Results of Proficiency Test
Transformer Oil (used)
November 2014

Organised by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

Author: ing. L. Dijkstra
Corrector: dr. R.G. Visser & ing. R. Starink
Report: iis14L30 + iis14L06F

February 2015

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1 INTRODUCTION

Since 2001, the Institute for Interlaboratory Studies organized a proficiency test for the analysis of fresh Transformer Oil and for Furanics in Transformer oil every year. It was decided that besides the proficiency test for fresh Transformer Oil also to organize a proficiency test for used Transformer Oil during the annual program 2014/2015. In this first interlaboratory study on used Transformer Oil 63 laboratories from 33 different countries have participated. See appendix 2 for the number of participants per country. In this report, the test results of the 2014 interlaboratory study on used Transformer Oil and for Furanics in Transformer Oil are presented and discussed. This report is also electronically available through the iis internet site www.iisnl.com.

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, the participants received, depending on the registration, 1*1 litre bottle used Transformer Oil (labelled #14223) and/or 1*100 ml bottle (labelled #14224) for Furanics in Transformer Oil only. Participants were requested to report rounded and unrounded results. The unrounded results were preferably used for statistical evaluation.

2.1 ACCREDITATION

he 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 PT falls under the accredited scope. 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 was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of April 2014 (iis-protocol, version 3.3). This protocol can be downloaded from the iis website www.iisnl.com.

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 of 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 for the used oil sample #14223 was obtained from a European supplier. The approximately 90 litre bulk material was homogenised in a pre-cleaned drum. After homogenisation, 82 subsamples were transferred to 1 litre amber glass bottles and labelled #14223. The homogeneity of the subsamples #14223 was checked by determination Density in accordance with ASTM D4052 on 8 stratified randomly selected samples.

	Density @ 20°C in kg/m^3
Sample #14223-1	853.43
Sample #14223-2	853.43
Sample #14223-3	853.46
Sample #14223-4	853.44
Sample #14223-5	853.44
Sample #14223-6	853.44
Sample #14223-7	853.44
Sample #14223-8	853.45

Table 1: homogeneity test results of subsamples #14223

From the above test results the repeatability was calculated and compared with 0.3 times the corresponding reproducibility of the reference method in agreement with the procedure of ISO 13528, Annex B2 in the next table.

	Density @ 20°C in kg/m^3
r (sample #14223)	0.03
reference method	ISO3675:98
$0.3xR_{(reference)}$	0.36

Table 2: repeatability of subsamples #14223

The necessary bulk material positive on Furanics, was obtained from a participating laboratory. After homogenisation, the bulk material approx. 6 L, was transferred to 55 amber glass bottles of 100 mL and labelled #14224. The homogeneity of the subsamples #14224 was checked by determination Density in accordance with ASTM D4052 on
8 stratified randomly selected samples.

	Density @ 20°C in kg/m^3
Sample #14224-1	876.32
Sample #14224-2	876.30
Sample #14224-3	876.30
Sample #14224-4	876.30
Sample #14224-5	876.31
Sample #14224-6	876.30
Sample #14224-7	876.30
Sample #14224-8	876.30

Table 3: homogeneity test results of subsamples #14224

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

	Density @ 20°C in kg/m^3
r (sample #14224)	0.02
reference method	ISO3675:98
0.3x$R_{(reference)}$	0.36

Table 4: repeatability of subsamples #14224

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 #14223) and/or 1*100mL bottle (labelled #14224) was sent on November 5, 2014.

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 #14223: 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 @ 40°C and Water.

On sample #14224, 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 the required standards and a letter of instructions were prepared and made available on the data entry portal www.kpmd.co.uk/sgs-iis/. The detailed report form was also 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 received. The original reported results are tabulated per determination in appendix 1 of this report. The laboratories are presented by their code numbers.
Directly after deadline, a reminder fax was sent to those laboratories that had not yet reported.

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 (raw data of the) reported results.
Additional or corrected results have been 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’ (iis-protocol, April 2014 version 3.3). 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 a variant of the Kolmogorov-Smirnov test and by the calculation of skewness and kurtosis. Evaluation of the three normality indicators in combination with the visual evaluation of the graphic Kernel density plot, lead to judgement of the normality being either ‘unknown’, ‘OK’, ‘suspect’ or ‘not OK’. 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, Grubbs and Rosner 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 and by R(0.01) for the Rosner General ESD test (see appendix 3, no.16). Stragglers are marked by D(0.05) for the Dixon test, by G(0.05) or DG(0.05) for the Grubbs test and by R(0.05) for the Rosner’s test. Both outliers and stragglers were not included in the calculations of the averages and the 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). Also a normal Gauss curve was projected over the Kernel Density Graph for reference.

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. This results in an evaluation independent of the spread of this interlaboratory study. The target standard deviation was calculated from the literature reproducibility by division with 2.8.

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 whether the reported test result is fit-for-use.
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.

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

$\lvert z\rvert < 1$	good
$1 < \lvert z\rvert < 2$	satisfactory
$2 < \lvert z\rvert < 3$	questionable
$3 < \lvert z\rvert$	unsatisfactory

4 EVALUATION

In this proficiency test some problems were encountered during the execution.
For the used Transformer Oil, iis14L30, 7 participants reported test results after the final reporting date and 2 participants did not report any test results at all.
For the Furanics in Transformer Oil: 4 participants reported the test results after the final reporting date and 2 participants did not report any test results at all.

In total 63 participants reported 508 numerical results. Observed were 23 outlying results, which is 4.5% of the numerical results. In proficiency studies, outlier percentages of 3% - 7.5% are quite normal.

4.1 EVALUATION PER TEST

In this section, the results are discussed per sample and per test. The specified test methods and requirements were taken into account for explaining the observed differences when possible and applicable. These methods are also in the tables together with the reported data. The abbreviations, used in these tables, are listed in appendix 3.

In the iis PT reports, ASTM methods are referred to with a number (e.g. D2086) and an added designation for the year that the method was adopted or revised (e.g. D2086-08). If applicable, a designation in parentheses is added to designate the year of reapproval (e.g. D2086-08 (2013)). In the results tables of Appendix 1 only the method number and year of adoption or revision will be used.

For the Furanics compounds the observed spreads were compared against the (strict) reproducibility estimated from the Horwitz equation. It is remarkable that the precision requirements of IEC 61198:94 are more strict than the requirements estimated from the Horwitz equation.

Not all original data sets proved to have a normal Gaussian distribution. These are referred to as “not OK” or “suspect”. The statistical evaluation of these data sets should be used with due care.

Acid Number: This determination was very problematic. Four statistical outliers were observed and eight test results from ASTM D664 were excluded. The application range of D664 is from 0.1 mg/g KOH to 150 mg/g KOH. The calculated reproducibility after rejection of the suspect data is not at all in agreement with the requirements of EN62021-1:03.

Breakdown Voltage: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of EN60156:95. The reproducibility of EN60156:95 was determined from Figure 3. The black line in Figure 3 shows the relative standard deviation as a function of the value of the mean based on six breakdown measurements.

To calculate the repeatability, RSDr has to be multiplied with 2.8. The reproducibility can be estimated from the repeatability by multiplication with the empirical factor 3.

Density @ 20°C: 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 ISO3675:98.

DD-Factor: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of EN60247:04.

Spec. Resistance: 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. Two test results were excluded as the test results were reported according to ASTM D92 which is not equivalent to ISO2719/ASTM D93/IP34 method A. No statistical outliers were observed. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of ISO2719:02 method A.

Interf. Surf. Tension: 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 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. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not at all in agreement with the requirements of ISO3104:96.

Water: This determination was problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirements of EN60814:98.

2-Furfural: This determination may not be problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the estimated requirements from the Horwitz equation.

2-Furfurylalcohol: This determination may be problematic for a number of laboratories. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the estimated requirements from the Horwitz equation.

5-Methyl-2-furfural: This determination may problematic for a number of laboratories. One statistical outlier and two false negative test results were observed. The calculated reproducibility after rejection of the statistical outlier is in good 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. Two laboratories may have identified the peak for 2-Acetylfuran incorrectly instead of 5-methyl-2-furfural.

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	40	0.018	0.017	0.006
Breakdown Voltage	kV/2.5 mm	54	32.3	28.7	48.9
Density @ 20°C	kg/m^3	46	853.3	1.8	1.2
Di-electric Dissipation Factor		39	0.0377	0.0158	0.0380
Specific Resistance	GΩm	32	11.3	5.5	11.8
Flash Point PMcc	°C	34	149.2	10.6	10.0
Interfacial Surface Tension	mN/m	37	26.38	5.42	2.64
Kinematic Viscosity @ 40°C	mm^2/s	33	8.16	0.18	0.06
Water	mg/kg	59	30.70	11.17	8.31

table 5: Performance of the group on sample #14223

Parameter	unit	n	average	2.8 * sd	R(lit)
* 2-furfural	mg/kg	32	0.496	0.206	0.247
* 2-furfurylalcohol	mg/kg	26	0.125	0.061	0.077
* 5-methyl-2-furfural	mg/kg	27	0.189	0.044	0.109
* 2-acetylfuran	mg/kg	23	<0.05	n.a.	n.a.
* 5-hydroxy-2-furfural	mg/kg	25	<0.05	n.a.	n.a.

table 6: Performance of the group on sample #14224

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 the Horwitz equation. The problematic tests have been discussed in paragraph 4.1

4.3 COMPARISON OF THE NOVEMBER 2014 PROFICIENCY TEST WITH PREVIOUS PTS.

	November 2014
Number of reporting labs	63
Number of results reported	508
Statistical outliers	23
Percentage outliers	4.5%

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 2014
Acid number (EN62021-1)	--
Breakdown Voltage	+
Density @ 20°C	-
Di-electric Dissipation Factor	++
Specific Resistance	++
Flash Point	+/-
Interfacial Surface Tension	--
Kinematic Viscosity @ 40°C	--
Water	-
2-furfural	+
2-furfurylalcohol	+
5-methyl-2-furfural	++
2-acetylfuran	n.e.
5-hydroxy-2-furfural	n.e.

table 8: comparison determinations against the standard requirements

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

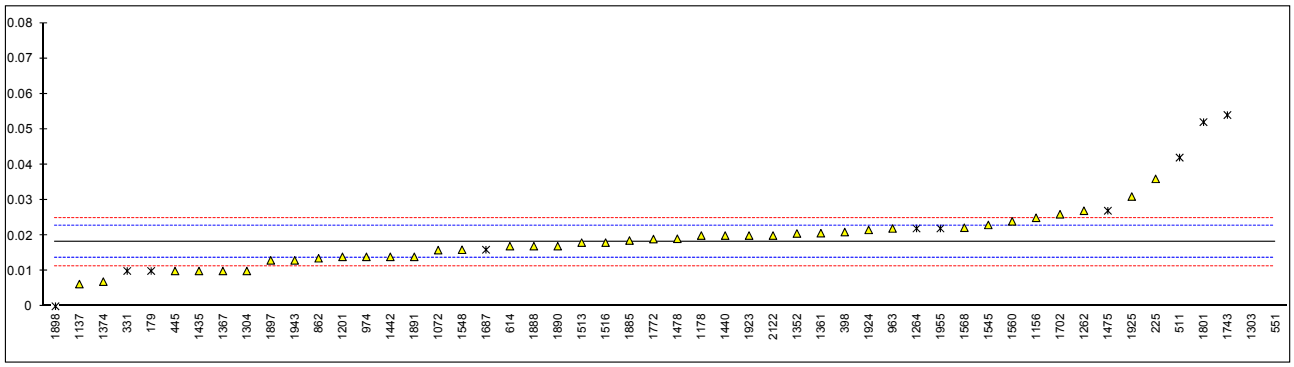
++: group performed much better than the standard
+ : group performed better than the standard
+/-: group performance equals the standard
- : group performed worse than the standard
-- : group performed much worse than the standard
n.e: not evaluated

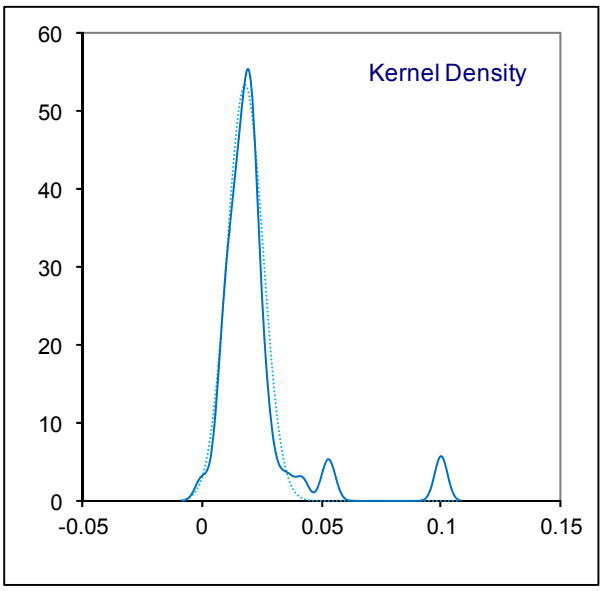
APPENDIX 1

Determination of Acid Number on sample #14223; results in g KOH/kg

lab	method	value	mark	z(targ)	remarks
179	D664	0.01	ex	-3.58	Result excluded, see §4.1
225	D974	0.036		7.90	
331	D664	0.01	ex	-3.58	Result excluded, see §4.1
398	EN62021-1	0.021		1.27	
445	EN62021-1	0.01		-3.58	
511	D664	0.042	ex	10.55	Result excluded, see §4.1
541		-----		-----	
551	D664	0.10	ex	36.17	Result excluded, see §4.1
614	EN62021-1	0.017	C	-0.49	first reported:0.0773
862	IEC62021-1	0.0136		-1.99	
963	D974	0.022		1.72	
974	D974	0.014		-1.82	
994		-----		-----	
1056		-----		-----	
1072	in house	0.0159		-0.98	
1137	D974	0.0063		-5.22	
1146		-----		-----	
1156	EN62021-1	0.025		3.04	
1178	EN62021-1	0.020		0.83	
1201	D976	0.014		-1.82	
1262	EN62021-1	0.027		3.92	
1264	D664	0.022	ex	1.72	Result excluded, see §4.1
1303	D974	0.100	R(0.01)	36.17	
1304	INH-122	0.01		-3.58	
1352	IEC62021	0.02057		1.09	
1361	EN62021-1	0.02066		1.12	
1367	EN62021-1	0.01		-3.58	
1374	IEC62021-1	0.007		-4.91	
1417		-----		-----	
1430		-----		-----	
1435	IEC62021-1	0.01		-3.58	
1440	EN62021-1	0.02		0.83	
1442	IEC62021-2	0.014		-1.82	
1458	D974	<0.02	C	-----	first reported:0.206
1461		-----		-----	
1475	D664	0.027	ex	3.92	Result excluded, see §4.1
1478	EN62021-1	0.0191		0.44	
1513	IEC62021-1	0.018		-0.05	
1516	D974	0.018		-0.05	
1545	D974	0.023		2.16	
1548	IEC62021-1	0.016		-0.93	
1560	IEC62021-1	0.024		2.60	
1568	D974	0.0222		1.80	
1626		-----		-----	
1660	EN62021-1	<0.01		-----	
1687	D664	0.016	ex	-0.93	Result excluded, see §4.1
1702	IEC62021	0.026		3.48	
1743	IEC62021-1	0.054	C,R(0.01)	15.85	first reported:0.064
1772	EN62021-2	0.019		0.39	
1801	EN62021-1	0.052	R(0.01)	14.97	first reported:0.04528
1831		-----		-----	
1885	D974	0.0186		0.21	
1888	EN62021-1	0.017		-0.49	
1890	ISO6619	0.017		-0.49	
1891	IEC62021-2	0.014		-1.82	
1897	IEC62021-2	0.013		-2.26	
1898		0.00004528	C,R(0.05)	-7.98	first reported:0.04528
1923	EN62021-1	0.020		0.83	
1924	EN62021-1	0.0216		1.54	
1925	EN62021-1	0.031		5.69	
1943	ISO6618	0.013		-2.26	
1955	D664	0.022	ex	1.72	Result excluded, see §4.1
2122	EN62021-1	0.02		0.83	

normality	OK
n	40
outliers	4 + 8 excl.
mean (n)	0.0181
st.dev. (n)	0.00619
R(calc.)	0.0173
R(EN62021-1:03)	0.0063

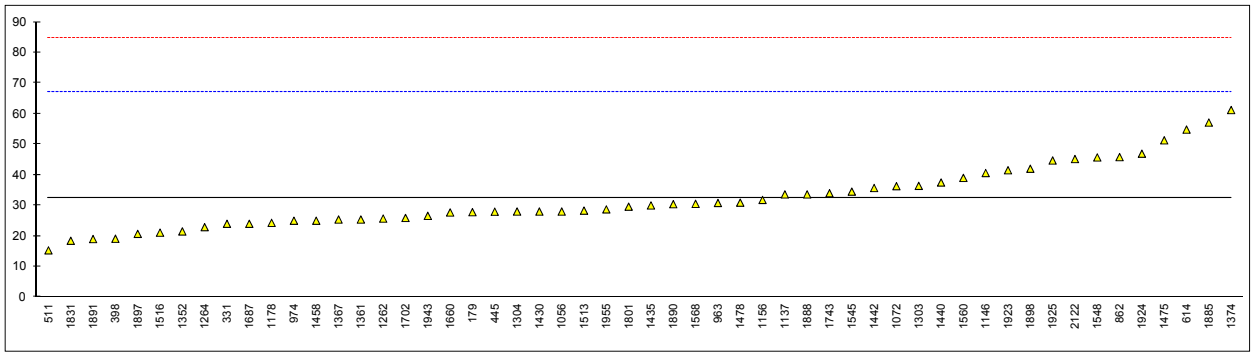

0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1898 1137 1374 331 179 445 1435 1367 1304 1897 1943 862 1201 974 1442 1891 1072 1548 1687 614 1888 1890 1513 1516 1885 1772 1478 1178 1440 1923 2122 1352 1361 398 1924 963 1264 1955 1568 1545 1560 1156 1702 1262 1475 1925 225 511 1801 1743 1303 551

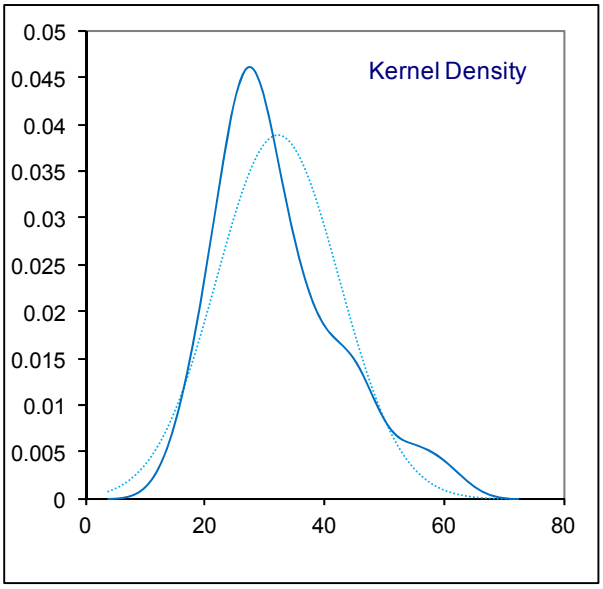

Kernel Density
60
50
40
30
20
10
0
-0.05
0
0.05
0.1
0.15

Determination of Breakdown Voltage on sample #14223, results in kV/2.5 mm

lab	method	value	mark	z(targ)	remarks
179	D877	27.8		-0.26	
225		-----		-----	
331	EN60156	24.0		-0.48	
398	EN60156	19.1		-0.76	
445	EN60156	27.95		-0.25	
511	D1816	15.30		-0.98	
541		-----		-----	
551		-----		-----	
614	IEC60156	54.8		1.29	
862	IEC60156	45.81		0.77	
963	D877	30.8		-0.09	
974	EN60156	25.0		-0.42	
994		-----		-----	
1056	IP295	28		-0.25	
1072	EN60156	36.3		0.23	
1137	IEC60156	33.6		0.07	
1146	IEC60156	40.6		0.47	
1156	EN60156	31.8		-0.03	
1178	EN60156	24.3		-0.46	
1201		-----		-----	
1262	EN60156	25.7		-0.38	
1264	EN60156	22.9		-0.54	
1303	IEC60156	36.4		0.23	
1304	INH-124	28		-0.25	
1352	IEC60156	21.5		-0.62	
1361	EN60156	25.4		-0.40	
1367	EN60156	25.4		-0.40	
1374	IEC60156	61.2		1.65	
1417		-----		-----	
1430	EN60156	28		-0.25	
1435	IEC60156	30		-0.13	
1440	EN60156	37.5		0.30	
1442	IEC60156	35.7		0.19	
1458	IEC60156	25.0		-0.42	
1461		-----		-----	
1475	IEC60156	51.3		1.09	
1478	EN60156	30.9		-0.08	
1513	IEC60156	28.3		-0.23	
1516	IEC60156	21.1		-0.64	
1545	IEC60156	34.52		0.13	
1548	EN60156	45.7		0.77	
1560	EN60156	39		0.38	
1568	D877	30.52		-0.10	
1626		-----		-----	
1660	EN60156	27.7		-0.26	
1687	EN60156	24		-0.48	
1702	IEC60156	25.9		-0.37	
1743	IEC60156	34		0.10	
1772		-----		-----	
1801	EN60156	29.6		-0.16	
1831	IEC60156	18.44		-0.80	
1885	IEC60156	57.1		1.42	
1888	EN60156	33.6		0.07	
1890	IEC60156	30.4		-0.11	
1891	IEC60156	19		-0.76	
1897	IEC60156	20.7		-0.67	
1898		42		0.55	
1923	EN60156	41.5		0.53	
1924	EN60156	46.92		0.84	
1925	EN60156	44.7		0.71	
1943	EN60156	26.6		-0.33	
1955	IEC156	28.7		-0.21	
2122	EN60156	45.1666667		0.74	

normality	OK
n	54
outliers	0
mean (n)	32.32
st.dev. (n)	10.255
R(calc.)	28.71
R(EN60156:95)	48.87

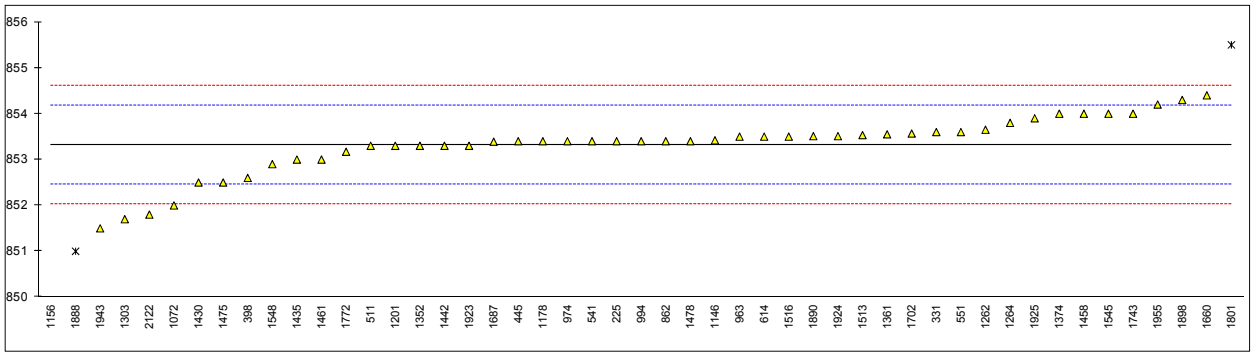

90
80
70
60
50
40
30
20
10
0
511 1831 1891 398 1897 1516 1352 1264 331 1687 1178 974 1458 1367 1361 1262 1702 1943 1660 179 445 1304 1430 1056 1513 1955 1801 1435 1890 1568 963 1478 1156 1137 1888 1743 1545 1442 1072 1303 1440 1560 1146 1923 1898 1925 2122 1548 862 1924 1475 614 1885 1374

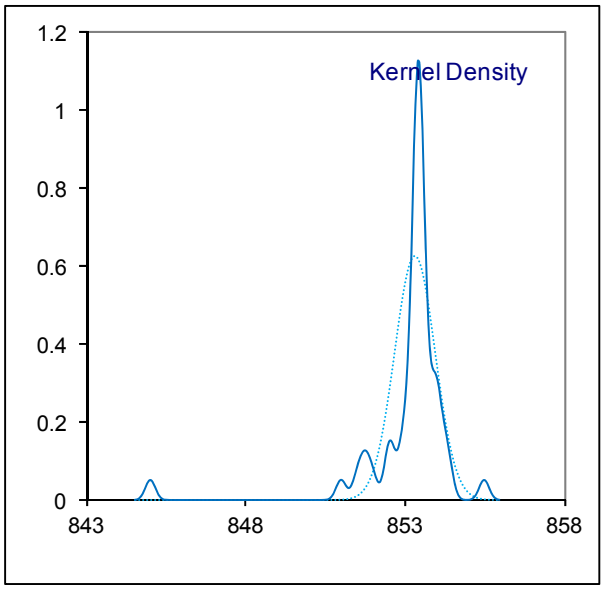

Kernel Density
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0
20
40
60
80

Determination of Density @ 20°C on sample #14223; results in kg/m^3

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
225	D4052	853.4		0.18	
331	ISO12185	853.6		0.65	
398	ISO12185	852.6		-1.68	
445	D4052	853.4		0.18	
511	D4052	853.3	C	-0.05	first reported:0.8533
541	ISO12185	853.4		0.18	
551	D4052	853.6		0.65	
614	D4052	853.5		0.42	
862	D4052	853.4		0.18	
963	D4052	853.5		0.42	
974	D4052	853.4		0.18	
994	D4052	853.4		0.18	
1056		-----		-----	
1072	ISO3675	852.0		-3.08	
1137		-----		-----	
1146	ISO12185	853.42		0.23	
1156	in house	845	R(0.01)	-19.42	
1178	ISO12185	853.40		0.18	
1201	ISO3675	853.3		-0.05	
1262	ISO3675	853.65		0.77	
1264	D4052	853.80		1.12	
1303	D4052	851.7		-3.78	
1304		-----		-----	
1352	ISO12185	853.3		-0.05	
1361	ISO3675	853.55		0.53	
1367		-----		-----	
1374	D7777	854		1.58	
1417		-----		-----	
1430	D4052	852.5		-1.92	
1435	D4052	853		-0.75	
1440		-----		-----	
1442	D7042	853.3		-0.05	
1458	D4052	854.0		1.58	
1461	ISO3675	853.0	C	-0.75	first reported:0.8530
1475	D1298	852.5		-1.92	
1478	ISO12185	853.4		0.18	
1513	ISO12185	853.533		0.49	
1516	ISO3675	853.5		0.42	
1545	ISO3675	854	C	1.58	first reported:0.8540
1548	ISO3675	852.9	C	-0.98	first reported:0.8529
1560		-----		-----	
1568		-----		-----	
1626		-----		-----	
1660	ISO3675	854.4	C	2.52	first reported:0.8544
1687	ISO12185	853.39		0.16	
1702	ISO12185	853.568		0.57	
1743	in house	854		1.58	
1772	ISO3675	853.17	C	-0.35	first reported:0.85317
1801	ISO3675	855.5	R(0.05)	5.08	
1831		-----		-----	
1885		-----		-----	
1888	ISO3675	851	C,R(0.05)	-5.42	first reported:0.8510
1890	ISO12185	853.51		0.44	
1891		-----		-----	
1897		-----		-----	
1898		854.3	C	2.28	first reported:0.8543
1923	ISO3675	853.3		-0.05	
1924	ISO3675	853.51		0.44	
1925	ISO3675	853.9		1.35	
1943	ISO3675	851.5		-4.25	
1955	D7042	854.2		2.05	
2122	INH-12185	851.8		-3.55	

normality	suspect
n	46
outliers	3
mean (n)	853.32
st.dev. (n)	0.637
R(calc.)	1.78
R(ISO3675:98)	1.20

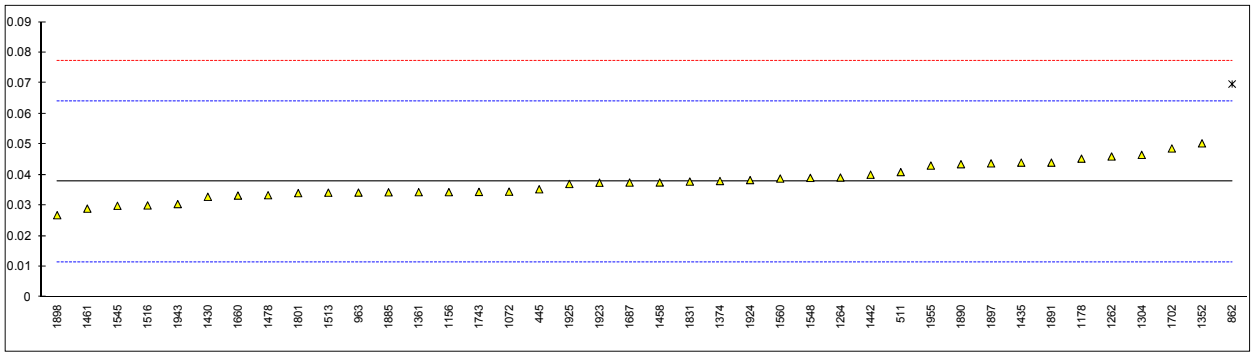

856
855
854
853
852
851
850
1156 1888 1943 1303 2122 1072 1430 1475 398 1548 1435 1461 1772 511 1201 1352 1442 1923 1687 445 1178 974 541 225 994 862 1478 1146 963 614 1516 1890 1924 1513 1361 1702 331 551 1262 1264 1925 1374 1458 1545 1743 1955 1898 1660 1801

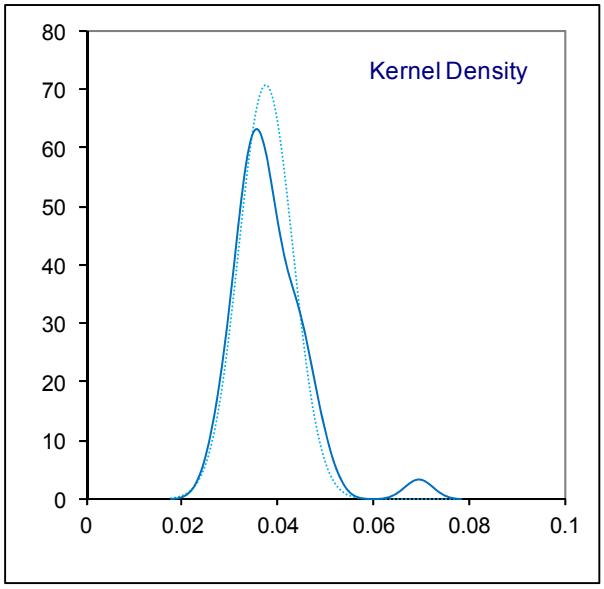

Kernel Density
1.2
1
0.8
0.6
0.4
0.2
0
843
848
853
858

Determination of Di-electric Dissipation Factor at 90°C on sample #14223

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
225		-----		-----	
331		-----		-----	
398		-----		-----	
445	IEC60247	0.03528		-0.18	
511	D924	0.0409	C	0.23	first reported:0.00409
541		-----		-----	
551		-----		-----	
614		-----		-----	
862	IEC60247	0.0697	C,R(0.01)	2.35	first reported:0.0699
963	IEC60247	0.0342		-0.26	
974		-----		-----	
994		-----		-----	
1056		-----		-----	
1072	EN60247	0.03450		-0.24	
1137		-----		-----	
1146		-----		-----	
1156	EN60247	0.03435		-0.25	
1178	EN60247	0.0453		0.56	
1201		-----		-----	
1262	IEC60247	0.046		0.61	
1264	EN60247	0.03912		0.10	
1303		-----		-----	
1304	INH-125	0.046532		0.65	
1352	IEC60247	0.0503		0.93	
1361	EN60247	0.034331		-0.25	
1367		-----		-----	
1374	IEC60247	0.03798		0.02	
1417		-----		-----	
1430	EN60247	0.032821		-0.36	
1435	IEC60247	0.044		0.46	
1440		-----		-----	
1442	IEC60247	0.04004		0.17	
1458	IEC60247	0.037498		-0.02	
1461	EN60247	0.028953		-0.65	
1475		-----		-----	
1478	EN60247	0.033334		-0.32	
1513	IEC60247	0.03417		-0.26	
1516	IEC60247	0.03000		-0.57	
1545	IEC60247	0.02988		-0.58	
1548	EN60247	0.039		0.09	
1560	IEC60247	0.0388		0.08	
1568		-----		-----	
1626		-----		-----	
1660	EN60247	0.03322		-0.33	
1687	EN60247	0.037487		-0.02	
1702	IEC60247	0.048630		0.80	
1743	IEC60247	0.034428		-0.24	
1772		-----		-----	
1801	EN60247	0.03402		-0.27	
1831	IEC60247	0.03780		0.01	
1885	IEC60247	0.03429	C	-0.25	first reported:3.429
1888		-----		-----	
1890	IEC60247	0.043475		0.42	
1891	IEC60247	0.0440		0.46	
1897	IEC60247	0.04375		0.44	
1898		0.02681	C	-0.80	first reported:2.681
1923	EN60247	0.03742		-0.02	
1924	EN60247	0.03829		0.04	
1925	EN60247	0.03702		-0.05	
1943	EN60247	0.030427		-0.54	
1955	IEC60247	0.04304		0.39	
2122		-----		-----	

normality	OK
n	39
outliers	1
mean (n)	0.03773
st.dev. (n)	0.005650
R(calc.)	0.01582
R(EN60247:04)	0.03803

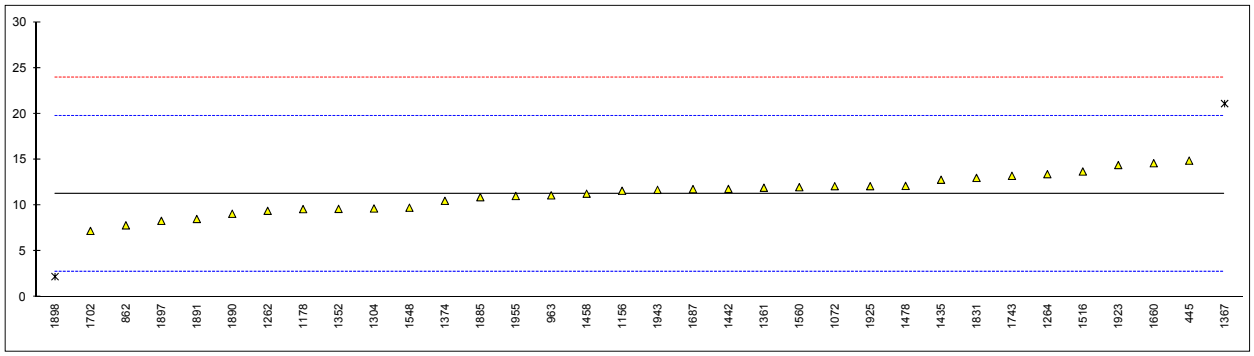

0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1898 1461 1545 1516 1943 1430 1660 1478 1801 1513 963 1885 1361 1156 1743 1072 445 1925 1923 1687 1458 1831 1374 1924 1560 1548 1264 1442 511 1955 1890 1897 1435 1891 1178 1262 1304 1702 1352 862

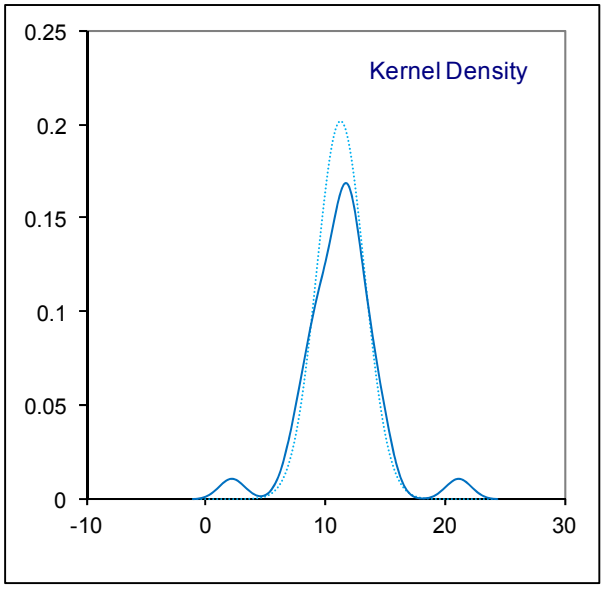

Kernel Density
80
70
60
50
40
30
20
10
0
0
0.02
0.04
0.06
0.08
0.1

Determination of Specific Resistance at 90°C on sample #14223; results in GΩm

lab	method	value	mark	z(targ)	remarks
179		-----		-----	
225		-----		-----	
331		-----		-----	
398		-----		-----	
445	EN60247	14.882		0.85	
511		-----		-----	
541		-----		-----	
551		-----		-----	
614		-----		-----	
862	IEC60247	7.83		-0.82	
963	D1169	11.1		-0.04	
974		-----		-----	
994		-----		-----	
1056		-----		-----	
1072	EN60247	12.1		0.19	
1137		-----		-----	
1146		-----		-----	
1156	EN60247	11.6		0.08	
1178	EN60247	9.6		-0.40	
1201		-----		-----	
1262	IEC60247	9.410		-0.44	
1264	EN60247	13.405		0.50	
1303		-----		-----	
1304	INH-125	9.67		-0.38	
1352	IEC60247	9.625		-0.39	
1361	EN60247	11.93		0.15	
1367	EN60247	21.1	R(0.01)	2.32	
1374	IEC60247	10.5		-0.18	
1417		-----		-----	
1430		-----		-----	
1435	IEC60247	12.8		0.36	
1440		-----		-----	
1442	IEC60247	11.8		0.12	
1458	IEC60247	11.28		0.00	
1461		-----		-----	
1475		-----		-----	
1478	EN60247	12.13		0.20	
1513		-----		-----	
1516	IEC60247	13.7		0.57	
1545		-----		-----	
1548	EN60247	9.75		-0.36	
1560	IEC60247	11.99		0.17	
1568		-----		-----	
1626		-----		-----	
1660	EN60247	14.6		0.78	
1687	EN60247	11.78		0.12	
1702	IEC60247	7.22		-0.96	
1743	IEC60247	13.23		0.46	
1772		-----		-----	
1801		-----		-----	
1831	IEC60247	13.0	C	0.41	first reported: -13.0 + 12.4
1885	IEC60247	10.9		-0.09	
1888		-----		-----	
1890	IEC60247	9.09		-0.52	
1891	IEC60247	8.52		-0.65	
1897	IEC60247	8.32		-0.70	
1898		2.24	C,R(0.01)	-2.14	first reported: 0.00224 GΩm
1923	EN60247	14.4		0.74	
1924		-----		-----	
1925	EN60247	12.1		0.19	
1943	EN60247	11.70		0.10	
1955	IEC60247	11.025		-0.06	
2122		-----		-----	

normality	OK
n	32
outliers	2
mean (n)	11.28
st.dev. (n)	1.979
R(calc.)	5.54
R(EN60247:04)	11.84

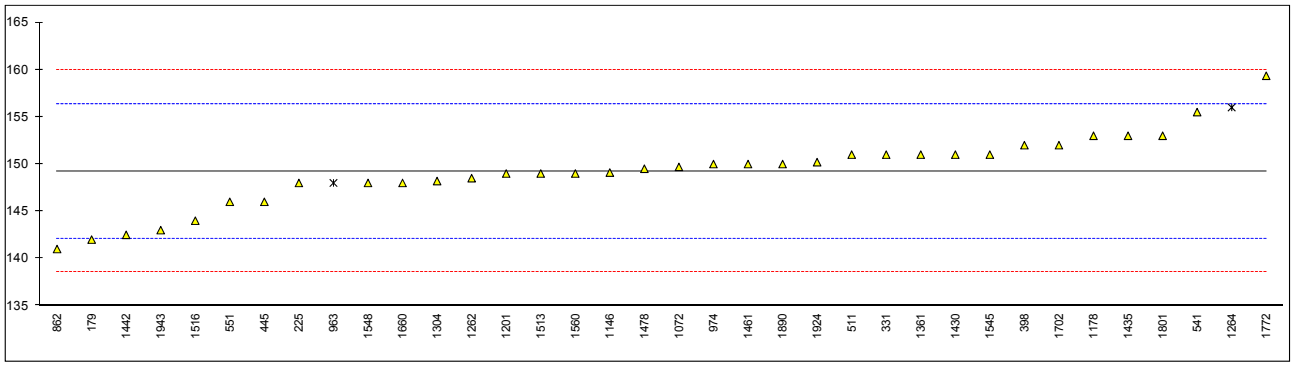

30
25
20
15
10
5
0
1898
1702
862
1897
1891
1890
1262
1178
1352
1304
1548
1374
1885
1955
963
1458
1156
1943
1687
1442
1361
1560
1072
1925
1478
1435
1831
1743
1264
1516
1923
1660
445
1367

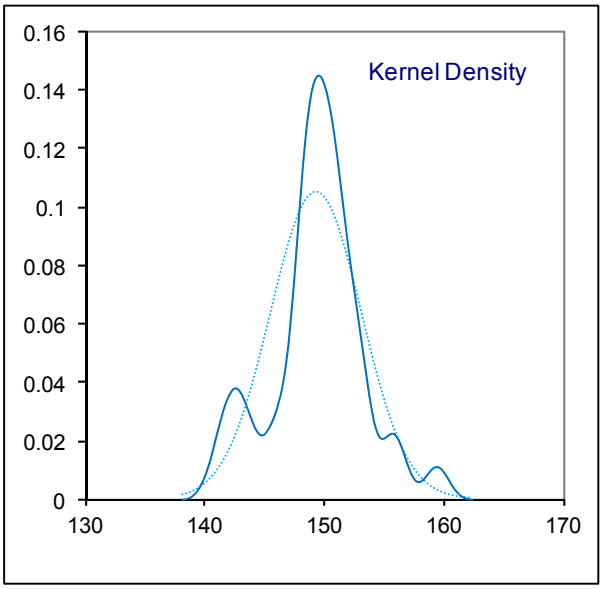

Kernel Density
0.25
0.2
0.15
0.1
0.05
0
-10
0
10
20
30

Determination of Flash Point PMcc on sample #14223; results in °C

lab	method	value	mark	z(targ)	remarks
179	D93	142.0		-2.02	
225	D93	148.0		-0.34	
331	D93	151.0		0.50	
398	ISO2719	152.0		0.78	
445	D93	146.0		-0.90	
511	D93	151.0		0.50	
541	ISO2719	155.5		1.76	
551	D93	146.0		-0.90	
614		-----		-----	
862	D93	141.0		-2.30	
963	D92	148	ex	-0.34	result excluded, method is not equivalent to Flash Point PMcc
974	D93	150.0		0.22	
994		-----		-----	
1056		-----		-----	
1072	ISO2719	149.7		0.13	
1137		-----		-----	
1146	in house	149.1		-0.03	
1156		-----		-----	
1178	ISO2719	153.0		1.06	
1201	ISO2719	149.0		-0.06	
1262	ISO2719	148.5		-0.20	
1264	D92	156	ex	1.90	result excluded, method is not equivalent to Flash Point PMcc
1303		-----		-----	
1304	IP34	148.2		-0.29	
1352		-----		-----	
1361	ISO2719	151.0		0.50	
1367		-----		-----	
1374		-----		-----	
1417		-----		-----	
1430	ISO2719	151		0.50	
1435	D93	153		1.06	
1440		-----		-----	
1442	ISO2719	142.5		-1.88	
1458		-----		-----	
1461	ISO2719	150		0.22	
1475		-----		-----	
1478	ISO2719	149.5		0.08	
1513	ISO2719	149.0		-0.06	
1516	ISO2719	144		-1.46	
1545	ISO2719	151		0.50	
1548	ISO2719	148		-0.34	
1560	ISO2719	149		-0.06	
1568		-----		-----	
1626		-----		-----	
1660	ISO2719	148.0		-0.34	
1687		-----		-----	
1702	ISO2719	152.0		0.78	
1743		-----		-----	
1772	ISO2719	159.35		2.84	
1801	ISO2719	153.0		1.06	
1831		-----		-----	
1885		-----		-----	
1888		-----		-----	
1890	ISO2719	150		0.22	
1891		-----		-----	
1897		-----		-----	
1898		-----		-----	
1923		-----		-----	
1924	ISO2719	150.2		0.27	
1925		-----		-----	
1943	ISO2719	143		-1.74	
1955		-----		-----	
2122		-----		-----	

normality	OK
n	34
outliers	0 + 2 excl.
mean (n)	149.22
st.dev. (n)	3.802
R(calc.)	10.65
R(ISO2719:02-A)	10.00

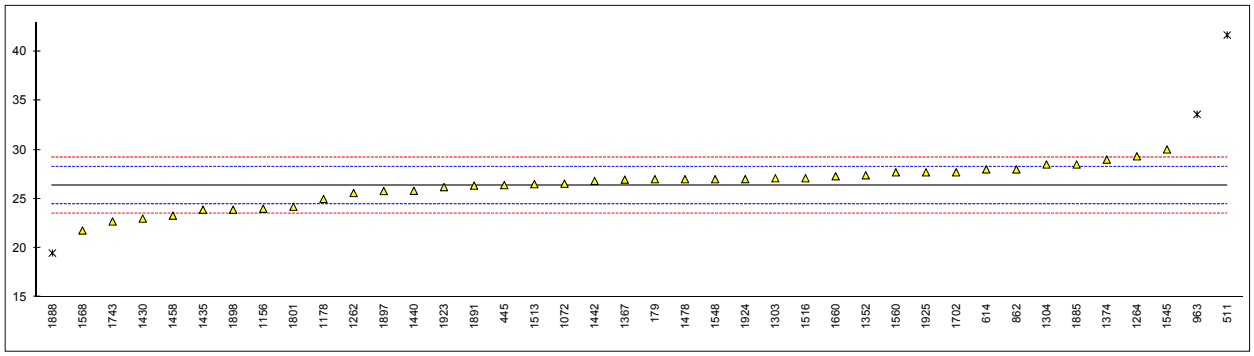

165
160
155
150
145
140
135
862
179
1442
1943
1516
551
445
225
963
1548
1660
1304
1262
1201
1513
1560
1146
1478
1072
974
1461
1890
1924
511
331
1361
1430
1545
398
1702
1178
1435
1801
541
1264
1772

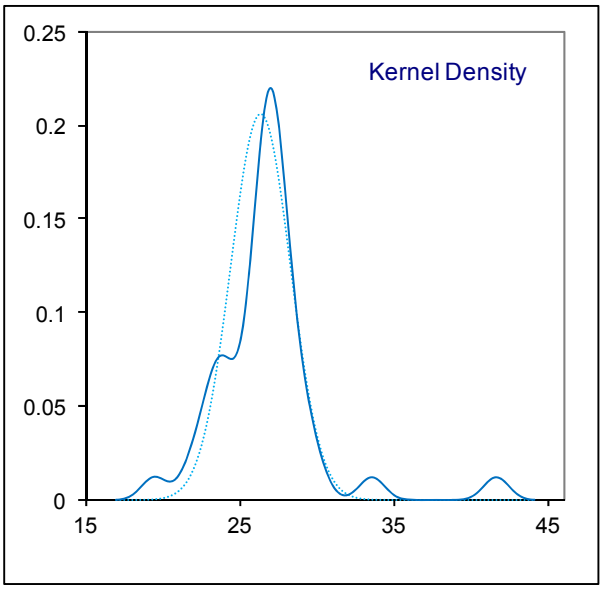

Kernel Density
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
130
140
150
160
170

Determination of Interfacial Surface Tension on sample #14223; results in mN/m

lab	method	value	mark	z(targ)	remarks
179	D971	27		0.66	
225		-----		-----	
331		-----		-----	
398		-----		-----	
445	D971	26.4		0.02	
511	D971	41.67	C,R(0.01)	16.22	first reported:68.01
541		-----		-----	
551		-----		-----	
614	ISO6295	28		1.72	
862	ISO6295	28.0		1.72	
963	D971	33.6	R(0.01)	7.66	
974		-----		-----	
994		-----		-----	
1056		-----		-----	
1072	ISO6295	26.55		0.18	
1137		-----		-----	
1146		-----		-----	
1156	EN14210	24.0		-2.53	
1178	D971	24.99		-1.48	
1201		-----		-----	
1262	D971	25.6		-0.83	
1264	D971	29.33		3.13	
1303	D971	27.1		0.76	
1304	INH-123	28.5		2.25	
1352	D971	27.4		1.08	
1361		-----		-----	
1367	ISO6295	26.96		0.61	
1374	D2285	29		2.78	
1417		-----		-----	
1430	ISO6295	23		-3.59	
1435	D971	23.9		-2.63	
1440	ISO6295	25.82		-0.60	
1442	EN14210	26.83		0.47	
1458	D971	23.3		-3.27	
1461		-----		-----	
1475		-----		-----	
1478	D971	27		0.66	
1513	D971	26.5		0.12	
1516	D971	27.1		0.76	
1545	D971	30.03	C	3.87	first reported:33.33
1548	D971	27		0.66	
1560	D971	27.7		1.40	
1568	D2285	21.7823		-4.88	
1626		-----		-----	
1660	ISO6295	27.3		0.97	
1687		-----		-----	
1702	D971	27.704		1.40	
1743	ISO6295	22.7	C	-3.91	first reported:19.5
1772		-----		-----	
1801	ISO6295	24.2		-2.32	
1831		-----		-----	
1885	D971	28.5		2.25	
1888	ISO6295	19.49	R(0.01)	-7.32	
1890		-----		-----	
1891	D971	26.35		-0.03	
1897	D971	25.8		-0.62	
1898		23.9		-2.63	
1923	ISO6295	26.2		-0.19	
1924	D971	27.01		0.67	
1925	ISO6295	27.7		1.40	
1943		-----		-----	
1955		-----		-----	
2122		-----		-----	

	normality	OK	
	n	37	
	outliers	3	
	mean (n)	26.383	
	st.dev. (n)	1.9362	
	R(calc.)	5.421	
	R(D971:12)	2.638	Compare R(ISO6295:83) = 2.638

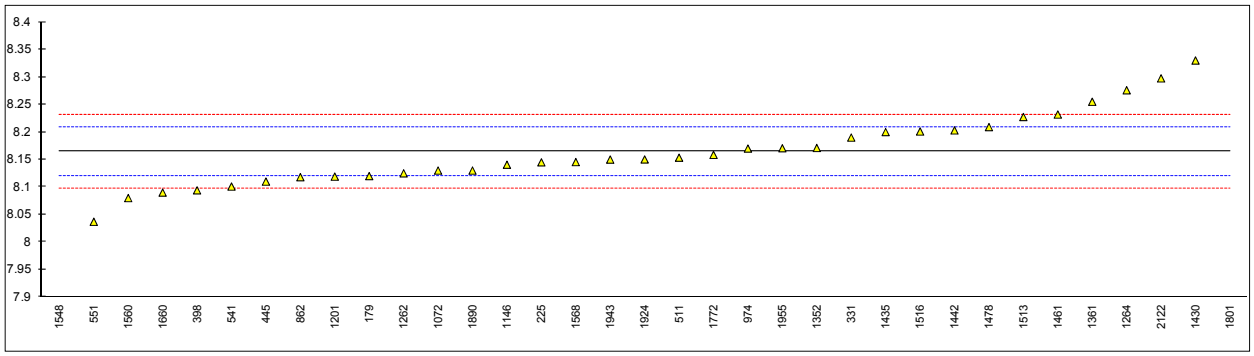

40
35
30
25
20
15
1888
1568
1743
1430
1458
1435
1898
1156
1801
1178
1262
1897
1440
1923
1891
445
1513
1072
1442
1367
179
1478
1548
1924
1303
1516
1660
1352
1560
1925
1702
614
862
1304
1885
1374
1264
1545
963
511

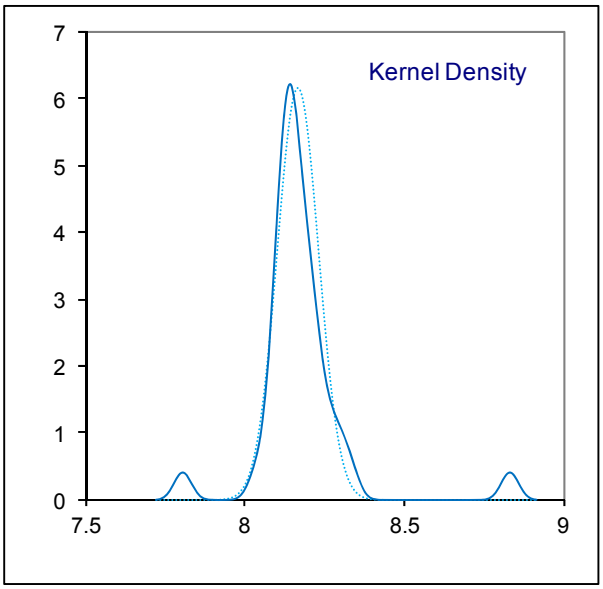

Kernel Density
0.25
0.2
0.15
0.1
0.05
0
15
25
35
45

Determination of Kinematic Viscosity @ 40°C on sample #14223; results in mm²/s

lab	method	value	mark	z(targ)	remarks
179	D445	8.12		-2.01	
225	D445	8.145		-0.88	
331	D7279	8.19		1.15	
398	ISO3104	8.0941		-3.18	
445	D445	8.110		-2.46	
511	D445	8.1534		-0.50	
541	ISO3104	8.101		-2.87	
551	D7279	8.037		-5.75	
614		-----		-----	
862	ISO3104	8.118		-2.10	
963		-----		-----	
974	D445	8.170	C	0.25	first reported:7.826
994		-----		-----	
1056		-----		-----	
1072	ISO3104	8.13		-1.56	
1137		-----		-----	
1146	ISO3104	8.1406		-1.08	
1156		-----		-----	
1178		-----		-----	
1201	ISO3104	8.119		-2.05	
1262	ISO3104	8.1250		-1.78	
1264	D7042	8.2759		5.03	
1303		-----		-----	
1304		-----		-----	
1352	ISO3104	8.1710		0.29	
1361	ISO3104	8.2550		4.08	
1367		-----		-----	
1374		-----		-----	
1417		-----		-----	
1430	ISO3104	8.33		7.47	
1435	D7042	8.2		1.60	
1440		-----		-----	
1442	D7042	8.203		1.74	
1458		-----		-----	
1461	ISO3104	8.2318		3.04	
1475		-----		-----	
1478	ISO3104	8.209		2.01	
1513	ISO3104	8.22736		2.84	
1516	ISO3104	8.201		1.65	
1545		-----		-----	
1548	ISO3104	7.803	R(0.01)	-16.31	
1560	ISO3104	8.08		-3.81	
1568	D445	8.1454		-0.86	
1626		-----		-----	
1660	ISO3104	8.09		-3.36	
1687		-----		-----	
1702		-----		-----	
1743		-----		-----	
1772	ISO3104	8.15856		-0.27	
1801	ISO3104	8.83	R(0.01)	30.03	
1831		-----		-----	
1885		-----		-----	
1888		-----		-----	
1890	ISO3104	8.13		-1.56	
1891		-----		-----	
1897		-----		-----	
1898		-----		-----	
1923		-----		-----	
1924	ISO3104	8.15019		-0.65	
1925		-----		-----	
1943	ISO3104	8.15		-0.66	
1955	D7042	8.1706		0.27	
2122	INH-445	8.2975		6.00	

normality	OK
n	33
outliers	2
mean (n)	8.165
st.dev. (n)	0.0647
R(calc.)	0.181
R(ISO3104:96)	0.062

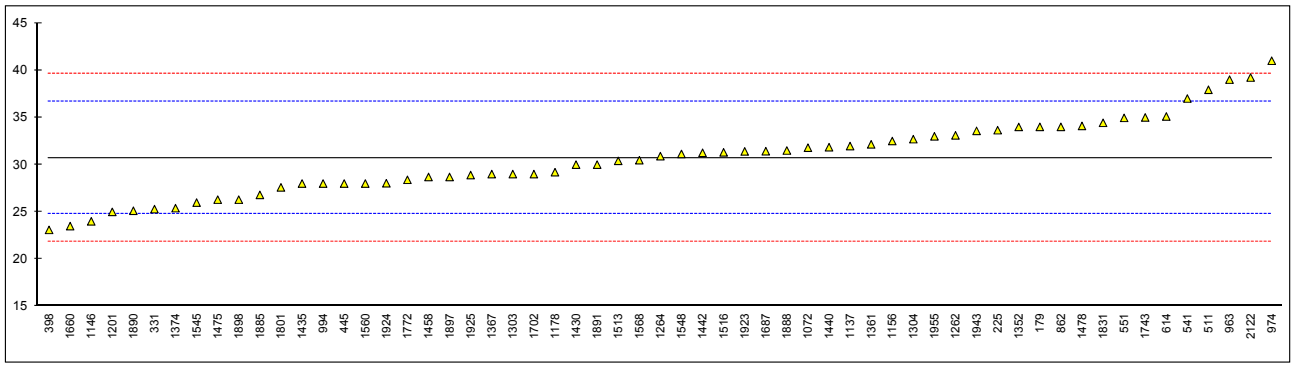

8.4
8.35
8.3
8.25
8.2
8.15
8.1
8.05
8
7.95
7.9
1548 551 1560 1660 398 541 445 862 1201 179 1262 1072 1890 1146 225 1568 1943 1924 511 1772 974 1955 1352 331 1435 1516 1442 1478 1513 1461 1361 1264 2122 1430 1801

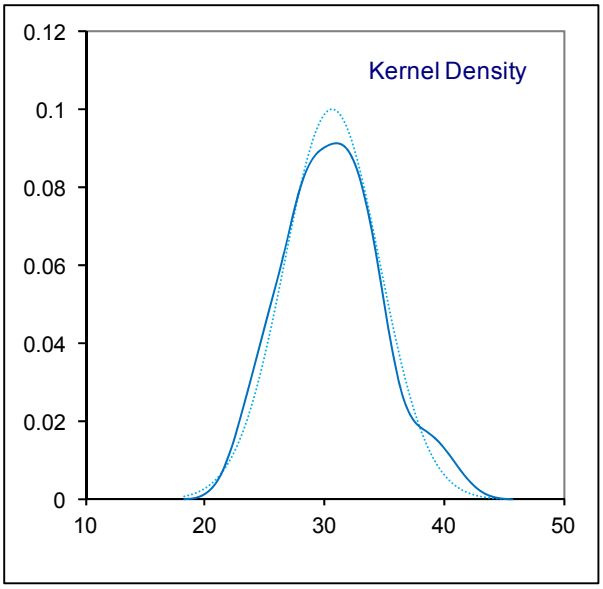

Kernel Density
7
6
5
4
3
2
1
0
7.5
8
8.5
9

Determination of Water on sample #14223; results in mg/kg

lab	method	value	mark	z(targ)	remarks
179	D6304	34		1.11	
225	D6304	33.65		0.99	
331	D6304	25.3		-1.82	
398	EN60814	23.1		-2.56	
445	IEC60814	28.0		-0.91	
511	D1533	37.93		2.44	
541	D6304	37		2.12	
551	EN60814	34.95		1.43	
614	EN60814	35.1		1.48	
862	D6304	34		1.11	
963	D1533	39		2.80	
974	D6304	41	C	3.47	first reported:52
994	D6304	28		-0.91	
1056		-----		-----	
1072	EN60814	31.8		0.37	
1137	ISO10337	31.965		0.43	
1146	D6304	24		-2.26	
1156	EN60814	32.5		0.61	
1178	EN60814	29.2		-0.50	
1201	EN60814	25		-1.92	
1262	EN60814	33.1		0.81	
1264	D1533	30.9		0.07	
1303	IEC60814	29		-0.57	
1304	INH-121	32.7		0.67	
1352	IEC60814	33.99		1.11	
1361	EN60814	32.15		0.49	
1367	EN60814	29		-0.57	
1374	IEC60814	25.4		-1.78	
1417		-----		-----	
1430	EN60814	30		-0.23	
1435	IEC60814	28		-0.91	
1440	EN60814	31.85		0.39	
1442	IEC60814	31.25		0.19	
1458	IEC60814	28.7		-0.67	
1461		-----		-----	
1475	D6304	26.3		-1.48	
1478	EN60814	34.1		1.15	
1513	IEC60814	30.4		-0.10	
1516	IEC60814	31.3		0.20	
1545	IEC60814	25.99		-1.59	
1548	EN60814	31.13		0.15	
1560	IEC60814	28		-0.91	
1568	D1533	30.4708		-0.08	
1626		-----		-----	
1660	EN60814	23.5		-2.42	
1687	EN60814	31.426		0.25	
1702	IEC60814	29.000		-0.57	
1743	IEC60814	35		1.45	
1772	EN60814	28.4		-0.77	
1801	EN60814	27.6		-1.04	
1831	IEC60814	34.43		1.26	
1885	D1533	26.8		-1.31	
1888	EN60814	31.5		0.27	
1890	IEC60814	25.12		-1.88	
1891	IEC60814	30		-0.23	
1897	IEC60814	28.7		-0.67	
1898		26.3		-1.48	
1923	EN60814	31.4		0.24	
1924	EN60814	28.03		-0.90	
1925	EN60814	28.9		-0.61	
1943	EN60814	33.57		0.97	
1955	D6304	33.0		0.78	
2122	EN60814	39.22		2.87	

normality	OK
n	59
outliers	0
mean (n)	30.697
st.dev. (n)	3.990
R(calc.)	11.173
R(EN60814:98)	8.311


45
40
35
30
25
20
15
398 1660 1146 1201 1890 331 1374 1545 1475 1898 1885 1801 1435 994 445 1560 1924 1772 1458 1897 1925 1367 1303 1702 1178 1430 1891 1513 1568 1264 1548 1442 1516 1923 1687 1888 1072 1440 1137 1361 1156 1304 1955 1262 1943 225 1352 179 862 1478 1831 551 1743 614 541 511 963 2122 974

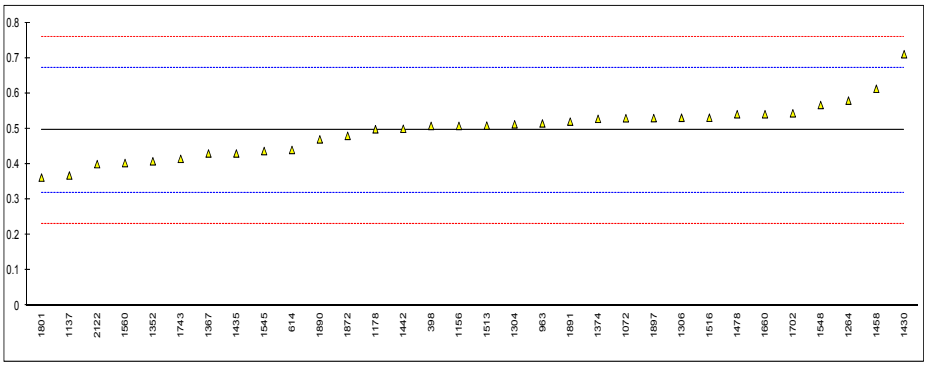

Kernel Density
0.12
0.1
0.08
0.06
0.04
0.02
0
10
20
30
40
50

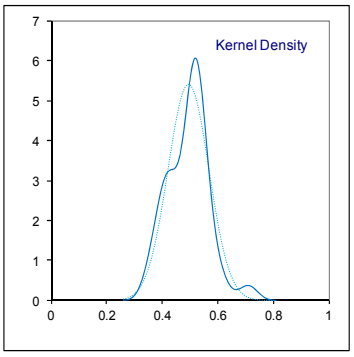
Determination of 2-Furfural on sample #14224; results in mg/kg

lab	method	value	mark	z(targ)	remarks
398	IEC61198	0.508		0.14	
445		-----		-----	
614	IEC61198	0.44		-0.63	
963	D5837	0.515		0.22	
1072	EN61198	0.5296		0.39	
1137	D5837	0.3679		-1.45	
1156	EN61198	0.508		0.14	
1178	EN61198	0.4985		0.03	
1264	D5837	0.57935	C	0.95	first reported:579.35
1304	INH-126	0.5124		0.19	
1306	IEC61198	0.531067		0.40	
1352	IEC61198	0.4080		-0.99	
1367	IEC61198	0.43		-0.74	
1374	D5837	0.528		0.37	
1417		-----		-----	
1430	EN61198	0.7106		2.44	
1435	IEC61198	0.430		-0.74	
1440	EN61198	<0.02		<-5.40	false negative test result?
1442	IEC61198	0.500		0.05	
1458	IEC61198	0.613		1.33	
1478	IEC61198	0.541		0.52	
1513	IEC61198	0.5089		0.15	
1516	IEC61198	0.53123		0.40	
1545	IEC61198	0.4370		-0.66	
1548	IEC61198	0.567		0.81	
1560	IEC61198	0.403		-1.05	
1660	IEC61198	0.541		0.52	
1702	IEC61198	0.5435		0.54	
1743	IEC61198	0.415		-0.91	
1801	IEC61198	0.362		-1.52	
1872	EN61198	0.48		-0.18	
1890	IEC61198	0.47		-0.29	
1891	IEC61198	0.520		0.28	
1897	IEC61198	0.530		0.39	
2122	INH-61198	0.40		-1.08	

normality	suspect
n	32
outliers	0
mean (n)	0.4956
st.dev. (n)	0.07368
R(calc.)	0.2063
R(Horwitz)	0.2468

Compare R(IEC61198:94) = 0.0734



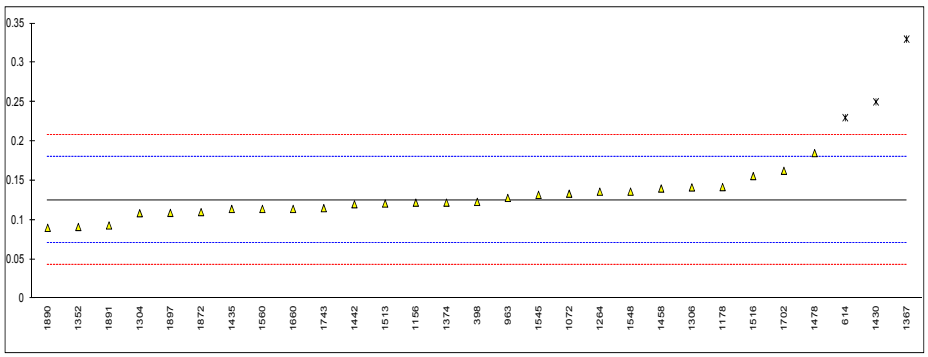


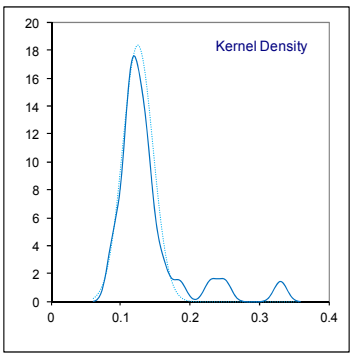
Determination of 2-Furfurylalcohol on sample #14224; results in mg/kg

lab	method	value	mark	z(targ)	remarks
398	IEC61198	0.123		-0.08	
445		-----		-----	
614	IEC61198	0.23	R(0.01)	3.82	
963	D5837	0.128		0.10	
1072	EN61198	0.1334		0.29	
1137		-----		-----	
1156	EN61198	0.122		-0.12	
1178	EN61198	0.1418		0.60	
1264	D5837	0.13599	C	0.39	first reported:135.99
1304	INH-126	0.1086		-0.61	
1306	IEC61198	0.14142		0.59	
1352	IEC61198	0.0911		-1.25	
1367	IEC61198	0.33	R(0.01)	7.47	
1374	D5837	0.122		-0.12	
1417		-----		-----	
1430	EN61198	0.2502	R(0.01)	4.56	
1435	IEC61198	0.114		-0.41	
1440	EN61198	<0.02		<-3.84	false negative test result?
1442	IEC61198	0.12		-0.19	
1458	IEC61198	0.140		0.54	
1478	IEC61198	0.185		2.18	
1513	IEC61198	0.1209		-0.16	
1516	IEC61198	0.15583		1.11	
1545	IEC61198	0.1319		0.24	
1548	IEC61198	0.136		0.39	
1560	IEC61198	0.114		-0.41	
1660	IEC61198	0.114		-0.41	
1702	IEC61198	0.1625		1.36	
1743	IEC61198	0.115		-0.38	
1801	IEC61198	<0.06		<-2.38	false negative test result?
1872	EN61198	0.11		-0.56	
1890	IEC61198	0.09		-1.29	
1891	IEC61198	0.093		-1.18	
1897	IEC61198	0.109		-0.60	
2122		-----		-----	

normality	suspect
n	26
outliers	3
mean (n)	0.1253
st.dev. (n)	0.02170
R(calc.)	0.0608
R(Horwitz)	0.0767

Compare R(IEC61198:94) = 0.0188



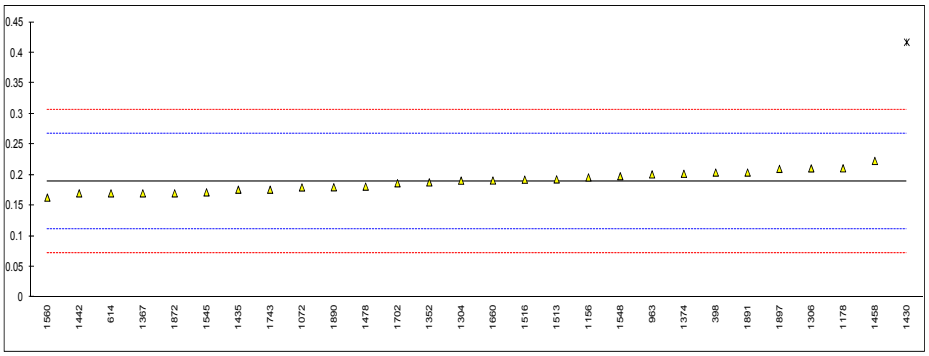


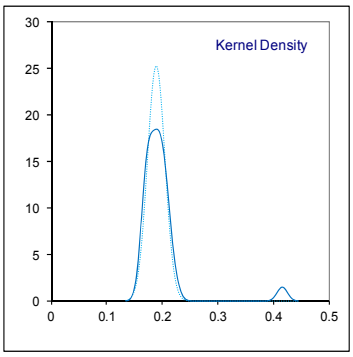
Determination of 5-Methyl-2-furfural on sample #14224; results in mg/kg

lab	method	value	mark	z(targ)	remarks
398	IEC61198	0.204		0.38	
445		-----		-----	
614	IEC61198	0.17		-0.49	
963	D5837	0.201		0.30	
1072	EN61198	0.1797		-0.24	
1137		-----		-----	
1156	EN61198	0.196		0.17	
1178	EN61198	0.2110		0.56	
1264	D5837	<0.01	C	<-4.60	first reported:<10 ppb, false negative test result?
1304	INH-126	0.1908		0.04	
1306	IEC61198	0.210810		0.56	
1352	IEC61198	0.1879		-0.03	
1367	IEC61198	0.17		-0.49	
1374	D5837	0.202		0.33	
1417		-----		-----	
1430	EN61198	0.4171	R(0.01)	5.86	
1435	IEC61198	0.176		-0.34	
1440	EN61198	<0.02		<-4.35	false negative test result?
1442	IEC61198	0.17		-0.49	
1458	IEC61198	0.223		0.87	
1478	IEC61198	0.181		-0.21	
1513	IEC61198	0.1928		0.09	
1516	IEC61198	0.19233		0.08	
1545	IEC61198	0.1716		-0.45	
1548	IEC61198	0.198		0.23	
1560	IEC61198	0.163		-0.67	
1660	IEC61198	0.191		0.05	
1702	IEC61198	0.1865		-0.07	
1743	IEC61198	0.176		-0.34	
1801	IEC61198	<0.05		<-3.58	false negative test result?
1872	EN61198	0.17		-0.49	
1890	IEC61198	0.18		-0.24	
1891	IEC61198	0.204		0.38	
1897	IEC61198	0.210		0.53	
2122		-----		-----	

	normality	OK
	n	27
	outliers	1
	mean (n)	0.1892
	st.dev. (n)	0.01579
	R(calc.)	0.0442
	R(Horwitz)	0.1089

Compare R(IEC61198:94) = 0.0284





Determination of other Furanic compounds on sample #14224; results in mg/kg

lab	method	2-af	mark	z(targ)	5-hm-2-f	mark	z(targ)	remarks
398	IEC61198	<0.01		-----	<0.01		-----	
445		-----		-----	-----		-----	
614	IEC61198	<0.01		-----	<0.01		-----	
963	D5837	<0.01		-----	<0.01		-----	
1072	EN61198	<0.01		-----	<0.01		-----	
1137		-----		-----	-----		-----	
1156	EN61198	0.000		-----	<0.01		-----	
1178	EN61198	0.0008		-----	0.0008		-----	
1264	D5837	0.2727	C,DG(0.01)	-----	<0.01	C	-----	
1304		-----		-----	-----		-----	
1306	IEC61198	<0.03		-----	<0.03		-----	
1352	IEC61198	n.d.		-----	n.d.		-----	
1367	IEC61198	0.01		-----	0.11	DG(0.01)	-----	
1374	D5837	<0.01		-----	<0.01		-----	
1417		-----		-----	-----		-----	
1430	EN61198	0		-----	0.0074		-----	
1435	IEC61198	0.000		-----	0.000		-----	
1440	EN61198	<0.02		-----	<0.02		-----	
1442	IEC61198	<0.05		-----	<0.05		-----	
1458	IEC61198	<0.01		-----	<0.01		-----	
1478	IEC61198	<0.01		-----	<0.01		-----	
1513	IEC61198	<0.05		-----	<0.05		-----	
1516	IEC61198	<0.05		-----	<0.05		-----	
1545	IEC61198	0.0000		-----	0.0070		-----	
1548	IEC61198	0		-----	0		-----	
1560	IEC61198	n.d.		-----	n.d.		-----	
1660	IEC61198	0.009		-----	<0.05		-----	
1702	IEC61198	n.d.		-----	n.d.		-----	
1743	IEC61198	<0.05		-----	0.006		-----	
1801	IEC61198	0.252	DG(0.01)	-----	<0.02		-----	
1872		-----		-----	0.09	C,DG(0.01)	-----	
1890	IEC61198	0		-----	0		-----	
1891	IEC61198	<0.01		-----	<0.01		-----	
1897	IEC61198	<0.01		-----	<0.01		-----	
2122		-----		-----	-----		-----	
	normality	n.a.			n.a.			
	n	23			25			
	outliers	2			2			
	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.			

* First reported results lab 1264 for 2-af: 272.70 and for 5-hm-2-f: <10 ppb
* First reported results lab 1872 for 5-hm-2-f: 0.11

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

APPENDIX 2

Number of participants per country

1 lab in	ARGENTINA
8 labs in	AUSTRALIA
1 lab in	AZERBAIJAN
2 labs in	BELGIUM
1 lab in	BRAZIL
7 labs in	BULGARIA
1 lab in	CHINA, People's Republic
1 lab in	COTE D'IVOIRE
1 lab in	CROATIA
3 labs in	FRANCE
2 labs in	GERMANY
1 lab in	ISRAEL
2 labs in	ITALY
2 labs in	MALAYSIA
1 lab in	MOROCCO
2 labs in	NETHERLANDS
1 lab in	NORWAY
1 lab in	PERU
1 lab in	POLAND
2 labs in	PORTUGAL
1 lab in	SAUDI ARABIA
1 lab in	SERBIA
2 labs in	SINGAPORE
1 lab in	SLOVENIA
1 lab in	SOUTH AFRIKA
1 lab in	SOUTH KOREA
4 labs in	SPAIN
1 lab in	SWEDEN
1 lab in	TURKEY
3 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
R(0.01)	= outlier in Rosner outlier test
R(0.05)	= straggler in Rosner 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:

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