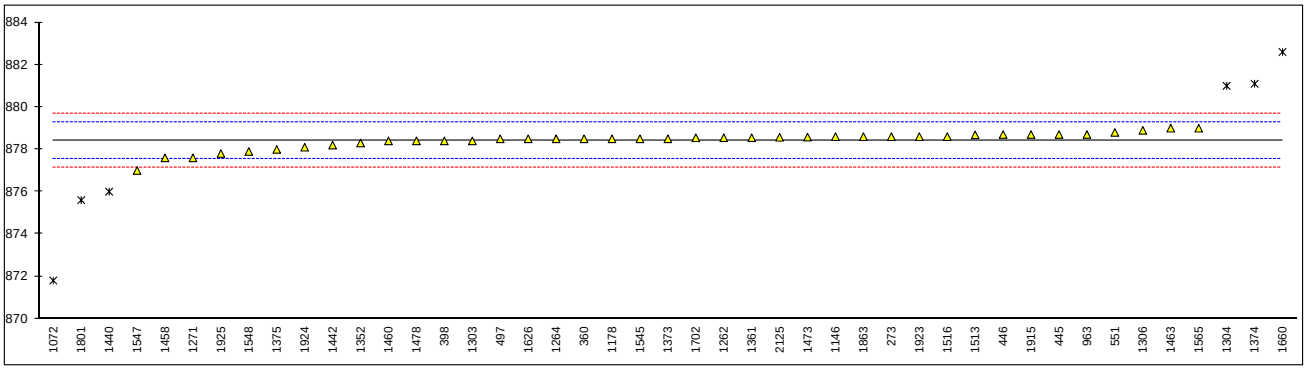
lab	method	value	mark	z(targ)	Remarks
273	D1500	<0.5		-----	
331	D1500	0.5		-----	
360	D1500	<0.5		-----	
398	D1500	<0.5		-----	
445	D1500	<0.5		-----	
446	D1500	<0.5		-----	
497	D1500	0.1		-----	
551	D1500	<0.5		-----	
614	INH-830	straw		-----	
963	D1500	<0.5		-----	
1056		-----		-----	
1072	D1500	<0.5		-----	
1146		-----		-----	
1156	D1500	0.0		-----	
1178	ISO2049	0.5		-----	
1257		-----		-----	
1262	D1500	<0.5		-----	
1264	D1500	<0.5		-----	
1271	D1500	0.1		-----	
1303	D1500	<0.5		-----	
1304	INH-132	0.0		-----	
1306	D1500	0		-----	
1352		-----		-----	
1361		-----		-----	
1367		-----		-----	
1373		-----		-----	
1374	D1524	<0.5		-----	
1375	ISO2049	0.0		-----	
1440	ISO2049	<0.5		-----	
1442	D1500	<0.5		-----	
1458	D1500	<0.5		-----	
1460	D1500	0.5		-----	
1461		-----		-----	
1463	D1500	0		-----	
1471		-----		-----	
1473	D1500	<0.5		-----	
1478	ISO2049	<0.5		-----	
1513	ISO2049	<0.5		-----	
1516	D1500	0		-----	
1529	ISO2049	0		-----	
1545	D1500	0.5		-----	
1547	D1524	<0.5		-----	
1548		-----		-----	
1560	ISO2049	0.5		-----	
1565	D1500	0.5		-----	
1572		-----		-----	
1576		-----		-----	
1626	D1500	<0.5		-----	
1628		-----		-----	
1660	D1500	<0.1		-----	
1702	D1500	0.0		-----	
1719	D1524	<0.5		-----	
1801	D1500	<0.5		-----	
1827		-----		-----	
1863	D1500	<0.5		-----	
1915	D1500	<0.5		-----	
1923	ISO2049	0.5		-----	
1924	D6045	<0.5		-----	
1925	ISO2049	0.5		-----	
2125		-----		-----	

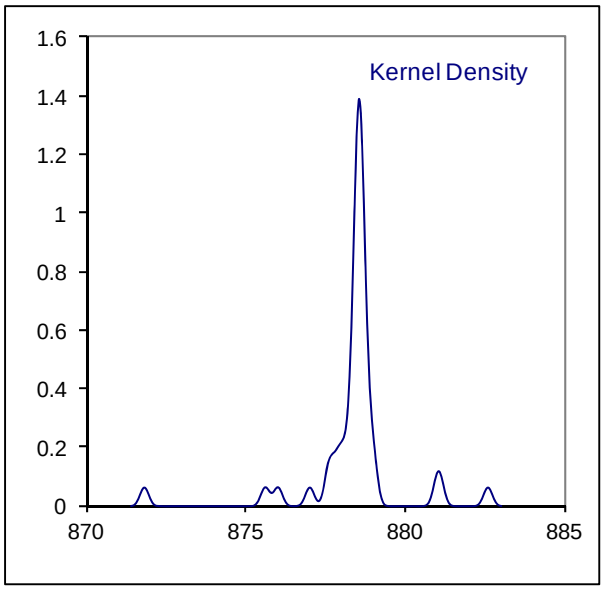
normality	n.a
n	33
outliers	n.a
mean (n)	< 0.5
st.dev. (n)	n.a
R(calc.)	n.a
R(D1500:07)	n.a

Determination of Density @20°C on sample #12145; results in kg/m^3

lab	method	value	mark	z(targ)	Remarks
273	D4052	878.6		0.41	
331		-----		-----	
360	D4052	878.5		0.17	
398	ISO3675	878.4		-0.06	
445	D4052	878.7		0.64	
446	D4052	878.7		0.64	
497	ISO3675	878.5		0.17	
551	D4052	878.8		0.87	
614		-----		-----	
963	D4052	878.7		0.64	
1056		-----		-----	
1072	ISO3675	871.8	G(0.01)	-15.46	
1146	ISO12185	878.60		0.41	
1156		-----		-----	
1178	ISO12185	878.50		0.17	
1257		-----		-----	
1262	ISO3675	878.55		0.29	
1264	D4052	878.5		0.17	
1271	ISO3675	877.6		-1.93	
1303	D4052	878.4	C	-0.06	first reported: 0.8784
1304	INH-120	881.0	G(0.01)	6.01	
1306	D1298	878.9		1.11	
1352	ISO12183	878.3		-0.29	
1361	ISO3675	878.55		0.29	
1367		-----		-----	
1373	INH-007	878.5		0.17	
1374	D7777	881.1	G(0.05)	6.24	
1375	ISO3675	878		-0.99	
1440	in house	876	G(0.05)	-5.66	
1442	D7042	878.20		-0.53	
1458	D4052	877.6	C	-1.93	first reported: 874.6
1460	D4052	878.4	C	-0.06	probably unit error, reported: 0.8784
1461		-----		-----	
1463	D1298	879		1.34	
1471		-----		-----	
1473	D1217	878.58	C	0.36	first reported: 874.33
1478	ISO12185	878.4		-0.06	
1513	ISO12185	878.686		0.61	
1516	ISO3675	878.6		0.41	
1529		-----		-----	
1545	ISO3675	878.5		0.17	
1547	D1298	877	C	-3.33	probably unit error, reported: 0.877
1548	ISO3675	877.9	C	-1.23	probably unit error, reported: 0.8779
1560		-----		-----	
1565	D1298	879		1.34	
1572		-----		-----	
1576		-----		-----	
1626	ISO12185	878.5	C	0.17	probably unit error, reported: 0.8785
1628		-----		-----	
1660	D7042	882.6	C,G(0.01)	9.74	probably unit error, reported: 0.8826
1702	ISO12185	878.547		0.28	
1719		-----		-----	
1801	ISO3675	875.6	G(0.05)	-6.59	
1827		-----		-----	
1863	D4052	878.6		0.41	
1915	D4052	878.7		0.64	
1923	ISO3675	878.6		0.41	
1924	ISO3675	878.10		-0.76	
1925	ISO3675	877.8		-1.46	
2125	ISO12185	878.57		0.34	

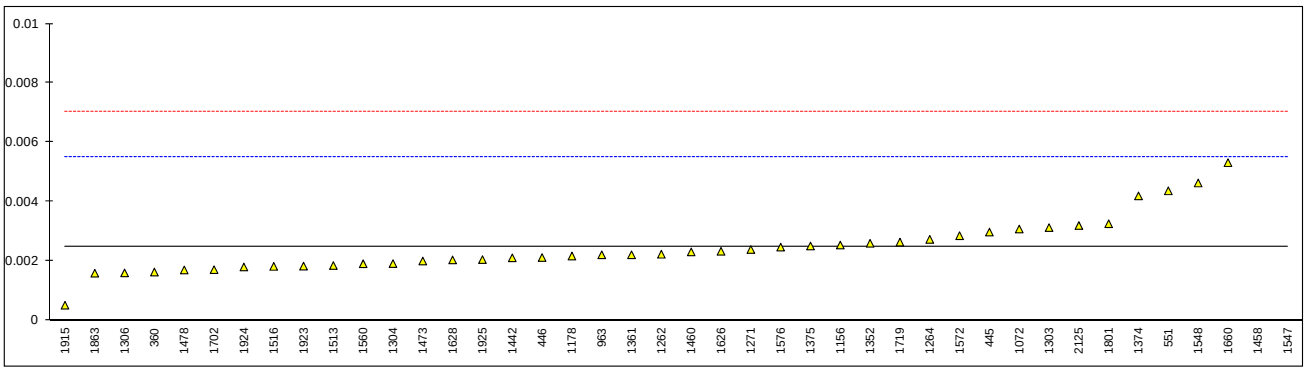
			Only ISO12185/D4052	Only ISO 3675
	normality	not OK	not OK	not OK
	n	39	20	12
	outliers	6	0	2
	mean (n)	878.425	878.515	878.258
	st.dev. (n)	0.4005	0.25101	0.3573
	R(calc.)	1.121	0.703	1.000
	R(ISO3675:98)	1.200	0.500	1.200

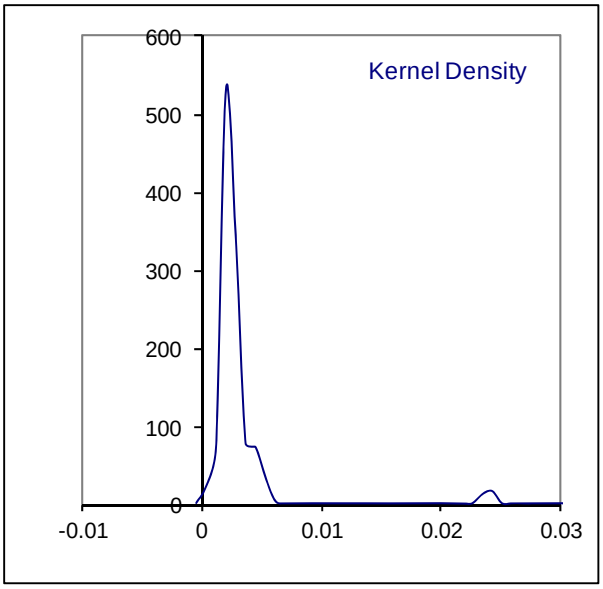

884
882
880
878
876
874
872
870
1072 1801 1440 1547 1458 1271 1925 1548 1375 1924 1442 1352 1460 1478 398 1303 497 1626 1264 360 1178 1545 1373 1702 1262 1361 2125 1473 1146 1863 273 1923 1516 1513 446 1915 445 963 551 1306 1463 1565 1304 1374 1660


Kernel Density
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
870
875
880
885

Determination of Di-electric Dissipation Factor on sample #12145;

lab	method	value	mark	z(targ)	remarks
273		-----		-----	
331		-----		-----	
360	EN60247	0.00162		-0.55	
398		-----		-----	
445	EN60247	0.00297		0.34	
446	EN60247	0.00211		-0.22	
497		-----		-----	
551	EN60247	0.00436		1.25	
614		-----		-----	
963	D924	0.0022		-0.17	
1056		-----		-----	
1072	EN60247	0.00307		0.40	
1146		-----		-----	
1156	EN60247	0.00253		0.05	
1178	EN60247	0.00216		-0.19	
1257		-----		-----	
1262	IEC60247	0.00222		-0.15	
1264	EN60247	0.002722		0.18	
1271	EN60247	0.00238		-0.05	
1303	IEC60247	0.00312		0.44	
1304	INH-125	0.001905		-0.36	
1306	IEC60247	0.00159		-0.56	
1352	IEC60247	0.00259		0.09	
1361	EN60247	0.002202		-0.16	
1367		-----		-----	
1373		-----		-----	
1374	IEC60247	0.00419		1.14	
1375	EN60247	0.0025		0.03	
1440		-----		-----	
1442	IEC60247	0.0021		-0.23	
1458	IEC60247	0.02383	G(0.01)	13.98	
1460	EN60247	0.0023		-0.10	
1461		-----		-----	
1463	D974	<0.01		-----	
1471		-----		-----	
1473	IEC60247	0.001992		-0.30	
1478	EN60247	0.001690		-0.50	
1513	IEC60247	0.00184		-0.40	
1516	IEC60247	0.00181		-0.42	
1529		-----		-----	
1545		-----		-----	
1547	D924	0.2088	G(0.01)	134.91	
1548	IEC60247	0.004625	C	1.42	first reported: 4.63
1560	IEC60247	0.0019		-0.36	
1565		-----		-----	
1572	IEC60247	0.002846		0.26	
1576	IEC60247	0.00246		0.00	
1626	IEC60247	0.0023185		-0.09	
1628	IEC60247	0.00203		-0.28	
1660	IEC60247	0.00531		1.87	
1702	IEC60247	0.001698		-0.49	
1719	IEC60247	0.00263		0.12	
1801	EN60247	0.00325		0.52	
1827		-----		-----	
1863	EN60247	0.00158		-0.57	
1915	D924	0.0005		-1.28	
1923	EN60247	0.00182		-0.41	
1924	EN60247	0.00179		-0.43	
1925	EN60247	0.00204		-0.27	
2125	EN60247	0.00319		0.48	
	normality	not OK			
	n	40			
	outliers	2			
	mean (n)	0.002454			
	st.dev. (n)	0.0009144			
	R(calc.)	0.002560			
	R(EN60247:04)	0.004283			

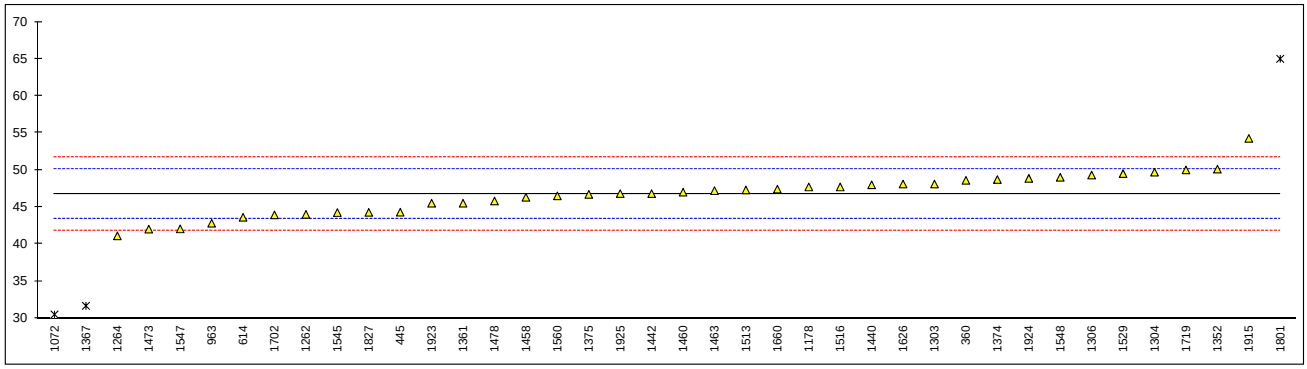

0.01
0.008
0.006
0.004
0.002
0
1915
1863
1306
360
1478
1702
1924
1516
1923
1513
1560
1304
1473
1628
1925
1442
446
1178
963
1361
1262
1460
1626
1271
1576
1375
1156
1352
1719
1264
1572
445
1072
1303
2125
1801
1374
551
1548
1660
1458
1547

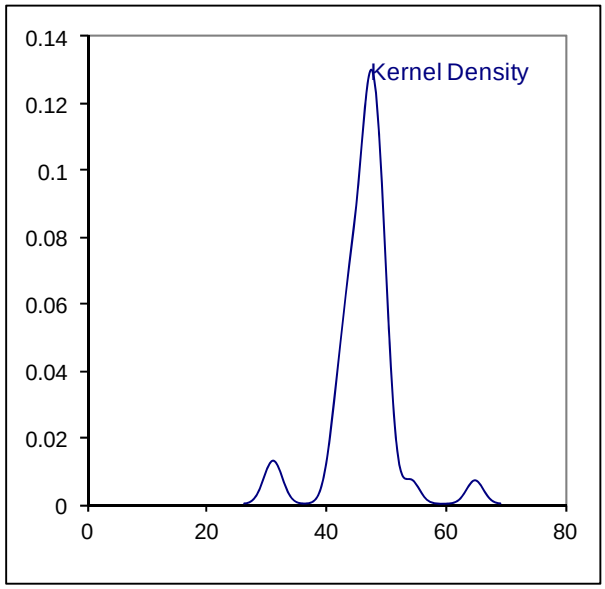

Kernel Density
600
500
400
300
200
100
0
-0.01
0
0.01
0.02
0.03

Determination of Interfacial Surface Tension on sample #12145; results in mN/m

lab	method	value	mark	z(targ)	remarks
273		-----		-----	
331		-----		-----	
360	D971	48.6		1.13	
398		-----		-----	
445	D971	44.3		-1.45	
446		-----		-----	
497		-----		-----	
551		-----		-----	
614	ISO6295	43.6	C	-1.87	first reported: 56.8
963	D971	42.8		-2.35	
1056		-----		-----	
1072	ISO6295	30.48	G(0.01)	-9.73	
1146		-----		-----	
1156		-----		-----	
1178	D971	47.7		0.59	
1257		-----		-----	
1262	D971	44.0		-1.63	
1264	ISO6295	41.1		-3.37	
1271		-----		-----	
1303	D971	48.1		0.83	
1304	INH-123	49.7		1.79	
1306	D971	49.3		1.55	
1352	D971	50.1		2.02	
1361	D971	45.5060		-0.73	
1367	ISO6295	31.65	G(0.01)	-9.03	
1373		-----		-----	
1374	D2285	48.7		1.19	
1375	ISO6295	46.7		-0.01	
1440	ISO6295	47.99		0.76	
1442	EN14210	46.8		0.05	
1458	D971	46.3		-0.25	
1460	D971	47.0		0.17	
1461		-----		-----	
1463	D971	47.2		0.29	
1471		-----		-----	
1473	D971	42		-2.83	
1478	D971	45.8		-0.55	
1513	D971	47.3		0.35	
1516	D971	47.7		0.59	
1529	D971	49.5		1.67	
1545	D971	44.24		-1.49	
1547	D971	42.0373		-2.81	
1548	ISO6295	49		1.37	
1560	D971	46.5		-0.13	
1565		-----		-----	
1572		-----		-----	
1576		-----		-----	
1626	ISO6295	48.1		0.83	
1628		-----		-----	
1660	D971	47.4		0.41	
1702	ISO6295	43.932		-1.67	
1719	D2285	50		1.96	
1801	ISO6295	65.0	G(0.01)	10.95	
1827	D971	44.27	C	-1.47	first reported: 36.05
1863		-----		-----	
1915	D971	54.25		4.51	
1923	ISO6295	45.5		-0.73	
1924	D971	48.86		1.28	
1925	D971	46.8		0.05	
2125		-----		-----	

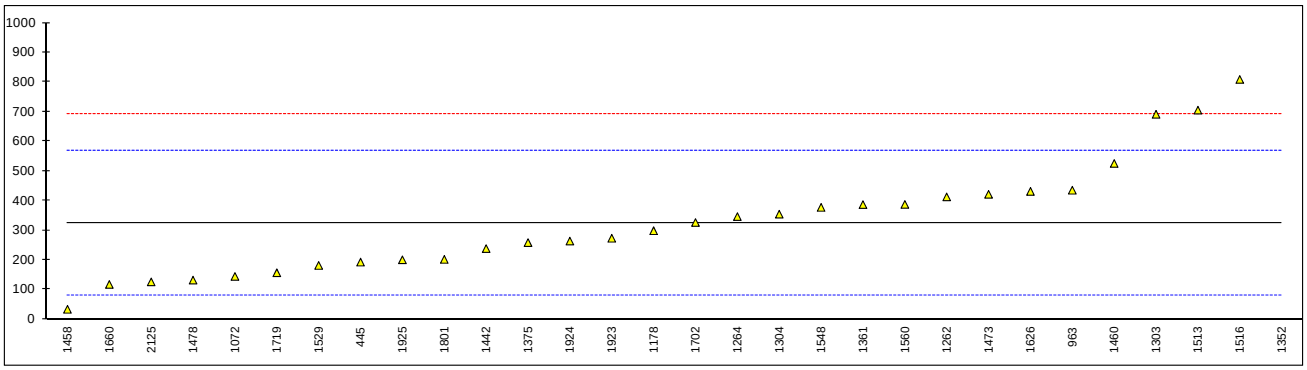
normality	OK
n	37
outliers	3
mean (n)	46.721
st.dev. (n)	2.7180
R(calc.)	7.610
R(ISO6295:83)	4.672
R(D971:12)	4.672


70
65
60
55
50
45
40
35
30
1072
1367
1264
1473
1547
963
614
1702
1262
1545
1827
445
1923
1361
1478
1458
1560
1375
1925
1442
1460
1463
1513
1660
1178
1516
1440
1626
1303
360
1374
1924
1548
1306
1529
1304
1719
1352
1915
1801


Kernel Density
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
20
40
60
80

Determination of Specific Resistance on sample #12145; results in GΩm

lab	method	value	mark	z(targ)	Remarks
273		-----		-----	
331		-----		-----	
360		-----		-----	
398		-----		-----	
445	EN60247	192.3		-1.09	
446		-----		-----	
497		-----		-----	
551		-----		-----	
614		-----		-----	
963	D1169	434.9		0.90	
1056		-----		-----	
1072	EN60247	144		-1.48	
1146		-----		-----	
1156		-----		-----	
1178	EN60247	298.2		-0.22	
1257		-----		-----	
1262	IEC60247	412.4		0.72	
1264	EN60247	346.41	C	0.17	probably unit error, reported: 3.4641E+11
1271		-----		-----	
1303	IEC60247	691.4		3.01	
1304	INH-125	354.09		0.24	
1306		-----		-----	
1352	IEC60247	1489	G(0.01)	9.56	
1361	EN60247	386.39		0.51	
1367		-----		-----	
1373		-----		-----	
1374		-----		-----	
1375	EN60247	258.14		-0.55	
1440		-----		-----	
1442	IEC60247	238.0		-0.71	
1458	IEC60247	32.99		-2.40	
1460	EN60247	525.4		1.65	
1461		-----		-----	
1463		-----		-----	
1471		-----		-----	
1473	IEC60247	421		0.79	
1478	EN60247	131.69		-1.59	
1513	IEC60247	705.3		3.12	
1516	IEC60247	808.8		3.97	
1529	IEC60247	181		-1.18	
1545		-----		-----	
1547		-----		-----	
1548	IEC60247	377.025		0.43	
1560	IEC60247	387.1		0.51	
1565		-----		-----	
1572		-----		-----	
1576		-----		-----	
1626	IEC60247	431.0		0.87	
1628		-----		-----	
1660	IEC60247	117.1		-1.71	
1702	IEC60247	326.0		0.01	
1719	IEC60247	156.25	C	-1.38	probably unit error, reported: 1.5625E11
1801	EN60247	201.5		-1.01	
1827		-----		-----	
1863		-----		-----	
1915		-----		-----	
1923	EN60247	272.8		-0.43	
1924	EN60247	263.4		-0.50	
1925	EN60247	200.0		-1.02	
2125	EN60247	125.55		-1.64	
	normality	OK			
	n	29			
	outliers	1			
	mean (n)	324.82			
	st.dev. (n)	185.190			
	R(calc.)	518.53			
	R(EN60247:04)	341.06			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900
800
700
600
500
400
300
200
100
0
1458
1660
2125
1478
1072
1719
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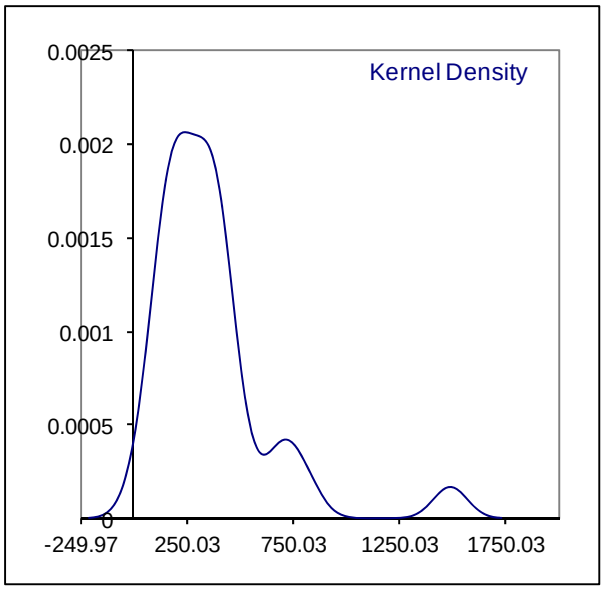
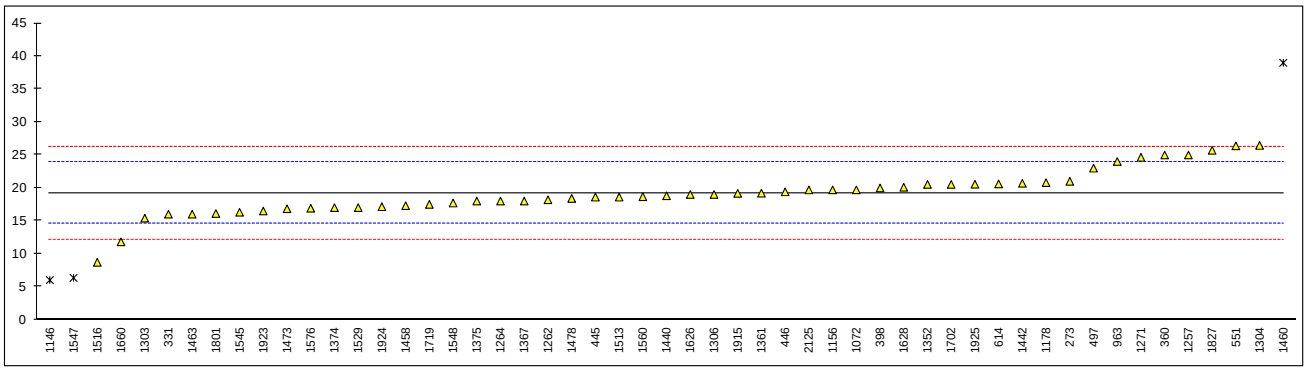
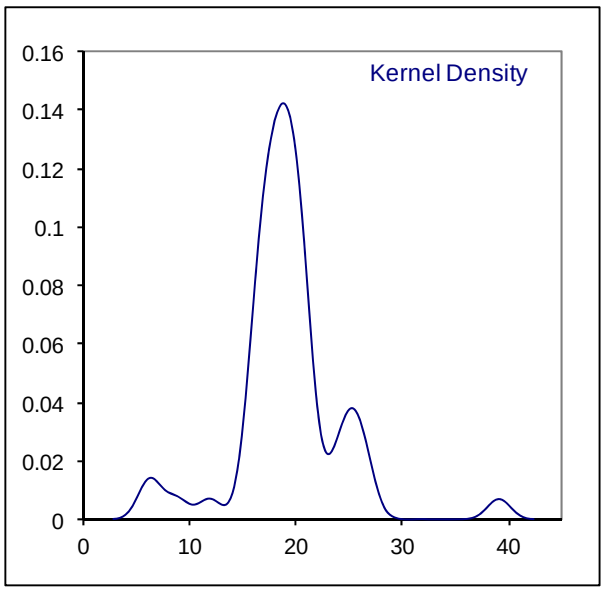
1925
1801
1442
1375
1924
1923
1178
1702
1264
1304
1548
1361
1560
1262
1473
1626
963
1460
1303
1513
1516
1352


Kernel Density
0.0025
0.002
0.0015
0.001
0.0005
0
-249.97
250.03
750.03
1250.03
1750.03

Determination of Water on sample #12145; results in mg/kg

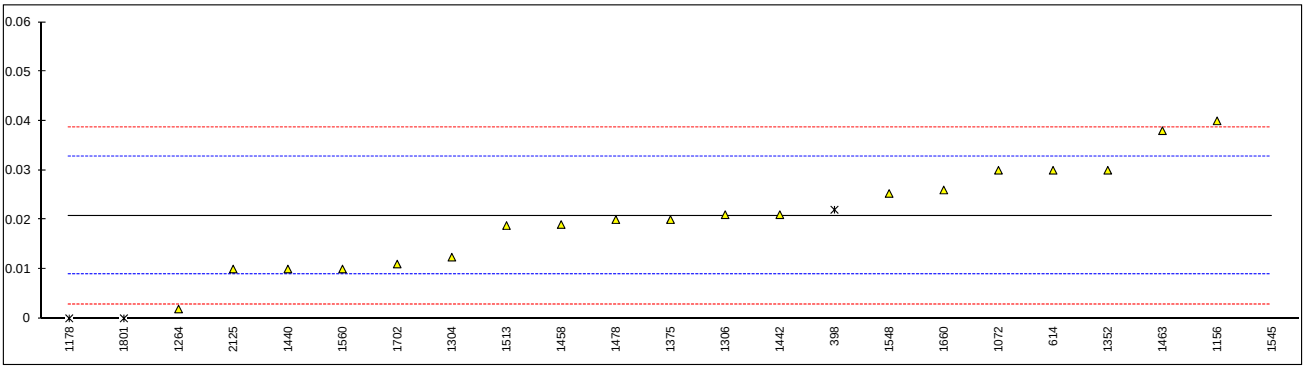
lab	method	value	mark	z(targ)	remarks
273	EN60814	21		0.77	
331	D6304	16.0		-1.36	
360	IEC60814	25.0		2.48	
398	EN60814	20.0		0.35	
445	EN60814	18.6		-0.25	
446	EN60814	19.4		0.09	
497	EN60814	23		1.63	
551	EN60814	26.38		3.07	
614	IEC60814	20.6		0.60	
963	D1533	24		2.05	
1056		-----		-----	
1072	EN60814	19.7		0.22	
1146	D6304C	6	DG(0.01)	-5.62	
1156	EN60814	19.7		0.22	
1178	EN60814	20.8		0.69	
1257	EN60814	25		2.48	
1262	EN60814	18.2		-0.42	
1264	EN60814	18		-0.505	
1271	EN60814	24.65	C	2.33	first reported: 32.95
1303	IEC60814	15.4		-1.61	
1304	INH-121	26.45		3.10	
1306	IEC60247	19		-0.08	
1352	IEC60814	20.53		0.57	
1361	EN60814	19.2		0.01	
1367	D4928	18		-0.51	
1373	INH-94	<100	C	-----	first reported:31.6
1374	IEC60814	17.0		-0.93	
1375	EN60814	18		-0.51	
1440	EN60814	18.8		-0.16	
1442	IEC60814	20.7		0.65	
1458	D1533	17.3		-0.80	
1460	EN60814	39.0	G(0.01)	8.44	
1461		-----		-----	
1463	D1533	16		-1.36	
1471		-----		-----	
1473	IEC60814	16.83		-1.00	
1478	EN60814	18.4		-0.33	
1513	IEC60814	18.6		-0.25	
1516	IEC60814	8.7		-4.47	
1529	IEC60814	17		-0.93	
1545	IEC60814	16.30		-1.23	
1547	D1533	6.34	DG(0.01)	-5.47	
1548	EN60814	17.7		-0.63	
1560	IEC60814	18.666		-0.22	
1565		-----		-----	
1572		-----		-----	
1576	IEC60814	16.9		-0.97	
1626	IEC60814	19.0		-0.08	
1628	IEC60814	20.1		0.39	
1660	IEC60814	11.8		-3.15	
1702	IEC60814	20.53		0.57	
1719	IEC60814	17.5		-0.72	
1801	EN60814	16.1		-1.31	
1827	D6304	25.7		2.78	
1863		-----		-----	
1915	D1533	19.16		-0.01	
1923	EN60814	16.5		-1.14	
1924	EN60814	17.14		-0.87	
1925	EN60814	20.55		0.58	
2125	IEC60814	19.69		0.21	
	normality	not OK			
	n	50			
	outliers	3			
	mean (n)	19.186			
	st.dev. (n)	3.3940			
	R(calc.)	9.503			
	R(EN60814:98)	6.570			

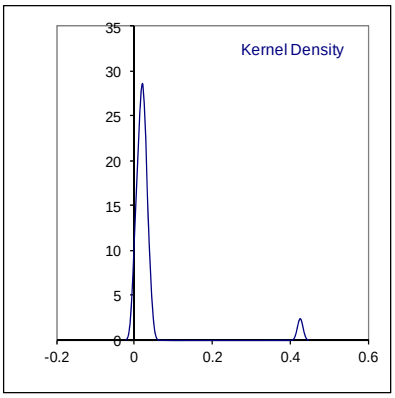

45
40
35
30
25
20
15
10
5
0
1146
1547
1516
1660
1303
331
1463
1801
1545
1923
1473
1576
1374
1529
1924
1458
1719
1548
1375
1264
1367
1262
1478
445
1513
1560
1440
1626
1306
1915
1361
446
2125
1156
1072
398
1628
1352
1702
1925
614
1442
1178
273
497
963
1271
360
1257
1827
551
1304
1460


Kernel Density
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
10
20
30
40

Determination of 2-Furfural on sample #12146; results in mg/kg

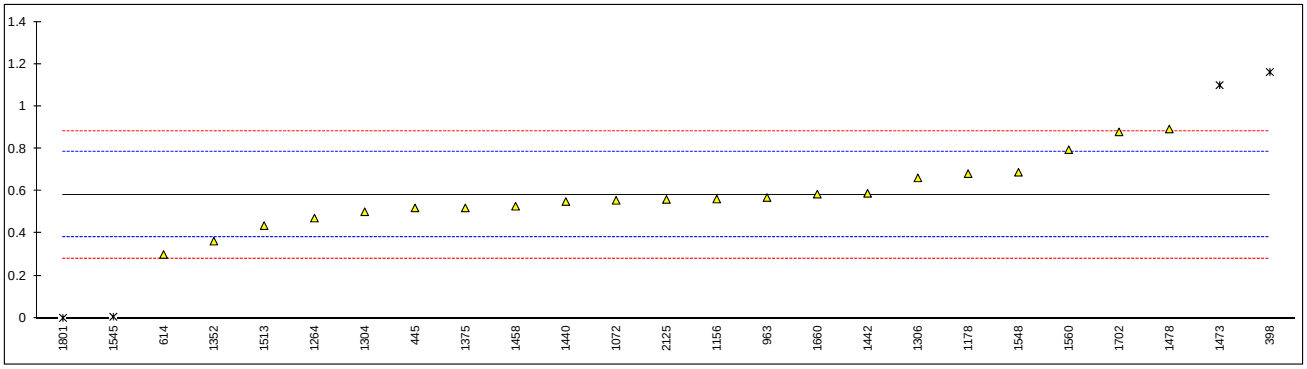
lab	method	Value	mark	z(targ)	remarks
398	IEC61198	0.022	ex	0.21	result excluded, see § 4.1
445	IEC61198	<0.05		-----	
614	IEC61198	0.03		1.55	
963	D5837	<0.01		<-1.90	
1072	EN61198	0.030		1.55	
1156	IEC61198	0.040		3.23	
1178	IEC61198	0.000	ex	-3.49	result excluded, zero is not a real value
1264	D5837	0.0019	C	-3.17	probably unit error, reported: 19
1304	INH-126	0.0124		-1.40	
1306	IEC61198	0.021		0.04	
1352	IEC61198	0.03		1.55	
1367		-----		-----	
1375	IEC61198	0.02		-0.13	
1430		-----		-----	
1440	IEC61198	0.01		-1.81	
1442	IEC61198	0.021		0.04	
1458	IEC61198	0.019		-0.30	
1463	D5837	0.038		2.90	
1473	IEC61198	<0.03		-----	
1478	IEC61198	0.020		-0.13	
1513	IEC61198	0.0188		-0.33	
1516		-----		-----	
1529	IEC61198	<0.1		-----	
1545	IEC61198	0.4248	C, G(0.01)	67.89	first reported: 0.5417
1548	IEC61198	0.0253		0.76	
1560	IEC61198	0.01		-1.81	
1660	IEC61198	0.026		0.88	
1702	IEC61198	0.011		-1.64	
1801	IEC61198	0.000	ex	-3.49	result excluded, zero is not a real value
2125	IEC61198	0.01		-1.81	
	normality	OK			
	n	19			
	outliers	1			
	mean (n)	0.0208			
	st.dev. (n)	0.01013			
	R(calc.)	0.0284			
	R(Horwitz)	0.0167			Compare R(IEC61198:94) = 0.0031 mg/kg

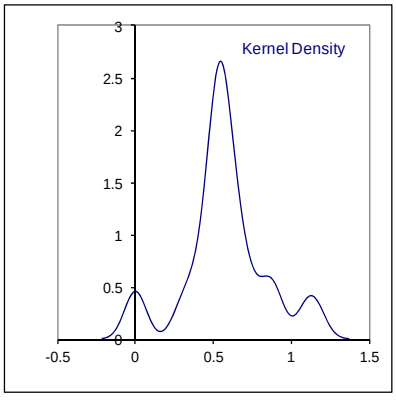




Determination of 2-Furfurylalcohol on sample #12146; results in mg/kg

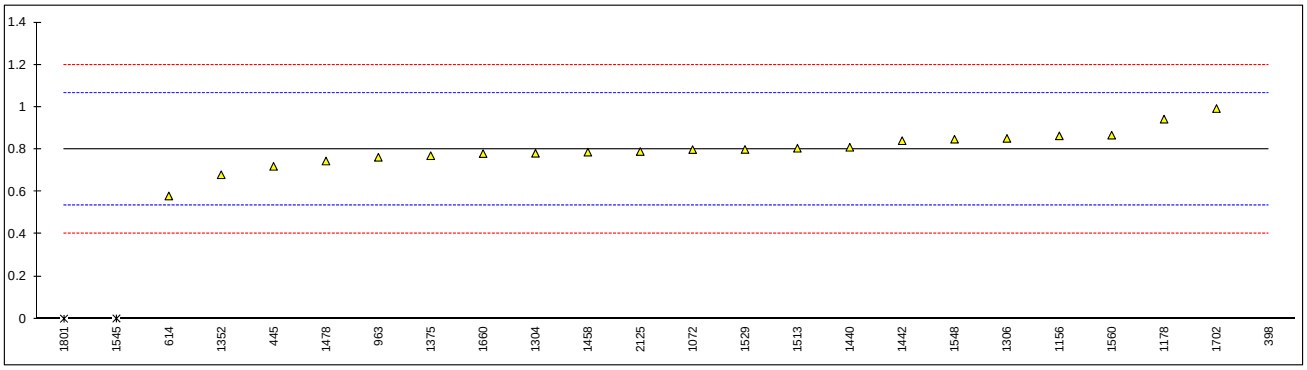
lab	method	Value	mark	z(targ)	remarks
398	IEC61198	1.162	G(0.05)	5.75	
445	IEC61198	0.52		-0.61	
614	IEC61198	0.30		-2.79	
963	D5837	0.569		-0.12	
1072	EN61198	0.556		-0.25	
1156	IEC61198	0.562		-0.19	
1178	IEC61198	0.682		1.00	
1264	D5837	0.472	C	-1.08	probably unit error, reported: 472
1304	INH-126	0.5016		-0.79	
1306	IEC61198	0.661846		0.80	
1352	IEC61198	0.3630	C	-2.16	first reported: n.d.
1367		-----		-----	
1375	IEC61198	0.52		-0.61	
1430		-----		-----	
1440	IEC61198	0.55		-0.31	
1442	IEC61198	0.589		0.07	
1458	IEC61198	0.528		-0.53	
1463		-----		-----	
1473	IEC61198	1.10	G(0.05)	5.14	
1478	IEC61198	0.893		3.09	
1513	IEC61198	0.4363		-1.44	
1516		-----		-----	
1529	IEC61198	<0.1		<-4.45	false negative?
1545	IEC61198	0.0057	C,G(0.05)	-5.70	first reported, 0.0080
1548	IEC61198	0.6884		1.06	
1560	IEC61198	0.795		2.12	
1660	IEC61198	0.585		0.03	
1702	IEC61198	0.879		2.95	
1801	IEC61198	0.000	ex	-5.76	result excluded, zero is not a real value
2125	IEC61198	0.56		-0.21	
	normality	not OK			
	n	21			
	outliers	3			
	mean (n)	0.5815			
	st.dev. (n)	0.14810			
	R(calc.)	0.4147			
	R(Horwitz)	0.2827			Compare R(IEC61198:94) = 0.090 mg/kg

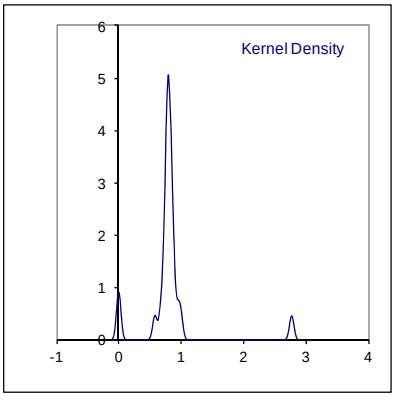




Determination of 5-Methyl-2-furfural on sample #12146; results in mg/kg

lab	method	value	mark	z(targ)	remarks
398	IEC61198	2.771	G(0.01)	14.87	
445	IEC61198	0.72		-0.61	
614	IEC61198	0.58		-1.67	
963	D5837	0.763		-0.29	
1072	EN61198	0.799		-0.01	
1156	IEC61198	0.864		0.48	
1178	IEC61198	0.943		1.07	
1264	D5837	<1		-----	
1304	INH-126	0.7818		-0.14	
1306	IEC61198	0.852183		0.39	
1352	IEC61198	0.68		-0.91	
1367		-----		-----	
1375	IEC61198	0.77		-0.23	
1430		-----		-----	
1440	IEC61198	0.81		0.07	
1442	IEC61198	0.841		0.30	
1458	IEC61198	0.787		-0.11	
1463		-----		-----	
1473	IEC61198	<0.03		<-5.82	false negative?
1478	IEC61198	0.745		-0.42	
1513	IEC61198	0.8054		0.03	
1516		-----		-----	
1529	IEC61198	0.80		-0.01	
1545	IEC61198	0.0011	C,G(0.01)	-6.04	first reported: 0.0000
1548	IEC61198	0.8482		0.36	
1560	IEC61198	0.867		0.50	
1660	IEC61198	0.780		-0.16	
1702	IEC61198	0.993		1.45	
1801	IEC61198	0.000	ex	-6.04	result excluded, zero is not a real value
2125	IEC61198	0.79		-0.08	
	normality	OK			
	n	21			
	outliers	2			
	mean (n)	0.8009			
	st.dev. (n)	0.08620			
	R(calc.)	0.2414			
	R(Horwitz)	0.3710			Compare IEC61198:94 = 0.1201 mg/kg





Determination of other Furanic compounds on sample #12146; results in mg/kg

lab	method	2-af	mark	z(targ)	5-hm-2-f	mark	z(targ)
398	IEC61198	0.098	G(0.05)	-----	0.023		-----
445	IEC61198	<0.05		-----	<0.05		-----
614	IEC61198	<0.01		-----	<0.01		-----
963	D5837	<0.01		-----	<0.01		-----
1072	EN61198	<0.01		-----	<0.01		-----
1156	IEC61198	<0.05		-----	<0.05		-----
1178	IEC61198	0.012		-----	0.011		-----
1264	D5837	0.0674	G(0.05)	-----	<1		-----
1304	INH-126	<0.01		-----	<0.01		-----
1306	IEC61198	<0.03		-----	<0.03		-----
1352	IEC61198	n.d.		-----	n.d.		-----
1367		-----		-----	-----		-----
1375	IEC61198	<0.03		-----	<0.03		-----
1430		-----		-----	-----		-----
1440	IEC61198	<0.01		-----	<0.01		-----
1442	IEC61198	<0.01		-----	<0.01		-----
1458	IEC61198	<0.01		-----	<0.01		-----
1463		-----		-----	-----		-----
1473	IEC61198	<0.03		-----	<0.03		-----
1478	IEC61198	<0.01		-----	<0.01		-----
1513	IEC61198	<0.05		-----	<0.05		-----
1516		-----		-----	-----		-----
1529	IEC61198	<0.1		-----	<0.1		-----
1545	IEC61198	0.0014		-----	0.0036	C, first reported: 0.0690	-----
1548	IEC61198	0.0004		-----	0.0004		-----
1560	IEC61198	n.d.		-----	0.003		-----
1660	IEC61198	<0.01		-----	<0.01		-----
1702	IEC61198	n.d.		-----	n.d.		-----
1801	IEC61198	0.000		-----	0.671	G(0.01)	-----
2125	IEC61198	0		-----	0		-----
	normality	n.a.			n.a.		
	n	24			25		
	outliers	2			1		
	mean (n)	<0.05			<0.05		
	st.dev. (n)	n.a.			n.a.		
	R(calc.)	n.a.			n.a.		
	R(Horwitz)	n.a.			n.a.		

Abbreviations:
2-af = 2-acetylfuran
5-hm-2-f = 5-hydroxymethyl-2-furfural
C = corrected, first reported result for lab 1545 = 0.0690

APPENDIX 2

Number of participants per country

6 labs in	AUSTRALIA
1 lab in	BELGIUM
1 lab in	BOSNIA and HERZEGOVINA
1 lab in	BRAZIL
7 labs in	BULGARIA
1 lab in	CANADA
1 lab in	CROATIA
1 lab in	ESTONIA
3 labs in	FRANCE
2 labs in	GERMANY
2 labs in	ITALY
1 lab in	KINGDOM OF BAHRAIN
1 lab in	KOREA
3 labs in	MALAYSIA
1 lab in	NEW ZEALAND
1 lab in	NORWAY
3 labs in	PORTUGAL
4 labs in	SAUDI ARABIA
1 lab in	SERBIA
1 lab in	SLOVENIA
2 labs in	SOUTH AFRICA
4 labs in	SPAIN
1 lab in	SWEDEN
2 labs in	THE NETHERLANDS
2 labs in	TURKEY
2 labs in	U.A.E.
3 labs in	UNITED KINGDOM
2 labs in	VIETNAM

APPENDIX 3

Abbreviations:

C	= final result after checking of first reported suspect result
C(0.01)	= outlier in Cochran's outlier test
C(0.05)	= straggler in Cochran's outlier test
D(0.01)	= outlier in Dixon's outlier test
D(0.05)	= straggler in Dixon's outlier test
G(0.01)	= outlier in Grubbs' outlier test
G(0.05)	= straggler in Grubbs' outlier test
DG(0.01)	= outlier in Double Grubbs' outlier test
DG(0.05)	= straggler in Double Grubbs' outlier test
ex	= excluded from calculations
n.a.	= not applicable
n.e	= not evaluated
W	= withdrawn on request participant
U	= reported in a deviating unit
E	= error in calculations
SDS	= Safety Data Sheet
fr.	= first reported

Literature:

1 iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, January 2010
2 prNEN 12766-2:2001
3 ASTM E178-02
4 ASTM E1301-03
5 ISO 5725-86
6 ISO 5725, parts 1-6, 1994
7 ISO13528-05
8 M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)
9 W.J. Youden and E.H. Steiner, Statistical Manual of the AOAC, (1975)
10 IP 367/96
11 DIN 38402 T41/42
12 P.L. Davies, First reported Z. Anal. Chem, 331, 513, (1988)
13 J.N. Miller, Analyst, 118, 455, (1993)
14 Analytical Methods Committee Technical Brief, No4 January 2001
15 The Royal Society of Chemistry 2002, Analyst 2002, 127 page1359-1364, P.J. Lowthian and M. Thompson. (see http://www.rsc.org/suppdata/an/b2/b205600n/)