Results of Proficiency Test
Transformer Oil
November 2013

Organised by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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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 2013/2014. In this interlaboratory study, 62 laboratories from 29 different countries have participated. See appendix 2 for a list of number of participants per country order. In this report, the results of the 2013 interlaboratory study on 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 #13206) and a bottle of 100 mL of used oil (labelled #13207). Sample #13207 is known to be positive for 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 #13206 was obtained from a local supplier. The approximately 100 litre bulk material was homogenised in a pre-cleaned drum. After homogenisation, 98 subsamples were transferred to 1 litre amber glass bottles and labelled #13206. The homogeneity of the subsamples #13206 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 #13206-1	18	878.96
Sample #13206-2	16	878.95
Sample #13206-3	16	878.95
Sample #13206-4	17	878.94
Sample #13206-5	17	878.94
Sample #13206-6	17	878.94
Sample #13206-7	17	878.94
Sample #13206-8	17	878.93

Table 1: homogeneity test results of subsamples #13206

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 (sample #13206)	2	0.03
reference method	EN60814:98	ISO3675:98
$0.3xR_{(reference)}$	2	0.36

Table 2: repeatabilities of subsamples #13206

The necessary bulk material for additional sample #13207, was obtained from a participating laboratory. After homogenisation, the bulk material was transferred to 48 amber glass bottles of 100 mL and labelled #13207. The homogeneity of the subsamples #13207 was checked by determination Density on 8 stratified randomly selected samples.

	Density @ 15°C in kg/m^3
Sample #13207-1	882.09
Sample #13207-2	882.09
Sample #13207-3	882.09
Sample #13207-4	882.09
Sample #13207-5	882.09
Sample #13207-6	882.09
Sample #13207-7	882.09
Sample #13207-8	882.09

Table 3: homogeneity test results of subsamples #13207

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.

	Density @ 15°C in kg/m^3
r (sample #13207)	0.00
reference method	ISO3675:98
0.3xR$_{(reference)}$	0.36

Table 4: repeatabilities of subsamples #13207

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 #13206) and/or 1*100mL bottle (labelled #13207) was sent on October 23, 2013.

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 #13206: Acid Number (Neutralization Number), Breakdown Voltage, Density @ 20°C, Di-electric loss 90°C (Di-electric Dissipation Factor and Specific Resistance), Flash Point, Interfacial Surface Tension, Kinematic Viscosity and Water.

On sample #13207, the participants were requested 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|	< 1	good
1 <	|z|	< 2	satisfactory
2 <	|z|	< 3	questionable
3 <	|z|		unsatisfactory

4 EVALUATION

In this proficiency test, no problems were encountered with the despatch of the samples. In total 9 participants reported the results after the final reporting date and 2 participants did not report at all. Not all participants were able to report results for all tests.

In total 60 participants reported 491 numerical results. Observed were 32 outlying results, which is 6.5% 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 #13206: Density, Di-electric Dissipation Factor, Interfacial Tension and Kinematic Viscosity. And on sample #13207 a not normal distribution was found on the determination 5-methyl-2-furfural. 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 the 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 by explaining the observed differences when possible and applicable. These methods listed in the tables with the original data. The abbreviations, used in these tables, are listed in appendix 3.

Acid Number: 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. Six statistical outliers were observed.

Breakdown Voltage: Regretfully, only a relative within-laboratory standard deviation RSDr is given in EN60156:95, figure 3. The method states the RSDr as a function of the mean value found. Multiplication of RSDr with 2.8 gives the repeatability. Multiplication of the repeatability by 3 gives an estimate of the target reproducibility.

This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is fully in agreement with the estimated requirements of EN60156:95.
This low precision, stated in figure 3 of EN60156:95, might indicate performance issues, which have not been addressed yet.

Density @ 20°C: This determination was problematic for a number of laboratories. Four statistical outliers were observed. However, 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.

Flash Point: This determination was not problematic. One statistical outlier was observed. However, the calculated reproducibility after rejection of

the statistical outlier is in good agreement with the requirements of ISO2719:02.

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

Kinematic Viscosity: This determination was very problematic. Six statistical outliers were observed and one excluded from statistical evaluation as the test method seems not to be equivalent. The calculated reproducibility after rejection of the suspect data is not at all in agreement with the requirements of ISO3104:96.

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

Water: This determination was problematic. Two 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 may not be 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.

2-Furfurylalcohol: This determination may not be problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in full agreement with the estimated requirements calculated using the Horwitz equation.

5-Methyl-2-furfural: This determination may not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in full agreement with the estimated requirements calculated using the Horwitz equation.

Other Furanics : The concentrations of 2-Acetylfuran and 5-Hydroxymethyl-2-furfural may be 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 (EN62021-1)	g KOH/kg	36	0.006	0.010	(0.002)
Breakdown Voltage	kV/2.5 mm	55	47.7	41.6	80.0
Density @ 20°C	kg/m^3	46	875.6	1.3	1.2
Di-electric Dissipation Factor		44	0.00123	0.00122	0.00217
Flash Point	°C	36	150.1	10.6	10.0
Interfacial Surface Tension	mN/m	36	46.99	8.81	4.70
Kinematic Viscosity @ 40°C	cSt	34	10.91	0.15	0.08
Specific Resistance	GΩm	30	569.1	1009.7	597.5
Water	mg/kg	53	19.60	8.76	6.64

table 5: Performance of the group on sample #13206

() = 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	20	0.018	0.015	0.015
* 2-furfurylalcohol	mg/kg	23	0.217	0.078	0.122
* 5-methyl-2-furfural	mg/kg	25	0.368	0.210	0.192
* 2-acetylfuran	mg/kg	23	<0.01	n.a.	n.a.
* 5-hydroxy-2-furfural	mg/kg	24	<0.01	n.a.	n.a.

table 6: Performance of the group on sample #13207

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 NOVEMBER 2013 PROFICIENCY TEST WITH PREVIOUS PTS.

	November 2013	October 2012	November 2011	November 2010
Number of reporting labs	6	59	56	46
Number of results reported	491	427	378	289
Statistical outliers	32	30	27	18
Percentage outliers	6.5%	7.0%	7.1%	6.2%

Table 7: 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	November 2013	October 2012	November 2011	November 2010
Acid number (EN62021-1)	(--)	(--)	n.e.	n.e.
Breakdown Voltage	++	--*	--*	--*
Density @ 20°C	+/-	+	-	+/-
Di-electric Dissipation Factor	++	++	++	++
Flash Point	+/-	n.e.	n.e.	n.e.
Interfacial Surface Tension	--	--	--	--
Kinematic Viscosity @ 40°C	--	n.e.	n.e.	n.e.
Specific Resistance	--	-	--	--
Water	-	-	+	--
2-furfural	+/-	--	+/-	+/-
2-furfurylalcohol	+	--	n.e.	n.e.
5-methyl-2-furfural	+/-	++	n.e.	n.e.
2-acetylfuran	n.e.	n.e.	n.e.	n.e.
5-hydroxy-2-furfural	n.e.	n.e.	n.e.	n.e.

table 8: comparison determinations against the standard

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

* Interpretation of the reproducibility of the test method was different than the round robin of 2013.

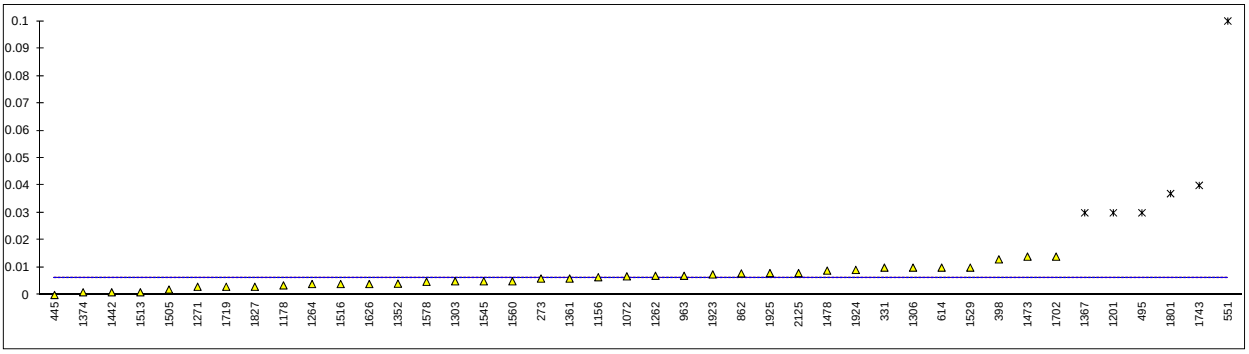
The performance of the determinations against the requirements of the respective standards is listed in the above table. The following performance categories were used:

++: 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 on sample #13206; results in g KOH/kg

lab	method	value	mark	z(targ)	remarks
173		-----		-----	
273	D974	0.006		-----	
331	D664	0.01		-----	
360	EN62021-2	<0.01		-----	
398	EN62021-1	0.013	C	-----	First reported: 0.036
445	EN62021-1	0.00		-----	
446		-----		-----	
495	EN62021-1	0.030	DG(0.01)	-----	False positive?
541		-----		-----	
551	D663	0.1	G(0.01)	-----	False positive?
614	EN62021	0.01		-----	
862	EN62021-1	0.0079		-----	
963	D974	0.007		-----	
1056		-----		-----	
1072	EN62021-1	0.0068		-----	
1146		-----		-----	
1156	EN62021-1	0.0065		-----	
1178	EN62021-1	0.0035		-----	
1201	EN62021-1	0.03	DG(0.01)	-----	False positive?
1262	EN62021-1	0.007		-----	
1264	D974	0.004		-----	
1271	ISO6618	0.003		-----	
1303	D974	0.005		-----	
1304	INH-122	<0.01		-----	
1306	EN62021-1	0.01		-----	
1352	IEC62021-1	0.00413		-----	
1361	EN62021-1	0.006		-----	
1367	EN62021-1	0.03	G(0.01)	-----	False positive?
1374	IEC62021-1	0.001		-----	
1430	EN62021-1	<0.01		-----	
1440	EN62021-1	<0.01		-----	
1442	IEC62021-2	0.001		-----	
1458		-----		-----	
1461		-----		-----	
1473	IEC62021-1	0.0140		-----	
1478	EN62021-1	0.0089		-----	
1505	D974	0.002		-----	
1513	IEC62021-1	0.001		-----	
1516	D974	0.004		-----	
1529	IEC62021-1	0.01		-----	
1545	D974	0.005		-----	
1560	EN62021-1	0.005		-----	
1578	ISO6618	0.004822		-----	
1595		-----		-----	
1626	D974	0.004		-----	
1628		-----		-----	
1660	IEC62021-1	<0.01		-----	
1687		-----		-----	
1702	IEC62021	0.014		-----	
1719	D664Mod.	0.003		-----	
1743	IEC62021-1	0.04	G(0.05)	-----	False positive?
1760		-----		-----	
1777	EN62021-1	<0.01		-----	
1801	EN62021-1	0.037	G(0.05)	-----	False positive?
1827	D664	0.003		-----	
1863	EN62021-1	<0.01		-----	
1915		-----		-----	
1923	EN62021-1	0.0075		-----	
1924	EN62021-1	0.00915		-----	
1925	EN62021-1	0.008		-----	
2122	EN62021-1	<0.01		-----	
2125	ISO6619	0.008		-----	
	normality	OK			
	n	36			
	outliers	6			
	mean (n)	0.0062			
	st.dev. (n)	0.00360			
	R(calc.)	0.0101			
	R(EN62021-1:03)	(0.0017)			Quantification limit >0.014 g KOH/kg


0.1
0.09
0.08
0.07
0.06
0.05
0.04
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0
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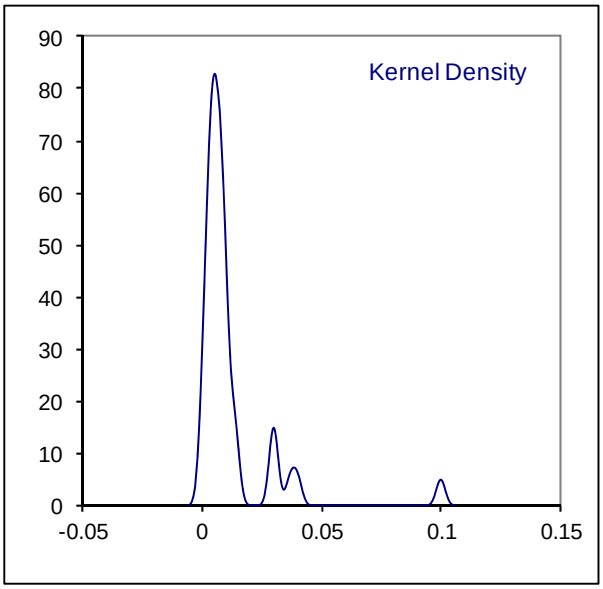
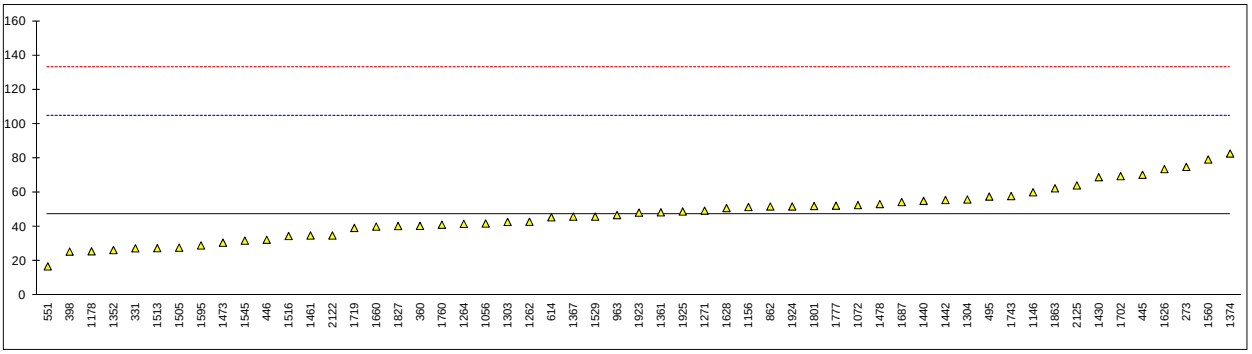

Kernel Density
90
80
70
60
50
40
30
20
10
0
-0.05
0
0.05
0.1
0.15

Determination of Breakdown Voltage on sample #13206, results in kV/2.5 mm

lab	method	value	mark	z(targ)	remarks
173		-----		-----	
273	EN60156	75.0		0.96	
331	EN60156	27.5		-0.70	
360	EN60156	40.6		-0.25	
398	EN60156	25.6		-0.77	
445	EN60156	70.4		0.80	
446	EN60156	32.5		-0.53	
495	EN60156	57.7		0.35	
541		-----		-----	
551	EN60156	17		-1.07	
614	IEC60156	45.6		-0.07	
862	EN60156	51.9		0.15	
963	D877	46.9		-0.03	
1056	IP295	42		-0.20	
1072	EN60156	52.7		0.18	
1146	IEC60156	60.2		0.44	
1156	EN60156	51.6		0.14	
1178	EN60156	25.8		-0.76	
1201		-----		-----	
1262	EN60156	43.0		-0.16	
1264	IEC60156	41.8		-0.20	
1271	EN60156	49.5		0.07	
1303	IEC60156	42.9		-0.17	
1304	INH-124	56		0.29	
1306		-----		-----	
1352	IEC60156	26.5		-0.74	
1361	EN60156	48.5		0.03	
1367	EN60156	46		-0.06	
1374	IEC60156	82.8		1.23	
1430	EN60156	69		0.75	
1440	EN60156	55.2		0.27	
1442	IEC60156	55.7		0.28	
1458		-----		-----	
1461	EN60156	35		-0.44	
1473	IEC60156	30.8		-0.59	
1478	EN60156	53.3		0.20	
1505	IEC60156	27.9		-0.69	
1513	IEC60156	27.6		-0.70	
1516	IEC60156	34.7		-0.45	
1529	IEC60156	46		-0.06	
1545	IEC60156	32.0		-0.55	
1560	EN60156	79.3		1.11	
1578		-----		-----	
1595	EN60156	29.2		-0.64	
1626	IEC60156	73.7		0.91	
1628	EN60156	51.0		0.12	
1660	IEC60156	40.2		-0.26	
1687	IEC60156	54.5		0.24	
1702	IEC60156	69.6		0.77	
1719	IEC60156	39.4		-0.29	
1743	IEC60156	58		0.36	
1760	IEC60156	41.3		-0.22	
1777	EN60156	52.4		0.17	
1801	EN60156	52.2		0.16	
1827	EN60156	40.5		-0.25	
1863	EN60156	62.5		0.52	
1915		-----		-----	
1923	EN60156	48.34		0.02	
1924	IEC60156	51.92		0.15	
1925	EN60156	49.0		0.05	
2122	EN60156	35		-0.44	
2125	IEC60156	64.2		0.58	
	normality	OK			
	n	55			
	outliers	0			
	mean (n)	47.67			
	st.dev. (n)	14.850			
	R(calc.)	41.58			
	R(EN60156:95)	80.01			Range of R(EN60156:95) = 32.03 – 144.15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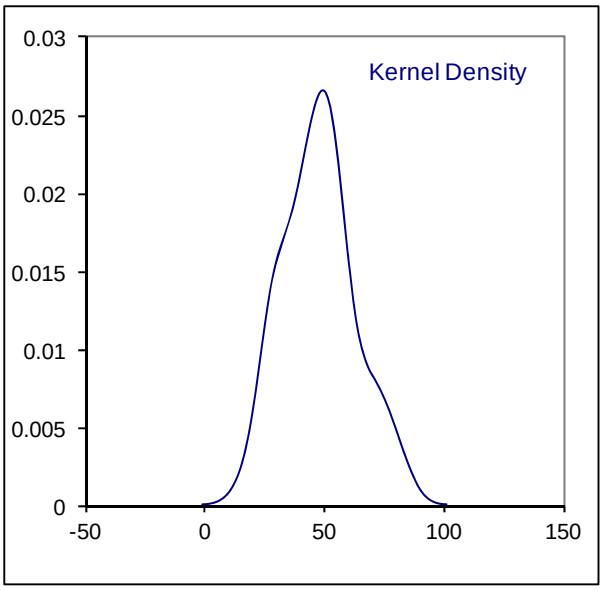
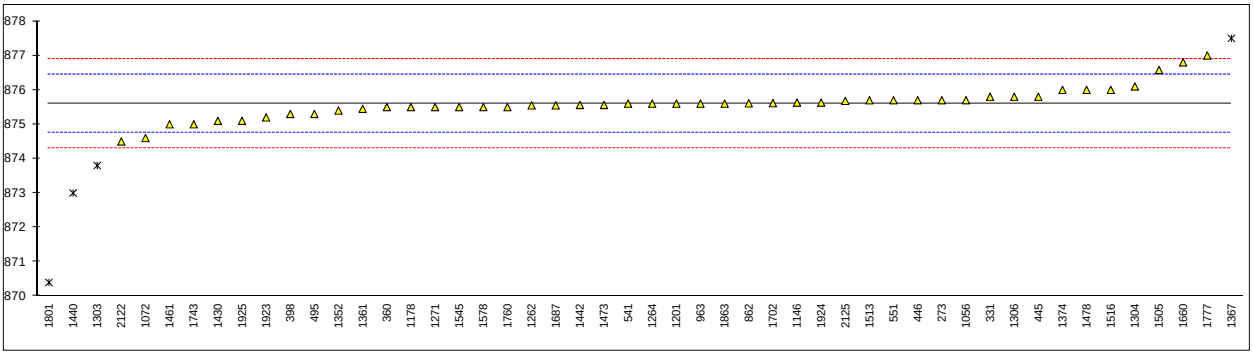
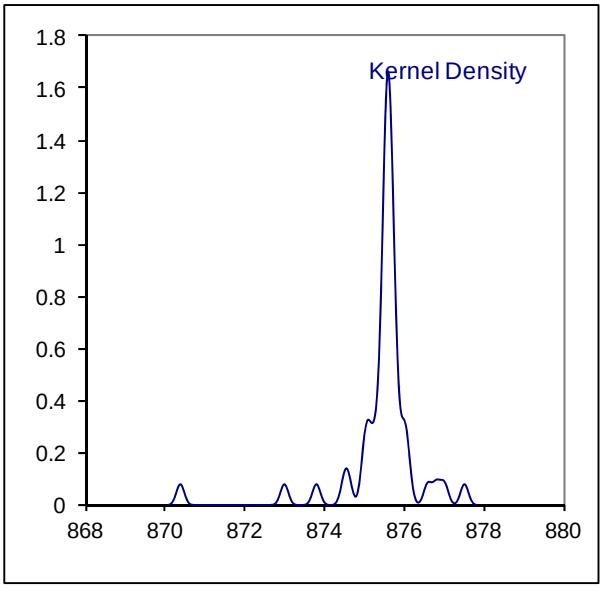
100
80
60
40
20
0
551 398 1178 1352 331 1513 1505 1595 1473 1545 446 1516 1461 2122 1719 1660 1827 360 1760 1264 1056 1303 1262 614 1367 1529 963 1923 1361 1925 1271 1628 1156 862 1924 1801 1777 1072 1478 1687 1440 1442 1304 495 1743 1146 1863 2125 1430 1702 445 1626 273 1560 1374


Kernel Density
0.03
0.025
0.02
0.015
0.01
0.005
0
-50
0
50
100
150

Determination of Density @ 20°C on sample #13206; results in kg/m^3

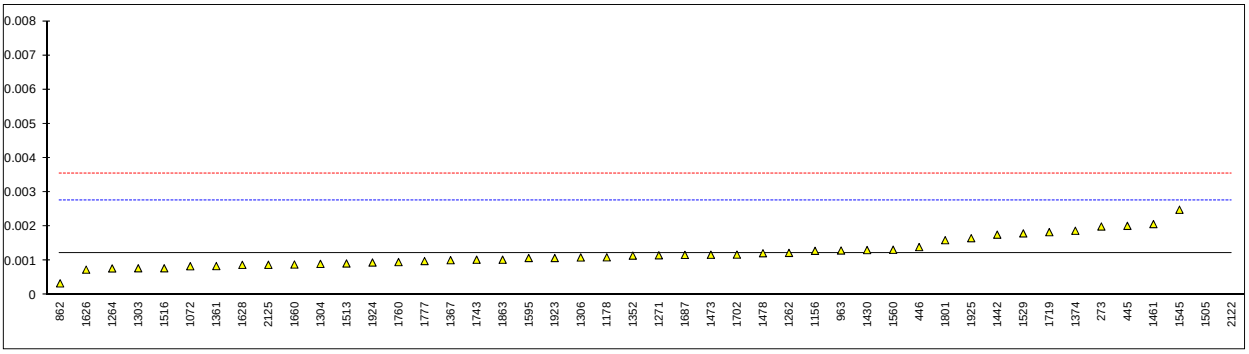
lab	method	value	mark	z(targ)	remarks
173		-----		-----	
273	D4052	875.7		0.23	
331	ISO12185	875.8		0.46	
360	ISO12185	875.5		-0.24	
398	ISO3675	875.3		-0.71	
445	D4052	875.8		0.46	
446	D4052	875.7		0.23	
495	ISO3675	875.3		-0.71	
541	D4052	875.6		-0.01	
551	D4052	875.7		0.23	
614		-----		-----	
862	ISO3675	875.61		0.02	
963	D4052	875.6		-0.01	
1056	D5002	875.7	C	0.23	First reported: 0.8757
1072	ISO3675	874.6		-2.34	
1146	ISO12185	875.63		0.06	
1156		-----		-----	
1178	ISO12185	875.50		-0.24	
1201	ISO3675	875.6		-0.01	
1262	ISO3675	875.55		-0.12	
1264	D4052	875.60		-0.01	
1271	D7042	875.5		-0.24	
1303	D4052	873.8	G(0.05)	-4.21	
1304	INH-102	876.1		1.16	
1306	D4052	875.8		0.46	
1352	ISO12185	875.4		-0.47	
1361	ISO3675	875.45		-0.36	
1367	ISO3675	877.5	C, G(0.05)	4.43	Reported: 0.8775, probably a unit error
1374	D7777	876		0.93	
1430	ISO3675	875.1		-1.17	
1440	in house	873	C, G(0.01)	-6.07	First reported: 0.873
1442	D7042	875.56	C	-0.10	First reported: 874.45
1458		-----		-----	
1461	ISO3675	875.0		-1.41	
1473	D1217	875.56		-0.10	
1478	ISO12185	876.0		0.93	
1505	D7042	876.58		2.28	
1513	ISO12185	875.698		0.22	
1516	ISO3675	876.0		0.93	
1529		-----		-----	
1545	ISO3675	875.5	C	-0.24	First reported: 879.1
1560		-----		-----	
1578	ISO3675	875.5	C	-0.24	First reported: 874.3
1595		-----		-----	
1626		-----		-----	
1628		-----		-----	
1660	D7042	876.8		2.79	
1687	ISO3675	875.55		-0.12	
1702	ISO12185	875.615		0.03	
1719		-----		-----	
1743	ISO12185	875		-1.41	
1760	D4052	875.50	C	-0.24	First reported: 0.87750
1777	D4052	877.0		3.26	
1801	ISO3675	870.4	C,G(0.01)	-12.14	First reported: 0.8704
1827		-----		-----	
1863	D4052	875.6		-0.01	
1915		-----		-----	
1923	ISO3675	875.2		-0.94	
1924	ISO3675	875.63		0.06	
1925	ISO3675	875.1		-1.17	
2122	in house	874.5	C	-2.57	First reported: 0.8745
2125	ISO12185	875.68		0.18	
	normality	not OK			
	n	46			
	outliers	4			
	mean (n)	875.60			
	st.dev. (n)	0.451			
	R(calc.)	1.26			
	R(ISO3675:98)	1.20			

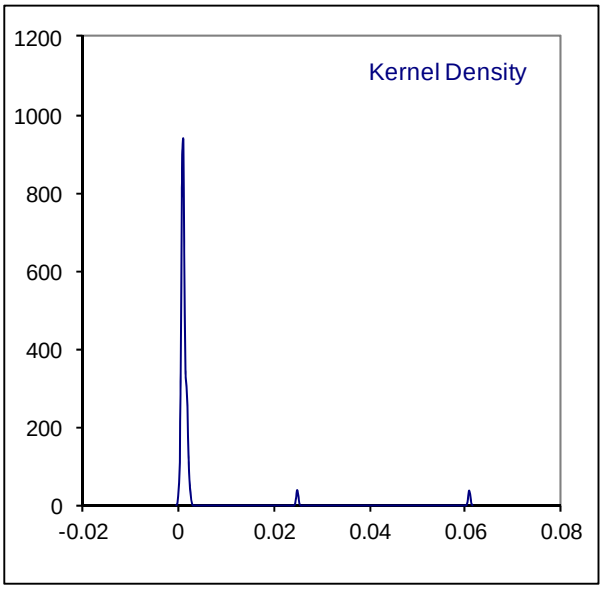

878
877
876
875
874
873
872
871
870
1801 1440 1303 2122 1072 1461 1743 1430 1925 1923 398 495 1352 1361 360 1178 1271 1545 1578 1760 1262 1687 1442 1473 541 1264 1201 963 1863 862 1702 1146 1924 2125 1513 551 446 273 1056 331 1306 445 1374 1478 1516 1304 1505 1660 1777 1367


Kernel Density
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
868 870 872 874 876 878 880

Determination of Di-electric Dissipation Factor on sample #13206

lab	method	value	mark	z(targ)	remarks
173		-----		-----	
273	EN60247	0.0020		1.00	
331		-----		-----	
360		-----		-----	
398		-----		-----	
445	EN60247	0.00202		1.03	
446	EN60247	0.0014		0.23	
495		-----		-----	
541		-----		-----	
551		-----		-----	
614		-----		-----	
862	EN60247	0.00034		-1.14	
963	EN60247	0.0013		0.10	
1056		-----		-----	
1072	EN60247	0.00084		-0.50	
1146		-----		-----	
1156	EN60247	0.00129		0.08	
1178	EN60247	0.00110		-0.16	
1201		-----		-----	
1262	IEC60247	0.00123		0.01	
1264	IEC60247	0.000776		-0.58	
1271	EN60247	0.00116		-0.09	
1303	IEC60247	0.00078		-0.58	
1304	INH-125	0.000909		-0.41	
1306	IEC60247	0.001096		-0.17	
1352	IEC60247	0.00115		-0.10	
1361	EN60247	0.000845		-0.49	
1367	EN60247	0.001016		-0.27	
1374	IEC60247	0.001876		0.84	
1430	EN60247	0.001312		0.11	
1440		-----		-----	
1442	IEC60247	0.001763		0.69	
1458		-----		-----	
1461	EN60247	0.00207		1.09	
1473	IEC60247	0.001175		-0.07	
1478	EN60247	0.001219		-0.01	
1505	IEC60247	0.025	G(0.01)	30.71	
1513	IEC60247	0.00092		-0.40	
1516	IEC60247	0.00078		-0.58	
1529	IEC60247	0.0018		0.74	
1545	IEC60247	0.00249	C	1.63	First reported: 0.00323
1560	EN60247	0.001321		0.12	
1578		-----		-----	
1595	EN60247	0.00108		-0.19	
1626	IEC60247	0.00074		-0.63	
1628	EN60247	0.00088		-0.45	
1660	IEC60247	0.00089		-0.43	
1687	IEC60247	0.0011705		-0.07	
1702	IEC60247	0.0011795		-0.06	
1719	IEC60247	0.001835		0.79	
1743	IEC60247	0.00103		-0.25	
1760	IEC60247	0.000961		-0.34	
1777	EN60247	0.00099		-0.30	
1801	EN60247	0.0016		0.48	
1827		-----		-----	
1863	EN60247	0.00103		-0.25	
1915		-----		-----	
1923	EN60247	0.00108		-0.19	
1924	EN60247	0.00095		-0.36	
1925	EN60247	0.00166		0.56	
2122	EN60247	0.061	G(0.01)	77.22	
2125	IEC60247	0.000882		-0.44	
	normality	not OK			
	n	44			
	outliers	2			
	mean (n)	0.001226			
	st.dev. (n)	0.0004370			
	R(calc.)	0.001224			
	R(EN60247:04)	0.002168			

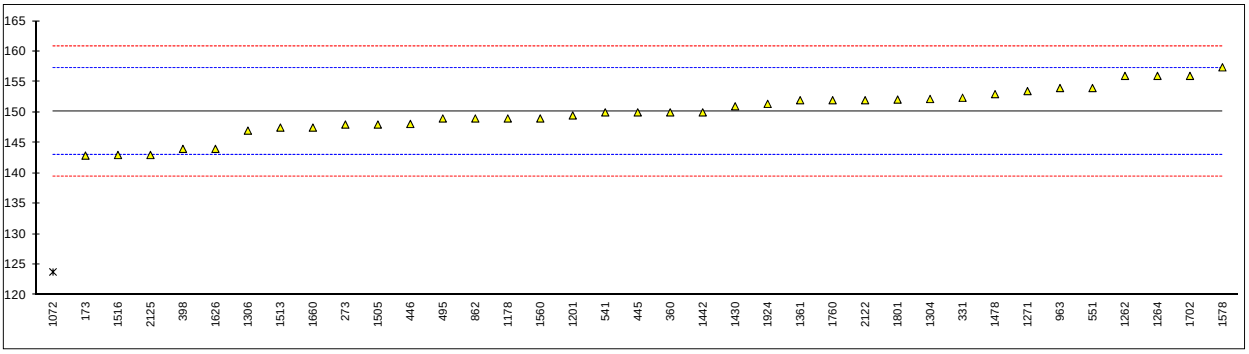

0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
862 1626 1264 1303 1516 1072 1361 1628 2125 1660 1304 1513 1924 1760 1777 1367 1743 1863 1595 1923 1306 1178 1352 1271 1687 1473 1702 1478 1262 1156 963 1430 1560 446 1801 1925 1442 1529 1719 1374 273 445 1461 1545 1505 2122

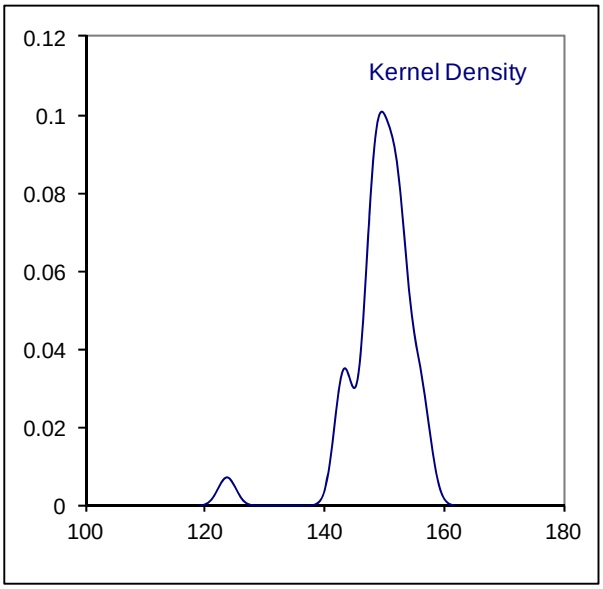

Kernel Density
1200
1000
800
600
400
200
0
-0.02
0
0.02
0.04
0.06
0.08

Determination of Flash Point on sample #13206; results in °C

lab	method	value	mark	z(targ)	remarks
173	D93	142.9		-2.02	
273	D93	148.0		-0.59	
331	D93	152.4		0.64	
360	ISO2719	150.0		-0.03	
398	ISO2719	144.0		-1.71	
445	ISO2719	150.0		-0.03	
446	ISO2719	148.1		-0.56	
495	ISO2719	149.0		-0.31	
541	ISO2719	150.0		-0.03	
551	D93	154.0		1.09	
614		-----		-----	
862	ISO2719	149.0		-0.31	
963	D92	154		1.09	
1056		-----		-----	
1072	ISO2719	123.78	G(0.01)	-7.37	
1146		-----		-----	
1156		-----		-----	
1178	ISO2719	149.0		-0.31	
1201	ISO2719	149.5		-0.17	
1262	ISO2719	156		1.65	
1264	D92	156		1.65	
1271	ISO2719	153.5		0.95	
1303		-----		-----	
1304	INH-115	152.2		0.59	
1306	D92	147		-0.87	
1352		-----		-----	
1361	ISO2719	152		0.53	
1367		-----		-----	
1374		-----		-----	
1430	ISO2719	151		0.25	
1440		-----		-----	
1442	ISO2719	150		-0.03	
1458		-----		-----	
1461		-----		-----	
1473		-----		-----	
1478	ISO2719	153.0		0.81	
1505	D93	148		-0.59	
1513	ISO2719	147.5		-0.73	
1516	ISO2719	143		-1.99	
1529		-----		-----	
1545		-----		-----	
1560	ISO2719	149		-0.31	
1578	ISO2719	157.40		2.04	
1595		-----		-----	
1626	D93	144.0		-1.71	
1628		-----		-----	
1660	ISO2719	147.5		-0.73	
1687		-----		-----	
1702	ISO2719	156.0		1.65	
1719		-----		-----	
1743		-----		-----	
1760	D93	152.0		0.53	
1777		-----		-----	
1801	ISO2719	152.1		0.56	
1827		-----		-----	
1863		-----		-----	
1915		-----		-----	
1923		-----		-----	
1924	ISO2719	151.40		0.36	
1925		-----		-----	
2122	IP34	152		0.53	
2125	ISO2719	143		-1.99	

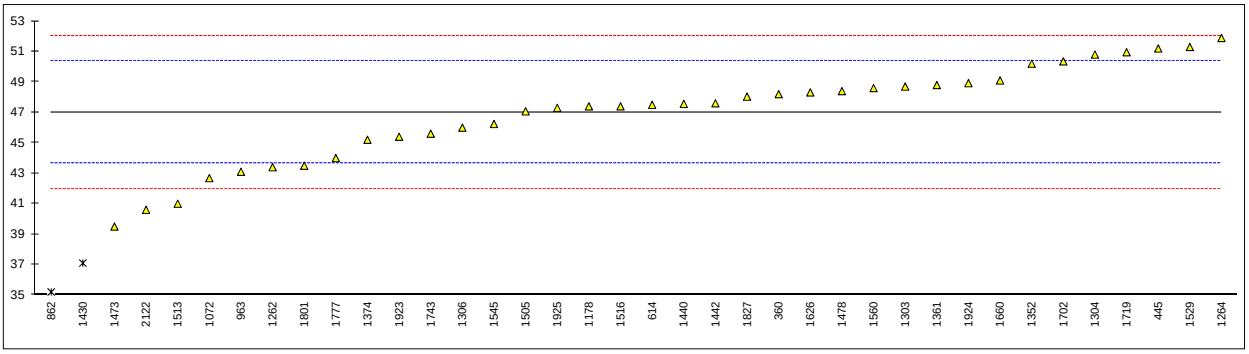
normality	OK
n	36
outliers	1
mean (n)	150.10
st.dev. (n)	3.793
R(calc.)	10.62
R(ISO2719:02)	10.00

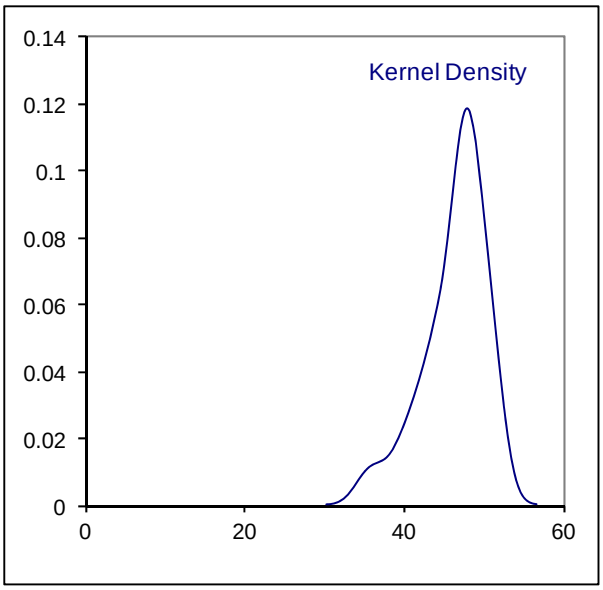

165
160
155
150
145
140
135
130
125
120
1072
173
1516
2125
398
1626
1306
1513
1660
273
1505
446
495
862
1178
1560
1201
541
445
360
1442
1430
1924
1361
1760
2122
1801
1304
331
1478
1271
963
551
1262
1264
1702
1578


Kernel Density
0.12
0.1
0.08
0.06
0.04
0.02
0
100
120
140
160
180

Determination of Interfacial Surface Tension on sample #13206; results in mN/m

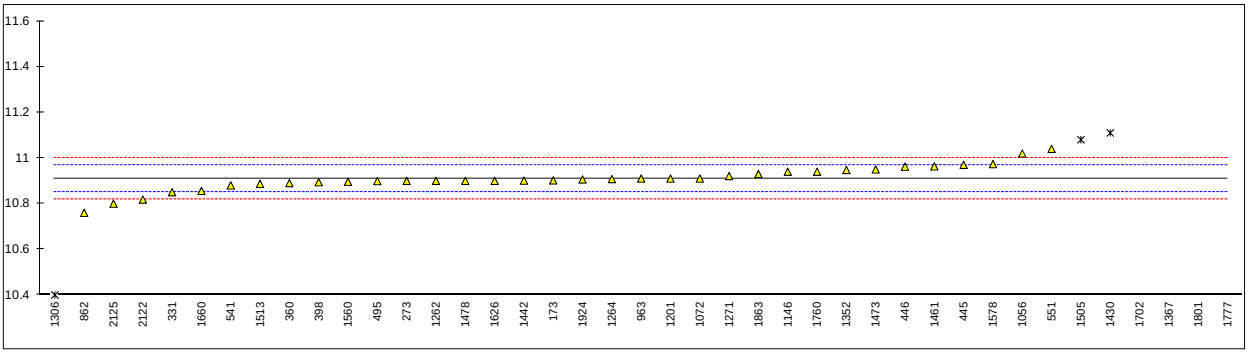
lab	method	value	mark	z(targ)	remarks
173		-----		-----	
273		-----		-----	
331		-----		-----	
360	D971	48.2		0.72	
398		-----		-----	
445	ISO6295	51.2		2.51	
446		-----		-----	
495		-----		-----	
541		-----		-----	
551		-----		-----	
614	ISO6295	47.5		0.30	
862	ISO6295	35.20	DG(0.05)	-7.03	
963	D971	43.1		-2.32	
1056		-----		-----	
1072	ISO6295	42.68		-2.57	
1146		-----		-----	
1156		-----		-----	
1178	D971	47.4		0.24	
1201		-----		-----	
1262	D971	43.4		-2.14	
1264	D971	51.89		2.92	
1271		-----		-----	
1303	D971	48.7		1.02	
1304	INH-123	50.8		2.27	
1306	D971	46		-0.59	
1352	D971	50.2		1.91	
1361	D971	48.8007		1.08	
1367		-----		-----	
1374	D2285	45.2		-1.07	
1430	D971	37.1	DG(0.05)	-5.90	
1440	ISO6295	47.56		0.34	
1442	IEC14210	47.6		0.36	
1458		-----		-----	
1461		-----		-----	
1473	D971	39.5		-4.47	
1478	D971	48.4		0.84	
1505	D971	47.07		0.04	
1513	D971	41.0		-3.57	
1516	D971	47.4		0.24	
1529	D971	51.3		2.56	
1545	D971	46.24		-0.45	
1560	D971	48.6		0.96	
1578		-----		-----	
1595		-----		-----	
1626	ISO6295	48.316		0.79	
1628		-----		-----	
1660	D971	49.1		1.25	
1687		-----		-----	
1702	D971	50.357		2.00	
1719	INH-2285	50.955		2.36	
1743	D971	45.6		-0.83	
1760		-----		-----	
1777	D971	44.0		-1.78	
1801	ISO6295	43.5		-2.08	
1827	D971	48.035		0.62	
1863		-----		-----	
1915		-----		-----	
1923	ISO6295	45.4		-0.95	
1924	D971	48.92		1.15	
1925	ISO6295	47.3		0.18	
2122	ISO6295	40.6		-3.81	
2125		-----		-----	
	normality	not OK			
	n	36			
	outliers	2			
	mean (n)	46.995			
	st.dev. (n)	3.1468			
	R(calc.)	8.811			
	R(ISO6295:83)	4.700			Compare R(D971:12) = 4.700

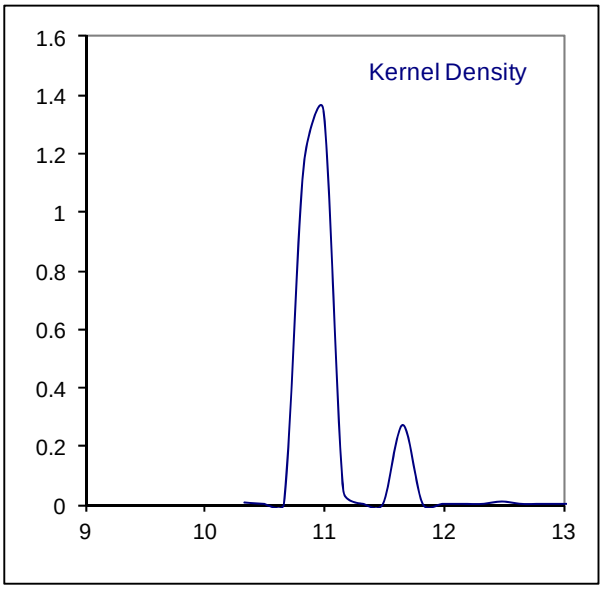

53
51
49
47
45
43
41
39
37
35
862
1430
1473
2122
1513
1072
963
1262
1801
1777
1374
1923
1743
1306
1545
1505
1925
1178
1516
614
1440
1442
1827
360
1626
1478
1560
1303
1361
1924
1660
1352
1702
1304
1719
445
1529
1264


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

Determination of Kinematic Viscosity @ 40°C on sample #13206; results in cSt

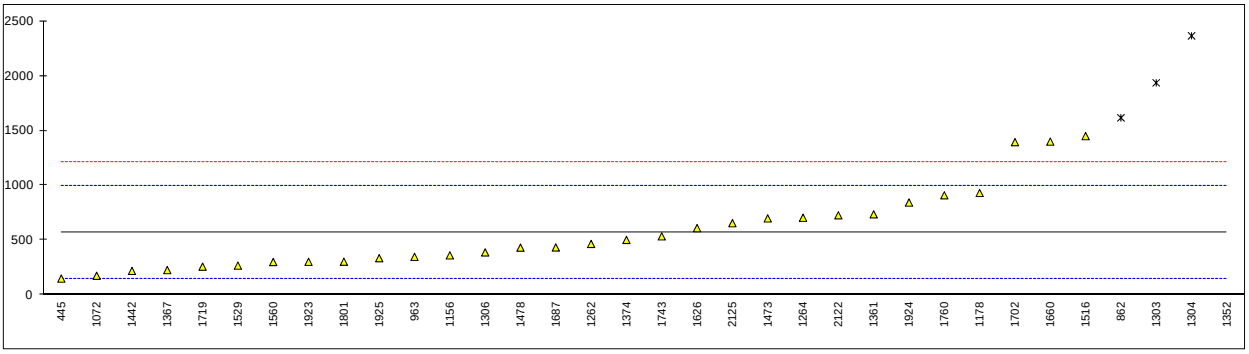
lab	method	value	mark	z(targ)	remarks
173	D445	10.90205		-0.26	
273	D445	10.90		-0.33	
331	D7279	10.85		-2.02	
360	ISO3104	10.890		-0.67	
398	ISO3104	10.894		-0.53	
445	ISO3104	10.97		2.03	
446	D445	10.962		1.76	
495	ISO3104	10.899		-0.37	
541	ISO3104	10.88		-1.01	
551	D445	11.04		4.40	
614		-----		-----	
862	ISO3104	10.760		-5.06	
963	D445	10.91		0.01	
1056	ISO3104	11.02		3.72	
1072	ISO3104	10.91		0.01	
1146	D445	10.940		1.02	
1156		-----		-----	
1178		-----		-----	
1201	ISO3104	10.91		0.01	
1262	ISO3104	10.9000		-0.33	
1264	D7042	10.9077		-0.07	
1271	D7042	10.921		0.38	
1303		-----		-----	
1304		-----		-----	
1306	D445	10.40	G(0.01)	-17.22	
1352	ISO3104	10.9477		1.28	
1361		-----		-----	
1367	ISO3104	11.68	G(0.01)	26.01	
1374		-----		-----	
1430	ISO3104	11.11	DG(0.05)	6.76	
1440		-----		-----	
1442	ISO3104	10.901		-0.30	
1458		-----		-----	
1461	ISO3104	10.9635		1.81	
1473	D445	10.9500	C	1.36	First reported: 11.1715
1478	ISO3104	10.90	C	-0.33	First reported: 11.36
1505	D7042	11.08	DG(0.05)	5.75	
1513	ISO3104	10.8869		-0.77	
1516		-----		-----	
1529		-----		-----	
1545		-----		-----	
1560	ISO3104	10.896		-0.47	
1578	ISO3104	10.97317		2.14	
1595		-----		-----	
1626	D445	10.9		-0.33	
1628		-----		-----	
1660	D7042	10.856		-1.82	
1687		-----		-----	
1702	ISO3104	11.6	C,G(0.01)	23.31	First reported: 11.8
1719		-----		-----	
1743		-----		-----	
1760	D445	10.940		1.02	
1777	D88	52.5	ex	1404.49	Excluded: method possibly not technically equivalent
1801	ISO3104	12.42	G(0.01)	51.00	
1827		-----		-----	
1863	ISO3104	10.93		0.68	
1915		-----		-----	
1923		-----		-----	
1924	ISO3104	10.90621		-0.12	
1925		-----		-----	
2122	D445	10.818		-3.10	
2125	ISO3104	10.8		-3.71	
	normality	not OK			
	n	34			
	outliers	6	+1 ex		
	mean (n)	10.910			
	st.dev. (n)	0.0551			
	R(calc.)	0.154			
	R(ISO3104:96)	0.083			

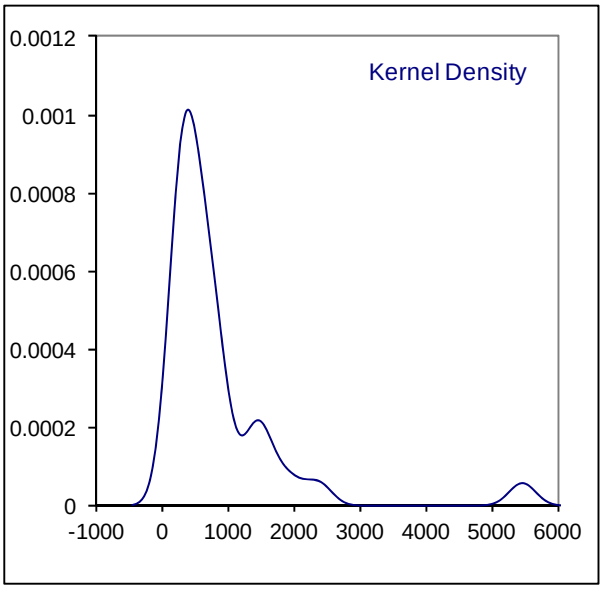

11.6
11.4
11.2
11
10.8
10.6
10.4
1306
862
2125
2122
331
1660
541
1513
360
398
1560
495
273
1262
1478
1626
1442
173
1924
1264
963
1201
1072
1271
1863
1146
1760
1352
1473
446
1461
445
1578
1056
551
1505
1430
1702
1367
1801
1777


Kernel Density
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
9
10
11
12
13

Determination of Specific Resistance on sample #13206; results in GΩm

lab	method	value	mark	z(targ)	remarks
173		-----		-----	
273		-----		-----	
331		-----		-----	
360		-----		-----	
398		-----		-----	
445	EN60247	149.7		-1.97	
446		-----		-----	
495		-----		-----	
541		-----		-----	
551		-----		-----	
614		-----		-----	
862	EN60247	1617	C,DG(0.05)	4.91	Reported: $1.617*10^{12}$, probably unit error
963	D1169	348.04		-1.04	
1056		-----		-----	
1072	EN60247	175		-1.85	
1146		-----		-----	
1156	EN60247	361.8		-0.97	
1178	EN60247	930.9		1.70	
1201		-----		-----	
1262	IEC60247	466.0		-0.48	
1264	IEC60247	704.98		0.64	
1271		-----		-----	
1303	IEC60247	1936	DG(0.05)	6.41	
1304	INH-125	2365.0	G(0.05)	8.42	
1306	IEC60247	388.75		-0.84	
1352	IEC60247	5462	G(0.01)	22.93	
1361	EN60247	736.12		0.78	
1367	EN60247	227.23		-1.60	
1374	IEC60247	502.2		-0.31	
1430		-----		-----	
1440		-----		-----	
1442	IEC60247	219.6		-1.64	
1458		-----		-----	
1461		-----		-----	
1473	IEC60247	699		0.61	
1478	EN60247	432.13		-0.64	
1505		-----		-----	
1513		-----		-----	
1516	IEC60247	1450		4.13	
1529	IEC60247	268		-1.41	
1545		-----		-----	
1560	EN60247	301.2		-1.26	
1578		-----		-----	
1595		-----		-----	
1626	IEC60247	610.2		0.19	
1628		-----		-----	
1660	IEC60247	1400		3.89	
1687	IEC60247	434.17		-0.63	
1702	IEC60247	1395.0		3.87	
1719	IEC60247	258.275	C	-1.46	Reported: 258.275 E9, probably unit error
1743	IEC60247	535		-0.16	
1760	IEC60247	909.82		1.60	
1777		-----		-----	
1801	EN60247	303.7		-1.24	
1827		-----		-----	
1863		-----		-----	
1915		-----		-----	
1923	EN60247	302.8		-1.25	
1924	EN60247	843.7		1.29	
1925	EN60247	336.1		-1.09	
2122	EN60247	727.2		0.74	
2125	IEC60247	655.39		0.40	
	normality	OK			
	n	30			
	outliers	4			
	mean (n)	569.07			
	st.dev. (n)	360.592			
	R(calc.)	1009.66			
	R(EN60247:04)	597.52			

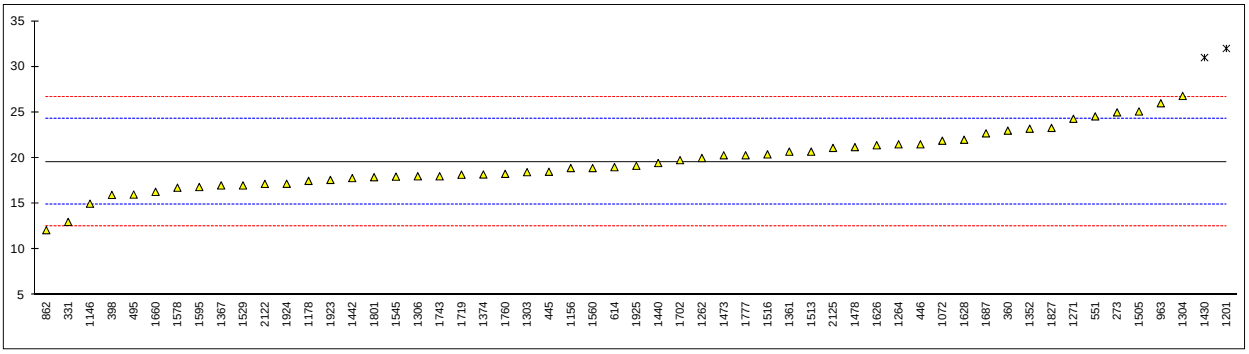

2500
2000
1500
1000
500
0
445
1072
1442
1367
1719
1529
1560
1923
1801
1925
963
1156
1306
1478
1687
1262
1374
1743
1626
2125
1473
1264
2122
1361
1924
1760
1178
1702
1660
1516
862
1303
1304
1352

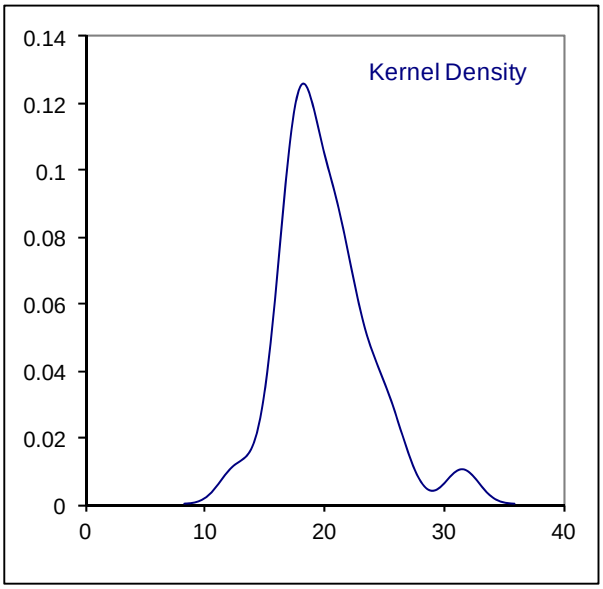

Kernel Density
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
-1000
0
1000
2000
3000
4000
5000
6000

Determination of Water on sample #13206; results in mg/kg

lab	method	value	mark	z(targ)	remarks
173		-----		-----	
273	EN60814	25		2.28	
331	D6304	13		-2.78	
360	EN60814	23.0		1.43	
398	EN60814	15.96		-1.53	
445	EN60814	18.5		-0.46	
446	EN60814	21.5		0.80	
495	EN60814	16		-1.52	
541		-----		-----	
551	D6304	24.56		2.09	
614	EN60814	19		-0.25	
862	EN60814	12.1		-3.16	
963	D1533	26		2.70	
1056		-----		-----	
1072	EN60814	21.9		0.97	
1146	D6304	15		-1.94	
1156	EN60814	18.9		-0.29	
1178	EN60814	17.5		-0.89	
1201	EN60814	32	DG(0.01)	5.23	
1262	EN60814	20.0		0.17	
1264	D1533	21.5		0.80	
1271	ISO12937	24.3		1.98	
1303	IEC60814	18.45		-0.48	
1304	INH-121	26.8		3.04	
1306	IEC60814	18.0		-0.67	
1352	IEC60814	23.21		1.52	
1361	EN60814	20.7		0.46	
1367	EN60814	17		-1.10	
1374	IEC60814	18.2		-0.59	
1430	EN60814	31	DG(0.01)	4.81	
1440	EN60814	19.45		-0.06	
1442	IEC60814	17.8		-0.76	
1458		-----		-----	
1461		-----		-----	
1473	IEC60814	20.3		0.30	
1478	EN60814	21.2		0.67	
1505	D1533	25.1		2.32	
1513	IEC60814	20.7		0.46	
1516	IEC60814	20.4		0.34	
1529	IEC60814	17		-1.10	
1545	IEC60814	17.96		-0.69	
1560	EN60814	18.9		-0.29	
1578	EN60814	16.75		-1.20	
1595	EN60814	16.827		-1.17	
1626	IEC60814	21.4		0.76	
1628	EN60814	22.0		1.01	
1660	IEC60814	16.3		-1.39	
1687	IEC60814	22.7		1.31	
1702	IEC60814	19.765		0.07	
1719	IEC60814	18.175		-0.60	
1743	IEC60814	18		-0.67	
1760	D6304	18.27		-0.56	
1777	EN60814	20.3		0.30	
1801	EN60814	17.9		-0.72	
1827	D6304	23.3		1.56	
1863		-----		-----	
1915		-----		-----	
1923	EN60814	17.6		-0.84	
1924	EN60814	17.18		-1.02	
1925	EN60814	19.15		-0.19	
2122	EN60814	17.17		-1.02	
2125	IEC60814	21.11		0.64	

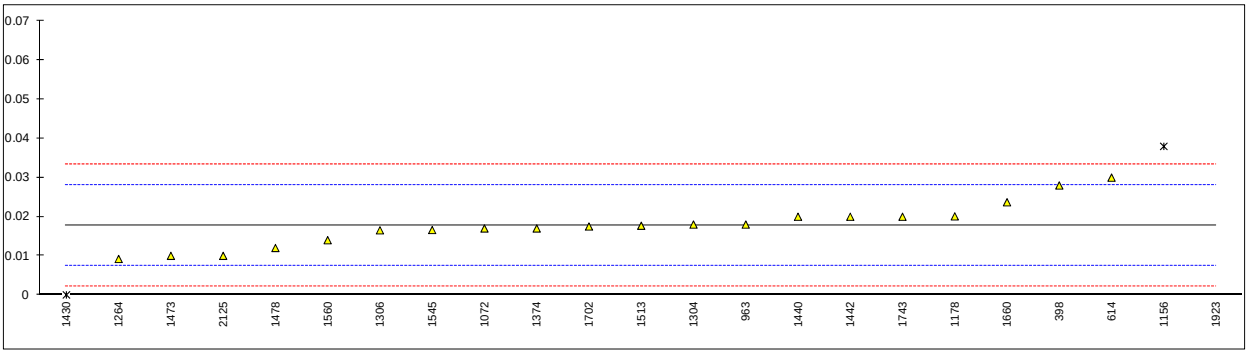
normality	OK
n	53
outliers	2
mean (n)	19.600
st.dev. (n)	3.1279
R(calc.)	8.758
R(EN60814:98)	6.643

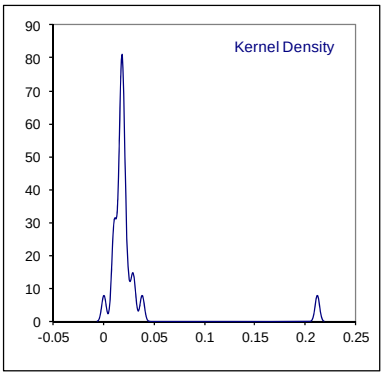

35
30
25
20
15
10
5
862 331 1146 388 495 1660 1578 1595 1367 1529 2122 1924 1178 1923 1442 1801 1545 1306 1743 1719 1374 1760 1303 445 1156 1560 614 1925 1440 1702 1262 1473 1777 1516 1361 1513 2125 1478 1626 1264 446 1072 1628 1687 360 1352 1827 1271 551 273 1505 963 1304 1430 1201


Kernel Density
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 #13207; results in mg/kg

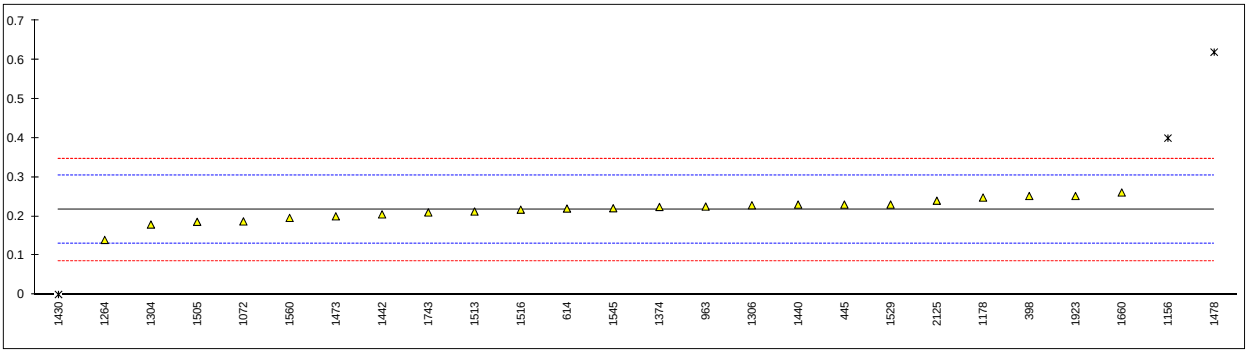
lab	method	value	mark	z(targ)	remarks
398	IEC61198	0.028	C	1.96	First reported: 0.038
445	IEC61198	<0.05		-----	
614	IEC61198	0.03		2.35	
963	D5837	0.018		0.04	
1072	EN61198	0.017		-0.15	
1156	EN61198	0.038	G(0.05)	3.88	
1178	EN61198	0.0201		0.45	
1264	D5837	0.0092		-1.64	
1304	INH-126	0.018		0.04	
1306	IEC61198	0.0165256		-0.24	
1352	IEC61198	n.d.		-----	
1367		-----		-----	
1374	D5837	0.017		-0.15	
1430	IEC61198	0	ex	-3.41	Result excluded, zero is not a real value
1440	IEC61198	0.02		0.43	
1442	IEC61198	0.020		0.43	
1458		-----		-----	
1473	IEC61198	0.01		-1.49	
1478	IEC61198	0.012		-1.11	
1505	D5837	<0.001		-----	
1513	IEC61198	0.0177		-0.01	
1516	IEC61198	<0.05		-----	
1529	IEC61198	<0.1		-----	
1545	IEC61198	0.0166		-0.22	
1560	IEC61198	0.014		-0.72	
1660	IEC61198	0.0237	C	1.14	First reported: 0.0335
1702	IEC61198	0.0175		-0.05	
1743	IEC61198	0.02		0.43	
1801	IEC61198	n.d.		-----	
1923	IEC61198	0.212	C,G(0.01)	37.25	First reported: 0.272
2122	IEC61198	<0.05		-----	
2125	IEC61198	0.01		-1.49	
	normality	OK			
	n	20			
	outliers	2	+1 ex		
	mean (n)	0.0178			
	st.dev. (n)	0.00541			
	R(calc.)	0.0151			
	R(Horwitz)	0.0146			Compare R(IEC61198:94) = 0.0027 mg/kg

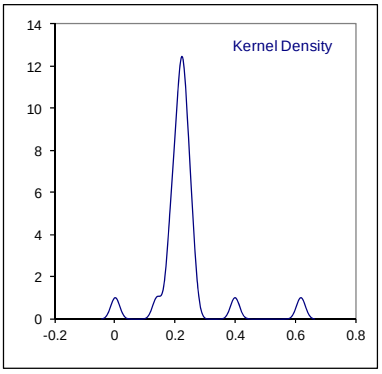




Determination of 2-Furfurylalcohol on sample #13207; results in mg/kg

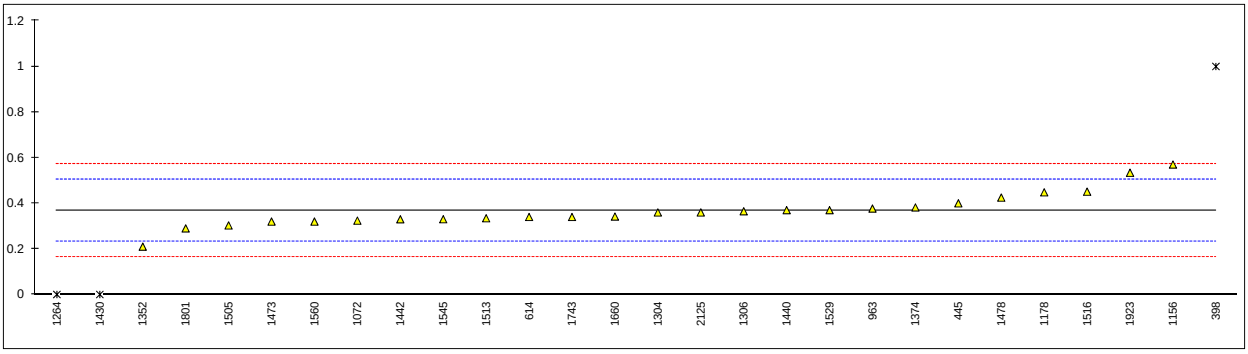
lab	method	value	Mark	z(targ)	remarks
398	IEC61198	0.252		0.80	
445	IEC61198	0.23		0.30	
614	IEC61198	0.22		0.07	
963	D5837	0.225		0.18	
1072	EN61198	0.187		-0.69	
1156	EN61198	0.400	C,G(0.01)	4.18	First reported: 0.000
1178	EN61198	0.248	C	0.71	First reported: 0.3158
1264	D5837	0.13976		-1.77	
1304	INH-126	0.179		-0.87	
1306	IEC61198	0.228303		0.26	
1352	IEC61198	n.d.	C	-----	First reported: 0.0934
1367		-----		-----	
1374	D5837	0.224		0.16	
1430	IEC61198	0	ex	-4.97	Result excluded, zero is not a real value
1440	IEC61198	0.23		0.30	
1442	IEC61198	0.205		-0.28	
1458		-----		-----	
1473	IEC61198	0.20		-0.39	
1478	IEC61198	0.620	C,G(0.01)	9.22	First reported: 0.462
1505	D5837	0.186		-0.71	
1513	IEC61198	0.2123		-0.11	
1516	IEC61198	0.217		0.00	
1529	IEC61198	0.23		0.30	
1545	IEC61198	0.2207		0.08	
1560	IEC61198	0.196		-0.48	
1660	IEC61198	0.261	C	1.00	First reported: 0.35
1702	IEC61198	n.d.		-----	False negative?
1743	IEC61198	0.21		-0.16	
1801	IEC61198	n.d.		-----	False negative?
1923	IEC61198	0.252		0.80	
2122		-----		-----	
2125	IEC61198	0.24		0.52	
	normality	OK			
	n	23			
	outliers	2	+1 ex		
	mean (n)	0.2171			
	st.dev. (n)	0.02769			
	R(calc.)	0.0775			
	R(Horwitz)	0.1224			Compare R(IEC61198:94) = 0.033 mg/kg

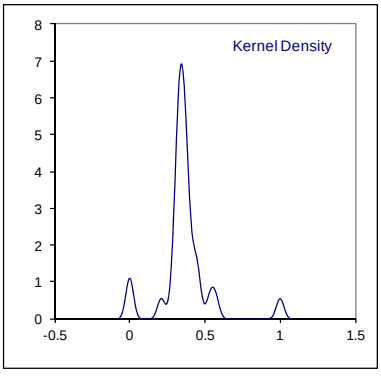




Determination of 5-Methyl-2-furfural on sample #13207; results in mg/kg

lab	method	value	mark	z(targ)	remarks
398	IEC61198	1.000	G(0.01)	9.24	
445	IEC61198	0.40		0.47	
614	IEC61198	0.34		-0.41	
963	D5837	0.377		0.13	
1072	EN61198	0.324		-0.64	
1156	EN61198	0.570		2.96	
1178	EN61198	0.4481		1.17	
1264	D5837	0	ex	-5.38	Result excluded, zero is not a real value
1304	INH-126	0.360		-0.11	
1306	IEC61198	0.364989		-0.04	
1352	IEC61198	0.20996		-2.31	
1367		-----		-----	
1374	D5837	0.382		0.21	
1430	IEC61198	0	ex	-5.38	Result excluded, zero is not a real value
1440	IEC61198	0.37		0.03	
1442	IEC61198	0.330		-0.55	
1458		-----		-----	
1473	IEC61198	0.32		-0.70	
1478	IEC61198	0.425	C	0.84	First reported: 0.356
1505	D5837	0.303		-0.95	
1513	IEC61198	0.3344		-0.49	
1516	IEC61198	0.451		1.22	
1529	IEC61198	0.37		0.03	
1545	IEC61198	0.3302		-0.55	
1560	IEC61198	0.32		-0.70	
1660	IEC61198	0.342	C	-0.38	First reported: 0.429
1702	IEC61198	n.d.		-----	False negative?
1743	IEC61198	0.34		-0.41	
1801	IEC61198	0.290		-1.14	
1923	IEC61198	0.534		2.43	
2122		-----		-----	
2125	IEC61198	0.36		-0.11	
	normality	not OK			
	n	25			
	outliers	1	+ 2 ex		
	mean (n)	0.3678			
	st.dev. (n)	0.07484			
	R(calc.)	0.2096			
	R(Horwitz)	0.1916			Compare R(IEC61198) = 0.0552 mg/kg





Determination of other Furanic compounds on sample #13207; results in mg/kg

lab	method	2-af	mark	z(targ)	5-hm-2-f	mark	z(targ)	remarks
398	IEC61198	<0.05		-----	<0.05		-----	
445	IEC61198	<0.05		-----	<0.05		-----	
614	IEC61198	<0.01		-----	<0.01		-----	
963	D5837	n.d.		-----	n.d.		-----	
1072	EN61198	<0.01		-----	<0.01		-----	
1156	EN61198	0.000		-----	0.000		-----	
1178	EN61198	0.0008		-----	0.0011		-----	
1264	D5837	0.18306	False positive?	-----	0.00294		-----	
1304	INH-126	<0.01		-----	<0.01		-----	
1306	IEC61198	<0.03		-----	<0.03		-----	
1352	IEC61198	n.d.		-----	n.d.		-----	
1367		-----		-----	-----		-----	
1374	D5837	<0.01		-----	<0.01		-----	
1430	IEC61198	0		-----	0		-----	
1440	IEC61198	<0.01		-----	<0.01		-----	
1442	IEC61198	<0.01		-----	<0.01		-----	
1458		-----		-----	-----		-----	
1473	IEC61198	<0.01		-----	<0.01		-----	
1478	IEC61198	<0.01		-----	<0.01		-----	
1505	D5837	<0.001		-----	<0.001		-----	
1513	IEC61198	<0.05		-----	<0.05		-----	
1516	IEC61198	<0.05		-----	<0.05		-----	
1529	IEC61198	<0.1		-----	<0.1		-----	
1545	IEC61198	<0.01		-----	0.0021		-----	
1560	IEC61198	<0.01		-----	<0.01		-----	
1660	IEC61198	0.00186	C*	-----	0.00717	C*	-----	
1702	IEC61198	n.d.		-----	n.d.		-----	
1743	IEC61198	0		-----	0		-----	
1801	IEC61198	n.d.		-----	n.d.		-----	
1923	IEC61198	0.094		-----	-----		-----	
2122		-----		-----	-----		-----	
2125	IEC61198	0		-----	0		-----	
	normality	n.a.			OK			
	n	23			24			
	outliers	n.a.			n.a.			
	mean (n)	<0.01			<0.01			
	st.dev. (n)	n.a.			n.a.			
	R(calc.)	n.a.			n.a.			
	R(Horwitz)	n.a.			n.a.			

* First reported by lab 1660 for 2-af: 0.0023 and for 5-hm-2-f: 0.0089

Abbreviations:

2-af	= 2-acetylfuran
5-hm-2-f	= 5-hydroxymethyl-2-furfural

APPENDIX 2

Number of participants per country

1 lab in ARGENTINA
6 labs in AUSTRALIA
1 lab in BELGIUM
1 lab in BOSNIA and HERZEGOVINA
1 lab in BRAZIL
8 labs in BULGARIA
1 lab in CHINA, People's Republic
1 lab in CROATIA
1 lab in ESTONIA
3 labs in FRANCE
3 labs in GERMANY
1 lab in GREECE
2 labs in ITALY
1 lab in KINGDOM OF BAHRAIN
3 labs in MALAYSIA
3 labs in NETHERLANDS
1 lab in NEW ZEALAND
1 lab in NORWAY
2 labs in PORTUGAL
3 labs in SAUDI ARABIA
1 lab in SLOVENIA
2 labs in SOUTH AFRICA
5 labs in SPAIN
1 lab in SWEDEN
1 lab in TURKEY
2 labs in UNITED ARAB EMIRATES
4 labs in UNITED KINGDOM
1 lab in UNITED STATES OF AMERICA
1 lab 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
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