Results of Proficiency Test
Unused Lubricating Oil
May 2012

Organised by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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Report no.: iis12L01 unused

July 2012

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1 INTRODUCTION

Since 1997, the Institute for Interlaboratory Studies organises every year a proficiency test for Lubricating Oil. In the annual proficiency testing program 2011/2012, it was decided to continue the proficiency test for the analyses of unused Lubricating Oil. In this interlaboratory study, 92 laboratories in 50 different countries have participated. See appendix 3 for the number of participants per country. In this report, the results of the Lubricating Oil (unused oil) proficiency test are presented and discussed.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, The Netherlands, was the organizer of this proficiency test. It was decided to send one bottle of 1L (labelled #12062) of unused Lubricating Oil that was purchased from a local supplier. The analyses for fit-for-use and homogeneity were subcontracted. 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 and ILAC-G13:2007, (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. Also customer’s satisfaction is measured on a regular basis by sending questionnaires.

2.2 PROTOCOL

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organization, Statistics and Evaluation' of January 2010 (iis-protocol, version 3.2), which can be downloaded from 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 was obtained from a local supplier. The 200 litre bulk material (Engine Oil 15W-40) was transferred after homogenizing into 126 brown glass bottles of 1 litre (labelled #12062). The homogeneity of the subsamples #12062 was checked by determination of Density @15°C in accordance with ASTM D4052:11 and Kinematic Viscosity @ 40ºC in accordance with ASTM D445:11a on 8 stratified randomly selected samples.

	Density @ 15 °C in kg/L	Viscosity @40°C in mm^2/s
Sample #12062-1	0.87779	106.4
Sample #12062-2	0.87779	106.3
Sample #12062-3	0.87779	106.3
Sample #12062-4	0.87779	106.3
Sample #12062-5	0.87779	106.3
Sample #12062-6	0.87779	106.3
Sample #12062-7	0.87779	106.3
Sample #12062-8	0.87779	106.3

Table 1: homogeneity test results of subsamples #12062

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

	Density @ 15 °C in kg/L	Viscosity @40°C in mm^2/s
r (sample #12062)	0.00000	0.10
reference test	ASTM D4052:11	ASTM D445:11a
0.3 x R(reference test)	0.00015	0.24

Table 2: evaluation of the repeatabilities of the subsamples #12062

The calculated repeatabilities are all less than 0.3 times the corresponding reproducibilities of the reference methods. Therefore, homogeneity of the subsamples #12062 was assumed.

To each of the participating laboratories, 1 sample of 1 L in a brown glass bottle (labelled #12062) was sent on April 25, 2012.

2.5 ANALYSES

The participants were requested to determine on sample #12062: Acid Number (Total), Base Number (Total), Color ASTM, Conradson Carbon Residue, Ramsbottom Carbon Residue, Density @ 15°C, Flash Point PMcc, Flash Point COC, Kinematic Viscosity @ 40°C and @ 100°C, Viscosity Stabinger @ 40°C and @100ºC, Nitrogen, Pour Point (manual, automated), Sulphated Ash, Sulphur, Water, Calcium, Phosphorus and Zinc.
To get comparable results a detailed report form, on which the units were prescribed as well as some of the required standards, was sent together with each set of samples. Also, a letter of instructions and a SDS were added to the 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 the appendix of this report. The laboratories are presented by their code numbers.

Directly after the deadline, a reminder fax was sent to those 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’ (iis-protocol, version 3.2) of January 2010. 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 visualize the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for one 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 "x". Accepted data are represented as a triangle. Furthermore, Kernel Density Graphs were made. The Kernel Density is a method for producing a smooth density approximation to a set of data that avoids some problems associated with histograms (see appendix 4; nos.12 and 13).

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 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 the fit-for-useness of the reported test result.
The z-scores were calculated according to:

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

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 is 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 interlaboratory study, some problems were encountered with the dispatch of the samples to laboratories in Ecuador, India, Saudi Arabia and Turkey. Eighteen participants reported after the final reporting date and five participants did not report any test results at all. Not all laboratories were able to report all analyses requested. In total 88 participants reported 949 test results. Observed were 41 outlying results, which is 4.3% of the numerical results. In proficiency studies, outlier percentages of 3% - 7.5% are quite normal.

Not all original data sets proved to have a normal distribution. Non-Gaussian distributions were found for the following determinations: Acid Number, Color, Density @ 15°C, Flash Point PMcc, Flash Point COC and Pour Point (manual and automated). In these cases the statistical evaluation should be used with due care.

4.1 EVALUATION PER TEST

In this section, the results are discussed per test. The methods, which are used by the various laboratories, are taken into account for explaining the observed differences when possible and applicable. These methods are also in the tables together with the original data. The abbreviations, used in these tables, are listed in appendix 3.

Acid Number (total): This determination was problematic for a large number of laboratories. Seven statistical outliers were observed. Another eight test results were excluded from the statistical evaluation, as the reported test method is not equivalent with ASTM D664 or the laboratory did not follow ASTM D664 correctly (see appendix 2). The calculated reproducibility after rejection of the suspect data is in full agreement with the requirements ofASTM D664:11a.

Base Number (total): This determination was problematic. Five statistical outliers were observed. Three test results were excluded from the statistical evaluation, as the reported test method is not equivalent with ASTM D2896. The calculated reproducibility after rejection of the suspected data is not in agreement with the requirements of ASTM D2896:11.

Color: This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in good agreement with ASTM D1500:07.

Conradson CR: This determination was problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirements of ASTM D189:10.

Ramsbottom CR: This determination was problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirements of ASTM D524:10.

Density @ 15°C: This determination was problematic. Four statistical outliers were observed and the calculated reproducibility, after rejection of the statistical outliers, is not in agreement with the requirements of ASTM D4052:11. The large spread may be explained by not correcting the test result for viscosity. (see density tables)

Flash Point PMcc: This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in good agreement with the requirements of ASTM D93:11 procedure A.

Flash Point COC: This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in full agreement with ASTM D92:12.

Kin.Visco.@ 40°C: This determination was problematic. Two statistical outliers were observed and the calculated reproducibility after rejection of the statistical outliers is not in agreement with the strict requirements of ASTM D445:12. The large spread might be explained by the fact that several laboratories used a Canon Fenske Routine Viscometers instead of Ubbelohde Viscometers.

Kin.Visco.@ 100°C: This determination was very problematic. Three statistical outliers were observed and the calculated reproducibility after rejection of the statistical outliers is not at all in agreement with the strict requirements of ASTM D445:12. The large spread might (party) be explained by the fact that several laboratories may have used a Canon Fenske Routine Viscometer instead of the superiour Ubbelohde Viscometer.

Visco. Stabinger at 40ºC This determination was very problematic. Only one statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is not at all in agreement with ASTM D7042:11.

Visco. Stabinger at 100ºC This determination was very problematic. Only one statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is not at all in agreement with ASTM D7042:11.

Nitrogen: This determination was problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with ASTM D3228:08.

Pour Point (manual): This determination was not problematic. Only one statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in full agreement with ASTM D97:11.

Pour Point (automated): This determination was problematic. No statistical outliers were observed and the calculated reproducibility is not in agreement with ASTM D5950:07.

Sulphated Ash: This determination was problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirements of ASTM D874:07.

Sulphur: This determination was very problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not at all agreement with the requirements of ASTM D2622:10.

When the ASTM D2622 data was evaluated separately, the calculated reproducibility is again not at all in agreement.

Water: This determination was very problematic for the majority of the laboratories. The preferred method to use for a product containing interfering components may be ASTM D6304:07 method C. This method is applicable for oils with difficult matrix interferences only. At least nine laboratories reported results determined according ASTM D6304 method C. These results were low, which suggests that the low average may be more reliable than the higher results, which is in agreement with the low solubility of water in lube oil. After excluding all results, except ASTM D6304-C, the calculated reproducibility is in good agreement with the requirements of ASTM D6304:07.

Calcium: This determination was very problematic. Six statistical outliers were observed and the calculated reproducibility after rejection of the statistical outliers is not at all in agreement with the requirements of ASTM D5185:09.

Phosphorus: This determination was problematic. Two statistical outliers were observed and the calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D5185:09.

Zinc: This determination was problematic. Only one statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D5185:09.

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 that participated. The average results, calculated reproducibilities and reproducibilities derived from literature standards (in casu ASTM and IP standards), are compared in the next table.

Parameter	unit	n	Average	2.8 * sd	R(lit)
Total Acid Number	mg KOH/g	42	2.68	0.56	0.52
Total Base Number	mg KOH/g	46	8.19	0.91	0.57
Color		38	2.7	0.7	1.0
Conradson Carbon Residue	%M/M	42	1.04	0.32	0.24
Ramsbottom Carbon Residue	%M/M	8	0.99	0.20	0.14
Density @ 15 °C	kg/L	75	0.8779	0.0006	0.0005
Flash Point PMcc	^{o}C	70	201.0	8.1	14.3
Flash Point COC	^{o}C	61	227.6	18.9	18.0
Kinematic Viscosity @ 40 °C	mm^2/s	80	105.76	1.06	0.80
Kinematic Viscosity @ 100 °C	mm^2/s	72	14.293	0.200	0.109
Stabinger Viscosity @ 40 °C	mm^2/s	18	105.77	1.60	0.57
Stabinger Viscosity @ 100 °C	mm^2/s	18	14.310	0.167	0.037
Nitrogen	mg/kg	11	809	290	200
Pour Point, manual	^{o}C	45	-31.0	9.8	9.0
Pour Point, automated	^{o}C	20	-34.3	5.2	4.5
Sulphated Ash	%M/M	38	0.82	0.24	0.16
Sulphur	%M/M	40	0.424	0.065	0.035
Water	mg/kg	8	190.1	275.2	393.6
Calcium	mg/kg	43	156.8	46.7	10.7
Phosphorus	mg/kg	43	983	216	135
Zinc	mg/kg	50	1112	233	186

Table 3: reproducibilities of results of sample #12062

Without further statistical calculations it can be concluded that for a number of tests there is a not a good compliance of the group of participants with the relevant standards. The tests that are problematic have been discussed in paragraph 4.1.

4.3 COMPARISON OF THE PROFICIENCY TEST OF MAY 2012 WITH PREVIOUS PT'S

	May 2012	May 2011	May 2010	April 2009
Number of reporting participants	88	78	96	86
Number of results reported	949	804	985	813
Statistical outliers	41	33	52	45
Percentage outliers	4.3%	4.1%	5.3%	5.5%

Table 4: 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 requirements of the respective standards. The conclusions are given the following table:

Determination	May 2012	May 2011	May 2010	April 2009
Total Acid Number	+/-	--	--	--
Total Base Number	--	++	--	--
Color	++	++	++	++
Conradson Carbon Residue	-	++	++	++
Ramsbottom Carbon Residue	-	n.e.	n.e.	n.e.
Density @ 15 °C	-	--	--	--
Flash Point PMcc	++	++	++	+
Flash Point COC	+/-	++	++	++
Kinematic Viscosity @ 40 °C	-	--	--	--
Kinematic Viscosity @ 100 °C	--	--	--	--
Stabinger Viscosity @ 40 °C	--	--	--	--
Stabinger Viscosity @ 100 °C	--	n.e.	n.e.	n.e.
Nitrogen	--	--	--	--
Pour Point, manual	+/-	++	++	-
Pour Point, automated	-	+/-	++	n.e.
Sulphated Ash	--	++	++	+/-
Sulphur	--	--	--	--
Water	++	++	++	--
Calcium	--	+/-	+/-	+
Phosphorus	--	--	--	--
Zinc	-	--	--	+

Table 5: comparison determinations against the standard

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

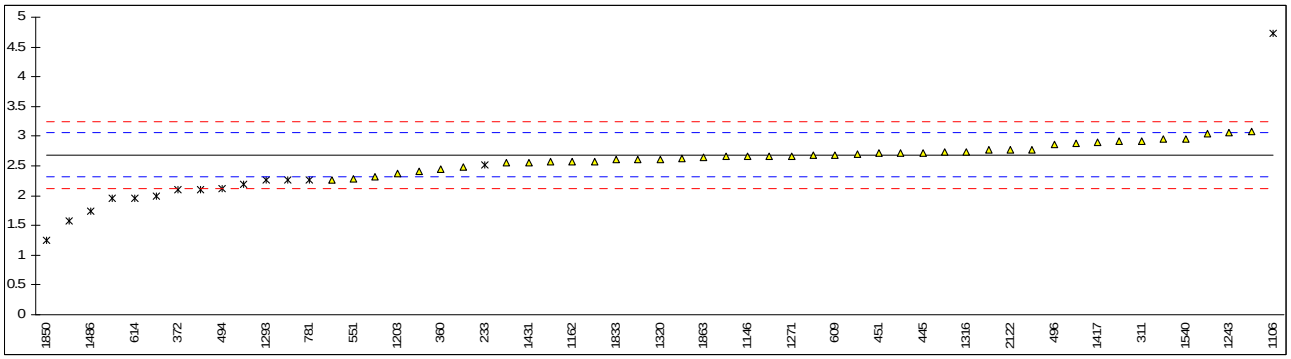
APPENDIX 1

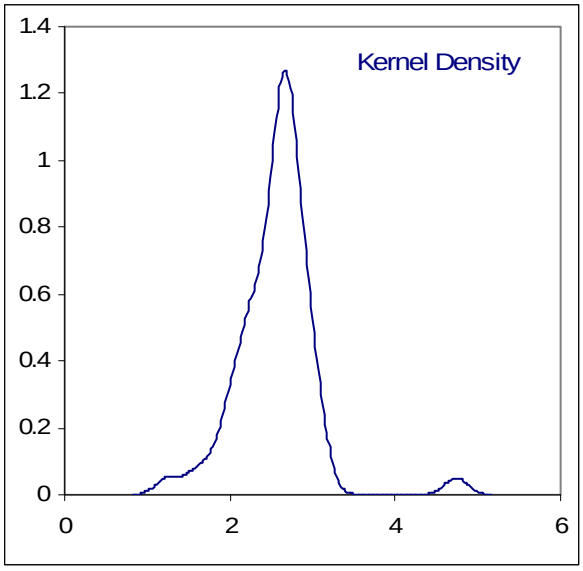
Determination of Acid Number (Total) on sample #12062; results in mg KOH/g

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233	D974	2.51	ex	-0.94	Result excluded as test method is not equivalent
237	D664	2.55		-0.72	
252		-----		-----	
254		-----		-----	
255		-----		-----	
311	D664	2.91		1.22	
315		-----		-----	
325	D664	2.61		-0.40	
333		-----		-----	
337		-----		-----	
340	D664	2.271		-2.23	
343	D664	3.08		2.13	
353	D664	2.323		-1.95	
357		-----		-----	
360	D664	2.442		-1.30	
372	D664	2.1	G(0.05)	-3.15	
396		-----		-----	
432		-----		-----	
445	D664	2.7245		0.22	
446		-----		-----	
450		-----		-----	
451	IP177	2.714		0.16	
473		-----		-----	
494	D664	2.12	ex	-3.04	Result excluded, did not follow the method properly (lab did not use KOH)
496	D664	2.865		0.98	
541	D974	2.00	ex	-3.69	Result excluded as test method is not equivalent
551	D664	2.29		-2.12	
593		-----		-----	
608	D664	2.718		0.18	
609	D664	2.6767		-0.04	
614	D664	1.96	ex	-3.90	Result excluded, did not follow the method properly (method B was used)
657	D664	2.78		0.52	
663		-----		-----	
704	D664	2.566		-0.64	
781	D664	2.27	C,ex	-2.23	First reported 0.0274, Result excluded, did not follow the method properly
840	D664	2.662		-0.12	88 mV<<162 mV
862	D664	2.627		-0.31	
875		-----		-----	
886		-----		-----	
902		-----		-----	
912	D664	2.7		0.09	
913		-----		-----	
963	D974	2.26	ex	-2.29	Result excluded as test method is not equivalent
994		-----		-----	
1013		-----		-----	
1017		-----		-----	
1023	D664	2.73		0.25	
1040		-----		-----	
1059	ISO6619	2.66		-0.13	
1106	D664	4.73725	G(0.01)	11.07	
1146	D664	2.66		-0.13	
1162	D664	2.57		-0.61	
1173		-----		-----	
1203	D664	2.38		-1.64	
1213	D664	2.48		-1.10	
1224		-----		-----	
1243	D664	3.07		2.08	
1262	D974	2.104	ex	-3.13	Result excluded as test method is not equivalent
1271	D664	2.665		-0.10	
1293	ISO12634	2.258	ex	-2.30	Result excluded as test method is not equivalent
1300	D664	2.7712		0.47	
1316	D664	2.74		0.30	
1320	D664	2.61		-0.40	
1349		-----		-----	
1402		-----		-----	
1406	D664	1.95	G(0.05)	-3.96	
1407		-----		-----	
1412		-----		-----	
1417	in house	2.90		1.16	
1431	D664	2.55		-0.72	
1433	D664	2.67292		-0.06	
1448		-----		-----	
1460	D664	1.573	G(0.05)	-5.99	

1463		-----		-----
1486	ISO6619	1.7468	G(0.05)	-5.05
1493	INH-14945	2.20	G(0.05)	-2.61
1526		-----		-----
1540	D664	2.960		1.49
1622	D664	2.9499		1.43
1650	D664	2.58		-0.56
1720	D664	3.04		1.92
1722		-----		-----
1827	D664A	2.879		1.05
1833	D664	2.60		-0.45
1842		-----		-----
1850	ISO6619	1.25	G(0.05)	-7.73
1854	D664	2.41		-1.48
1863	D664	2.65		-0.18
1915		-----		-----
2122	IP177	2.78		0.52
2129	D664	2.91		1.22

		Compare all reported results	Only results that followed D664 completely
normality	OK	not OK	OK
n	42	53	33
outliers	7	4	5
mean (n)	2.684	2.575	2.712
st.dev. (n)	0.2010	0.2891	0.2032
R(calc.)	0.563	0.810	0.569
R(D664:11a)	0.519	0.504	0.523



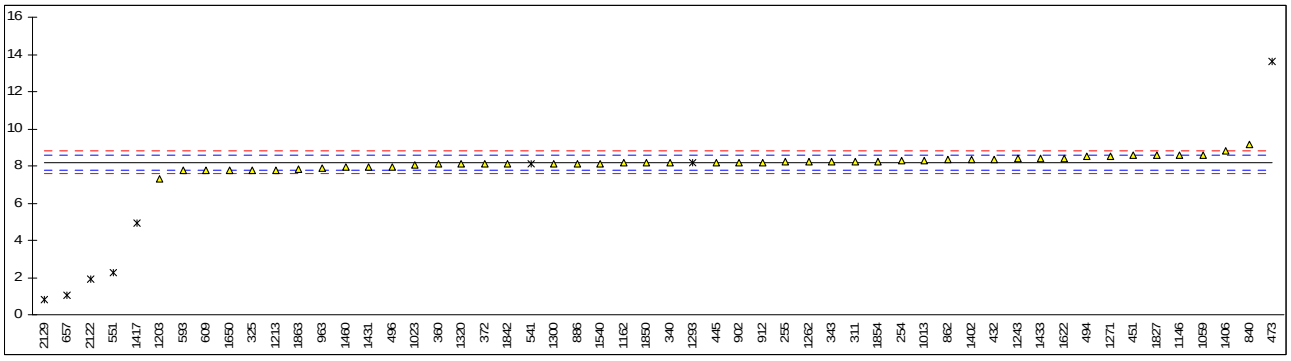


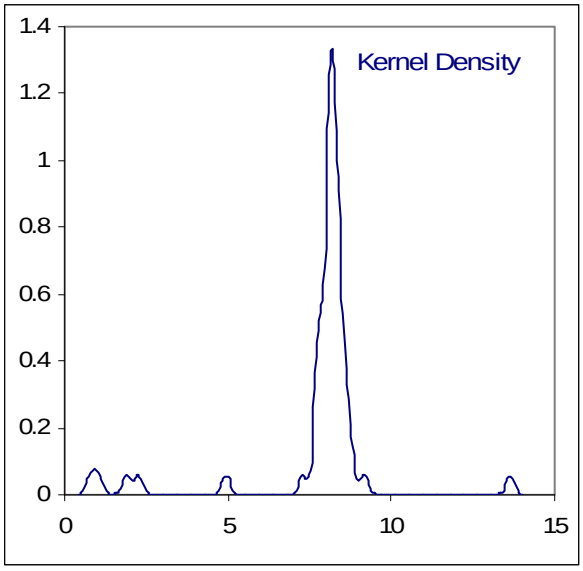
Determination of Base Number (Total) on sample #12062; results in mg KOH/g

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237		-----		-----	
252		-----		-----	
254	D2896	8.28		0.42	
255	D2896	8.22		0.13	
311	D2896	8.24		0.23	
315		-----		-----	
325	D2896	7.77		-2.07	
333		-----		-----	
337		-----		-----	
340	D2896	8.18		-0.06	
343	D2896	8.24		0.23	
353		-----		-----	
357		-----		-----	
360	D2896	8.09		-0.50	
372	D2896	8.1		-0.45	
396		-----		-----	
432	D2896	8.35		0.77	
445	D2896	8.19		-0.01	
446		-----		-----	
450		-----		-----	
451	D2896	8.58		1.89	
473	D2896	13.640	G(0.05)	26.59	
494	D2896	8.52		1.60	
496	D2896	7.95		-1.19	
541	D4739	8.11	ex	-0.41	Result excluded as test method is not equivalent
551	D2896	2.27	G(0.01)	-28.92	
593	D2896	7.7395		-2.21	
608		-----		-----	
609	D2896	7.7467		-2.18	
614		-----		-----	
657	D2896	1.035	G(0.01)	-34.95	
663		-----		-----	
704		-----		-----	
781		-----		-----	
840	D2896	9.18		4.82	
862	D2896	8.324		0.64	
875		-----		-----	
886	D2896	8.14		-0.26	
902	D2896	8.195		0.01	
912	D2896	8.2		0.03	
913		-----		-----	
963	D2896	7.86		-1.63	
994		-----		-----	
1013	D2896	8.3		0.52	
1017		-----		-----	
1023	D2896	8.08		-0.55	
1040		-----		-----	
1059	ISO3771	8.6		1.99	
1106		-----	C	-----	Reported first 4.73725 (= acid number)
1146	D2896	8.6		1.99	
1162	D2896	8.16		-0.16	
1173		-----		-----	
1203	ISO3771	7.3		-4.36	
1213	D2896	7.77		-2.07	
1224		-----		-----	
1243	ISO3771	8.38		0.91	
1262	D2896-A	8.22		0.13	
1271	ISO3771	8.54		1.69	
1293	ISO12634	8.185	ex	-0.04	Result excluded as test method is not equivalent
1300	D2896	8.1185		-0.36	
1316		-----		-----	
1320	D2896	8.10		-0.45	
1349		-----		-----	
1402	D2896	8.33		0.67	
1406	D2896	8.80		2.96	
1407		-----		-----	
1412		-----		-----	
1417	in house	4.95	C,G(0.01)	-15.83	First reported 5.5
1431	D2896	7.94		-1.24	
1433	D2896	8.39830		1.00	
1448		-----		-----	
1460	D2896	7.92		-1.33	

1463		-----		-----	
1486		-----		-----	
1493		-----		-----	
1526		-----		-----	
1540	ISO3771	8.14		-0.26	
1622	D2896	8.4292		1.15	
1650	D2896	7.75		-2.16	
1720		-----		-----	
1722		-----		-----	
1827	D2896B	8.590		1.94	
1833		-----		-----	
1842	IP276	8.1		-0.45	
1850	ISO3771	8.17		-0.11	
1854	D2896	8.25		0.28	
1863	D2896	7.8		-1.92	
1915		-----		-----	
2122	IP400	1.90	ex	-30.72	Result excluded as test method is not equivalent
2129	D2896	0.80	G(0.05)	-36.09	

normality	OK
n	46
outliers	5
mean (n)	8.193
st.dev. (n)	0.3236
R(calc.)	0.906
R(D2896:11)	0.574



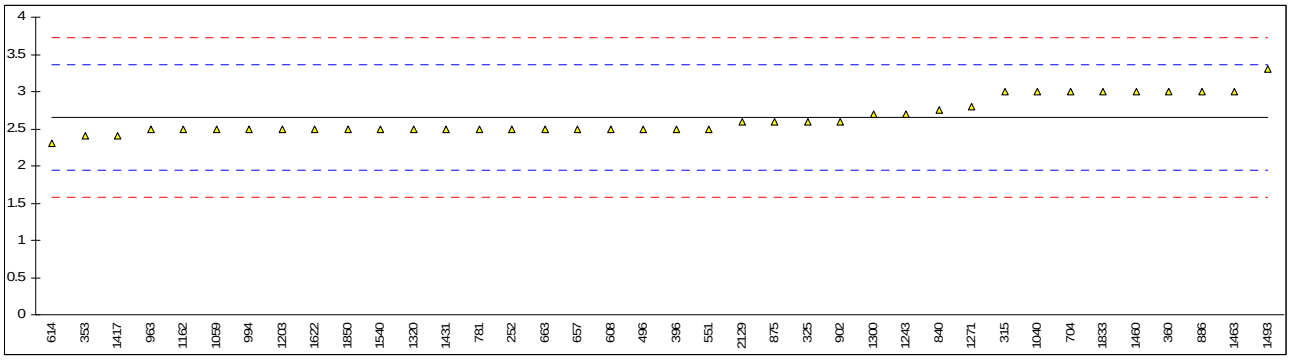


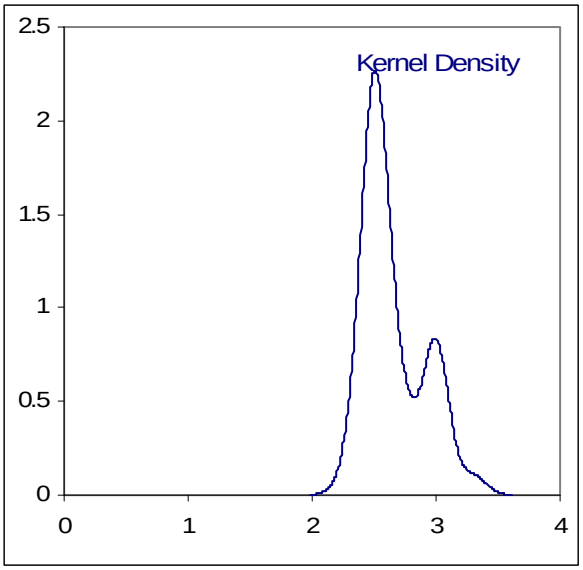
Determination of Color on sample #12062

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237	D1500	L3.0		-----	
252	D1500	2.5		-0.42	
254	D1500	L2.5		-----	
255		-----		-----	
311	D1500	L3.0		-----	
315	D1500	3.0		0.98	
325	D6045	2.6		-0.14	
333		-----		-----	
337	D1500	L3.0		-----	
340	D1500	L3.0		-----	
343	D1500	L2.5		-----	
353	D6045	2.4		-0.70	
357	D1500	L3.0		-----	
360	D1500	3.0		0.98	
372	D1500	L3.0		-----	
396	D1500	2.5		-0.42	
432	D1500	L3.0		-----	
445	D1500	<3.0		-----	
446	D1500	<3.0		-----	
450		-----		-----	
451		-----		-----	
473		-----		-----	
494	D1500	L2.5		-----	
496	D1500	2.5		-0.42	
541		-----		-----	
551	D1500	2.5		-0.42	
593		-----		-----	
608	D1500	2.5		-0.42	
609		-----		-----	
614	D1500	2.3		-0.98	
657	D1500	2.5		-0.42	
663	D1500	2.5		-0.42	
704	D1500	3.0		0.98	
781	D1500	2.5		-0.42	
840	D1500	2.75		0.28	
862	D1500	L3.0		-----	
875	D6045	2.6		-0.14	
886	D1500	3.0		0.98	
902	D1500	2.6		-0.14	
912	D1500	L3.0		-----	
913		-----		-----	
963	D1500	2.5		-0.42	
994	D1500	2.5		-0.42	
1013		-----		-----	
1017		-----		-----	
1023		-----		-----	
1040	D1500	3.0		0.98	
1059	D1500	2.5		-0.42	
1106		-----		-----	
1146		-----		-----	
1162	D1500	2.5		-0.42	
1173		-----		-----	
1203	D1500	2.5		-0.42	
1213	D1500	L3.0		-----	
1224		-----		-----	
1243	ISO2049	2.7		0.14	
1262	D1500	L3.0		-----	
1271	ISO2049	2.8		0.42	
1293		-----		-----	
1300	D1500	2.7		0.14	
1316		-----		-----	
1320	ISO2049	2.5		-0.42	
1349	D1500	L3.0		-----	
1402	D1500	L3.0		-----	
1406		-----		-----	
1407		-----		-----	
1412	D1500	L3.0		-----	
1417	D1500	2.4		-0.70	
1431	D1500	2.5		-0.42	
1433		-----		-----	
1448		-----		-----	
1460	D1500	3.0		0.98	

1463	D1500	3	0.98
1486		-----	-----
1493	D1500	3.3	1.82
1526		-----	-----
1540	ISO2049	2.5	-0.42
1622	D1500	2.5	-0.42
1650		-----	-----
1720		-----	-----
1722		-----	-----
1827		-----	-----
1833	D1500	3.0	0.98
1842		-----	-----
1850	ISO2049	2.5	-0.42
1854	D1500	L2.5	-----
1863	D1500	<3.0	-----
1915		-----	-----
2122		-----	-----
2129	D1500	2.6	-0.14

normality	not OK
n	38
outliers	0
mean (n)	2.65
st.dev. (n)	0.238
R(calc.)	0.67
R(D1500:07)	1.00



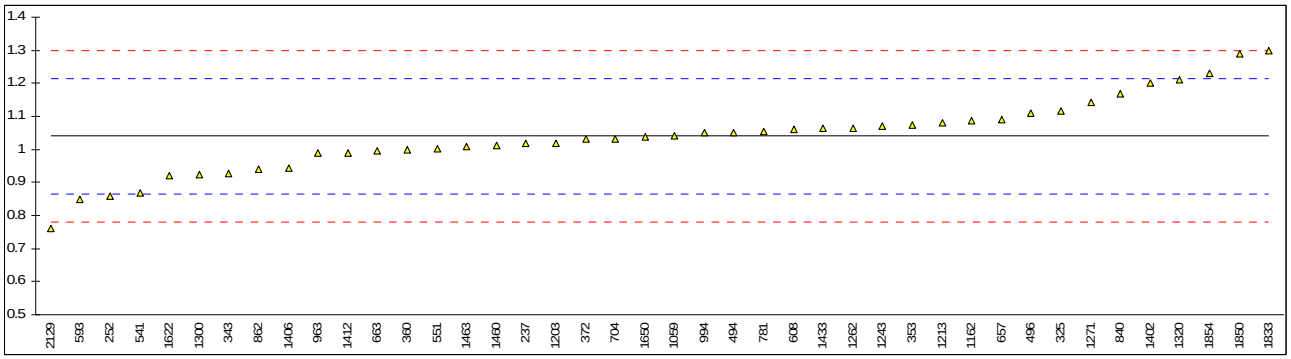


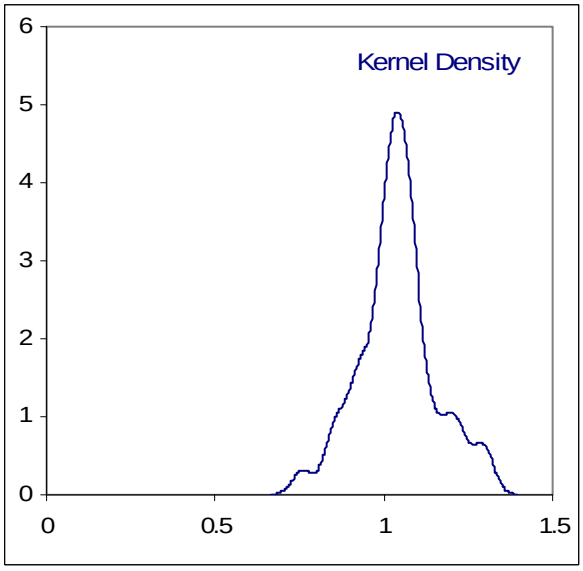
Determination of Conradson Carbon Residue on sample #12062; results in %M/M

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237	D189	1.017		-0.26	
252	D4530	0.858		-2.10	
254		-----		-----	
255		-----		-----	
311		-----		-----	
315		-----		-----	
325	D4530	1.1160		0.88	
333		-----		-----	
337		-----		-----	
340		-----		-----	
343	D4530	0.927		-1.30	
353	IP13	1.0747		0.40	
357		-----		-----	
360	D4530	1.00		-0.46	
372	D189	1.03		-0.11	
396		-----		-----	
432		-----		-----	
445		-----		-----	
446		-----		-----	
450		-----		-----	
451		-----		-----	
473		-----		-----	
494	D4530	1.05		0.12	
496	D4530	1.109		0.80	
541	D189	0.870		-1.96	
551	D189	1.0029		-0.43	
593	D189	0.85		-2.19	
608	D4530	1.06		0.23	
609		-----		-----	
614		-----		-----	
657	D4530	1.09		0.58	
663	D189	0.996		-0.51	
704	D189	1.032		-0.09	
781	D189	1.054		0.16	
840	D189	1.170		1.50	
862	D189	0.939		-1.16	
875		-----		-----	
886		-----		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D189	0.99		-0.58	
994	D189	1.05		0.12	
1013		-----		-----	
1017		-----		-----	
1023		-----		-----	
1040		-----		-----	
1059	D189	1.04		0.00	
1106		-----		-----	
1146		-----		-----	
1162	D189	1.087		0.54	
1173		-----		-----	
1203	ISO10370	1.02		-0.23	
1213	D4530	1.08		0.46	
1224		-----		-----	
1243	DIN51571-1	1.07		0.35	
1262	D189	1.065		0.29	
1271	ISO6615	1.141		1.16	
1293		-----		-----	
1300	D189	0.9226		-1.35	
1316		-----		-----	
1320	D189	1.21		1.96	
1349		-----		-----	
1402	D189	1.20		1.84	
1406	D4530	0.943		-1.12	
1407		-----		-----	
1412	D189	0.99		-0.58	
1417		-----		-----	
1431		-----		-----	
1433	D4530	1.064054		0.28	
1448		-----		-----	
1460	D4530	1.012		-0.32	

1463	D189	1.01	-0.35
1486		-----	-----
1493		-----	-----
1526		-----	-----
1540		-----	-----
1622	D189	0.92	-1.38
1650	D189	1.038	-0.02
1720		-----	-----
1722		-----	-----
1827		-----	-----
1833	D189	1.3	3.00
1842		-----	-----
1850	ISO6615	1.29	2.88
1854	D4530	1.23	2.19
1863		-----	-----
1915		-----	-----
2122		-----	-----
2129	D189	0.760	-3.23

		Only ASTM D189 data:	Only ASTM D4530 data:
normality	OK	OK	OK
n	42	27	14
outliers	0	0	0
mean (n)	1.040	1.039	1.040
st.dev. (n)	0.1125	0.1252	0.0919
R(calc.)	0.315	0.351	0.257
R(D189:10)	0.243	0.243	0.189



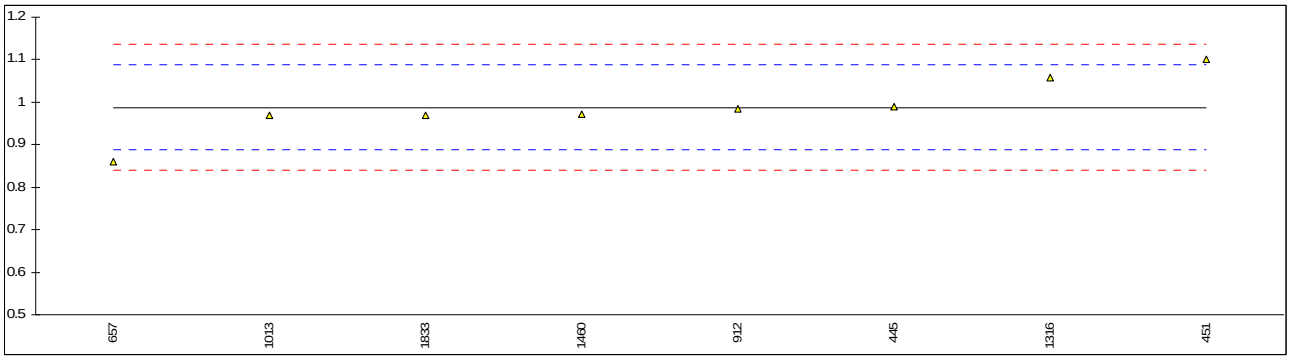


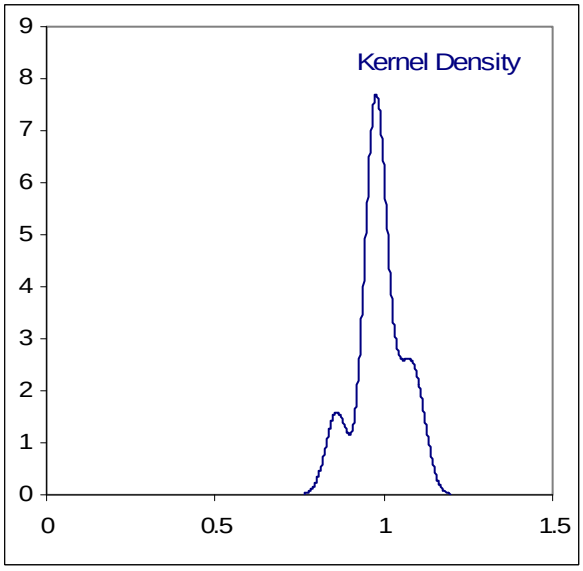
Determination of Ramsbottom Carbon Residue on sample #12062; results in %M/M

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237		-----		-----	
252		-----		-----	
254		-----		-----	
255		-----		-----	
311		-----		-----	
315		-----		-----	
325		-----		-----	
333		-----		-----	
337		-----		-----	
340		-----		-----	
343		-----		-----	
353		-----		-----	
357		-----		-----	
360		-----		-----	
372		-----		-----	
396		-----		-----	
432		-----		-----	
445	D524	0.990		0.04	
446		-----		-----	
450		-----		-----	
451	IP14	1.10	C	2.26	First reported 0.10
473		-----		-----	
494		-----		-----	
496		-----		-----	
541		-----		-----	
551		-----		-----	
593		-----		-----	
608		-----		-----	
609		-----		-----	
614		-----		-----	
657	D524	0.86		-2.58	
663		-----		-----	
704		-----		-----	
781		-----		-----	
840		-----		-----	
862		-----		-----	
875		-----		-----	
886		-----		-----	
902		-----		-----	
912	D524	0.984		-0.08	
913		-----		-----	
963		-----		-----	
994		-----		-----	
1013	D524	0.97		-0.36	
1017		-----		-----	
1023		-----		-----	
1040		-----		-----	
1059		-----		-----	
1106		-----		-----	
1146		-----		-----	
1162		-----		-----	
1173		-----		-----	
1203		-----		-----	
1213		-----		-----	
1224		-----		-----	
1243		-----		-----	
1262		-----		-----	
1271		-----		-----	
1293		-----		-----	
1300		-----		-----	
1316	D524	1.05838		1.42	
1320		-----		-----	
1349		-----		-----	
1402		-----		-----	
1406		-----		-----	
1407		-----		-----	
1412		-----		-----	
1417		-----		-----	
1431		-----		-----	
1433		-----		-----	
1448		-----		-----	
1460	D524	0.972		-0.32	

1463		-----	-----
1486		-----	-----
1493		-----	-----
1526		-----	-----
1540		-----	-----
1622		-----	-----
1650		-----	-----
1720		-----	-----
1722		-----	-----
1827		-----	-----
1833	D524	0.97	-0.36
1842		-----	-----
1850		-----	-----
1854		-----	-----
1863		-----	-----
1915		-----	-----
2122		-----	-----
2129		-----	-----

normality	OK
n	8
outliers	0
mean (n)	0.988
st.dev. (n)	0.0705
R(calc.)	0.197
R(D524:10)	0.139



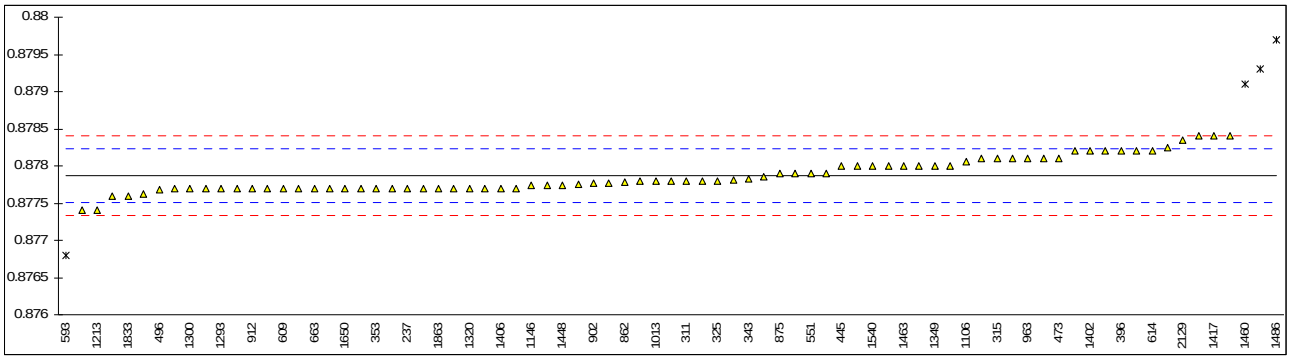


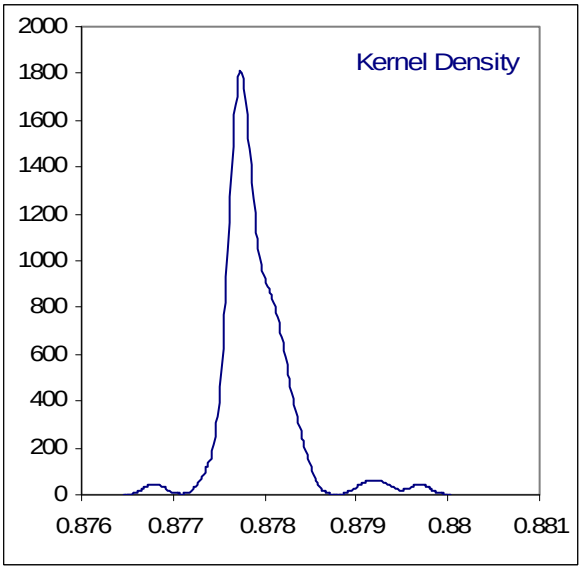
Determination of Density @ 15°C on sample #12062; results in kg/L

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237	D4052	0.8777		-0.95	
252		-----		-----	
254	D4052	0.8777		-0.95	
255		-----		-----	
311	D4052	0.8778		-0.39	
315	D4052	0.8781		1.29	
325	D4052	0.8778		-0.39	
333	D4052	0.8777		-0.95	
337	D4052	0.8778		-0.39	
340	D4052	0.8782	C	1.85	First reported 878.20
343	D4052	0.87782		-0.28	
353	IP365	0.8777		-0.95	
357	D4052	0.8782		1.85	
360	D4052	0.8777		-0.95	
372	D4052	0.8778		-0.39	
396	D4052	0.8782		1.85	
432	D4052	0.87781		-0.34	
445	D4052	0.8780		0.73	
446	D4052	0.8781		1.29	
450		-----		-----	
451	IP365	0.87825		2.13	
473	D4052	0.8781		1.29	
494	D4052	0.8777		-0.95	
496	D4052	0.87768	C	-1.06	First reported 877.68
541	D4052	0.8781		1.29	
551	D4052	0.8779		0.17	
593	D4052	0.8768	C,G(0.01)	-5.99	
608	D4052	0.8779		0.17	
609	D4052	0.8777		-0.95	
614	D4052	0.8782		1.85	
657	D4052	0.8777		-0.95	
663	D4052	0.8777		-0.95	
704	D4052	0.87786		-0.06	
781	D4052	0.8780		0.73	
840	D4052	0.87777		-0.56	
862	D4052	0.87778		-0.50	
875	D4052	0.8779		0.17	
886		-----		-----	
902	D4052	0.87777		-0.56	
912	D4052	0.8777	C	-0.95	First reported 877.7
913		-----		-----	
963	D4052	0.8781		1.29	
994	D4052	0.8780		0.73	
1013	D4052	0.8778		-0.39	
1017		-----		-----	
1023	D4052	0.8778		-0.39	
1040	D4052	0.8781	C	1.29	First reported 878.1
1059	D4052	0.8777	C	-0.95	First reported 877.7
1106	D5002	0.87806		1.06	
1146	D4052	0.87774		-0.73	
1162	D4052	0.87769	C	-1.01	First reported 877.69
1173		-----		-----	
1203	ISO12185	0.8777		-0.95	
1213	D1298	0.8774		-2.63	
1224	ISO12185	0.87776		-0.62	
1243		-----		-----	
1262	D4052	0.87774		-0.73	
1271		-----		-----	
1293	ISO12185	0.87770		-0.95	
1300	D4052	0.8777	C	-0.95	First reported 877.7
1316	D4052	0.8777		-0.95	
1320	D4052	0.8777		-0.95	
1349	D4052	0.8780		0.73	
1402	D4052	0.8782		1.85	
1406	ISO12185	0.8777		-0.95	
1407	ISO12185	0.8777		-0.95	
1412	D4052	0.87820	C	1.85	First reported 0.8793
1417	D4052	0.8784		2.97	
1431	D4052	0.87762		-1.40	
1433	D4052	0.878		0.73	
1448	D4052	0.87774		-0.73	
1460	D7042	0.8791	G(0.01)	6.89	

1463	D4052	0.878		0.73	
1486	ISO12185	0.87969	G(0.01)	10.19	
1493	D4052	0.8777		-0.95	
1526	D5002	0.878	C	0.73	First reported 0.8805
1540	ISO3675	0.8780		0.73	
1622	D4052	0.8777		-0.95	
1650	D4052	0.8777		-0.95	
1720	D4052	0.8779	C	0.17	First reported 0.8880
1722	D4052	0.8784		2.97	
1827		-----		-----	
1833	D4052	0.8776		-1.51	
1842	IP365	0.8784		2.97	
1850	D4052	0.8776		-1.51	
1854	D4052	0.8774		-2.63	
1863	D4052	0.8777		-0.95	
1915		-----		-----	
2122	IP365	0.8793	G(0.01)	8.01	
2129	D4052	0.87835	C	2.69	

normality	not OK
n	75
outliers	4
mean (n)	0.87787
st.dev. (n)	0.000228
R(calc.)	0.00064
R(D4052:11)	0.00050





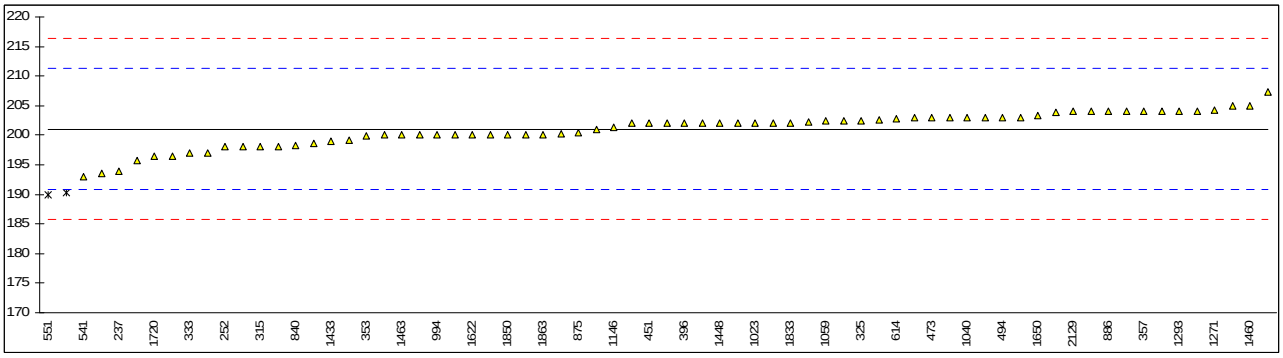
Determination of Flash Point PMcc on sample #12062; results in °C

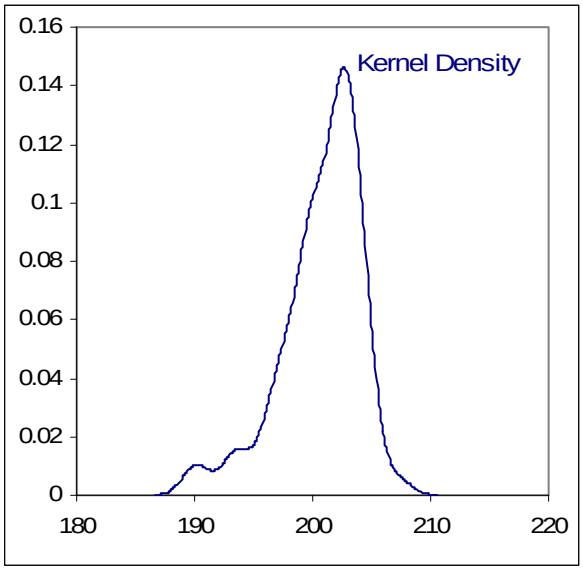
lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237	D93-M	194.0		-1.38	
252	D93-ME	198.0		-0.60	
254		-----		-----	
255		-----		-----	
311	D93-AE	202.0		0.19	
315	D93-AE	198.0		-0.60	
325	D93-AE	202.5		0.29	
333	D93-AF	197.0		-0.79	
337		-----		-----	
340	D93-AF	202.5		0.29	
343	D93-AE	205.0		0.78	
353	IP34	199.925		-0.22	
357	D93-AE	204.0		0.58	
360	D93-AE	204.0		0.58	
372	D93-AE	204.0		0.58	
396	D93-MF	202		0.19	
432	D93-AE	203		0.39	
445	D93-AF	202.0		0.19	
446	D93-AF	203.0		0.39	
450		-----		-----	
451	IP34	202.0		0.19	
473	D93-AE	203.0		0.39	
494	D93-AE	203.0		0.39	
496	D93-AF	200.3		-0.14	
541	D93-M	193.0		-1.58	
551	D93-AF	190	DG(0.01)	-2.16	
593	D93-	200		-0.20	
608	D93-M	196.5		-0.89	
609	D3828-AF	202.2		0.23	
614	D93-M	202.8		0.35	
657	D93-MF	204		0.58	
663	D93-MF	202.0		0.19	
704	D93-MF	195.8		-1.03	
781	D93-AF	200		-0.20	
840	D93-MF	198.2		-0.56	
862	D93-MF	202.0		0.19	
875	D93-MF	200.5		-0.10	
886	D93-AF	204		0.58	
902	D93-AE	204		0.58	
912		-----		-----	
913		-----		-----	
963	D93-MF	200.0		-0.20	
994	D93-MF	200.0		-0.20	
1013	D93-	200.0		-0.20	
1017		-----		-----	
1023	D93-	202		0.19	
1040	D93-AE	203		0.39	
1059	ISO2719	202.5		0.29	
1106	D93-AE	202.0		0.19	
1146	in house	201.30		0.05	
1162	D93-MF	198.7		-0.46	
1173	IP34-MF	207.25		1.22	
1203	ISO2719	193.5		-1.48	
1213	D93-	>200		>-0.20	
1224	ISO2719	199.2		-0.36	
1243	ISO2719	190.3	DG(0.01)	-2.11	
1262	D93-ME	203.9		0.56	
1271	ISO2719-AF	204.2		0.62	
1293	D6450-AE	204		0.58	
1300	D93-AF	197		-0.79	
1316		-----		-----	
1320		-----		-----	
1349		-----		-----	
1402	D93-AE	203.0		0.39	
1406		-----		-----	
1407		-----		-----	
1412	D93-ME	201.0		-0.01	
1417		-----		-----	
1431	D93-AF	202.6		0.31	
1433	D93-AE	199		-0.40	
1448	D93-AE	202.0		0.19	
1460	D93-AE	205.0		0.78	

1463	D93-	200	-0.20
1486		-----	-----
1493	D93-AE	200	-0.20
1526		-----	-----
1540		-----	-----
1622	D93-MF	200.0	-0.20
1650	D93-AE	203.4	0.46
1720	D93-AE	196.5	-0.89
1722		-----	-----
1827		-----	-----
1833	D93-AE	202	0.19
1842	D93-A	203	0.39
1850	ISO2719-AE	200	-0.20
1854	D93-MF	198	-0.60
1863	D93-AE	200	-0.20
1915		-----	-----
2122	D93-MF	198	-0.60
2129	D93-MF	204.0	0.58

normality	not OK
n	70
outliers	0
mean (n)	201.03
st.dev. (n)	2.882
R(calc.)	8.07
R(D93:11, meth A)	14.27

M	= Manual mode	A	= Automated mode
MF	= Manual mode, flame ignition	AF	= Automated mode, flame ignition
ME	= Manual mode, electric ignition	AE	= Automated mode, electric ignition



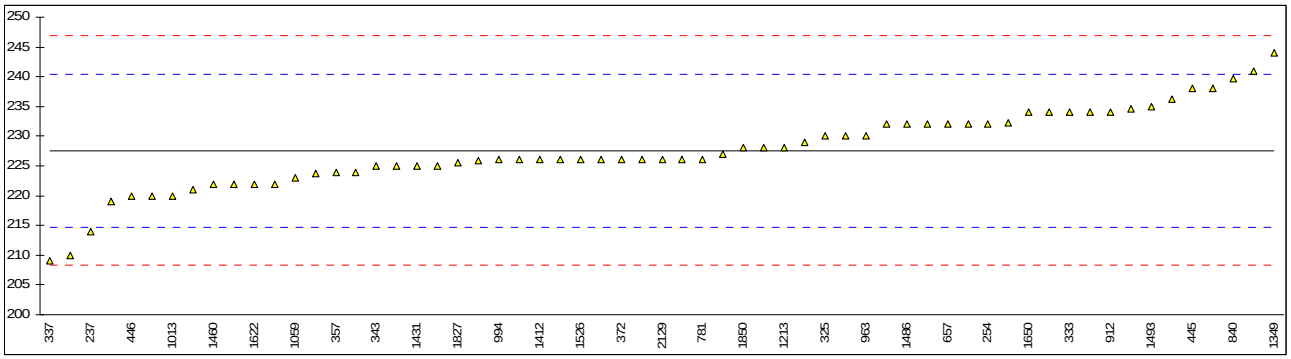


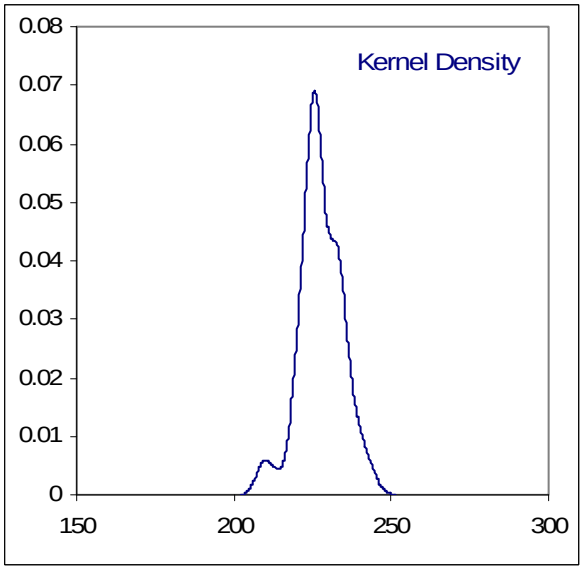
Determination of Flash Point C.O.C. on sample #12062; results in °C

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233	D92	234		0.99	
237	D92	214.0		-2.12	
252		-----		-----	
254	D92	232.0		0.68	
255		-----		-----	
311		-----		-----	
315	D92	229.0		0.22	
325	D92	230		0.37	
333	D92	234		0.99	
337	D92	209		-2.89	
340		-----		-----	
343	D92	225.0		-0.41	
353	IP36	223.750		-0.60	
357	D92	224		-0.56	
360	D92	226		-0.25	
372	D92	226		-0.25	
396	D92	226		-0.25	
432	D92	220		-1.18	
445	D92	238		1.62	
446	D92	220		-1.18	
450		-----		-----	
451		-----		-----	
473		-----		-----	
494	D92	230.0		0.37	
496		-----		-----	
541		-----		-----	
551	D92	225		-0.41	
593		-----		-----	
608		-----		-----	
609		-----		-----	
614		-----		-----	
657	D92	232		0.68	
663	D92	228		0.06	
704	D92	232.2		0.71	
781	D92	226		-0.25	
840	D92	239.7		1.88	
862	D92	219		-1.34	
875	D92	224		-0.56	
886	D92	234		0.99	
902		-----		-----	
912	D92	234		0.99	
913		-----		-----	
963	D92	230		0.37	
994	D92	226.0		-0.25	
1013	D92	220		-1.18	
1017		-----		-----	
1023		-----		-----	
1040	D92	232		0.68	
1059	ISO2592	223		-0.72	
1106		-----		-----	
1146		-----		-----	
1162	D92	232.0		0.68	
1173		-----		-----	
1203	ISO2592	238	C	1.62	First reported 246
1213	D92	228		0.06	
1224	ISO2592	236.2		1.34	
1243	ISO2849	226		-0.25	
1262	D92	225.9		-0.27	
1271	ISO2592	234.6		1.09	
1293		-----		-----	
1300	D92	222		-0.87	
1316	D92	226		-0.25	
1320	D92	225		-0.41	
1349	D92	244		2.55	
1402		-----		-----	
1406	D92	221		-1.03	
1407		-----		-----	
1412	D92	226.0		-0.25	
1417		-----		-----	
1431	D92	225		-0.41	
1433	D92	241		2.08	
1448		-----		-----	
1460	D92	222.0		-0.87	

1463	D92	227	-0.09
1486	ISO2592	232	0.68
1493	D92	235	1.15
1526	D92	226	-0.25
1540	ISO2592	232	0.68
1622	D92	222	-0.87
1650	D92	234.0	0.99
1720		-----	-----
1722		-----	-----
1827	D92	225.5	-0.33
1833	D92	222	-0.87
1842		-----	-----
1850	ISO2592	228	0.06
1854	D92	210	-2.74
1863	D92	226	-0.25
1915		-----	-----
2122		-----	-----
2129	D92	226.0	-0.25

normality	not OK
n	61
outliers	0
mean (n)	227.60
st.dev. (n)	6.748
R(calc.)	18.90
R(D92:12)	18.00



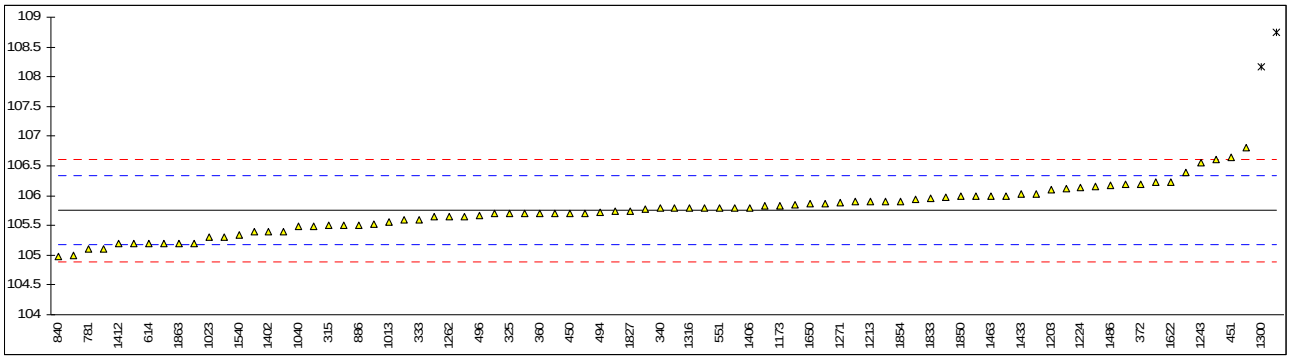


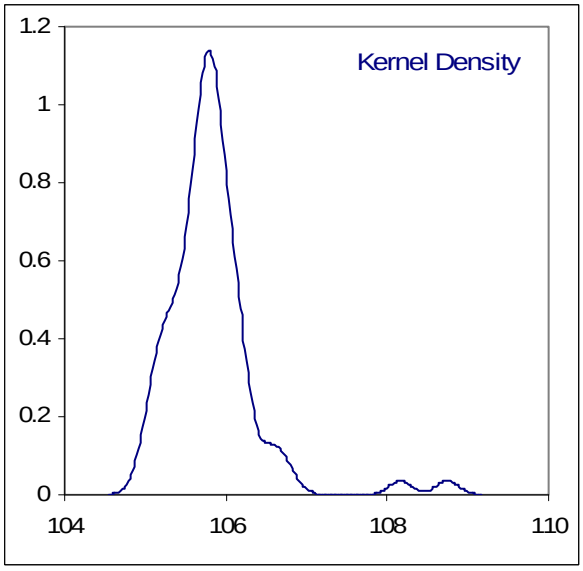
Determination of Kinematic Viscosity @ 40°C on sample #12062; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233	D2896	106.2		1.55	
237	D445	105.7		-0.20	
252	D445	105.83		0.26	
254		-----		-----	
255	D7279	108.75	C,G(0.01)	10.43	First reported 104.52
311	D445	105.4		-1.24	
315	D445	105.50		-0.89	
325	D445	105.7		-0.20	
333	D445	105.6		-0.54	
337		-----		-----	
340	D445	105.79		0.12	
343	D445	105.85	C	0.33	First reported 14.272
353	IP71	105.781		0.09	
357	D445	105.7		-0.20	
360	D445	105.70		-0.20	
372	D445	106.2		1.55	
396	D445	105.7		-0.20	
432	D445	105.65		-0.37	
445	D445	105.1		-2.29	
446	D445	105.86		0.36	
450	D445	105.7		-0.20	
451	D445	106.65		3.11	
473	D445	106.22		1.62	
494	D445	105.73		-0.09	
496	D445	105.67		-0.30	
541	D445	106.0		0.85	
551	D445	105.8		0.15	
593	D445	106.8		3.64	
608	D445	105.2		-1.94	
609		-----		-----	
614	D445	105.2		-1.94	
657	D445	105.9		0.50	
663	D445	106.0		0.85	
704	D445	105.53		-0.79	
781	D445	105.1	C	-2.29	First reported 104.59
840	D445	104.97		-2.74	
862	D445	106.12		1.27	
875	D445	105.3		-1.59	
886	D445	105.5		-0.89	
902	D445	105.8		0.15	
912	D445	105.2		-1.94	
913		-----		-----	
963	D445	106.6		2.94	
994	D445	105.65		-0.37	
1013	D445	105.55		-0.72	
1017		-----		-----	
1023	D445	105.3		-1.59	
1040	D445	105.48		-0.96	
1059	ISO3104	106.4		2.24	
1106		-----		-----	
1146	D445	106.03		0.95	
1162	D445	105.94		0.64	
1173	IP71	105.83		0.26	
1203	ISO3104	106.1		1.20	
1213	D445	105.9		0.50	
1224	ISO3104	106.13		1.30	
1243	DIN51561-1	106.55		2.77	
1262	D445	105.65		-0.37	
1271	ISO3104	105.8799		0.43	
1293	ISO3104	105.4	C	-1.24	First reported 104.70
1300	D445	108.1693	C,G(0.01)	8.41	First reported 109.6251
1316	D445	105.8		0.15	
1320	D445	105.6		-0.54	
1349	D445	105.7900		0.12	
1402	D445	105.4		-1.24	
1406	D445	105.8		0.15	
1407	ISO3104	105.5		-0.89	
1412	D445	105.20	C	-1.94	First reported 103.9
1417	in house	105.9		0.50	
1431		-----		-----	
1433	D445	106.0296		0.95	
1448		-----		-----	
1460	D445	105.49		-0.93	

1463	D445	106	0.85
1486	ISO3104	106.17	1.44
1493	D445	105.7	-0.20
1526	D445	105	-2.63
1540	ISO3104	105.34	-1.45
1622	D445	106.22	1.62
1650	D445	105.86	0.36
1720	D445	105.2	-1.94
1722	D445	105.7380	-0.06
1827	D445	105.740	-0.06
1833	D445	105.95	0.68
1842	IP71	105.8	0.15
1850	ISO3104	106.0	0.85
1854	D445	105.9	0.50
1863	D445	105.2	-1.94
1915		-----	-----
2122	in house	106.15	1.37
2129	D445	105.97	0.75

normality	OK
n	80
outliers	2
mean (n)	105.756
st.dev. (n)	0.3777
R(calc.)	1.058
R(D445:12)	0.804



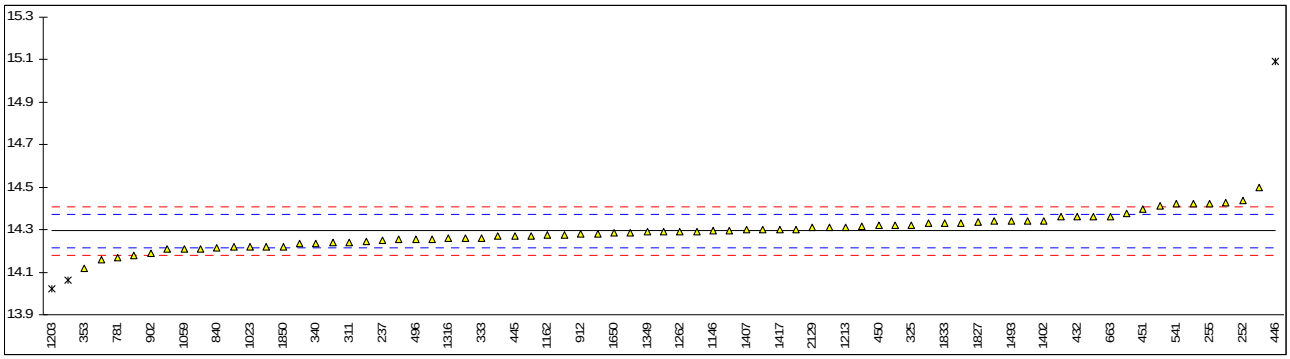


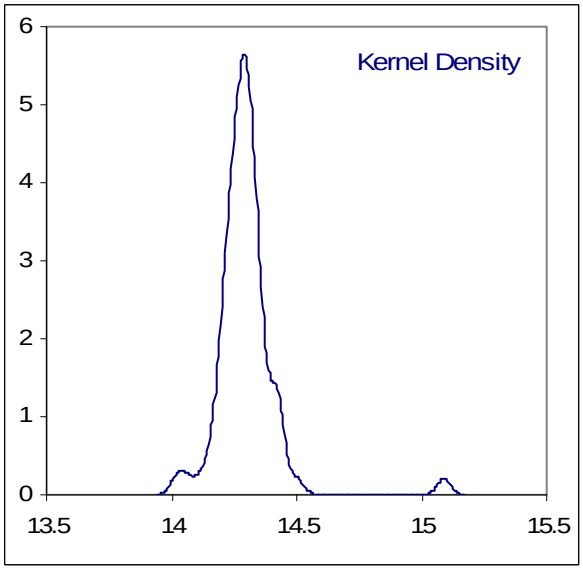
Determination of Kinematic Viscosity @ 100°C on sample #12062; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233	D2896	14.31		0.43	
237	D445	14.25		-1.12	
252	D445	14.437		3.70	
254		-----		-----	
255	D7279	14.4239		3.37	
311	D445	14.24		-1.37	
315	D445	14.293		-0.01	
325	D445	14.32		0.69	
333	D445	14.26		-0.86	
337	D445	14.36		1.72	
340	D445	14.237		-1.45	
343	D445	14.272	C	-0.55	First reported 105.85
353	IP71	14.1173		-4.54	
357	D445	14.24		-1.37	
360	D445	14.316		0.58	
372	D445	14.30		0.17	
396	D445	14.21		-2.15	
432	D445	14.36		1.72	
445	D445	14.27		-0.60	
446	D445	15.090	G(0.01)	20.53	
450	D445	14.32		0.69	
451	D445	14.396		2.65	
473	D445	14.329		0.92	
494	D445	14.286		-0.19	
496	D445	14.254		-1.01	
541	D445	14.42		3.27	
551	D445	14.22		-1.89	
593	D445	14.29		-0.09	
608		-----		-----	
609		-----		-----	
614	D445	14.41		3.01	
657	D445	14.28		-0.34	
663	D445	14.36		1.72	
704	D445	14.219		-1.92	
781	D445	14.17		-3.18	
840	D445	14.212		-2.10	
862	D445	14.375		2.11	
875	D445	14.36		1.72	
886	D445	14.32		0.69	
902	D445	14.19	C	-2.66	First reported 14.47
912	D445	14.28		-0.34	
913		-----		-----	
963	D445	14.21		-2.15	
994		-----		-----	
1013	D445	14.255		-0.99	
1017		-----		-----	
1023	D445	14.22		-1.89	
1040	D445	14.253		-1.04	
1059	ISO3104	14.21		-2.15	
1106		-----		-----	
1146	D445	14.296		0.07	
1162	D445	14.275		-0.47	
1173		-----		-----	
1203	ISO3104	14.02	DG(0.05)	-7.05	
1213	D445	14.31		0.43	
1224		-----		-----	
1243	DIN51561-1	14.26		-0.86	
1262	D445	14.291		-0.06	
1271	ISO3104	14.277		-0.42	
1293	ISO3104	14.18		-2.92	
1300	D445	14.4232	C	3.35	First reported 14.845
1316	D445	14.26		-0.86	
1320	D445	14.34		1.20	
1349	D445	14.2886		-0.12	
1402	D445	14.34		1.20	
1406	D445	14.33		0.95	
1407	ISO3104	14.30		0.17	
1412	D445	14.06	DG(0.05)	-6.01	
1417	in house	14.3		0.17	
1431		-----		-----	
1433	D445	14.296171		0.07	
1448		-----		-----	
1460	D445	14.301		0.20	

1463	D445	14.5	5.33
1486		-----	-----
1493	D445	14.34	1.20
1526		-----	-----
1540	ISO3104	14.235	-1.50
1622	D445	14.245	-1.25
1650	D445	14.283	-0.27
1720		-----	-----
1722		-----	-----
1827	D445	14.334	1.05
1833	D445	14.33	0.95
1842	IP71	14.43	3.52
1850	ISO3104	14.22	-1.89
1854	D445	14.16	-3.44
1863	D445	14.27	-0.60
1915		-----	-----
2122	in house	14.34	1.20
2129	D445	14.309	0.40

normality	OK
n	72
outliers	3
mean (n)	14.293
st.dev. (n)	0.0714
R(calc.)	0.200
R(D445:12)	0.109



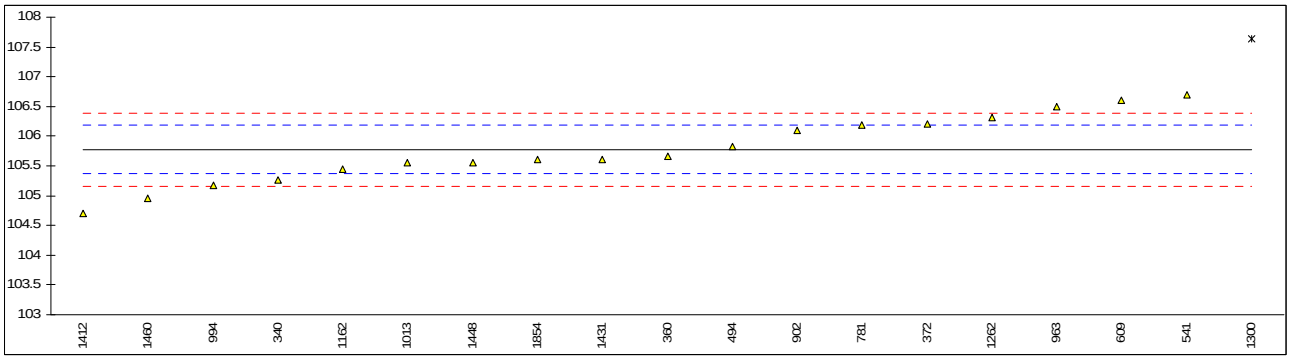


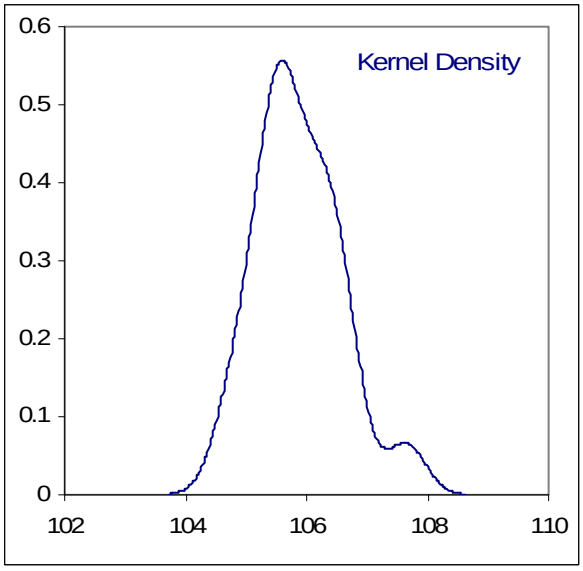
Determination of Viscosity Stabinger @ 40 °C on sample #12062; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237		-----		-----	
252		-----		-----	
254		-----		-----	
255		-----		-----	
311		-----		-----	
315		-----		-----	
325		-----		-----	
333		-----		-----	
337		-----		-----	
340	D7042	105.27		-2.47	
343		-----		-----	
353		-----		-----	
357		-----		-----	
360	D7042	105.67		-0.51	
372	D7042	106.2		2.09	
396		-----		-----	
432		-----		-----	
445		-----		-----	
446		-----		-----	
450		-----		-----	
451		-----		-----	
473		-----		-----	
494	D7042	105.83		0.27	
496		-----		-----	
541	D7042	106.7		4.54	
551		-----		-----	
593		-----		-----	
608		-----		-----	
609	D7042	106.60		4.05	
614		-----		-----	
657		-----		-----	
663		-----		-----	
704		-----		-----	
781	D7042	106.19		2.04	
840		-----		-----	
862		-----		-----	
875		-----		-----	
886		-----		-----	
902	D7042	106.1	C	1.60	First reported 104.1
912		-----		-----	
913		-----		-----	
963	D7042	106.5		3.56	
994	D7042	105.18		-2.91	
1013	D7042	105.55		-1.10	
1017		-----		-----	
1023		-----		-----	
1040		-----		-----	
1059		-----		-----	
1106		-----		-----	
1146		-----		-----	
1162	D7042	105.44		-1.64	
1173		-----		-----	
1203		-----		-----	
1213		-----		-----	
1224		-----		-----	
1243		-----		-----	
1262	D7042	106.31		2.63	
1271		-----		-----	
1293		-----		-----	
1300	D7042	107.644	C,G(0.05)	9.16	First reported 109.8433
1316		-----		-----	
1320		-----		-----	
1349		-----		-----	
1402		-----		-----	
1406		-----		-----	
1407		-----		-----	
1412	D7042	104.7		-5.27	
1417		-----		-----	
1431	D7042	105.6		-0.86	
1433		-----		-----	
1448	D7042	105.55		-1.10	
1460	D7042	104.95		-4.04	

1463		-----	-----
1486		-----	-----
1493		-----	-----
1526		-----	-----
1540		-----	-----
1622		-----	-----
1650		-----	-----
1720		-----	-----
1722		-----	-----
1827		-----	-----
1833		-----	-----
1842		-----	-----
1850		-----	-----
1854	D7042	105.6	-0.86
1863		-----	-----
1915		-----	-----
2122		-----	-----
2129		-----	-----

normality	OK
n	18
outliers	1
mean (n)	105.774
st.dev. (n)	0.5709
R(calc.)	1.599
R(D7042:11)	0.571



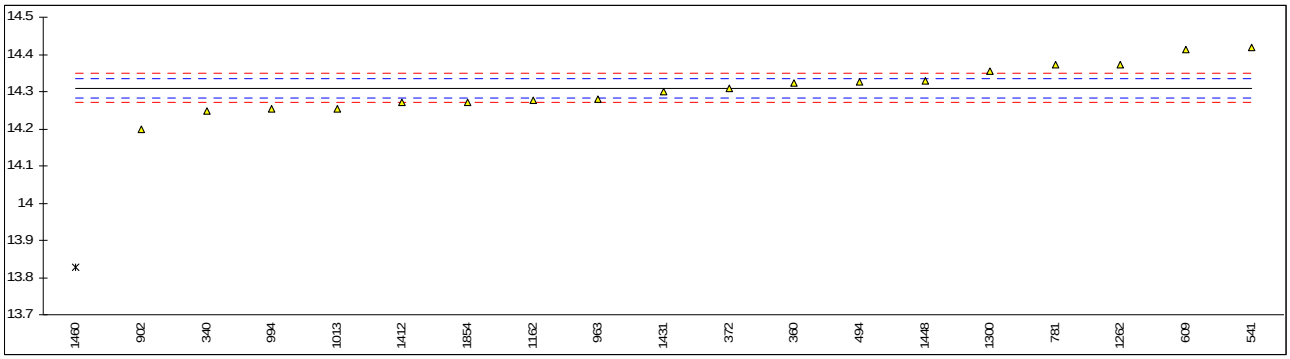


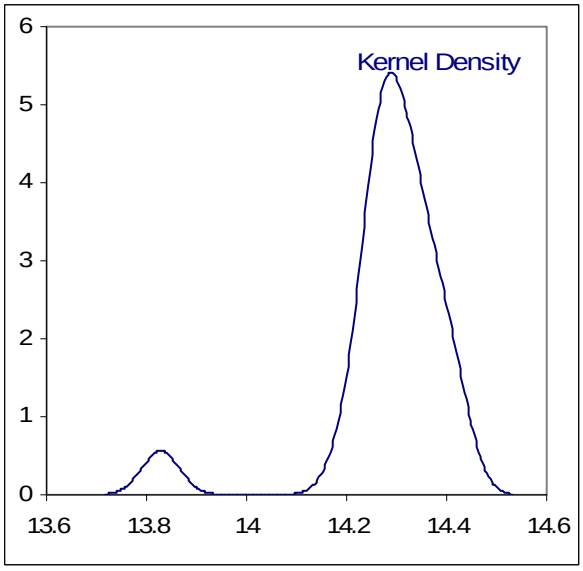
Determination of Viscosity Stabinger @ 100 °C on sample #12062; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237		-----		-----	
252		-----		-----	
254		-----		-----	
255		-----		-----	
311		-----		-----	
315		-----		-----	
325		-----		-----	
333		-----		-----	
337		-----		-----	
340	D7042	14.247		-4.78	
343		-----		-----	
353		-----		-----	
357		-----		-----	
360	D7042	14.323		1.03	
372	D7042	14.31		0.03	
396		-----		-----	
432		-----		-----	
445		-----		-----	
446		-----		-----	
450		-----		-----	
451		-----		-----	
473		-----		-----	
494	D7042	14.326		1.26	
496		-----		-----	
541	D7042	14.42		8.43	
551		-----		-----	
593		-----		-----	
608		-----		-----	
609	D7042	14.412		7.82	
614		-----		-----	
657		-----		-----	
663		-----		-----	
704		-----		-----	
781	D7042	14.372		4.77	
840		-----		-----	
862		-----		-----	
875		-----		-----	
886		-----		-----	
902	D7042	14.20		-8.36	
912		-----		-----	
913		-----		-----	
963	D7042	14.28		-2.26	
994	D7042	14.255		-4.17	
1013	D7042	14.255		-4.17	
1017		-----		-----	
1023		-----		-----	
1040		-----		-----	
1059		-----		-----	
1106		-----		-----	
1146		-----		-----	
1162	D7042	14.276		-2.56	
1173		-----		-----	
1203		-----		-----	
1213		-----		-----	
1224		-----		-----	
1243		-----		-----	
1262	D7042	14.3730		4.84	
1271		-----		-----	
1293		-----		-----	
1300	D7042	14.3550	C	3.47	First reported 14.7748
1316		-----		-----	
1320		-----		-----	
1349		-----		-----	
1402		-----		-----	
1406		-----		-----	
1407		-----		-----	
1412	D7042	14.27		-3.02	
1417		-----		-----	
1431	D7042	14.30		-0.73	
1433		-----		-----	
1448	D7042	14.328		1.41	
1460	D7042	13.828	G(0.01)	-36.76	

1463		-----	-----
1486		-----	-----
1493		-----	-----
1526		-----	-----
1540		-----	-----
1622		-----	-----
1650		-----	-----
1720		-----	-----
1722		-----	-----
1827		-----	-----
1833		-----	-----
1842		-----	-----
1850		-----	-----
1854	D7042	14.27	-3.02
1863		-----	-----
1915		-----	-----
2122		-----	-----
2129		-----	-----

normality	OK
n	18
outliers	1
mean (n)	14.310
st.dev. (n)	0.0597
R(calc.)	0.167
R(D7042:11)	0.037





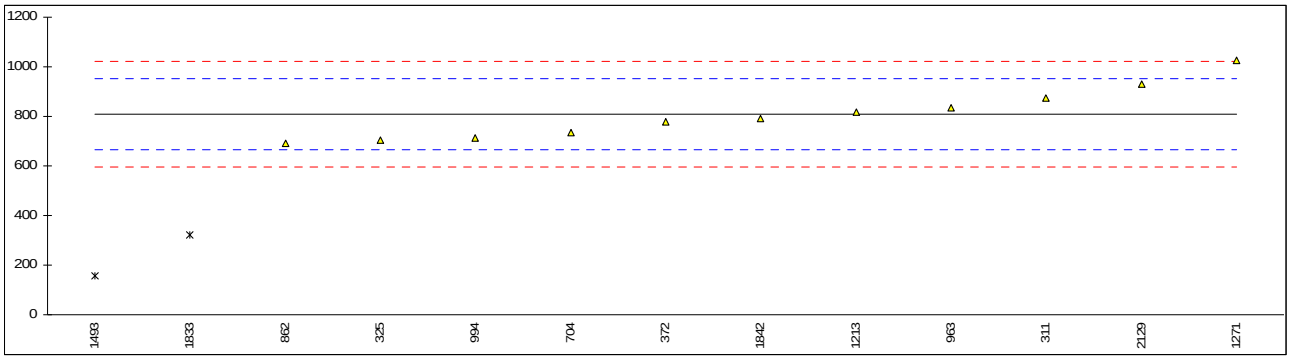
Determination of Nitrogen on sample #12062; results in mg/kg

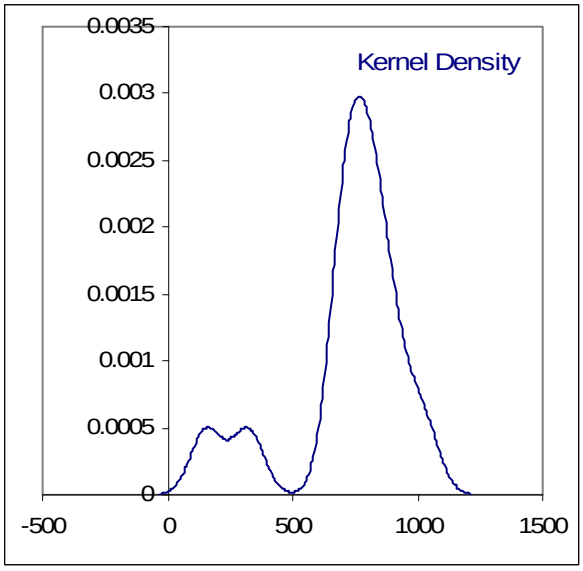
lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237		-----		-----	
252		-----		-----	
254		-----		-----	
255		-----		-----	
311	D5762	875		0.93	
315		-----		-----	
325	D5762	706		-1.44	
333		-----		-----	
337		-----		-----	
340		-----		-----	
343		-----		-----	
353		-----		-----	
357		-----		-----	
360		-----		-----	
372	D5762	780		-0.40	
396		-----		-----	
432		-----		-----	
445		-----		-----	
446		-----		-----	
450		-----		-----	
451		-----		-----	
473		-----		-----	
494		-----		-----	
496		-----		-----	
541		-----		-----	
551		-----		-----	
593		-----		-----	
608		-----		-----	
609		-----		-----	
614		-----		-----	
657		-----		-----	
663		-----		-----	
704	D5762	734.7		-1.04	
781		-----		-----	
840		-----		-----	
862	D3228	690	C	-1.66	First reported 0.0690
875		-----		-----	
886		-----		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D4629	835.8		0.38	
994	D5762	713		-1.34	
1013		-----		-----	
1017		-----		-----	
1023		-----		-----	
1040		-----		-----	
1059		-----		-----	
1106		-----		-----	
1146		-----		-----	
1162		-----		-----	
1173		-----		-----	
1203		-----		-----	
1213	D3228	817		0.12	
1224		-----		-----	
1243		-----		-----	
1262		-----		-----	
1271	D3228	1026.10	C	3.04	First reported 1261.6
1293		-----		-----	
1300		-----		-----	
1316		-----		-----	
1320		-----		-----	
1349		-----		-----	
1402		-----		-----	
1406		-----		-----	
1407		-----		-----	
1412		-----		-----	
1417		-----		-----	
1431		-----		-----	
1433		-----		-----	
1448		-----		-----	
1460		-----		-----	

1463		-----		-----
1486		-----		-----
1493	D4629	156.1	DG(0.01)	-9.14
1526		-----		-----
1540		-----		-----
1622		-----		-----
1650		-----		-----
1720		-----		-----
1722		-----		-----
1827		-----		-----
1833	D3228	322	DG(0.01)	-6.81
1842	in house	790		-0.26
1850		-----		-----
1854		-----		-----
1863		-----		-----
1915		-----		-----
2122		-----		-----
2129	D3228	929		1.68

normality	OK
n	11
outliers	2
mean (n)	808.8
st.dev. (n)	103.62
R(calc.)	290.1
R(D3228:08)	200.0

Compare R(D5762:11) = 215.1



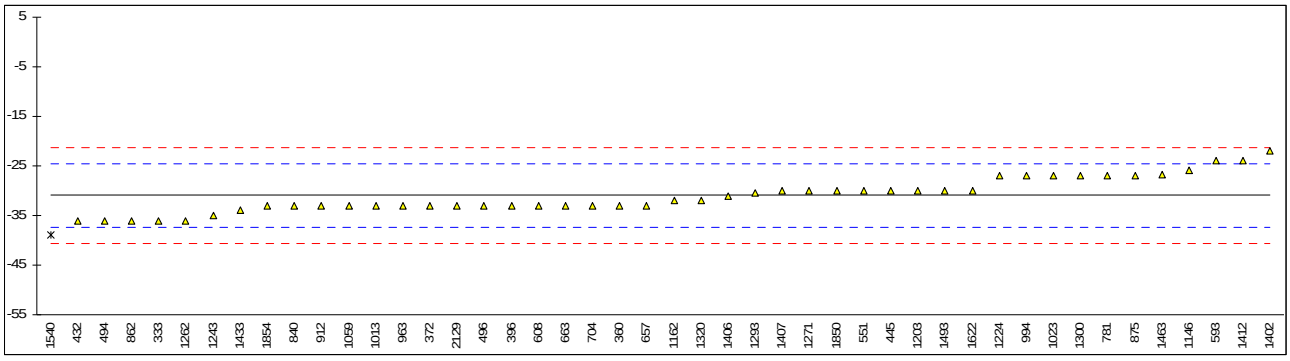


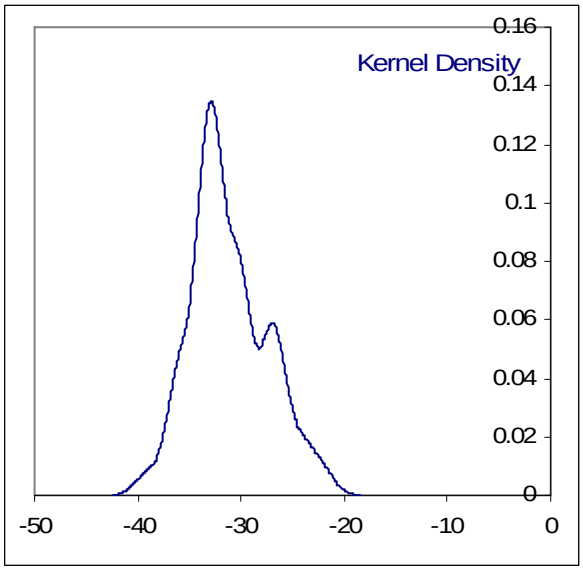
Determination of Pour Point (Manual) on sample #12062; results in °C

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237	D97	<-24		-----	
252		-----		-----	
254	D97	<-12		-----	
255		-----		-----	
311		-----		-----	
315		-----		-----	
325		-----		-----	
333	D97	-36		-1.56	
337		-----		-----	
340		-----		-----	
343		-----		-----	
353		-----		-----	
357		-----		-----	
360	D97	-33		-0.63	
372	D97	-33		-0.63	
396	D97	-33		-0.63	
432	D97	-36		-1.56	
445	D97	-30		0.30	
446		-----		-----	
450		-----		-----	
451		-----		-----	
473		-----		-----	
494	D6892	-36		-1.56	
496	D97	-33		-0.63	
541		-----		-----	
551	D97	-30		0.30	
593	D97	-24		2.17	
608	D97	-33		-0.63	
609		-----		-----	
614		-----		-----	
657	D97	-33		-0.63	
663	D97	-33		-0.63	
704	D97	-33		-0.63	
781	D97	-27		1.24	
840	D97	-33		-0.63	
862	D97	-36		-1.56	
875	D97	-27		1.24	
886		-----		-----	
902		-----		-----	
912	D97	-33		-0.63	
913		-----		-----	
963	D97	-33		-0.63	
994	D97	-27		1.24	
1013	D97	-33		-0.63	
1017		-----		-----	
1023	D97	-27		1.24	
1040		-----		-----	
1059	ISO3016	-33	C	-0.63	First reported as PP automated, method is manual
1106		-----		-----	
1146	D97	-25.8		1.61	
1162	D97	-32		-0.32	
1173		-----		-----	
1203	ISO3016	-30		0.30	
1213	D97	<-27		-----	
1224	ISO3016	-27		1.24	
1243	ISO3016	-35	C	-1.25	First reported as PP automated, method is manual
1262	D97	-36		-1.56	
1271	D97	-30		0.30	
1293	D97	-30.5	C	0.15	First reported -19.8
1300	D97	-27		1.24	
1316		-----		-----	
1320	D97	-32		-0.32	
1349		-----		-----	
1402	D97	-22		2.79	
1406	D97	-31		-0.01	
1407	ISO3016	-30		0.30	
1412	D97	-24		2.17	
1417		-----		-----	
1431		-----		-----	
1433	D97	-34		-0.94	
1448		-----		-----	
1460		-----		-----	

1463	D97	-26.7		1.33	
1486		-----		-----	
1493	D97	-30		0.30	
1526		-----		-----	
1540	ISO3016	-39	G(0.05)	-2.50	First reported -42
1622	D97	-30		0.30	
1650		-----		-----	
1720		-----		-----	
1722		-----		-----	
1827		-----		-----	
1833		-----		-----	
1842		-----		-----	
1850	ISO3016	-30	C	0.30	First reported as PP automated, method is manual
1854	D97	-33		-0.63	
1863		-----		-----	
1915		-----		-----	
2122		-----		-----	
2129	D97	-33		-0.63	

normality	not OK
n	45
outliers	1
mean (n)	-30.98
st.dev. (n)	3.506
R(calc.)	9.82
R(D97:11)	9.00



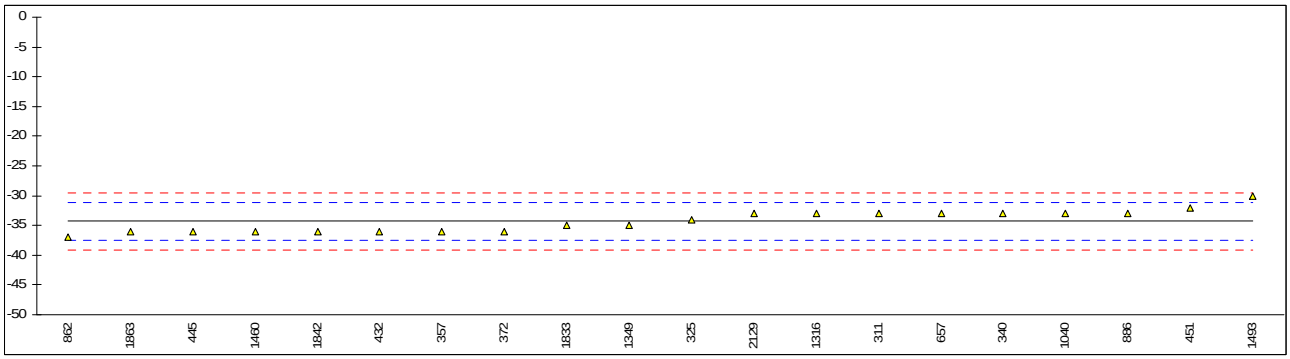


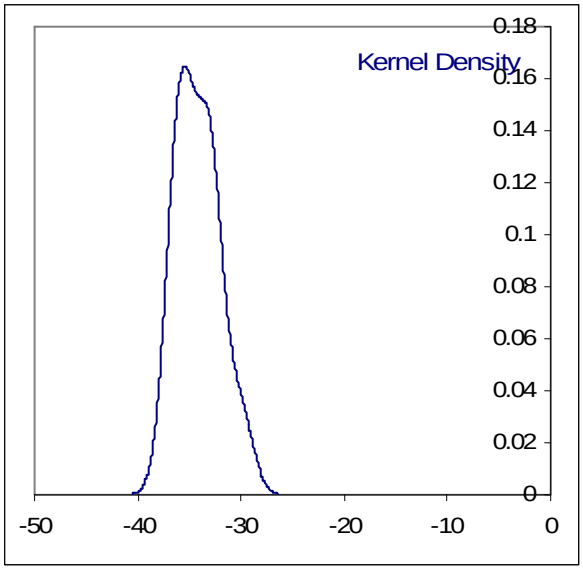
Determination of Pour Point (Automated, 1°C interval) on sample #12062; results in °C

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237		-----		-----	
252		-----		-----	
254		-----		-----	
255		-----		-----	
311	D5950	-33	C	0.81	First reported as PP manual, method is automated
315		-----		-----	
325	D5950	-34		0.19	
333		-----		-----	
337		-----		-----	
340	D5950	-33		0.81	
343		-----		-----	
353		-----		-----	
357	D5950	-36		-1.06	
360		-----		-----	
372	D5950	-36		-1.06	
396		-----		-----	
432	D5950	-36		-1.06	
445	D5950	-36		-1.06	
446		-----		-----	
450		-----		-----	
451	D5949	-32		1.43	
473		-----		-----	
494		-----		-----	
496		-----		-----	
541		-----		-----	
551		-----		-----	
593		-----		-----	
608		-----		-----	
609		-----		-----	
614		-----		-----	
657	D5950	-33		0.81	
663		-----		-----	
704		-----		-----	
781		-----		-----	
840		-----		-----	
862	D5950	-37		-1.68	
875		-----		-----	
886	D5950	-33		0.81	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963		-----		-----	
994		-----		-----	
1013		-----		-----	
1017		-----		-----	
1023		-----		-----	
1040	D5950	-33		0.81	
1059		-----		-----	
1106		-----		-----	
1146		-----		-----	
1162		-----		-----	
1173		-----		-----	
1203		-----		-----	
1213		-----		-----	
1224		-----		-----	
1243		-----		-----	
1262		-----		-----	
1271		-----		-----	
1293		-----		-----	
1300		-----		-----	
1316	D5950	-33		0.81	
1320		-----		-----	
1349	D5950	-35		-0.44	
1402		-----		-----	
1406		-----		-----	
1407		-----		-----	
1412		-----		-----	
1417		-----		-----	
1431		-----		-----	
1433		-----		-----	
1448		-----		-----	
1460	D5950	-36.0		-1.06	

1463		-----	-----
1486		-----	-----
1493	D5950	-30	2.68
1526		-----	-----
1540		-----	-----
1622		-----	-----
1650		-----	-----
1720		-----	-----
1722		-----	-----
1827		-----	-----
1833	D5950	-35	-0.44
1842	D5950	-36	-1.06
1850		-----	-----
1854		-----	-----
1863	D5950	-36	-1.06
1915		-----	-----
2122		-----	-----
2129	D5950	-33	0.81

normality	not OK
n	20
outliers	0
mean (n)	-34.30
st.dev. (n)	1.838
R(calc.)	5.15
R(D5950:07)	4.50



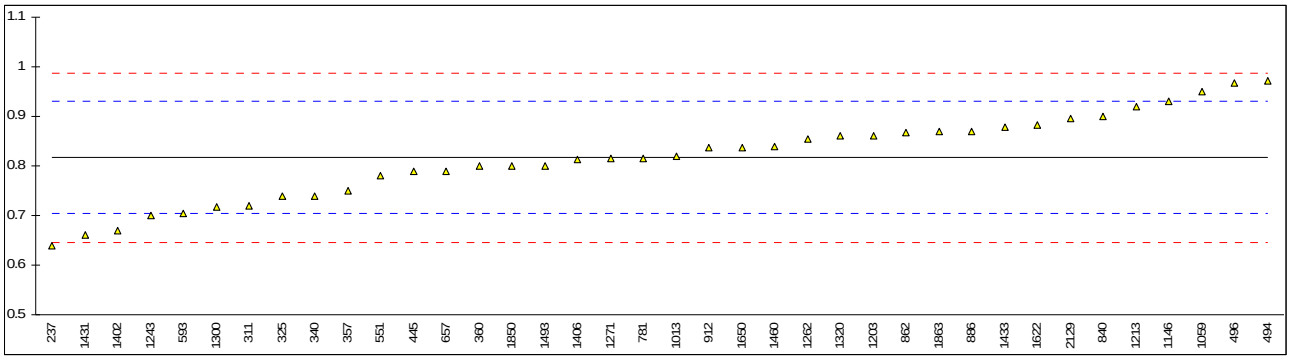


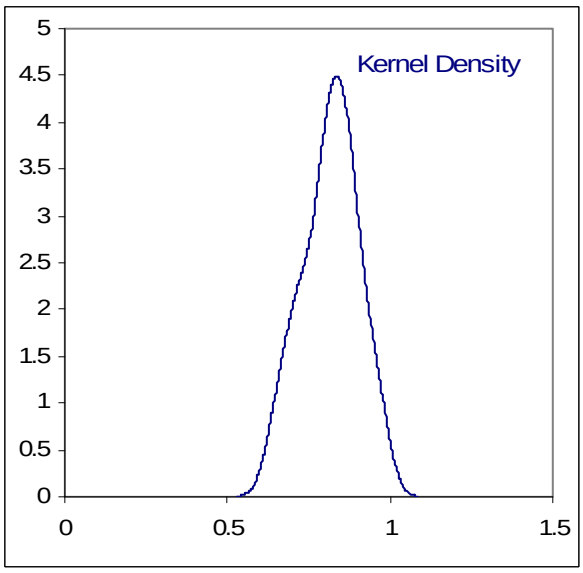
Determination of Sulphated Ash on sample #12062; results in %M/M

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237	D874	0.640		-3.12	
252		-----		-----	
254		-----		-----	
255		-----		-----	
311	D874	0.72		-1.71	
315		-----		-----	
325	D874	0.739		-1.38	
333		-----		-----	
337		-----		-----	
340	D874	0.739		-1.38	
343		-----		-----	
353		-----		-----	
357	D874	0.75	C	-1.18	First reported 0.6
360	D874	0.80		-0.30	
372		-----		-----	
396		-----		-----	
432		-----		-----	
445	D874	0.790		-0.48	
446		-----		-----	
450		-----		-----	
451		-----		-----	
473		-----		-----	
494	D874	0.972		2.72	
496	D874	0.967		2.63	
541		-----		-----	
551	D874	0.78		-0.65	
593	D874	0.704		-1.99	
608		-----		-----	
609		-----		-----	
614		-----		-----	
657	D874	0.79		-0.48	
663		-----		-----	
704		-----		-----	
781	D874	0.816		-0.02	
840	D874	0.901		1.47	
862	D874	0.867		0.88	
875		-----		-----	
886	D874	0.870		0.93	
902		-----		-----	
912	D874	0.836		0.33	
913		-----		-----	
963		-----		-----	
994		-----		-----	
1013	D874	0.82		0.05	
1017		-----		-----	
1023		-----		-----	
1040		-----		-----	
1059	ISO3987	0.95		2.34	
1106		-----		-----	
1146	D874	0.9304		1.99	
1162		-----		-----	
1173		-----		-----	
1203	ISO3987	0.8612		0.77	
1213	D874	0.920		1.81	
1224		-----		-----	
1243	DIN51575	0.70		-2.06	
1262	D874	0.855		0.66	
1271	ISO3987	0.815		-0.04	
1293		-----		-----	
1300	D874	0.7184		-1.74	
1316		-----		-----	
1320	D874	0.86		0.75	
1349		-----		-----	
1402	D874	0.67		-2.59	
1406	D874	0.812		-0.09	
1407		-----		-----	
1412		-----		-----	
1417		-----		-----	
1431	D874	0.66		-2.76	
1433	D874	0.87826		1.07	
1448		-----		-----	
1460	D874	0.839		0.38	

1463		-----	-----
1486		-----	-----
1493	D874	0.80	-0.30
1526		-----	-----
1540		-----	-----
1622	D874	0.8816	1.13
1650	D874	0.837	0.35
1720		-----	-----
1722		-----	-----
1827		-----	-----
1833		-----	-----
1842		-----	-----
1850	ISO3987	0.80	-0.30
1854		-----	-----
1863	D874	0.87	0.93
1915		-----	-----
2122		-----	-----
2129	D874	0.895	1.37

normality	OK
n	38
outliers	0
mean (n)	0.817
st.dev. (n)	0.0849
R(calc.)	0.238
R(D874:07)	0.159

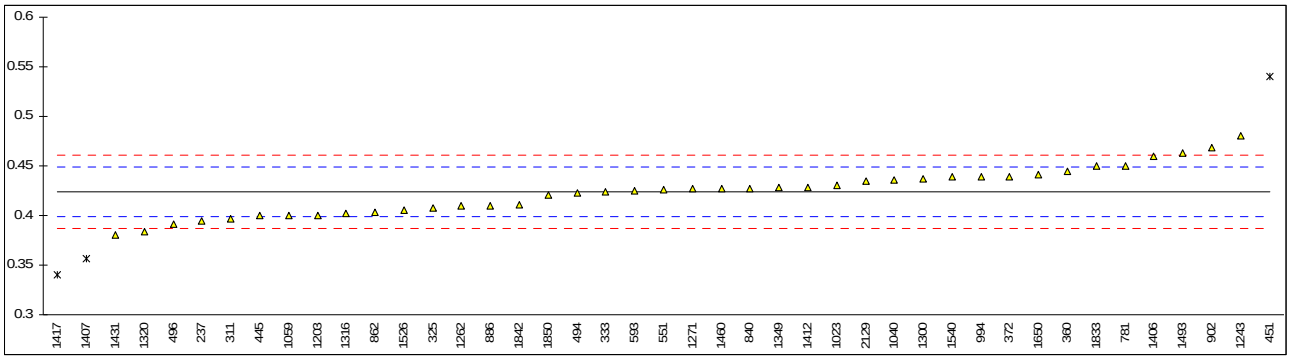


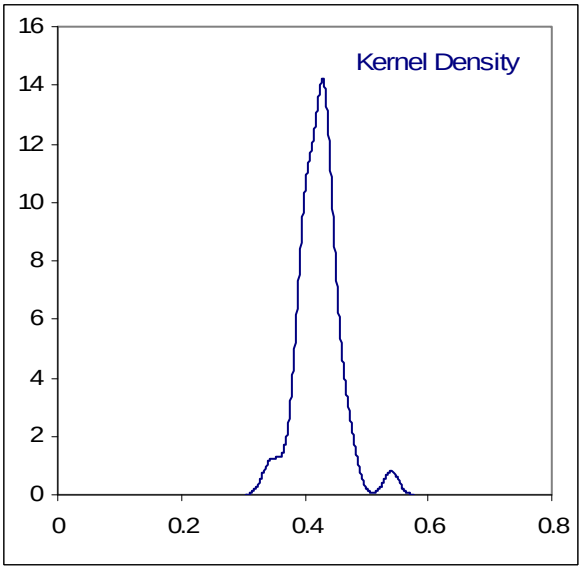


Determination of Sulphur on sample #12062; results in %M/M

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233		-----		-----	
237	D4294	0.395	C	-2.36	First reported 0.321
252		-----		-----	
254		-----		-----	
255		-----		-----	
311	D2622	0.397		-2.20	
315		-----		-----	
325	D6443	0.408		-1.30	
333	D2622	0.424		-0.01	
337		-----		-----	
340		-----		-----	
343		-----		-----	
353		-----		-----	
357		-----		-----	
360	D5453	0.445		1.70	
372	D4294	0.439		1.21	
396		-----		-----	
432		-----		-----	
445	D2622	0.3995		-1.99	
446		-----		-----	
450		-----		-----	
451	D5185	0.5406	C,G(0.01)	9.45	First reported 5406
473		-----		-----	
494	D4294	0.423		-0.09	
496	D2622	0.3916		-2.63	
541		-----		-----	
551	D4294	0.4257		0.13	
593	D2622	0.4252		0.09	
608		-----		-----	
609		-----		-----	
614		-----		-----	
657		-----		-----	
663		-----		-----	
704		-----		-----	
781	D2622	0.450		2.10	
840	D4294	0.4271		0.25	
862	D2622	0.403		-1.71	
875		-----		-----	
886	D2622	0.410		-1.14	
902	D4294	0.468		3.56	
912		-----		-----	
913		-----		-----	
963		-----		-----	
994	D5453	0.439		1.21	
1013		-----		-----	
1017		-----		-----	
1023	D2622	0.43		0.48	
1040	ISO8754	0.436		0.97	
1059	ISO14596	0.40		-1.95	
1106		-----		-----	
1146		-----		-----	
1162		-----		-----	
1173		-----		-----	
1203	ISO14596	0.40		-1.95	
1213		-----		-----	
1224		-----		-----	
1243	ISO8754	0.48		4.54	
1262	D4927	0.4097		-1.17	
1271	ISO8754	0.427		0.24	
1293		-----		-----	
1300	D5453	0.43666		1.02	
1316	D2622	0.402		-1.79	
1320	ISO20846	0.3833		-3.31	
1349	D2622	0.428		0.32	
1402		-----		-----	
1406	D2622	0.460		2.91	
1407	in house	0.3570	G(0.05)	-5.44	
1412	D4294	0.4281		0.33	
1417	in house	0.34	G(0.05)	-6.82	
1431	D4294	0.38		-3.57	
1433		-----		-----	
1448		-----		-----	
1460	D4294	0.427		0.24	

1463		-----		-----	
1486		-----		-----	
1493	D5453	0.4629	C	3.15	First reported 4629
1526	D4294	0.405	C	-1.55	First reported 0.3536
1540	D4294	0.4387		1.19	
1622		-----		-----	
1650	D4294	0.4415		1.41	
1720		-----		-----	
1722		-----		-----	
1827		-----		-----	
1833	D2622	0.45		2.10	
1842	D2622	0.411		-1.06	
1850	ISO8754	0.4210		-0.25	
1854		-----		-----	
1863		-----		-----	
1915		-----		-----	
2122		-----		-----	
2129	IP336	0.435		0.89	
					Only ASTM D2622
	normality	OK			OK
	n	40			14
	outliers	3			0
	mean (n)	0.4241			0.4201
	st.dev. (n)	0.02335			0.02176
	R(calc.)	0.0654			0.0609
	R(D2622:10)	0.0345			0.0383



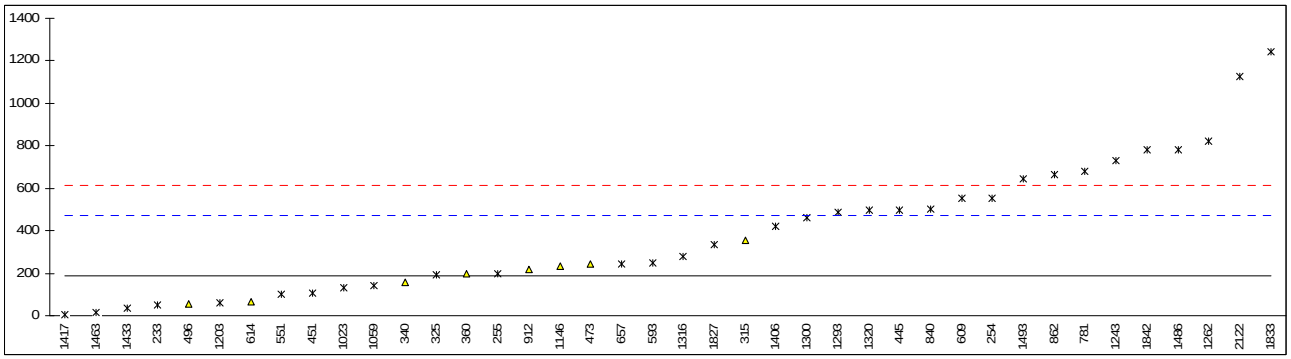


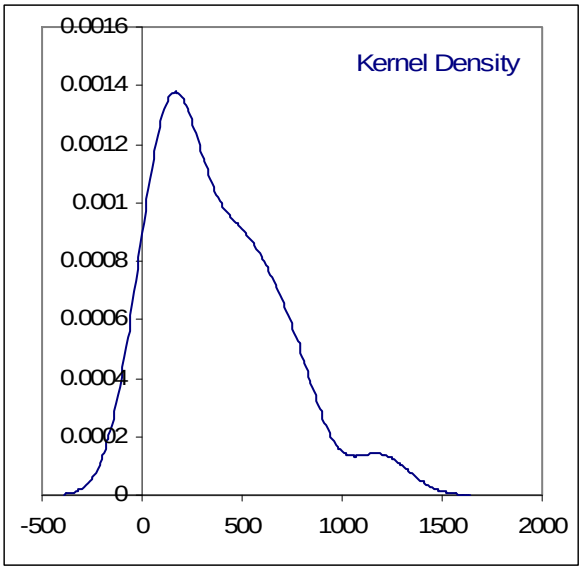
Determination of Water on sample #12062; results in mg/kg

lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233	D7358	50	ex	-1.00	Result excluded, see §4.1
237		-----		-----	
252	D95	<500	ex	-----	
254	D6304-B	553	ex	2.58	Result excluded, see §4.1
255	ISO9114	200	ex	0.07	Result excluded, see §4.1
311		-----		-----	
315	D6304-C	354		1.17	
325	D6304-A	192	ex	0.01	Result excluded, see §4.1
333		-----		-----	
337		-----		-----	
340	D6304-C	157.0		-0.24	
343		-----		-----	
353		-----		-----	
357		-----		-----	
360	D6304-C	195.9		0.04	
372		-----		-----	
396		-----		-----	
432		-----		-----	
445	D6304-A	495	ex	2.17	Result excluded, see §4.1
446		-----		-----	
450		-----		-----	
451	D6304-A	108.3	ex	-0.58	Result excluded, see §4.1
473	D6304-C	241.1		0.36	
494		-----		-----	
496	D6304-C	54.2		-0.97	
541		-----		-----	
551	D6304-A	103.7	ex	-0.61	Result excluded, see §4.1
593	D4006	250	ex	0.43	Result excluded, see §4.1
608		-----		-----	
609	D6304	551	ex	2.57	Result excluded, see §4.1
614	D6304-C	64.7		-0.89	
657	D6304	243.5	ex	0.38	Result excluded, see §4.1
663		-----		-----	
704		-----		-----	
781	D6304-A	682	ex	3.50	Result excluded, see §4.1
840	D95	500	ex	2.20	Result excluded, see §4.1
862	D6304-C	666.1	G(0.01)	3.39	
875		-----		-----	
886		-----		-----	
902		-----		-----	
912	D6304-C	220		0.21	
913		-----		-----	
963		-----		-----	
994		-----		-----	
1013		-----		-----	
1017		-----		-----	
1023	D6304-A	133	ex	-0.41	Result excluded, see §4.1
1040		-----		-----	
1059	D6304	140	ex	-0.36	Result excluded, see §4.1
1106		-----		-----	
1146	D6304-C	234		0.31	
1162		-----		-----	
1173		-----		-----	
1203	ISO12937	62.3	ex	-0.91	Result excluded, see §4.1
1213		-----		-----	
1224		-----		-----	
1243	DIN51777-1	730	ex	3.84	Result excluded, see §4.1
1262	D6304-A	823	ex	4.50	Result excluded, see §4.1
1271		-----		-----	
1293	ISO12937	487.55	ex	2.12	Result excluded, see §4.1
1300	D6304-A	460.39	ex	1.92	Result excluded, see §4.1
1316	D6304-A	280	ex	0.64	Result excluded, see §4.1
1320	D6304	495	ex	2.17	Result excluded, see §4.1
1349		-----		-----	
1402		-----		-----	
1406	D1744	420	ex	1.64	Result excluded, see §4.1
1407		-----		-----	
1412		-----		-----	
1417	in house	5	ex	-1.32	Result excluded, see §4.1
1431		-----		-----	
1433	ISO12937	36.52619	C,ex	-1.09	First reported 0.0036526192, result excluded, see §4.1
1448		-----		-----	
1460		-----		-----	

1463	D6304-A	15	ex	-1.25	Result excluded, see §4.1
1486	IR ABS	783.3	ex	4.22	Result excluded, see §4.1
1493	D6304	643	ex	3.22	Result excluded, see §4.1
1526	D4377	<5000	ex	-----	
1540		-----		-----	
1622		-----		-----	
1650		-----		-----	
1720		-----		-----	
1722		-----		-----	
1827	D6304-A	334.5	ex	1.03	Result excluded, see §4.1
1833	D6304	1241	ex	7.48	Result excluded, see §4.1
1842	in house	780	ex	4.20	Result excluded, see §4.1
1850		-----		-----	
1854		-----		-----	
1863		-----		-----	
1915		-----		-----	
2122	KF	1127	ex	6.66	Result excluded, see §4.1
2129		-----		-----	

normality	OK
n	8
outliers	1
mean (n)	190.11
st.dev. (n)	98.277
R(calc.)	275.18
R(D6304:07)	393.62





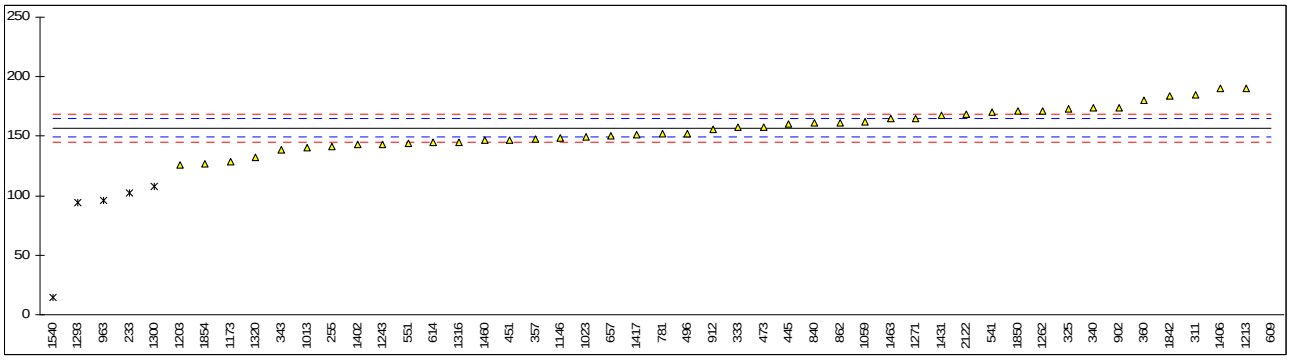
Determination of Calcium (Ca) on sample #12062; results in mg/kg

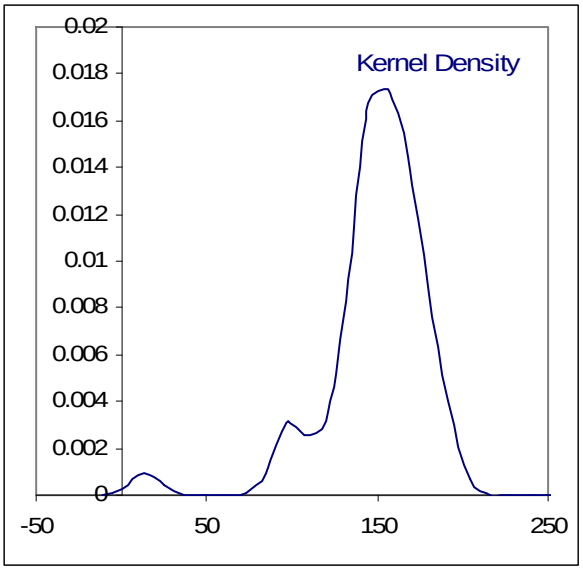
lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233	D6595	102.14	G(0.05)	-14.28	
237		-----		-----	
252		-----		-----	
254		-----		-----	
255	INH-E02	141.33	C	-4.05	First reported 235.57
311	D5185	185		7.36	
315		-----		-----	
325	D5185	173		4.23	
333	D5185	158		0.31	
337		-----		-----	
340	D5185	174		4.49	
343	D5185	139		-4.65	
353		-----		-----	
357	IP501	148		-2.30	
360	D5185	180		6.06	
372		-----		-----	
396		-----		-----	
432		-----		-----	
445	D5185	160		0.83	
446		-----		-----	
450		-----		-----	
451	D5185	147		-2.56	
473	D5185	158		0.31	
494		-----		-----	
496	D5185	152.1		-1.23	
541	D5185	170		3.44	
551	D5185	144		-3.35	
593		-----		-----	
608		-----		-----	
609	D5185	3010	C,G(0.01)	745.39	First reported 2884
614	D5185	144.5		-3.22	
657	D5185	150.0		-1.78	
663		-----		-----	
704		-----		-----	
781	D5185	152		-1.26	
840	UOP389	161.0		1.09	
862	D5185	161.2		1.15	
875		-----		-----	
886		-----		-----	
902	D5185	174.2		4.54	
912	D5185	156		-0.21	
913		-----		-----	
963	D5185	96.38	G(0.05)	-15.79	
994		-----		-----	
1013	D5185	140		-4.39	
1017		-----		-----	
1023	D5185	149.4		-1.94	
1040		-----		-----	
1059	in house	162		1.35	
1106		-----		-----	
1146	D5185	148.2		-2.25	
1162		-----		-----	
1173	in house	128.4		-7.42	
1203	XRF	126		-8.05	
1213	D4628	190		8.67	
1224		-----		-----	
1243	DIN51391-3	143.5		-3.48	
1262	D5185	171		3.71	
1271	D6481	165.20		2.19	
1293	D6595	94.45	C,G(0.05)	-16.29	First reported 74.050
1300	D5185	107.5	G(0.05)	-12.88	
1316	D5185	145		-3.09	
1320	D5185	131.9		-6.51	
1349		-----		-----	
1402	D5185	143		-3.61	
1406	D4628	190	C	8.67	First reported 220
1407		-----		-----	
1412		-----		-----	
1417	in house	151		-1.52	
1431	XRF	168		2.92	
1433		-----		-----	
1448		-----		-----	
1460	D5185	146.3		-2.75	

1463	ICP	165		2.14
1486		-----		-----
1493		-----		-----
1526		-----		-----
1540	D6481	14.1	G(0.01)	-37.28
1622		-----		-----
1650		-----		-----
1720		-----		-----
1722		-----		-----
1827		-----		-----
1833		-----		-----
1842	in house	184		7.10
1850	in house	171		3.71
1854	D5185	127		-7.79
1863		-----		-----
1915		-----		-----
2122	D5185	168.9		3.16
2129		-----		-----

normality	OK
n	43
outliers	6
mean (n)	156.82
st.dev. (n)	16.665
R(calc.)	46.66
R(D5185:09)	10.72

Application range: 40 – 9000 mg/kg





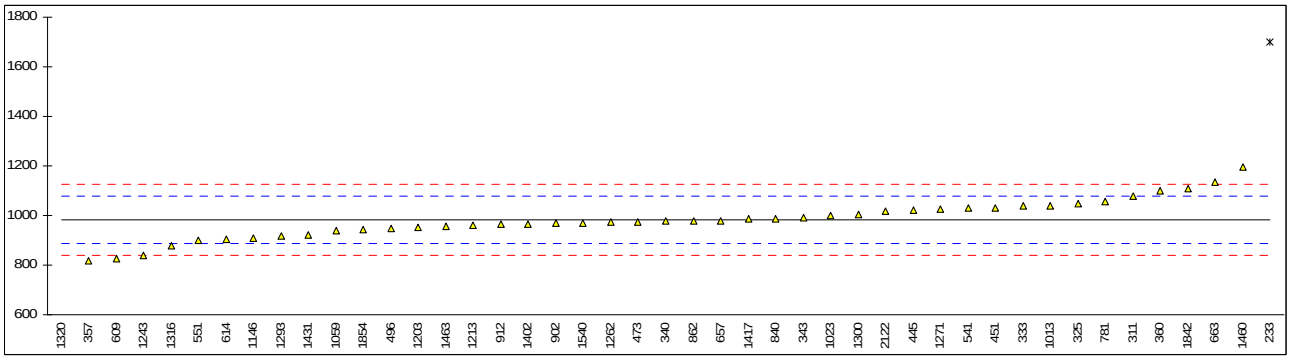
Determination of Phosphorus (P) on sample #12062; results in mg/kg

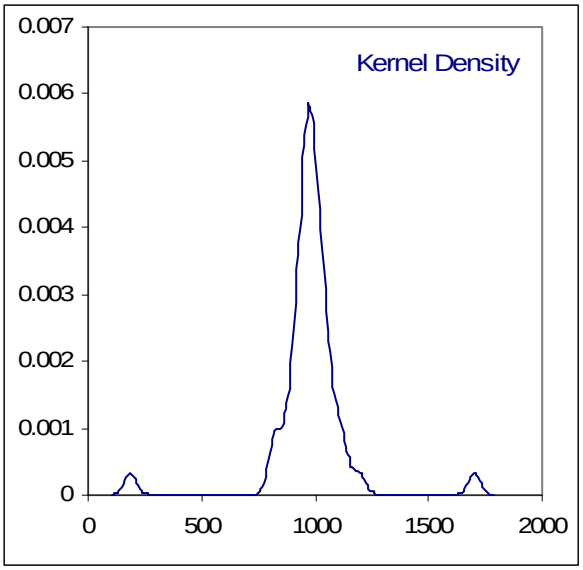
lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233	D6595	1701	G(0.01)	14.92	
237		-----		-----	
252		-----		-----	
254		-----		-----	
255		-----		-----	
311	D5185	1080		2.02	
315		-----		-----	
325	D5185	1046		1.31	
333	D5185	1039		1.17	
337		-----		-----	
340	D5185	977		-0.12	
343	D5185	990		0.15	
353		-----		-----	
357	IP501	816		-3.46	
360	D5185	1098		2.39	
372		-----		-----	
396		-----		-----	
432		-----		-----	
445	D5185	1020		0.77	
446		-----		-----	
450		-----		-----	
451	D5185	1030		0.98	
473	D5185	975		-0.16	
494		-----		-----	
496	D5185	946.4		-0.75	
541	D5185	1030		0.98	
551	D5185	902		-1.68	
593		-----		-----	
608		-----		-----	
609	D5185	824	C	-3.30	First reported 714
614	D5185	903.1		-1.65	
657	D5185	977.2		-0.12	
663	D5185	1133		3.12	
704		-----		-----	
781	D5185	1058		1.56	
840	UOP389	989.1		0.13	
862	D5185	977.0		-0.12	
875		-----		-----	
886		-----		-----	
902	D5185	970.7		-0.25	
912	D5185	964		-0.39	
913		-----		-----	
963		-----		-----	
994		-----		-----	
1013	D5185	1040		1.19	
1017		-----		-----	
1023	D5185	998		0.32	
1040		-----		-----	
1059	in house	941		-0.87	
1106		-----		-----	
1146	D5185	910.1		-1.51	
1162		-----		-----	
1173		-----		-----	
1203	XRF	953		-0.62	
1213	D4951	963		-0.41	
1224		-----		-----	
1243	DIN51391-3	840.0		-2.96	
1262	D5185	974		-0.18	
1271	D6481	1024		0.86	
1293	D6595	916.58	C	-1.37	First reported 1199
1300	D5185	1006.1		0.49	
1316	D5185	880		-2.13	
1320	D1091	185	C,G(0.01)	-16.57	First reported 644.7
1349		-----		-----	
1402	D5185	964		-0.39	
1406		-----		-----	
1407		-----		-----	
1412		-----		-----	
1417	in house	988		0.11	
1431	XRF	923		-1.24	
1433		-----		-----	
1448		-----		-----	
1460	D5185	1195		4.41	

1463	ICP	955	-0.58
1486		-----	-----
1493		-----	-----
1526		-----	-----
1540	D6481	971.5	-0.23
1622		-----	-----
1650		-----	-----
1720		-----	-----
1722		-----	-----
1827		-----	-----
1833		-----	-----
1842	in house	1110	2.64
1850		-----	-----
1854	D5185	942	-0.85
1863		-----	-----
1915		-----	-----
2122	D5185	1018	0.73
2129		-----	-----

normality	OK
n	43
outliers	2
mean (n)	982.74
st.dev. (n)	77.209
R(calc.)	216.18
R(D5185:09)	134.80

Application range: 10 – 1000 mg/kg





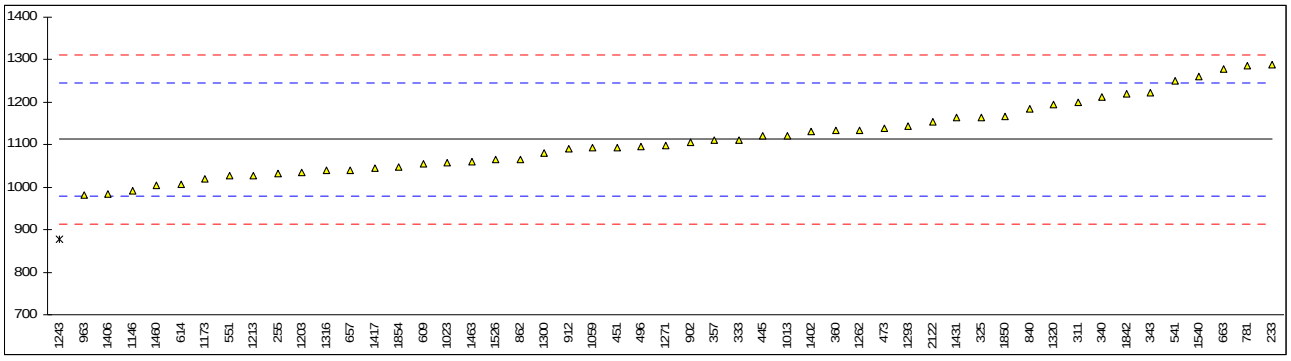
Determination of Zinc (Zn) on sample #12062; results in mg/kg

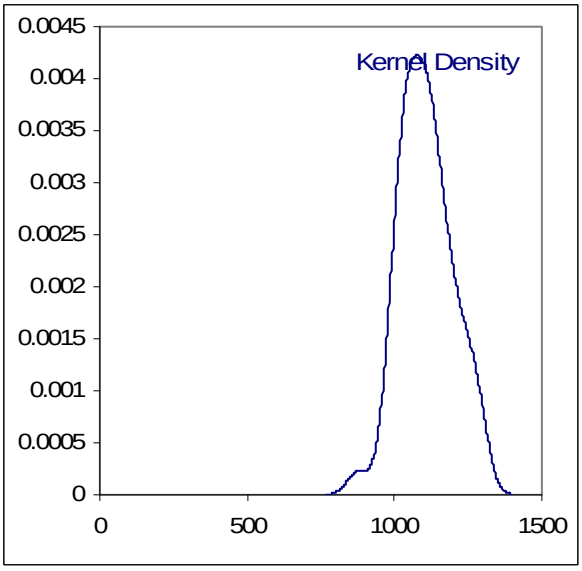
lab	method	value	mark	z(targ)	remarks
128		-----		-----	
233	D6595	1288		2.64	
237		-----		-----	
252		-----		-----	
254		-----		-----	
255	INH-E02	1032.645		-1.20	
311	D5185	1200		1.31	
315		-----		-----	
325	D5185	1165		0.79	
333	D5185	1111		-0.02	
337		-----		-----	
340	D5185	1213		1.51	
343	D5185	1222		1.64	
353		-----		-----	
357	IP501	1111		-0.02	
360	D5185	1133		0.31	
372		-----		-----	
396		-----		-----	
432		-----		-----	
445	D5185	1120		0.11	
446		-----		-----	
450		-----		-----	
451	D5185	1093		-0.29	
473	D5185	1138		0.38	
494		-----		-----	
496	D5185	1095		-0.26	
541	D5185	1250		2.07	
551	D5185	1026		-1.30	
593		-----		-----	
608		-----		-----	
609	D5185	1055	C	-0.87	First reported 874.4
614	D5185	1006.5		-1.60	
657	D5185	1040.4		-1.09	
663	D5185	1278		2.49	
704		-----		-----	
781	D5185	1286		2.61	
840	UOP389	1185.4		1.09	
862	D5185	1065.8		-0.70	
875		-----		-----	
886		-----		-----	
902	D5185	1106.96		-0.08	
912	D5185	1090		-0.34	
913		-----		-----	
963	D5185	982.2		-1.96	
994		-----		-----	
1013	D5185	1120		0.11	
1017		-----		-----	
1023	D5185	1058		-0.82	
1040		-----		-----	
1059	in house	1093		-0.29	
1106		-----		-----	
1146	D5185	990.8		-1.83	
1162		-----		-----	
1173	in house	1020.7		-1.38	
1203	XRF	1034	C	-1.18	First reported 682
1213	D4628	1026		-1.30	
1224		-----		-----	
1243	DIN51391-3	877.0	G(0.05)	-3.54	
1262	D5185	1134		0.32	
1271	D6481	1097.9		-0.22	
1293	D6595	1145.000		0.49	
1300	D5185	1081.66		-0.47	
1316	D5185	1040		-1.09	
1320	D5185	1194.1		1.23	
1349		-----		-----	
1402	D5185	1130		0.26	
1406	D4628	985		-1.92	
1407		-----		-----	
1412		-----		-----	
1417	in house	1044		-1.03	
1431	XRF	1164		0.77	
1433		-----		-----	
1448		-----		-----	
1460	D5185	1005		-1.62	

1463	ICP	1060	-0.79
1486		-----	-----
1493		-----	-----
1526	D5185	1064.5	-0.72
1540	D6481	1260.5	2.22
1622		-----	-----
1650		-----	-----
1720		-----	-----
1722		-----	-----
1827		-----	-----
1833		-----	-----
1842	in house	1220	1.61
1850	in house	1166	0.80
1854	D5185	1047	-0.99
1863		-----	-----
1915		-----	-----
2122	D5185	1155	0.64
2129		-----	-----

normality	OK
n	50
outliers	1
mean (n)	1112.6
st.dev. (n)	83.05
R(calc.)	232.5
R(D5185:09)	186.2

Application range: 60 – 1600 mg/kg





APPENDIX 2

Analytical details acid number determination via ASTM D664

lab	method	type of apparatus	KOH solution A	KOH solution B	KOH solution C	type electrodes	pH4/pH7 (mV)	drift of electrode	blank titration	sample size (g)	unit reading
128											
233											
237	2009a; A	Titrino 848 plus	Yes	Yes	Yes	LiCl sat. EtOH	162.9	1	yes	5.039	mV
252											
254											
255											
311	A	Titrando 835	No	No	No	pH, Ag/AgCl	169		Yes	5	pH
315											
325	2009a; A	Automatic autosampler	No	Yes	Yes	LLsolyotrode;LiCl sat EtoH	175	1	Yes	1	pH
333											
337											
340	A	798 MPT	Yes	Yes		Ag/AgCl; LiCl sat EtOH	180	2	Yes	5.185	mV
343	2009; A	702 Titrino	*)	*)	*)	LiCl sat EtOH	173.4	1	Yes	5	mV
353	2011a; A	702 Titrino	Yes	Yes	Yes	Ag/AgCl	171		Yes	1.672	pH
357											
360	A	Titrator DL38	Yes	Yes	Yes	DG113-SC	164.0	1	Yes	5	mV
372	2011a; A	794 basic titrino	Yes	Yes	Yes	Solvatrode	185	1	Yes	5	mV
396											
432											
445	2011a; A	716 DMS Titrino	*)	*)	*)	Unitrode	207		Yes	5	mV
446											
450											
451											
473											
494	2011a; A	Titrando Fa	**)	**)	**)	Solvotrode	182	1	Yes	5	mV
496	2011a; A	721 Titrino	*)	*)	*)	Pt tritrode; Ag/AgCl	169	2		1.6	mV
541											
551											
593	A	Potentiometer	No	Yes	No	Ag/AgCl	163	1	Yes	2.03	pH
608	2011a; A	Autotitrator 809	Yes	Yes	Yes	Combined pH	174.2		Yes	4 - 5	mV
609	2011a; A	Autotitrator	No	No	No	Ag/AgCl	177.4	1	Yes	120 mL	mV
614	B	102 SM Titrino	Yes	Yes	No				No	4.029	mV
657	2011a; A	Titrino 848 plus	*)	*)	*)	LL solvotrode	177.5	1	Yes	5	mV
663											
704	2011a; A	Titrino 799 GPT	Yes	Yes	Yes	LL Solvotrode	165	<1	Yes	5	mV
781	2011a; A	Kemat 500N-1	Yes	Yes	Yes	Glas C-173	88		Yes	20	mV
840	2011a; A	Titrino DMP 785	Yes	Yes	Yes	LL solvotrode, LiCl sat EtOH	180	1	Yes	5	mV
862	2011a; A	809 Titrando	Yes	Yes	Yes		167.2	1	Yes	2.3	mV
875											
886											
902											
912	A	Titranomotor	Yes	Yes	No	Combi; Ag/AgCl	163		Yes		mV
913											
963											
994											
1013											
1017											
1023											
1040											
1059											
1106	2011a; A	Titranomotor	Yes	Yes	Yes	Ag/AgCl	207		Yes	1.026	mV
1146	2009a; A	716 DMS Titrino	*)	*)	*)	Ag/AgCl; LiCl sat EtOH	163.3	3	Yes	5.06	mV
1162	2011a; A	T70 Toledo	Yes	Yes	Yes	Combi elect.		3	Yes	1 - 2	mV
1173											
1203	2011	KEM titrator AT510	Yes	Yes	No	Combi elect.	171.7		Yes	5	mV
1213	2009a; A	Titrino 848 plus	Yes	Yes	Yes		183		Yes	10	mV
1224											
1243											
1262											
1271	2009; A	716 DMS Titrino	Yes	Yes		LL Solvotrode	177		No	5	mV
1293											
1300	2009a; A	T50 Toledo	Yes	Yes	Yes	DG113-SC	173	<1	Yes	5.9	mV
1316											
1320											
1349											
1402											
1406											

1407											
1412											
1417											
1431											
1433	2011a; A	Metrohm 702 SM	Yes	Yes	Yes	Ag/AgCl			Yes	5	mV
1448											
1460	2009a; A	DL-28 Toledo	Yes	Yes	Yes	MT DG-113	183.5	2	Yes	20	mV
1463											
1486											
1493											
1526											
1540	2011a; A	716 DMS Titrino	*)	*)	*)	Pt/glass, LiCl sat IPA	163	1	Yes	5	mV
1622	2009a; A	794 Titrino	Yes	Yes	Yes	LiCl sat EtOH		1	Yes	5	mV
1650	2009a; A	794 Titrino	No	No	No	Solvotrode	152		Yes	5	mV
1720	2011a	D50 toledo	Yes	Yes	Yes		165		Yes	5	mV
1722											
1827	2011a; A	702 Titrino	*)	*)	*)	LL Solvotrode	182	1	Yes	1	mV
1833											
1842											
1850											
1854	2011a; A		No	No	No	LiCl	280		No	4.64	mV
1863	2011a; A		No	No	No	Combi glass	175.9	1	Yes	6.09	mV
1915											
2122											
2129	2009a; A	702 SM Titrino	*)	*)	*)		170	1	Yes	5.09	mV

A = boiled for 10 minutes

B = stand for 2 days

C = filtered

*) a commercial “ready for use” KOH standard solution was used

**) a T-n-Butylammonium hydroxide solution was used instead of KOH solution

APPENDIX 3

Number of participants per country

1 laboratory in	ARGENTINA
1 laboratory in	AUSTRALIA
1 laboratory in	AUSTRIA
2 laboratories in	AZERBAIJAN
2 laboratories in	BELGIUM
1 laboratory in	BOSNIA and HERZEGOVINA
1 laboratory in	BRAZIL
2 laboratories in	BULGARIA
1 laboratory in	CANADA
1 laboratory in	CROATIA
1 laboratory in	ECUADOR
3 laboratories in	ESTONIA
1 laboratory in	FINLAND
3 laboratories in	FRANCE
4 laboratories in	GERMANY
1 laboratory in	GHANA
4 laboratories in	GREECE
2 laboratories in	HUNGARY
2 laboratories in	INDIA
1 laboratory in	INDONESIA
1 laboratory in	IRELAND
1 laboratory in	ITALY
2 laboratories in	KENYA
4 laboratories in	MALAYSIA
1 laboratory in	NEGARA BRUNEI DARUSSALAM
1 laboratory in	NIGERIA
2 laboratories in	NORWAY
3 laboratories in	P.R. of CHINA
1 laboratory in	POLAND
1 laboratory in	PORTUGAL
1 laboratory in	REPUBLIC OF MACEDONIA
2 laboratories in	RUSSIA
3 laboratories in	SAUDI ARABIA
1 laboratory in	SERBIA
1 laboratory in	SINGAPORE
1 laboratory in	SLOVAKIA
1 laboratory in	SLOVENIA
3 laboratories in	SPAIN
1 laboratory in	SUDAN
1 laboratory in	SWEDEN
1 laboratory in	TAIWAN R.O.C.
1 laboratory in	TANZANIA
2 laboratories in	THAILAND
3 laboratories in	THE NETHERLANDS
3 laboratories in	TURKEY
1 laboratory in	U.S.A.
1 laboratory in	UKRAINE
11 laboratories in	UNITED KINGDOM
2 laboratories in	VIETNAM

APPENDIX 4

Abbreviations:

C	= final result after checking of first reported suspect result
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
U	= reported in different unit
W	= result withdrawn on request of the participants
fr.	= first reported
S	= scope of the reported method is not applicable
n.a.	= not applicable
n.e.	= not evaluated
SDS	= Material Safety Data Sheet

Literature:

1 iis Interlaboratory Studies, Protocol for the Organization, Statistics and Evaluation, January 2010

2 ASTM E178-89

3 ASTM E1301-89

4 ISO 5725-86

5 ISO 5725, parts 1-6, 1994

6 ISO13528-05

7 M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)

8 W.J. Youden and E.H. Steiner, Statistical Manual of the AOAC, (1975)

9 IP 367/84

10 DIN 38402 T41/42

11 P.L. Davies, First reported Z. Anal. Chem, 331, 513, (1988)

12 J.N. Miller, Analyst, 118, 455, (1993)

13 Analytical Methods Committee Technical brief, No4 January 2001.

14 The Royal Society of Chemistry 2002, Analyst 2002, 127 pages 1359-1364, P.J. Lowthian and M. Thompson (see http://www.rsc.org/suppdata/an/b2/b205600n/).