Results of Proficiency Test
Hydraulic Oil (used)
November 2021

Organized by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

Author: ing. A. Ouwerkerk
Correctors: ing. G.A. Oosterlaken-Buijs & ing. R.J. Starink
Report: iis21L10

January 2022

CONTENTS

1 INTRODUCTION

Since 2003 the Institute for Interlaboratory Studies (iis) organizes a proficiency scheme for the analysis of Hydraulic Oil (used) every year. During the annual proficiency test program 2021/2022 it was decided to continue the round robin for the analysis of Hydraulic Oil (used). This interlaboratory study contains also a proficiency test for the determination of Metals in Hydraulic Oil (used) only.

In the proficiency test for the regular analyzes in Hydraulic Oil (used) 66 laboratories in 39 countries registered for participation. In the proficiency test for analyses of metals in Hydraulic Oil (used) 48 laboratories in 33 countries registered for participation. In total 68 laboratories in 40 different countries registered for participation in one or more proficiency tests. See appendix 2 for the number of participants per country. In this report the results of the Hydraulic Oil (used) proficiency tests are presented and discussed. This report is also electronically available through the iis website www.iisnl.com.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organizer of this proficiency test (PT). Sample analyzes for fit-for-use and homogeneity testing were subcontracted to an ISO/IEC17025 accredited laboratory.
In this proficiency test the participants received, depending on the registration: a 1L bottle with Hydraulic Oil (used) labelled #21215 for regular analyzes and/or a 50mL PE bottle labelled #21216 for the analyzes of metals only.
The participants were requested to report rounded and unrounded test results. The unrounded test 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/IEC17043:2010 (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% confidentiality 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 organization of this proficiency test was the one as described for proficiency testing in the report ‘iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation’ of June 2018 (iis-protocol, version 3.5). This protocol is electronically available through the iis website www.iisnl.com, from the FAQ page.

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

A batch of approximately 200 liters of Hydraulic Oil (used) was obtained from a local supplier. After homogenization 88 amber glass bottles of 1L were filled and labelled #21215.
The homogeneity of the subsamples was checked by determination of Density at 15°C in accordance with ISO12185 and by determination of Kinematic Viscosity at 40°C in accordance with ASTM D445 on 8 stratified randomly selected subsamples.

	Density at 15°C in kg/L	Kinematic Viscosity at 40°C in mm^2/s
sample #21215-1	0.87279	42.18
sample #21215-2	0.87279	42.18
sample #21215-3	0.87278	42.16
sample #21215-4	0.87279	42.16
sample #21215-5	0.87278	42.16
sample #21215-6	0.87279	42.16
sample #21215-7	0.87277	42.18
sample #21215-8	0.87279	42.20

Table 1: homogeneity test results of subsamples #21215

From the above test results the repeatabilities were calculated and compared with 0.3 times the corresponding reproducibility of the reference methods in agreement with the procedure of ISO13528, Annex B2 in the next table.

	Density at 15°C in kg/L	Kinematic Viscosity at 40°C in mm^2/s
r (observed)	0.00002	0.042
reference method	ISO12185:96	iis memo 1401
0.3 x R (reference method)	0.00015	0.228

Table 2: evaluation of the repeatabilities of subsamples #21215

The calculated repeatabilities are in agreement with 0.3 times the corresponding reproducibility of the reference methods. Therefore, homogeneity of the subsamples was assumed.

A batch of approximately 7 liters of Hydraulic Oil (used) with different elements added was obtained from a third party. After homogenization 90 PE bottles of 50 mL were filled and labelled #21216.
The homogeneity of the subsamples was checked by the determination of Copper and Nickel in accordance with ASTM D5185 on 8 stratified randomly selected subsamples.

	Copper as Cu in mg/kg	Nickel as Ni in mg/kg
sample #21216-1	14.0	10.1
sample #21216-2	13.9	10.0
sample #21216-3	13.9	10.0
sample #21216-4	14.0	10.0
sample #21216-5	14.4	9.8
sample #21216-6	14.2	10.0
sample #21216-7	14.3	10.4
sample #21216-8	14.4	10.9

Table 3: homogeneity test results of subsamples #21216

From the above test results the repeatabilities were calculated and compared with 0.3 times the corresponding reproducibility of the reference test method in agreement with the procedure of ISO13528, Annex B2 in the next table.

	Copper as Cu in mg/kg	Nickel as Ni in mg/kg
r (observed)	0.60	0.97
reference test method	D5185:18	D5185:18
0.3 x R (reference test method)	1.02	1.43

Table 4: evaluation of the repeatabilities of subsamples #21216

The calculated repeatabilities are in agreement with 0.3 times the corresponding reproducibility of the reference test method. Therefore, homogeneity of the subsamples was assumed.

Depending on the registration the appropriate set of PT samples was sent on October 6, 2021. An SDS was added to the sample package.

2.5 STABILITY OF THE SAMPLES

The stability of Hydraulic Oil (used) packed in amber glass and PE bottles was checked. The material was found sufficiently stable for the period of the proficiency test.

2.6 ANALYZES

The participants were requested to determine on sample #21215: Total Acid Number, Density at 15°C, Flash Point PMcc, Kinematic Viscosity at 40 and 100°C, Kinematic Viscosity Stabinger at 40 and 100°C, Sulfur, Water and Level of Contamination (counts/mL and scale number).
Also, some additional questions were asked about Total Acid Number.
On sample #21216 it was requested to determine 23 elements: Al, Ba, B, Cd, Cr, Cu, Fe, Pb, Li, Mg, Mn, Mo, Ni, K, Si, Ag, Na, Sn, Ti, V, Ca, P and Zn.

It was explicitly requested to treat the samples as if they were routine samples and to report the test results using the indicated units on the report form and not to round the test results but report as much significant figures as possible. It was also requested not to report ‘less than’ test results, which are above the detection limit, because such test results cannot be used for meaningful statistical evaluations.

To get comparable test results a detailed report form and a letter of instructions are prepared. On the report form the reporting units are given as well as the reference test methods (when applicable) that will be used during the evaluation. The detailed report form and the letter of instructions are both made available on the data entry portal www.kpmd.co.uk/sgs-iis/. The participating laboratories are also requested to confirm the sample receipt on this data entry portal. The letter of instructions can also be downloaded from the iis website www.iisnl.com.

3 RESULTS

During five weeks after sample dispatch, the test results of the individual laboratories were gathered via the data entry portal www.kpmd.co.uk/sgs-iis/. The reported test results are tabulated per determination in appendix 1 of this report. The laboratories are presented by their code numbers.

Directly after the deadline, a reminder was sent to those laboratories that had not reported test results at that moment. Shortly after the deadline, the available test results were screened for suspect data. A test 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 reported test results (no reanalyzes). Additional or corrected test results are used for data analysis and the original test results are placed under ‘Remarks’ in the test result tables in appendix 1. Test results that came in after the deadline were not taken into account in this screening for suspect data and thus these participants were not requested for checks.

3.1 STATISTICS

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 Organisation, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5).

For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded test results. Test 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. If a data set does not have a normal distribution, the (results of the) statistical evaluation should be used with due care.

The assigned value is determined by consensus based on the test results of the group of participants after rejection of the statistical outliers and/or suspect data.

According to ISO13528 all (original received or corrected) results per determination were submitted to outlier tests. In the iis procedure for proficiency tests, outliers are detected prior to calculation of the mean, standard deviation and reproducibility. For small data sets, Dixon (up to 20 test results) or Grubbs (up to 40 test results) outlier tests can be used. For larger data sets (above 20 test results) Rosner’s outlier test can be used. Outliers are marked by D(0.01) for the Dixon’s test, by G(0.01) or DG(0.01) for the Grubbs’ test and by R(0.01) for the Rosner’s test. Stragglers are marked by D(0.05) for the Dixon’s 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 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. In this PT the criterion of ISO13528, paragraph 9.2.1. was met for all evaluated tests, therefore, the uncertainty of all assigned values may be negligible and need not be included in the PT report.

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 test results are plotted. The corresponding laboratory numbers are on 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 reference test method. 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. Also, a normal Gauss curve (dotted line) was projected over the Kernel Density Graph (smooth line) for reference. The Gauss curve is calculated from the consensus value and the corresponding standard deviation.

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 (derived from e.g. ISO or ASTM test methods), the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the variation in this interlaboratory study.

The target standard deviation was calculated from the literature reproducibility by division with 2.8. In case no literature reproducibility was available, other target values were used, like Horwitz or an estimated reproducibility based on former iis proficiency tests.

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 according to:

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

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

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

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

4 EVALUATION

Some problems were encountered with the dispatch of the samples due to COVID-19 pandemic. Therefore, the reporting time on the data entry portal was extended with one week. For the sample for the regular analyzes three participants reported the test results after the extended final reporting date and six other participants did not report any test results. For the sample for the metal analyses three participants reported the test result after the extended final reporting date and seven other participants did not report any test results. Not all laboratories were able to report all tests requested.

In total 62 participants reported 1320 numerical test results. Observed were 48 outlying test results, which is 3.6%. In proficiency studies, outlier percentages of 3% - 7.5% are quite normal.

Not all 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, see also paragraph 3.1.

4.1 EVALUATION PER SAMPLE AND PER TEST

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

Unfortunately, a suitable reference test method, providing the precision data, is not available for all determinations. For these tests the calculated reproducibility was compared against the estimated reproducibility calculated with the Horwitz equation.

In the iis PT reports ASTM test methods are referred to with a number (e.g. ASTM D7647) and an added designation for the year that the test method was adopted or revised (e.g. ASTM D7647:10). If applicable a designation in parentheses is added to designate the year of reapproval (e.g. ASTM D7647:10(2018)). In the test results tables of appendix 1 only the method number (sub) and year of adoption or revision (e.g. ASTM D7647:10) will be used.

sample #21215

Total Acid Number: This determination was not problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D664-A:18e2 Buffer End Point 60mL and Inflection Point 60mL. The calculated reproducibility is not in agreement with the precision data for Buffer End Point 125mL and Inflection Point 125mL.
It is observed that five participants reported to have used BEP at pH 11 as determination end point. In method ASTM D664-A version 2018e2 the Buffer End Point at pH 10 is mentioned.

Density at 15°C: This determination was not problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in full agreement with the requirements of ISO12185:96.

Flash Point PMcc: This determination may not be problematic depending on the test method used. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D93:20 procedure A, but not with the requirements of procedure B.

Kinematic Viscosity at 40°C: The precision statement given in ASTM D445 for used (in-service) formulated oils appears to be very strict. Therefore, it is decided to use the reproducibilities found in previous iis PTs on used oils as mentioned in iis memo 1401.
This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the estimated reproducibility from iis memo 1401, but not in agreement with the requirements of ASTM D445:21e1.

Kinematic Viscosity at 100°C: The precision statement given in ASTM D445 for used (in-service) formulated oils appears to be very strict. Therefore, it is decided to use the reproducibilities found in previous iis PTs on used oils as mentioned in iis memo 1401.
This determination was not problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the estimated reproducibility from iis memo 1401, but not in agreement with the requirements of ASTM D445:21e1.

Viscosity Stabinger at 40°C: This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D7042:21a.

Viscosity Stabinger at 100°C: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D7042:21a.

Sulfur: This determination was problematic. Four statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D4294:21.

Water: This determination may be problematic depending on the test method used. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D6304-A:20 nor with procedure C but it is in agreement with procedure B.
When the test results from ASTM D6304:20 were evaluated separately for the procedures A, B and C the calculated reproducibilities of procedure A and C are not in agreement with the respective requirements but the calculated reproducibility of procedure B is in agreement with the requirements.
A new version of ASTM D6304 was published in 2020 with major changes. In the 2016 version one precision statement was mentioned for test results based on mass with a broad application range and one based on volume. In the 2020 version all precision statements are based on mass with three different procedures (A - direct injection, B - oven accessory and C - evaporation accessory) each with a different application range. In ASTM D6304:20 the reproducibility for all three procedures A, B and C is

much stricter compared to ASTM D6304:16e1. Although there is a new version of ASTM D6304 published in 2020 eleven participants mentioned to have used the A, B or C of the 2016 version still.

Level of Contamination: The reproducibility of ASTM D7647 is used for the calculation of the z-scores because ISO11500 does not mention a reproducibility but only 'Maximum allowable difference' in Annex A.
This determination was problematic. In total over six parameters six statistical outliers were observed and ten other test results were excluded. None of the calculated reproducibilities after rejection of the suspect data are in agreement with the requirements of ASTM D7647:10(2018).

sample #21216

Aluminum: This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D5185:18.

Barium: The consensus value of the group for the analysis of Barium is above the application range as it is mentioned in test method ASTM D5185:18. However, it is decided to extrapolate the reproducibility mentioned in ASTM D5185:18 to use for the calculation of the z-scores.
This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D5185:18.

Boron: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D5185:18.

Cadmium: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the estimated reproducibility calculated with the Horwitz equation.

Chromium: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D5185:18.

Copper: This determination was not problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D5185:18.

Iron: This determination was not problematic. No statistical outliers were observed, but one test result was excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of ASTM D5185:18.

Lead: This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D5185:18.

Lithium: This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility is in agreement with the estimated reproducibility calculated with the Horwitz equation.

Magnesium: This determination was not problematic. No statistical outliers were observed, but one test result was excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of ASTM D5185:18.

Manganese: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D5185:18.

Molybdenum: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D5185:18.

Nickel: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D5185:18.

Potassium: This determination may not be problematic. The reporting participants agreed on a test result of less than 10 mg/kg. Therefore, no z-scores were calculated.

Silicon: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D5185:18.

Silver: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D5185:18.

Sodium: This determination was not problematic. No statistical outliers were observed but one test result was excluded. The calculated reproducibility after rejection of the suspect data is in full agreement with the requirements of ASTM D5185:18.

Tin: This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D5185:18.

Titanium: This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D5185:18.

Vanadium: This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D5185:18.

Calcium: This determination was not problematic. One statistical outlier was observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the estimated reproducibility calculated with the Horwitz equation, but is not at all in agreement with the strict requirements of ASTM D5185:18.

Phosphorus: This determination was not problematic. No statistical outliers were observed but one test result was excluded. The calculated reproducibility after rejection of the suspect data is in full agreement with the requirements of ASTM D5185:18.

Zinc: This determination was problematic. No statistical outliers were observed, but one other test result was excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of ASTM D5185:18.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the reference test method and the reproducibility as found for the group of participating laboratories. The number of significant test results, the average, the calculated reproducibility (2.8 * standard deviation) and the target reproducibility derived from literature reference test methods (in casu ASTM and ISO test methods) or based on previous proficiency tests or estimated using the Horwitz equation are presented in the next tables.

Parameter	unit	n	average	2.8 * sd	R(lit)
Total Acid Number	mg KOH/g	44	0.49	0.18	0.27
Density at 15°C	kg/L	40	0.8728	0.0005	0.0005
Flash Point PMcc	°C	37	197.2	11.2	14.0
Kinematic Viscosity at 40°C	mm^2/s	44	42.261	0.551	0.761
Kinematic Viscosity at 100°C	mm^2/s	41	7.517	0.126	0.165
Viscosity Stabinger at 40°C	mm^2/s	14	42.347	0.233	0.576
Viscosity Stabinger at 100°C	mm^2/s	15	7.524	0.071	0.097
Sulfur	mg/kg	21	4905	560	459
Water	mg/kg	48	61.8	59.8	42.9
L. of Contamination ≥ 4 µm (c)	counts/mL	24	718	1006	820
L. of Contamination ≥ 6 µm (c)	counts/mL	25	169	277	130
L. of Contamination ≥ 14 µm (c)	counts/mL	23	15.8	34.7	21.5

Parameter	unit	n	average	2.8 * sd	R(lit)
L. of Contamination ≥ 4 µm (c)	scale no.	28	16.4	2.9	1.7
L. of Contamination ≥ 6 µm (c)	scale no.	29	14.2	3.1	1.2
L. of Contamination ≥ 14 µm (c)	scale no.	27	10.5	4.3	2.0

Table 5: reproducibilities of tests on sample #21215

Element	unit	n	average	2.8 * sd	R(lit)
Aluminum as Al	mg/kg	37	12.2	2.5	7.3
Barium as Ba	mg/kg	35	25.4	4.1	11.6
Boron as B	mg/kg	34	13.0	9.9	13.3
Cadmium as Cd	mg/kg	28	11.7	1.7	3.6
Chromium as Cr	mg/kg	39	12.0	3.1	3.7
Copper as Cu	mg/kg	37	13.8	1.7	3.3
Iron as Fe	mg/kg	40	15.1	2.9	4.6
Lead as Pb	mg/kg	37	12.0	2.9	7.3
Lithium as Li	mg/kg	15	53.2	4.9	13.1
Magnesium as Mg	mg/kg	38	24.1	5.6	8.3
Manganese as Mn	mg/kg	34	11.3	2.1	2.4
Molybdenum as Mo	mg/kg	37	11.6	3.0	3.7
Nickel as Ni	mg/kg	40	12.0	2.3	5.2
Potassium as K	mg/kg	26	<10	n.e.	n.e.
Silicon as Si	mg/kg	37	11.8	2.1	7.6
Silver as Ag	mg/kg	34	11.9	3.2	4.2
Sodium as Na	mg/kg	36	13.1	7.5	6.8
Tin as Sn	mg/kg	36	10.8	2.6	9.2
Titanium as Ti	mg/kg	37	11.8	2.1	8.0
Vanadium as V	mg/kg	37	11.7	1.9	4.2
Calcium as Ca	mg/kg	35	75.6	15.5	17.7
Phosphorus as P	mg/kg	37	264	76	70
Zinc as Zn	mg/kg	38	314	58	46

Table 6: reproducibilities of tests on sample #21216

Without further statistical calculations, it can be concluded that for many tests there is a good compliance of the group of participants with the reference test methods. The problematic tests have been discussed in paragraph 4.1.

4.3 COMPARISON OF THE PROFICIENCY TEST OF NOVEMBER 2021 WITH PREVIOUS PTS

	November 2021	November 2020	November 2019	November 2018	November 2017
Number of reporting laboratories	62	57	63	52	57
Number of test results	1320	1313	1402	1053	1202
Number of statistical outliers	48	57	87	49	89
Percentage of statistical outliers	3.6%	4.3%	6.2%	4.7%	7.4%

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 to the requirements of the reference test methods. The conclusions are given in the following table.

Determination	November 2021	November 2020	November 2019	November 2018	November 2017
Total Acid Number	+	+	+/-	+/-	+
Density at 15°C	+/-	-	+	+/-	+/-
Flash Point PMcc	+	+	+/-	+/-	+/-
Kinematic Viscosity at 40°C	+	+	+	+	+
Kinematic Viscosity at 100°C	+	+	+	+	+
Viscosity Stabinger at 40°C	++	+	+	+/-	+
Viscosity Stabinger at 100°C	+	+	+	-	-
Sulfur	-	-	-	--	-
Water	-	++	++	++	++
L. of Contamination – counts/mL	-	+/-	-	-	--
L. of Contamination – scale no.	--	-	-	-	-
Aluminum as Al	++	++	+	+	++
Barium as Ba	++	+	++	++	+
Boron as B	+	++	++	++	++
Cadmium as Cd	++	++	-	n.e.	+
Chromium as Cr	+	+	+/-	n.e.	+/-
Copper as Cu	+	+	+	+	+
Iron as Fe	+	+/-	+	+/-	+
Lead as Pb	++	++	++	++	++
Lithium as Li	++	-	++	n.e.	+
Magnesium as Mg	+	+	+	+	+
Manganese as Mn	+	+/-	+/-	+/-	--
Molybdenum as Mo	+	+	+	++	+/-
Nickel as Ni	++	++	+	+/-	++
Potassium as K	n.e.	n.e.	(+)	++	+
Silicon as Si	++	+	++	+	+

Determination	November 2021	November 2020	November 2019	November 2018	November 2017
Silver as Ag	+	+	+	n.e.	+
Sodium as Na	+/-	+	+/-	+/-	-
Tin as Sn	++	++	++	+	++
Titanium as Ti	++	++	++	n.e.	++
Vanadium as V	++	+	+	n.e.	+
Calcium as Ca	+	+	+	--	--
Phosphorus as P	+/-	-	+	-	-
Zinc as Zn	-	-	+/-	-	+/-

Table 8: comparison determinations against the reference test methods

In the table above the following performance categories were used:

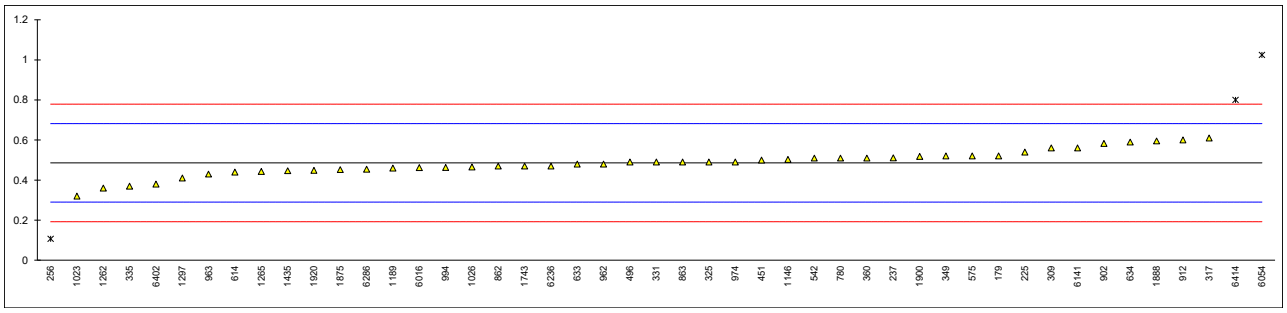
++ : group performed much better than the reference test method
+ : group performed better than the reference test method
+/- : group performance equals the reference test method
- : group performed worse than the reference test method
-- : group performed much worse than the reference test method
n.e.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

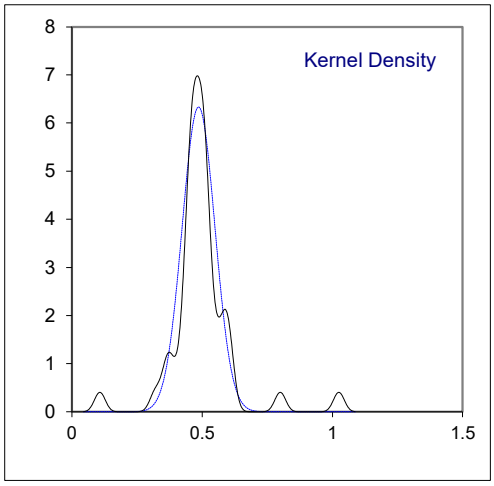
APPENDIX 1

Determination of Total Acid Number on sample #21215; results in mg KOH/g

lab	method	value	mark	z(targ)	remarks	End Point	Volume
178		-----		-----		---	---
179	D664	0.52		0.35		Inflection Point	60 mL
225	D974	0.54		0.55		---	---
237	D664-A	0.511		0.25		Inflection Point	60 mL
256	D7889	0.107	C,R(0.01)	-3.87	fr 1.07	---	---
257		-----		-----		---	---
309		0.56		0.76		Buffer End Point pH 10	60 mL
317	D974	0.61		1.27		Inflection Point	125 mL
325	D664-A	0.49		0.04		Buffer End Point pH 10	125 mL
331	D664 Mod.	0.49		0.04		Inflection Point	60 mL
335		0.37		-1.19		Inflection Point	125 mL
339		-----		-----		---	---
349	D664-A	0.52		0.35		---	---
360	D664-A	0.510		0.24		Inflection Point	60 mL
432		-----		-----		---	---
442		-----		-----		---	---
451	D664-A	0.50		0.14		Buffer End Point pH 10	60 mL
496	D664-A	0.49		0.04		Buffer End Point pH 10	60 mL
542	D974	0.51		0.24		Buffer End Point pH 11	60 mL
562		-----		-----		---	---
575	D664-A	0.52		0.35		Buffer End Point pH 10	60 mL
614	D664-A	0.44		-0.47		---	60 mL
633	D664-A	0.48		-0.06		---	---
634	D664-A	0.59		1.06		---	---
780	D664-A	0.51		0.24		Inflection Point	60 mL
862	D664-A	0.47		-0.16		Inflection Point	60 mL
863	D664-A	0.49		0.04		Inflection Point	60 mL
902	D664-A	0.583		0.99		Inflection Point	60 mL
912	D664-A	0.6		1.16		---	---
962	D664-A	0.48		-0.06		---	---
963	D664-A	0.43		-0.57		Inflection Point	60 mL
974	D664-A	0.49		0.04		Inflection Point	125 mL
975		-----		-----		---	---
994	D664-A	0.463		-0.24		Inflection Point	125 mL
1023	D8045	0.32		-1.70		---	---
1026	D664-A	0.4654		-0.21		Buffer End Point pH 10	125 mL
1146	D664-A	0.503		0.17		Buffer End Point pH 10	125 mL
1189	D664-A	0.46		-0.27		Inflection Point	60 mL
1262	ISO6618	0.36		-1.29		---	60 mL
1265	D664-A	0.4435		-0.43		Inflection Point	60 mL
1297	D664-A	0.41		-0.78		Buffer End Point pH 11	125 mL
1397		-----		-----		---	---
1435	D664-A	0.447		-0.40		Buffer End Point pH 10	---
1448		-----		-----		---	---
1531		-----		-----		---	---
1660		-----		-----		---	---
1720		-----		-----		---	---
1743	D664-A	0.47		-0.16		Buffer End Point pH 11	60 mL
1752		-----		-----		---	---
1788		-----		-----		---	---
1875	ISO6618	0.4527		-0.34		---	---
1888	D664-A	0.595		1.11		Buffer End Point pH 11	60 mL
1900	D664-A	0.518		0.33		Inflection Point	60 mL
1920	D664-AMod.	0.449		-0.38		Inflection Point	---
6016	D664-A	0.462		-0.25		Buffer End Point pH 11	60 mL
6054	D974	1.025	R(0.01)	5.50		---	---
6141	D974	0.56		0.76		---	---
6235		-----		-----		---	---
6236		0.47		-0.16		Inflection Point	60 mL
6286	ISO6619	0.4544		-0.32		Inflection Point	60 mL
6322		-----		-----		---	---
6402	D7889	0.38		-1.08		---	---
6404		-----		-----		---	---
6409		-----		-----		---	---
6413		-----		-----		---	---
6414	D664-A	0.80	C,R(0.01)	3.21	fr 0.84	---	---

normality	OK
n	44
outliers	3
mean	0.4861
st.dev. (n)	0.06302
R(calc.)	0.1764
st.dev.(D664-A:18e2, BEP 60mL)	0.09790
R(D664-A:18e2, BEP 60mL)	0.2741
Compare	
R(D664-A:18e2, IP 60mL)	0.2226
R(D664-A:18e2, BEP 125mL)	0.1480
R(D664-A:18e2, IP 125mL)	0.1031

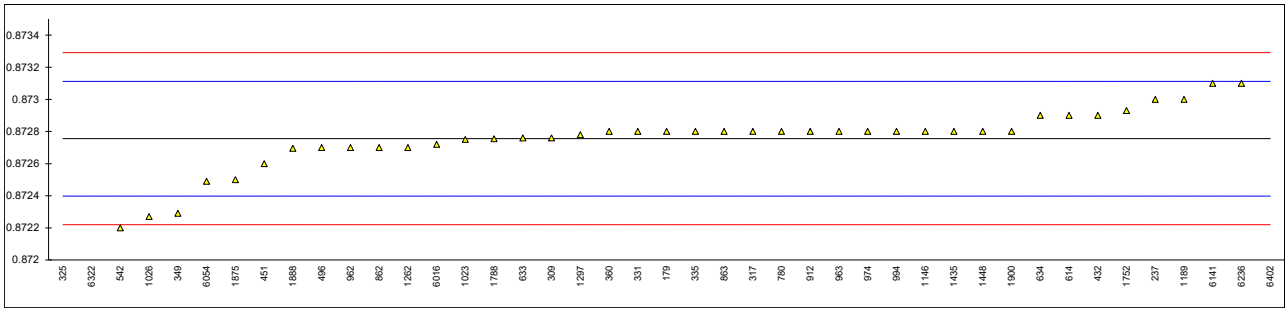


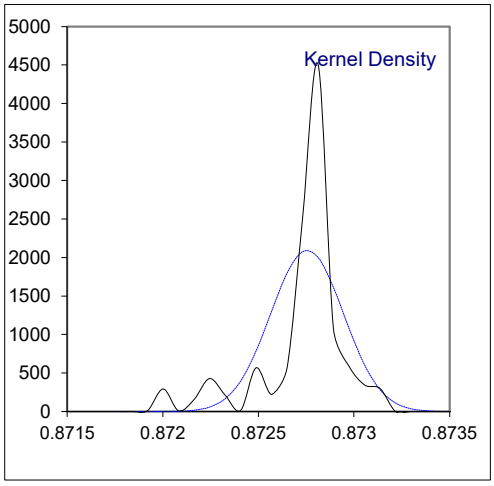


Determination of Density at 15°C on sample #21215; results in kg/L

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D4052	0.8728		0.25	
225		-----		-----	
237	D4052	0.8730		1.37	
256		-----		-----	
257		-----		-----	
309	D4052	0.87276		0.03	
317	D4052	0.8728		0.25	
325	D4052	0.8708	R(0.01)	-10.95	
331	ISO12185	0.8728		0.25	
335	ISO12185	0.8728		0.25	
339		-----		-----	
349	D4052	0.87229		-2.61	
360	D4052	0.8728		0.25	
432	D4052	0.87290		0.81	
442		-----		-----	
451	D4052	0.8726		-0.87	
496	ISO12185	0.87270		-0.31	
542	D4052	0.8722		-3.11	
562		-----		-----	
575		-----		-----	
614	D4052	0.8729		0.81	
633	D4052	0.87276		0.03	
634	D4052	0.8729		0.81	
780	ISO12185	0.8728		0.25	
862	D4052	0.8727	C	-0.31	Reported 872.7 kg/L
863	D4052	0.8728		0.25	
902		-----		-----	
912	ISO12185	0.8728		0.25	
962	D4052	0.8727		-0.31	
963	D4052	0.8728		0.25	
974	D4052	0.8728		0.25	
975		-----		-----	
994	ISO12185	0.8728		0.25	
1023	D4052	0.87275		-0.03	
1026	D4052	0.87227		-2.72	
1146	D4052	0.8728		0.25	
1189	D4052	0.8730		1.37	
1262	D4052	0.8727		-0.31	
1265		-----		-----	
1297	D4052	0.87278		0.14	
1397		-----		-----	
1435	D4052	0.8728		0.25	
1448	D4052	0.8728		0.25	
1531		-----		-----	
1660		-----		-----	
1720		-----		-----	
1743		-----		-----	
1752	D4052	0.87293		0.98	
1788	D4052	0.872755		0.00	
1875	DIN51757	0.8725		-1.43	
1888	ISO12185	0.872695		-0.34	
1900	D4052	0.8728		0.25	
1920		-----		-----	
6016	D4052	0.87272	C	-0.20	First reported 872.72 kg/L
6054	D4052	0.87249		-1.49	
6141	D4052	0.8731		1.93	
6235		-----		-----	
6236	D4052	0.8731	C	1.93	First reported 0.8064
6286		-----		-----	
6322	ISO12185	0.8720	R(0.05)	-4.23	
6402	ISO12185	0.89128	R(0.01)	103.74	
6404		-----		-----	
6409		-----		-----	
6413		-----		-----	
6414		-----		-----	

normality	not OK
n	40
outliers	3
mean (n)	0.87276
st.dev. (n)	0.000191
R(calc.)	0.00053
st.dev.(ISO12185:96)	0.000179
R(ISO12185:96)	0.0005

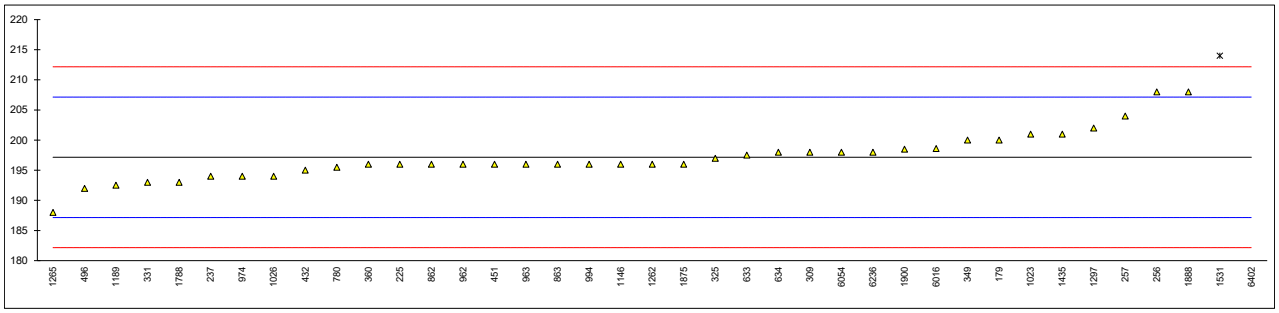


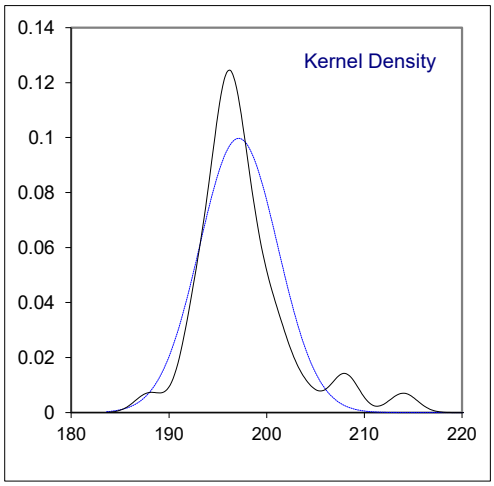


Determination of Flash Point PMcc on sample #21215; results in °C

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D93-A	200.0		0.57	
225	D93-B	196.0		-0.23	
237	D93-B	194.0		-0.63	
256	D3828	208.0		2.17	
257	D93-A	204		1.37	
309	D93-A	198.0		0.17	
317		-----		-----	
325	D93-A	197		-0.03	
331	D93-A	193		-0.83	
335		-----		-----	
339		-----		-----	
349	D93-A	200		0.57	
360	D93-A	196.0		-0.23	
432	D93-A	195.0		-0.43	
442		-----		-----	
451	D93-A	196		-0.23	
496	D93-B	192.0		-1.03	
542		-----		-----	
562		-----		-----	
575		-----		-----	
614		-----		-----	
633	D93-A	197.50		0.07	
634	D93-B	198.0		0.17	
780	D93-A	195.5		-0.33	
862	D93-A	196		-0.23	
863	D93-A	196.0		-0.23	
902		-----		-----	
912		-----		-----	
962	D93-A	196.0		-0.23	
963	D93-A	196.0		-0.23	
974	D93-A	194.0		-0.63	
975		-----		-----	
994	D93-A	196.0		-0.23	
1023	D93-A	201.0		0.77	
1026	D93-A	194	C	-0.63	First reported 222
1146	D93-A	196.0		-0.23	
1189	D93-A	192.5		-0.93	
1262	D93-A	196.0		-0.23	
1265	D93-A	188		-1.83	
1297	D93-B	202.0		0.97	
1397		-----		-----	
1435	D93-A	201.0		0.77	
1448		-----		-----	
1531	D92	214	R(0.01)	3.37	
1660		-----		-----	
1720		-----		-----	
1743		-----		-----	
1752		-----		-----	
1788	D93-B	193.0		-0.83	
1875	ISO2719-B	196		-0.23	
1888	ISO2719-A	208		2.17	
1900	D7094	198.50		0.27	
1920		-----		-----	
6016	D6450	198.6		0.29	
6054	D93-A	198.0		0.17	
6141		-----		-----	
6235		-----		-----	
6236	D93-A	198		0.17	
6286		-----		-----	
6322		-----		-----	
6402	D93-A	260	R(0.01)	12.57	
6404		-----		-----	
6409		-----		-----	
6413		-----		-----	
6414		-----		-----	

normality	suspect
n	37
outliers	2
mean (n)	197.15
st.dev. (n)	4.002
R(calc.)	11.21
st.dev.(D93-A:20)	4.999
R(D93-A:20)	14.00
Compare	
R(D93-B:20)	10

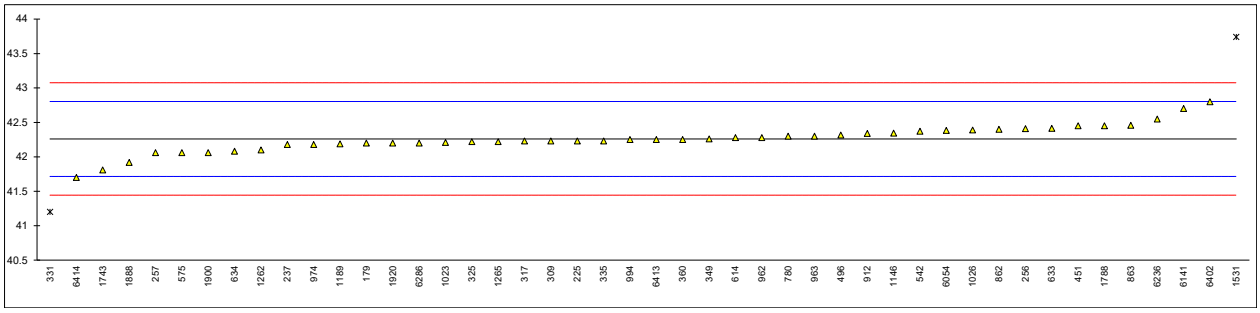


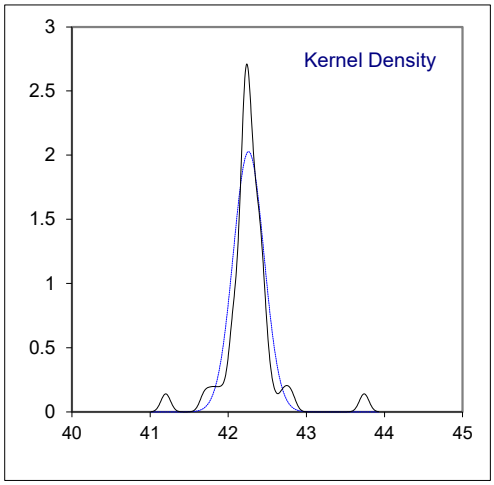


Determination of Kinematic Viscosity at 40°C on sample #21215; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D445	42.20		-0.22	
225	D445	42.23		-0.11	
237	D445	42.18		-0.30	
256	D7279 corrected to D445	42.41		0.55	
257	D7279 corrected to D445	42.06		-0.74	
309	D445	42.23		-0.11	
317	D445	42.23		-0.11	
325	D445	42.22		-0.15	
331	D7279Mod.	41.2	R(0.01)	-3.90	
335	D445	42.23		-0.11	
339		-----		-----	
349	D445	42.26		0.00	
360	D445	42.251		-0.04	
432		-----		-----	
442		-----		-----	
451	D7279 corrected to D445	42.45		0.70	
496	D445	42.317		0.21	
542	D7042	42.374		0.42	
562		-----		-----	
575	D7279 corrected to D445	42.06		-0.74	
614	D445	42.28		0.07	
633	D445	42.415		0.57	
634	D7279 corrected to D445	42.08		-0.66	
780	D445	42.30		0.14	
862	D445	42.4		0.51	
863	D445	42.46		0.73	
902		-----		-----	
912	D445	42.34		0.29	
962	D445	42.28		0.07	
963	D445	42.30		0.14	
974	D445	42.18		-0.30	
975		-----		-----	
994	D445	42.25		-0.04	
1023	D445	42.21		-0.19	
1026	D445	42.39		0.48	
1146	D445	42.345		0.31	
1189	D445	42.19		-0.26	
1262	D445	42.10		-0.59	
1265	D7279	42.22		-0.15	
1297		-----		-----	
1397		-----		-----	
1435		-----		-----	
1448		-----		-----	
1531	D445	43.74	R(0.01)	5.45	
1660		-----		-----	
1720		-----		-----	
1743	D7279 corrected to D445	41.81		-1.66	
1752		-----		-----	
1788	D445	42.4506		0.70	
1875		-----		-----	
1888	D445	41.92	C	-1.25	First reported 43.22
1900	D7279	42.06		-0.74	
1920	D445	42.200		-0.22	
6016		-----		-----	
6054	D445	42.384		0.45	
6141	D445	42.7017		1.62	
6235		-----		-----	
6236	D7279 corrected to D445	42.549		1.06	
6286	ISO3104	42.20		-0.22	
6322		-----		-----	
6402	D445	42.8		1.99	
6404		-----		-----	
6409		-----		-----	
6413	ISO3104	42.25		-0.04	
6414	D7279 corrected to D445	41.7		-2.06	

normality	not OK
n	44
outliers	2
mean (n)	42.2606
st.dev. (n)	0.19664
R(calc.)	0.5506
st.dev.(iis memo 1401)	0.27168
R(iis memo 1401)	0.7607
Compare	
R(D445:21e1)	0.3747

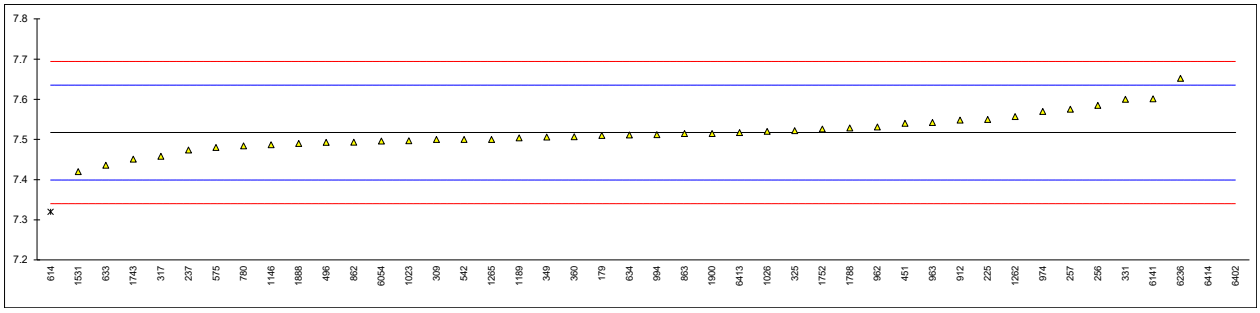


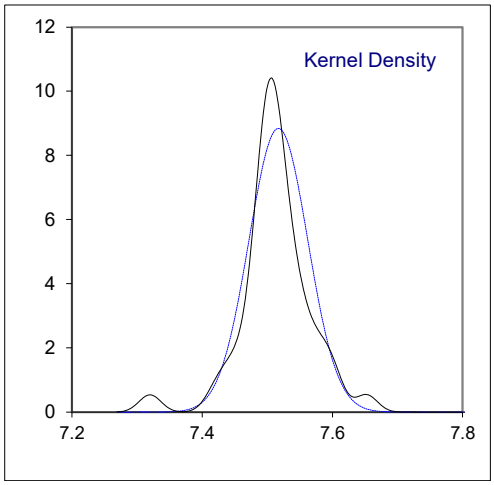


Determination of Kinematic Viscosity at 100°C on sample #21215; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D445	7.51		-0.12	
225	D445	7.550		0.56	
237	D445	7.474		-0.73	
256	D7279 corrected to D445	7.585	C	1.15	First reported 8.09
257	D7279 corrected to D445	7.575		0.98	
309	D445	7.500		-0.29	
317	D445	7.458		-1.00	
325	D445	7.522		0.08	
331	D7279Mod.	7.60		1.40	
335		-----		-----	
339		-----		-----	
349	D445	7.506		-0.19	
360	D445	7.5069		-0.17	
432		-----		-----	
442		-----		-----	
451	D7279 corrected to D445	7.54		0.39	
496	D445	7.4929		-0.41	
542	D7042	7.500		-0.29	
562		-----		-----	
575	D7279 corrected to D445	7.48		-0.63	
614	D445	7.32	R(0.01)	-3.34	
633	D445	7.436	C	-1.37	First reported 7.015
634	D7279 corrected to D445	7.511		-0.10	
780	D445	7.484		-0.56	
862	D445	7.493		-0.41	
863	D445	7.515		-0.04	
902		-----		-----	
912	D445	7.548		0.52	
962	D445	7.531		0.23	
963	D445	7.542		0.42	
974	D445	7.570		0.89	
975		-----		-----	
994	D445	7.512		-0.09	
1023	D445	7.497		-0.34	
1026	D445	7.520		0.05	
1146	D445	7.4867		-0.52	
1189	D445	7.504		-0.22	
1262	D445	7.557		0.67	
1265	D7279	7.50		-0.29	
1297		-----		-----	
1397		-----		-----	
1435		-----		-----	
1448		-----		-----	
1531	D445	7.42		-1.64	
1660		-----		-----	
1720		-----		-----	
1743	D7279 corrected to D445	7.451	C	-1.12	First reported 7.297
1752	D7279 corrected to D445	7.526		0.15	
1788	D445	7.5286		0.19	
1875		-----		-----	
1888	D445	7.49		-0.46	
1900	D7279	7.515		-0.04	
1920		-----		-----	
6016		-----		-----	
6054	D445	7.4958		-0.36	
6141	D445	7.6012		1.42	
6235		-----		-----	
6236	D7279 corrected to D445	7.6521	C	2.28	First reported 7.677
6286		-----		-----	
6322		-----		-----	
6402	D445	8.3	C,R(0.01)	13.25	First reported 6.4
6404		-----		-----	
6409		-----		-----	
6413	ISO3104	7.517		0.00	
6414	D7279 corrected to D445	7.88	C,R(0.01)	6.14	First reported 7.9

normality	suspect
n	41
outliers	3
mean (n)	7.5172
st.dev. (n)	0.04512
R(calc.)	0.1263
st.dev.(iis memo 1401)	0.05906
R(iis memo 1401)	0.1654
Compare	
R(D445:21e1)	0.0643

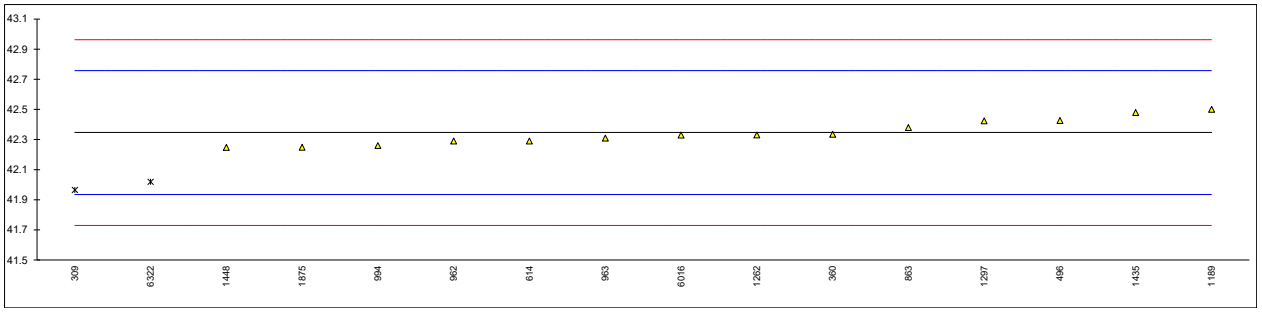


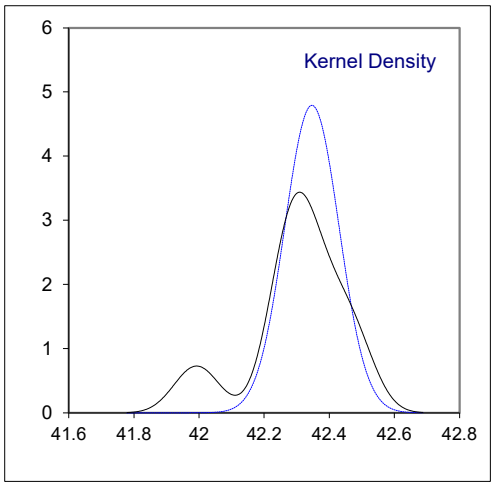


Determination of Kinematic Viscosity Stabinger at 40°C on sample #21215; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
225		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
309	D7042	41.966	DG(0.05)	-1.85	
317		-----		-----	
325		-----		-----	
331		-----		-----	
335		-----		-----	
339		-----		-----	
349		-----		-----	
360	D7042	42.335		-0.06	
432		-----		-----	
442		-----		-----	
451		-----		-----	
496	D7042	42.426		0.39	
542		-----		-----	
562		-----		-----	
575		-----		-----	
614	D7042	42.29		-0.28	
633		-----		-----	
634		-----		-----	
780		-----		-----	
862		-----		-----	
863	D7279	42.38		0.16	
902		-----		-----	
912		-----		-----	
962	D7042	42.29		-0.28	
963	D7042	42.31		-0.18	
974		-----		-----	
975		-----		-----	
994	D7042	42.26		-0.42	
1023		-----		-----	
1026		-----		-----	
1146		-----		-----	
1189	D7042	42.50		0.75	
1262	D7042	42.33		-0.08	
1265		-----		-----	
1297	D7042	42.425		0.38	
1397		-----		-----	
1435	D7042	42.48		0.65	
1448	D7042	42.248		-0.48	
1531		-----		-----	
1660		-----		-----	
1720		-----		-----	
1743		-----		-----	
1752		-----		-----	
1788		-----		-----	
1875	D7042	42.249		-0.47	
1888		-----		-----	
1900		-----		-----	
1920		-----		-----	
6016	D7042	42.329		-0.09	
6054		-----		-----	
6141		-----		-----	
6235		-----		-----	
6236		-----		-----	
6286		-----		-----	
6322	D7042	42.019	DG(0.05)	-1.59	
6402		-----		-----	
6404		-----		-----	
6409		-----		-----	
6413		-----		-----	
6414		-----		-----	

normality	OK
n	14
outliers	2
mean (n)	42.3466
st.dev. (n)	0.08325
R(calc.)	0.2331
st.dev.(D7042:21a)	0.20555
R(D7042:21a)	0.5755

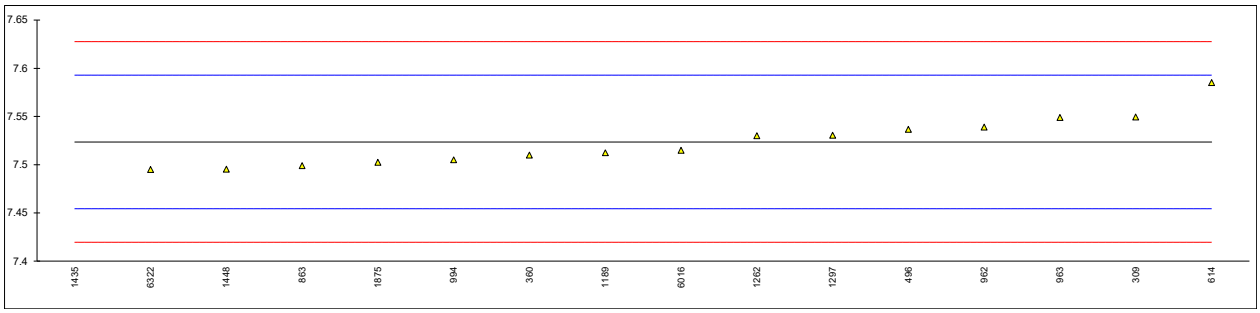


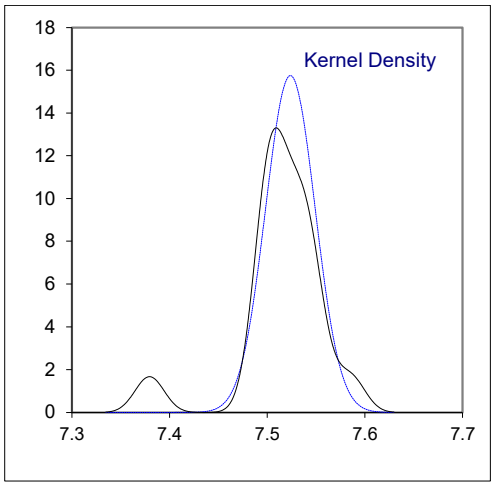


Determination of Kinematic Viscosity Stabinger at 100°C on sample #21215; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
225		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
309	D7042	7.5495		0.75	
317		-----		-----	
325		-----		-----	
331		-----		-----	
335		-----		-----	
339		-----		-----	
349		-----		-----	
360	D7042	7.510		-0.39	
432		-----		-----	
442		-----		-----	
451		-----		-----	
496	D7042	7.5368		0.38	
542		-----		-----	
562		-----		-----	
575		-----		-----	
614	D7042	7.585		1.77	
633		-----		-----	
634		-----		-----	
780		-----		-----	
862		-----		-----	
863	D7279	7.499		-0.71	
902		-----		-----	
912		-----		-----	
962	D7042	7.539		0.44	
963	D7042	7.549		0.73	
974		-----		-----	
975		-----		-----	
994	D7042	7.505		-0.54	
1023		-----		-----	
1026		-----		-----	
1146		-----		-----	
1189	D7042	7.5123	C	-0.33	First reported 7.769
1262	D7042	7.530		0.18	
1265		-----		-----	
1297	D7042	7.5306		0.20	
1397		-----		-----	
1435	D7042	7.3795	G(0.01)	-4.16	
1448	D7042	7.4954		-0.81	
1531		-----		-----	
1660		-----		-----	
1720		-----		-----	
1743		-----		-----	
1752		-----		-----	
1788		-----		-----	
1875	D7042	7.5024		-0.61	
1888		-----		-----	
1900		-----		-----	
1920		-----		-----	
6016	D7042	7.515		-0.25	
6054		-----		-----	
6141		-----		-----	
6235		-----		-----	
6236		-----		-----	
6286		-----		-----	
6322	D7042	7.495		-0.83	
6402		-----		-----	
6404		-----		-----	
6409		-----		-----	
6413		-----		-----	
6414		-----		-----	

normality	OK
n	15
outliers	1
mean (n)	7.5236
st.dev. (n)	0.02534
R(calc.)	0.0709
st.dev.(D7042:21a)	0.03466
R(D7042:21a)	0.0971

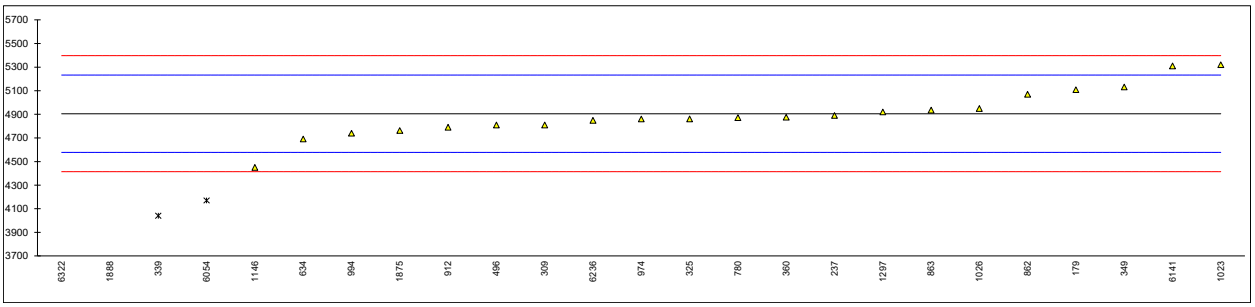


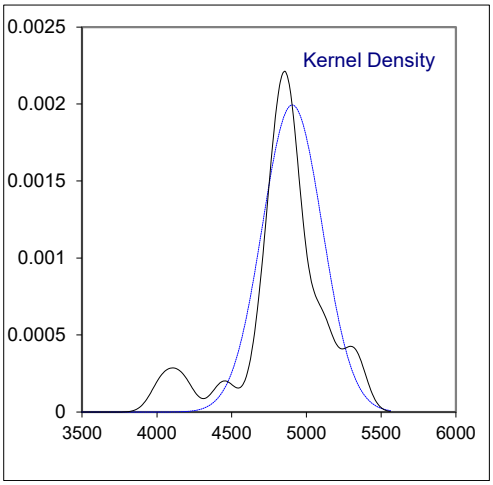


Determination of Sulfur on sample #21215; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D4294	5109		1.24	
225		-----		-----	
237	D4294	4890		-0.09	
256		-----		-----	
257		-----		-----	
309	D2622	4810		-0.58	
317		-----		-----	
325	D5185	4861		-0.27	
331		-----		-----	
335		-----		-----	
339	INH-050	4040	R(0.05)	-5.28	
349	D2622	5131		1.38	
360	D4294	4875		-0.18	
432		-----		-----	
442		-----		-----	
451		-----		-----	
496	D4294	4810		-0.58	
542		-----		-----	
562		-----		-----	
575		-----		-----	
614		-----		-----	
633		-----		-----	
634	D4294	4691		-1.31	
780	D4294	4872		-0.20	
862	D2622	5070		1.01	
863	D5185	4936		0.19	
902		-----		-----	
912	D4294	4790		-0.70	
962		-----		-----	
963		-----		-----	
974	D4294	4860		-0.28	
975		-----		-----	
994	D4294	4740		-1.01	
1023	D4294	5320	C	2.53	First reported 0.532 mg/kg
1026	D2622	4950	C	0.27	First reported 0.495 mg/kg
1146	D4294	4450		-2.78	
1189		-----		-----	
1262		-----		-----	
1265		-----		-----	
1297	D4294	4920		0.09	
1397		-----		-----	
1435		-----		-----	
1448		-----		-----	
1531		-----		-----	
1660		-----		-----	
1720		-----		-----	
1743		-----		-----	
1752		-----		-----	
1788		-----		-----	
1875	DIN51724-1	4763		-0.87	
1888	D5185	1212.15	C,R(0.05)	-22.52	First reported 712.15
1900		-----		-----	
1920		-----		-----	
6016		-----		-----	
6054	D4294	4170	R(0.05)	-4.48	
6141	D4294	5310	C	2.47	First reported 4290
6235		-----		-----	
6236	D5185	4849.13		-0.34	
6286		-----		-----	
6322	DIN51418	1080	R(0.05)	-23.33	
6402		-----		-----	
6404		-----		-----	
6409		-----		-----	
6413		-----		-----	
6414		-----		-----	

normality	suspect
n	21
outliers	4
mean (n)	4905.1
st.dev. (n)	200.02
R(calc.)	560.1
st.dev.(D4294:21)	163.96
R(D4294:21)	459.1

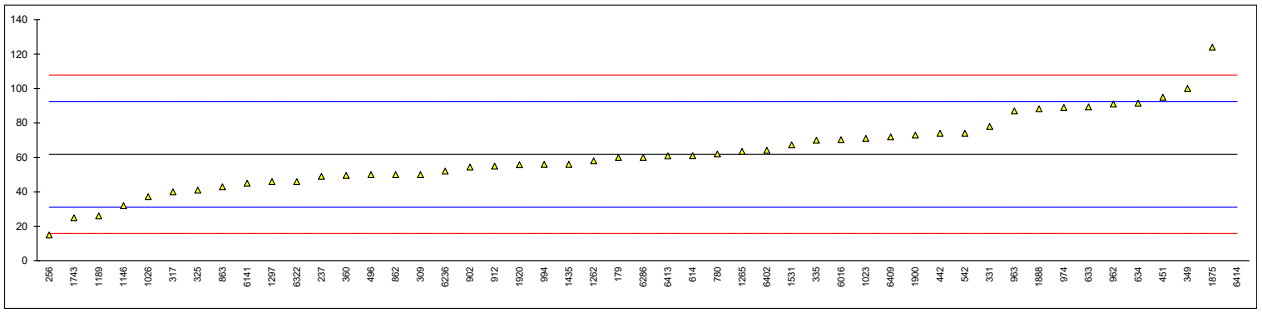


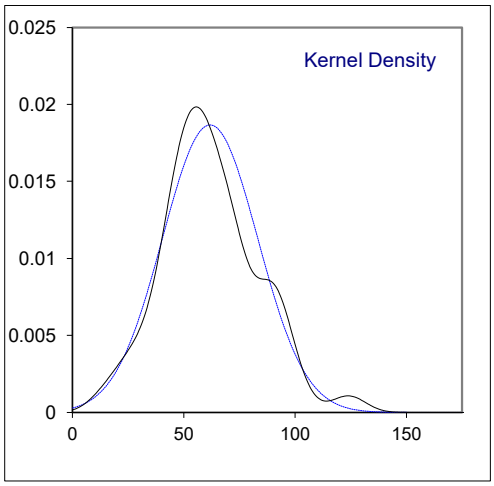


Determination of Water on sample #21215; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D6304	60		-0.12	
225		-----		-----	
237	D6304-C:16e1	49		-0.84	
256	D7889	15	C	-3.06	First reported 0
257		-----		-----	
309	D6304-C:20	50		-0.77	
317	D6304-A:20	40		-1.43	
325	D6304-C:20	41		-1.36	
331		78		1.06	
335	ISO12937	70		0.53	
339		-----		-----	
349	D6304-A:20	100		2.49	
360	D6304-A:20	49.6		-0.80	
432		-----		-----	
442	IP438	74		0.79	
451	D6304-A:20	95		2.17	
496	D6304-B:20	50		-0.77	
542	D6304-A:20	74		0.79	
562		-----		-----	
575		-----		-----	
614	D6304-B:20	61		-0.05	
633	D6304-B:20	89.3		1.79	
634	D6304-B:20	91.5		1.94	
780	D6304-B:20	62		0.01	
862	D6304-B:20	50		-0.77	
863	D6304-B	43		-1.23	
902	D6304-A:20	54.4		-0.49	
912	D6304-C:16e1	55		-0.45	
962	D6304-C:20	91		1.90	
963	D6304-A:20	87		1.64	
974	D6304-A:16e1	89		1.77	
975		-----		-----	
994	D6304-C:20	56		-0.38	
1023	D6304-A:20	71		0.60	
1026	D6304-C:16e1	37.26		-1.60	
1146	D6304-C:20	32		-1.95	
1189	D6304-B:16e1	26		-2.34	
1262	D6304-A:20	58		-0.25	
1265	D6304-A:20	63.49		0.11	
1297	D6304-A:16e1	46.0		-1.03	
1397		-----		-----	
1435	D6304-A:20	56.0		-0.38	
1448		-----		-----	
1531	D6304-A:16e1	67.3		0.36	
1660		-----		-----	
1720		-----		-----	
1743	ISO12937	25		-2.41	
1752		-----		-----	
1788		-----		-----	
1875	ISO12937	124		4.06	
1888	EN60814	88.29		1.73	
1900	D6304-C:20	73		0.73	
1920	D6304-C:16e1	55.8		-0.39	
6016	D6304-A:16e1	70.3		0.55	
6054		-----		-----	
6141	D1533	45		-1.10	
6235		-----		-----	
6236	D6304-A:16e1	52		-0.64	
6286	ISO12937	60		-0.12	
6322	EN60814	46		-1.03	
6402	D1533	64.1		0.15	
6404		-----		-----	
6409	ISO12937	72		0.66	
6413	ISO12937	60.90		-0.06	
6414	D6304-A:16e1	240	C,R(0.01)	11.63	First reported 235

		D6304-A:20 only	D6304-B:20 only	D6304-C:20 only
normality	OK	OK	OK	OK
n	48	11	6	6
outliers	1	0	0	0
mean (n)	61.838	68.045	67.300	57.167
st.dev. (n)	21.3692	19.3154	18.6333	21.6464
R(calc.)	59.834	54.083	52.173	60.610
st.dev.(D6304-A:20)	15.3138	16.3828	-----	-----
R(D6304-A:20)	42.879	45.872	-----	-----
Compare				
R(D6304-B:20)	126.416	-----	131.436	-----
R(D6304-C:20)	30.325	-----	-----	32.464



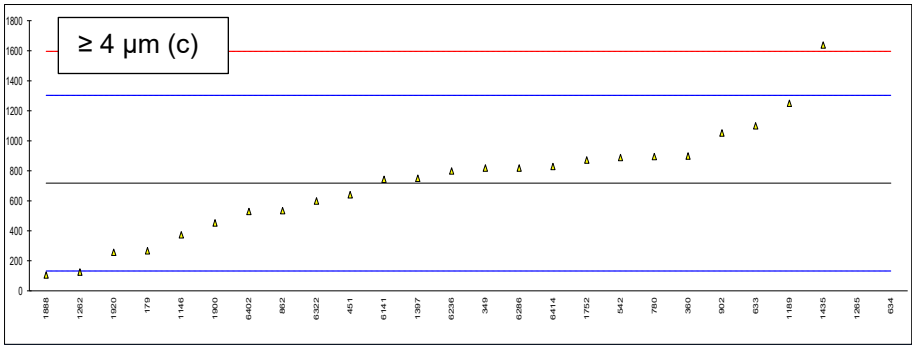


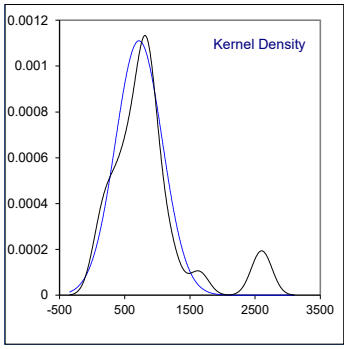
Determination of Level of Contamination on sample #21215; results in counts/mL

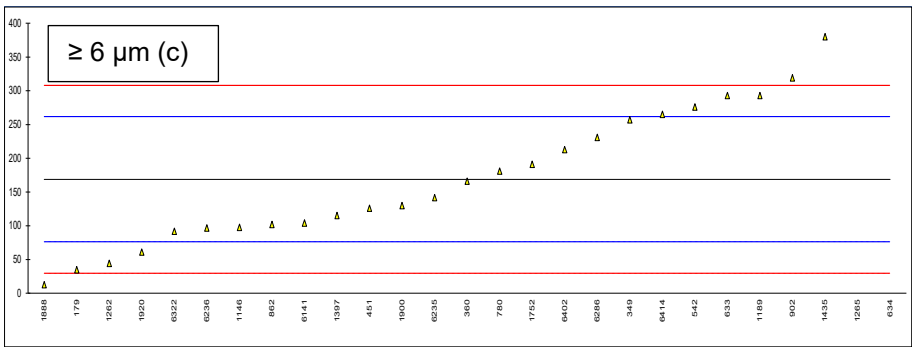
lab	method	≥ 4 µm (c)	mark	z(targ)	≥ 6 µm (c)	mark	z(targ)	≥ 14 µm (c)	mark	z(targ)
178		-----		-----	-----		-----	-----		-----
179	INH-1185	267		-1.54	35		-2.89	6		-1.27
225		-----		-----	-----		-----	-----		-----
237		-----		-----	-----		-----	-----		-----
256		-----		-----	-----		-----	-----		-----
257		-----		-----	-----		-----	-----		-----
309		-----		-----	-----		-----	-----		-----
317		-----		-----	-----		-----	-----		-----
325		-----		-----	-----		-----	-----		-----
331		-----		-----	-----		-----	-----		-----
335		-----		-----	-----		-----	-----		-----
339		-----		-----	-----		-----	-----		-----
349	ISO11500	818		0.34	257		1.90	44		3.67
360	ISO4406	898.5		0.62	166.1		-0.06	15.6		-0.02
432		-----		-----	-----		-----	-----		-----
442		-----		-----	-----		-----	-----		-----
451	ISO11500	640		-0.27	126		-0.93	7		-1.14
496		-----		-----	-----		-----	-----		-----
542	ISO11500	888.87		0.58	276.07		2.31	40.17		3.17
562		-----		-----	-----		-----	-----		-----
575		-----		-----	-----		-----	-----		-----
614		-----		-----	-----		-----	-----		-----
633	D7647	1100		1.30	293		2.68	29		1.72
634	ISO11500	2650	R(0.01)	6.59	731	R(0.01)	12.13	74	R(0.01)	7.57
780	ISO11500	895		0.60	181		0.26	17		0.16
862	ISO11500	534		-0.63	102		-1.44	7		-1.14
863		-----		-----	-----		-----	-----		-----
902	D7647	1052		1.14	319		3.24	79	R(0.01)	8.22
912		-----		-----	-----		-----	-----		-----
962		-----		-----	-----		-----	-----		-----
963		-----		-----	-----		-----	-----		-----
974		-----		-----	-----		-----	-----		-----
975		-----		-----	-----		-----	-----		-----
994		-----		-----	-----		-----	-----		-----
1023		-----		-----	-----		-----	-----		-----
1026		-----		-----	-----		-----	-----		-----
1146	ISO11500	373.33		-1.18	97.6667		-1.54	9.4667		-0.82
1189		1250		1.82	293		2.68	21		0.68
1262		125.16		-2.02	44.21		-2.69	3.74		-1.57
1265	ISO11500	2550.3	R(0.01)	6.25	687.5	R(0.01)	11.19	39.9	ex	3.14
1297		-----		-----	-----		-----	-----		-----
1397		750.3		0.11	115.3		-1.16	11.8		-0.52
1435		1638.67	C	3.14	380	C	4.55	31.73	C	2.08
1448		-----		-----	-----		-----	-----		-----
1531		-----		-----	-----		-----	-----		-----
1660		-----		-----	-----		-----	-----		-----
1720		-----		-----	-----		-----	-----		-----
1743		-----		-----	-----		-----	-----		-----
1752		872		0.53	191		0.48	12		-0.49
1788		-----		-----	-----		-----	-----		-----
1875		-----		-----	-----		-----	-----		-----
1888	ISO4407	105.13		-2.09	12.73		-3.37	1.7		-1.83
1900	ISO4407	452.78		-0.91	129.93		-0.84	15.39		-0.05
1920	D7596	257.1667		-1.57	61.1		-2.33	3.1		-1.65
6016		-----		-----	-----		-----	-----		-----
6054		-----		-----	-----		-----	-----		-----
6141	ISO4406	743.33		0.09	103.98		-1.40	7.82		-1.03
6235		-----		-----	141.58		-0.59	2.395	ex	-1.74
6236	D7647	798.5		0.27	96.8		-1.56	1.0		-1.92
6286	ISO11500	818		0.34	231		1.34	29		1.72
6322	ISO4406	599		-0.41	92		-1.66	4		-1.53
6402	D7596	528.7		-0.65	212.7		0.94	20.3		0.59
6404		-----		-----	-----		-----	-----		-----
6409		-----		-----	-----		-----	-----		-----
6413		-----		-----	-----		-----	-----		-----
6414	D7596	829	C	0.38	265	C	2.07	25	C	1.20

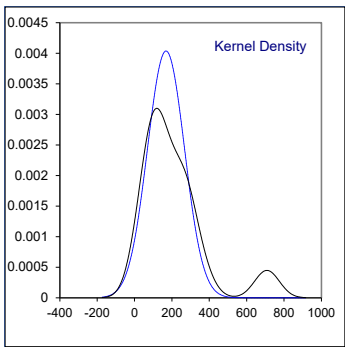
Lab 1265 test result excluded at ≥ 14 µm as corresponding test results in counts/mL are statistical outliers
Lab 1435 first reported 163867, 38000 and 3173 respectively
Lab 6235 test result excluded at ≥ 14 µm as test result in counts/mL and ISO4406 scale number did not match
Lab 6414 first reported 82889, 26513 and 2471 respectively

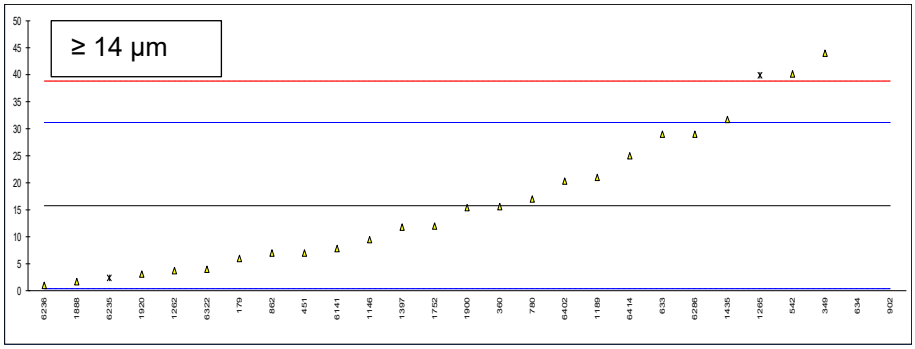
normality	OK	OK	OK
n	24	25	23
outliers	2	2	2 (+2ex)
mean (n)	718.102	168.927	15.775
st.dev. (n)	359.1873	98.7708	12.3839
R(calc.)	1005.724	276.558	34.675
st.dev.(D7647:10)	292.9440	46.3481	7.6880
R(D7647:10)	820.243	129.775	21.526

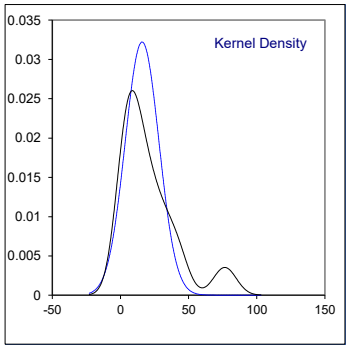










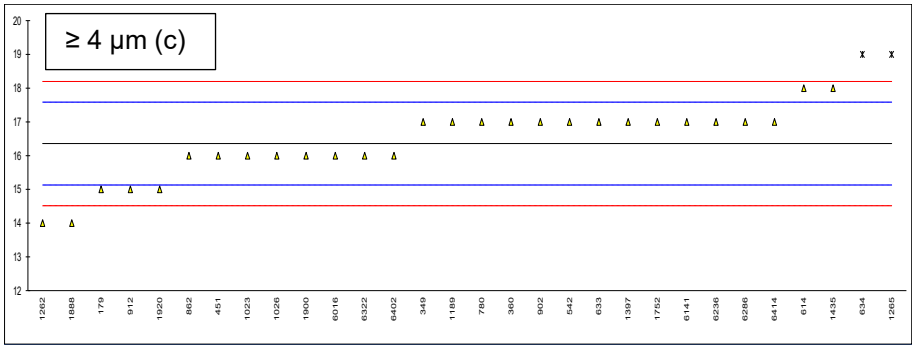


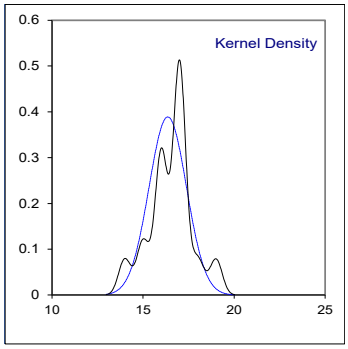
Determination of Level of Contamination acc. to ISO4406 scale on sample #21215; results in scale number

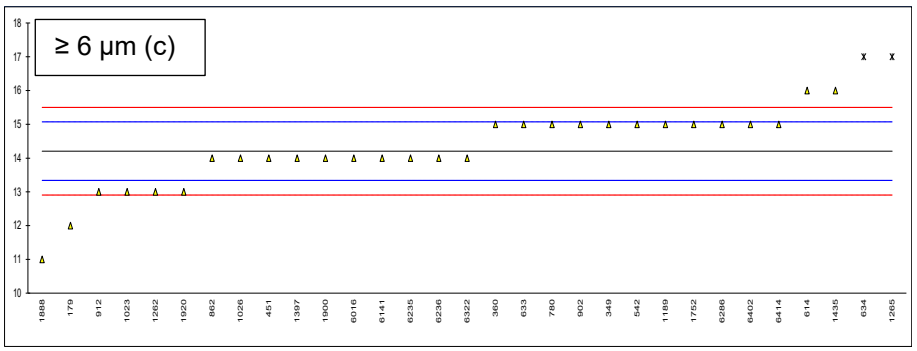
lab	method	≥ 4 µm (c)	mark	z(targ)	≥ 6 µm (c)	mark	z(targ)	≥ 14 µm (c)	mark	z(targ)
178		-----		-----	-----		-----	-----		-----
179	INH-1185	15		-2.21	12		-5.09	10		-0.72
225		-----		-----	-----		-----	-----		-----
237		-----		-----	-----		-----	-----		-----
256		-----		-----	-----		-----	-----		-----
257		-----		-----	-----		-----	-----		-----
309		-----		-----	-----		-----	-----		-----
317		-----		-----	-----		-----	-----		-----
325		-----		-----	-----		-----	-----		-----
331		-----		-----	-----		-----	-----		-----
335		-----		-----	-----		-----	-----		-----
339		-----		-----	-----		-----	-----		-----
349		17		1.05	15		1.83	13		3.44
360	ISO4406	17		1.05	15		1.83	11		0.67
432		-----		-----	-----		-----	-----		-----
442		-----		-----	-----		-----	-----		-----
451	ISO4406	16		-0.58	14		-0.48	10		-0.72
496		-----		-----	-----		-----	-----		-----
542	ISO4406	17		1.05	15		1.83	13		3.44
562		-----		-----	-----		-----	-----		-----
575		-----		-----	-----		-----	-----		-----
614	ISO4406	18		2.68	16		4.14	12		2.05
633	ISO4406	17		1.05	15		1.83	12		2.05
634	ISO4406	19	ex	4.31	17	ex	6.45	13	ex	3.44
780	ISO4406	17		1.05	15		1.83	11		0.67
862	ISO4406	16		-0.58	14		-0.48	10		-0.72
863		-----		-----	-----		-----	-----		-----
902	ISO4406	17		1.05	15		1.83	13	ex	3.44
912		15		-2.21	13		-2.79	10		-0.72
962		-----		-----	-----		-----	-----		-----
963		-----		-----	-----		-----	-----		-----
974		-----		-----	-----		-----	-----		-----
975		-----		-----	-----		-----	-----		-----
994		-----		-----	-----		-----	-----		-----
1023	ISO4406	16		-0.58	13		-2.79	8		-3.49
1026	ISO4406	16		-0.58	14		-0.48	10		-0.72
1146		-----		-----	-----		-----	-----		-----
1189		17		1.05	15		1.83	12		2.05
1262	ISO4406	14		-3.84	13		-2.79	9		-2.10
1265	ISO4406	19	ex	4.31	17	ex	6.45	12	ex	2.05
1297		-----		-----	-----		-----	-----		-----
1397	D7647	17		1.05	14		-0.48	11		0.67
1435	ISO4406	18		2.68	16		4.14	12		2.05
1448		-----		-----	-----		-----	-----		-----
1531		-----		-----	-----		-----	-----		-----
1660		-----		-----	-----		-----	-----		-----
1720		-----		-----	-----		-----	-----		-----
1743		-----		-----	-----		-----	-----		-----
1752	ISO4406	17		1.05	15		1.83	11		0.67
1788		-----		-----	-----		-----	-----		-----
1875		-----		-----	-----		-----	-----		-----
1888	ISO4406	14		-3.84	11		-7.40	8		-3.49
1900	ISO4406	16		-0.58	14		-0.48	11		0.67
1920	ISO4406	15		-2.21	13		-2.79	9		-2.10
6016	D7596	16	C	-0.58	14	C	-0.48	10		-0.72
6054		-----		-----	-----		-----	-----		-----
6141	ISO4406	17		1.05	14		-0.48	10		-0.72
6235		-----		-----	14		-0.48	12	ex	2.05
6236	ISO4406	17		1.05	14		-0.48	7		-4.87
6286	ISO4406	17		1.05	15		1.83	12		2.05
6322	ISO4406	16		-0.58	14		-0.48	9		-2.10
6402	ISO4406	16		-0.58	15		1.83	11		0.67
6404		-----		-----			-----	-----		-----
6409		-----		-----			-----	-----		-----
6413		-----		-----	-----		-----	-----		-----
6414	ISO4406	17		1.05	15		1.83	12		2.05

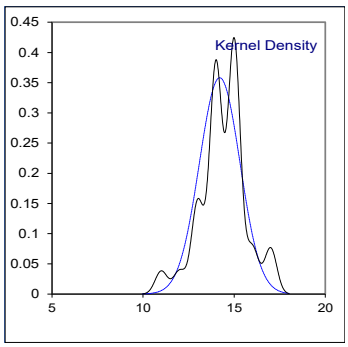
Lab 634 test results excluded as corresponding test results in counts/mL are statistical outliers
Lab 902 test result at ≥ 14 µm excluded as corresponding test result in counts/mL is a statistical outlier
Lab 6235 test result at ≥ 14 µm excluded as test results in counts/mL and ISO4406 scale number did not match
Lab 1265 test results excluded as corresponding test results in counts/mL are statistical outliers or is an excluded test result
Lab 6016 first reported 487 and 171 respectively

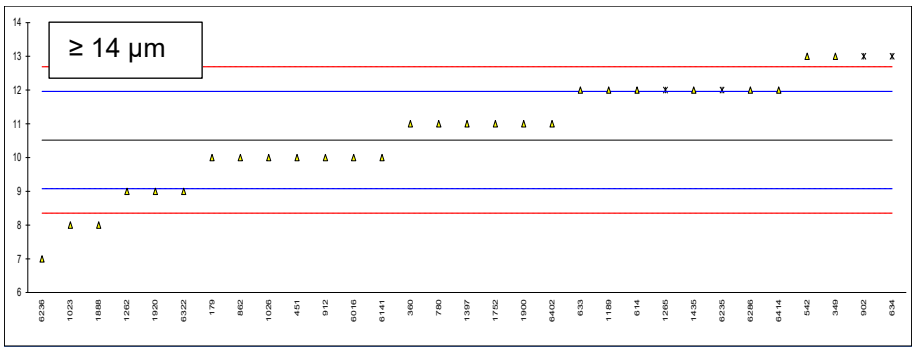
normality	OK	suspect	OK
n	28	29	27
outliers	0 (+2ex)	0 (+2ex)	0 (+4ex)
mean (n)	16.36	14.21	10.52
st.dev. (n)	1.026	1.114	1.528
R(calc.)	2.87	3.12	4.28
st.dev.(D7647:10)	0.614	0.433	0.722
R(D7647:10)	1.72	1.21	2.02

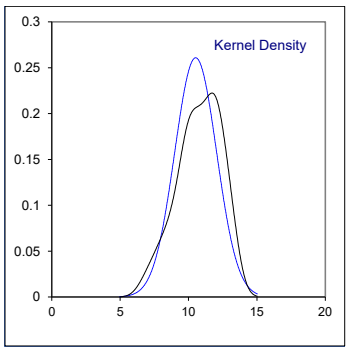








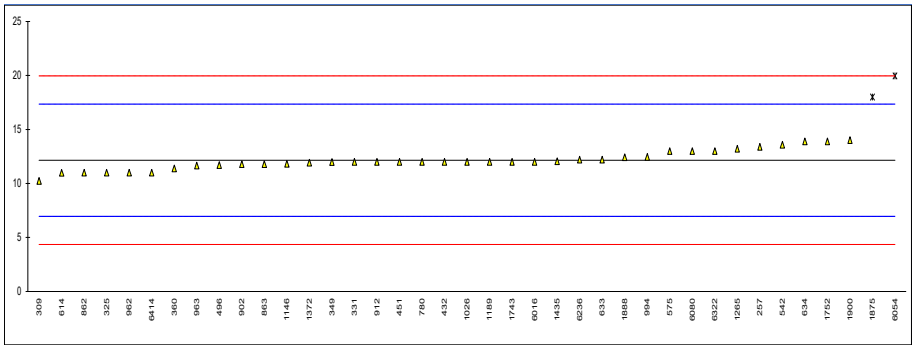


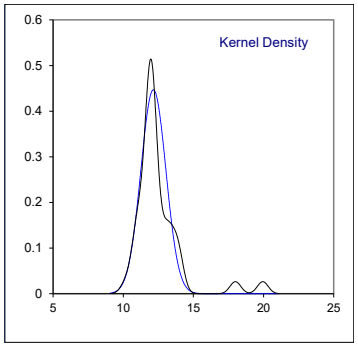


Determination of Aluminum as Al on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	13.40		0.48	
309	D5185	10.24		-0.74	
325	D5185	11		-0.44	
331	D5185Mod.	12		-0.06	
339	INH-165	<10		-----	
349		11.98		-0.07	
360	D5185	11.4		-0.29	
432	D5185	12		-0.06	
451	D5185	12		-0.06	
496		11.7		-0.17	
542	D6595	13.59		0.55	
575	D6595	13		0.33	
614	D5185	10.99		-0.45	
633	D6595	12.21		0.02	
634	D6595	13.9		0.67	
780	D5185	12		-0.06	
862	D5185	11		-0.44	
863	D5185	11.8		-0.14	
902	D5185	11.8		-0.14	
912	D5185	12		-0.06	
962	D5185	11		-0.44	
963	D5185	11.66		-0.19	
974		-----		-----	
975		-----		-----	
994	D5185	12.45		0.11	
1026	D5185	12		-0.06	
1146	D5185	11.817		-0.13	
1189	D5185	12		-0.06	
1265	D6595	13.227		0.41	
1297		-----		-----	
1372	D5185	11.92		-0.09	
1435	D5185	12.058		-0.04	
1660		-----		-----	
1743	D5185	12		-0.06	
1752	D6595	13.9		0.67	
1875	EN11885	18	R(0.01)	2.25	
1888	D5185	12.42		0.10	
1900	D5185	14.01		0.71	
6016	D6595	12		-0.06	
6054	IP501	19.9532	R(0.01)	3.00	
6080	D5185	13.0		0.33	
6236	D5185	12.2		0.02	
6322	DIN51418	13		0.33	
6414	D5185	11		-0.44	

normality	OK
n	37
outliers	2
mean (n)	12.153
st.dev. (n)	0.8922
R(calc.)	2.498
st.dev.(D5185:18)	2.5980
R(D5185:18)	7.275



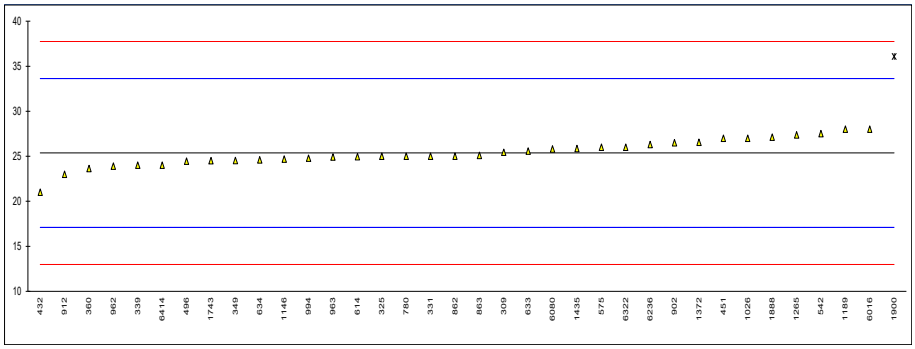


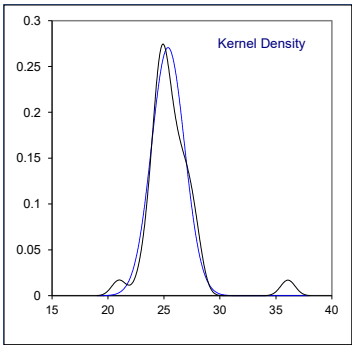
Determination of Barium as Ba on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
309	D5185	25.44		0.02	
325	D5185	25		-0.09	
331	D5185Mod.	25		-0.09	
339	INH-165	24		-0.33	
349		24.53		-0.20	
360	D5185	23.64		-0.42	
432	D5185	21		-1.06	
451	D5185	27		0.39	
496		24.45		-0.22	
542	D6595	27.52		0.52	
575	D6595	26		0.15	
614	D5185	24.95		-0.10	
633	D6595	25.58		0.05	
634	D6595	24.6		-0.19	
780	D5185	25		-0.09	
862	D5185	25		-0.09	
863	D5185	25.1		-0.07	
902	D5185	26.5		0.27	
912	D5185	23		-0.58	
962	D5185	23.9		-0.36	
963	D5185	24.93		-0.11	
974		-----		-----	
975		-----		-----	
994	D5185	24.79		-0.14	
1026	D5185	27		0.39	
1146	D5185	24.683		-0.17	
1189	D5185	28		0.64	
1265	D6595	27.357		0.48	
1297		-----		-----	
1372	D5185	26.55		0.28	
1435	D5185	25.860		0.12	
1660		-----		-----	
1743	D5185	24.5		-0.21	
1752		-----		-----	
1875		-----		-----	
1888	D5185	27.12		0.42	
1900	D5185	36.074	R(0.01)	2.59	
6016	D6595	28		0.64	
6054		-----		-----	
6080	D5185	25.8		0.10	
6236	D5185	26.3		0.22	
6322	DIN51418	26		0.15	
6414	D5185	24		-0.33	

normality	suspect
n	35
outliers	1
mean (n)	25.374
st.dev. (n)	1.4743
R(calc.)	4.128
st.dev.(D5185:18)	4.1280
R(D5185:18)	11.558

Application range 0.5 - 4 mg/kg

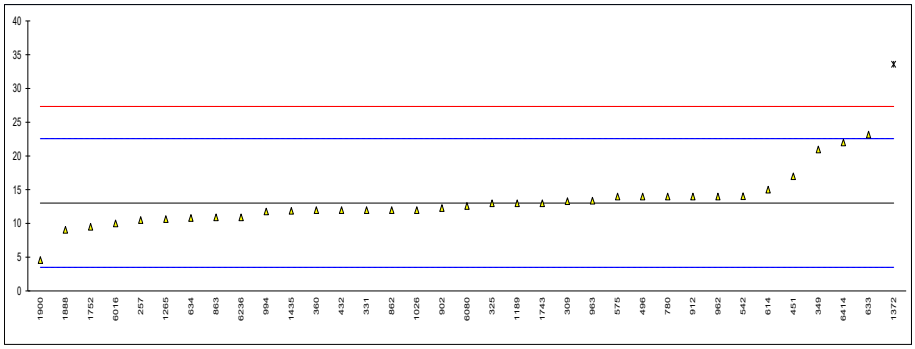


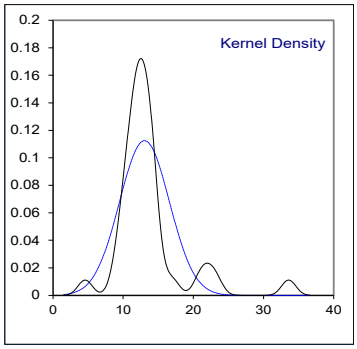


Determination of Boron as B on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	10.51		-0.53	
309	D5185	13.30		0.05	
325	D5185	13		-0.01	
331	D5185Mod.	12		-0.22	
339	INH-165	<25		-----	
349		20.96		1.66	
360	D5185	12.0		-0.22	
432	D5185	12		-0.22	
451	D5185	17		0.83	
496		14.0		0.20	
542	D6595	14.04		0.21	
575	D6595	14		0.20	
614	D5185	15.0		0.41	
633	D6595	23.19		2.13	
634	D6595	10.8		-0.47	
780	D5185	14		0.20	
862	D5185	12		-0.22	
863	D5185	10.9		-0.45	
902	D5185	12.3		-0.16	
912	D5185	14		0.20	
962	D5185	14		0.20	
963	D5185	13.37		0.07	
974		-----		-----	
975		-----		-----	
994	D5185	11.78		-0.26	
1026	D5185	12		-0.22	
1146		-----		-----	
1189	D5185	13		-0.01	
1265	D6595	10.654		-0.50	
1297		-----		-----	
1372	D5185	33.59	R(0.01)	4.31	
1435	D5185	11.877		-0.24	
1660		-----		-----	
1743	D5185	13		-0.01	
1752	D6595	9.5		-0.74	
1875		-----		-----	
1888	D5185	9.07		-0.83	
1900	D5185	4.580		-1.78	
6016	D6595	10		-0.64	
6054		-----		-----	
6080	D5185	12.6		-0.09	
6236	D5185	10.9		-0.45	
6322		-----		-----	
6414	D5185	22		1.88	

normality	not OK
n	34
outliers	1
mean (n)	13.039
st.dev. (n)	3.5497
R(calc.)	9.939
st.dev.(D5185:18)	4.7636
R(D5185:18)	13.338

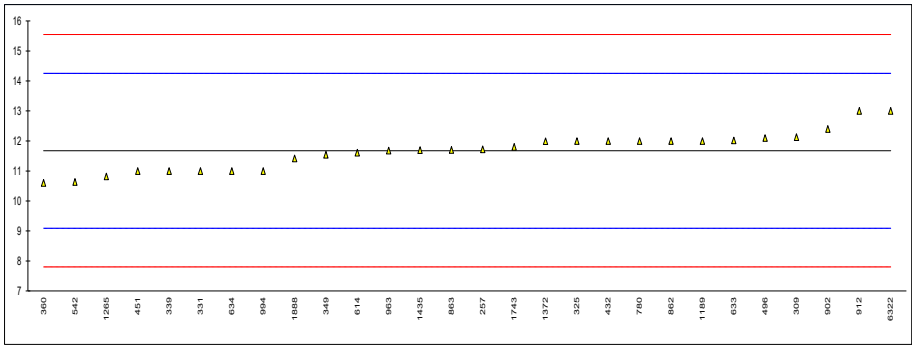


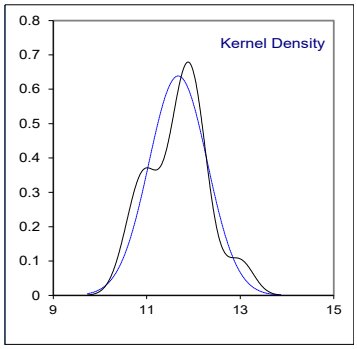


Determination of Cadmium as Cd on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	11.72		0.04	
309	D5185	12.13		0.35	
325	D5185	12		0.25	
331	D5185Mod.	11		-0.52	
339	INH-165	11		-0.52	
349		11.54		-0.10	
360	D5185	10.6		-0.83	
432	D5185	12		0.25	
451	D5185	11		-0.52	
496		12.1		0.33	
542	D6595	10.63		-0.81	
575		-----		-----	
614	D5185	11.61		-0.05	
633	D6595	12.02		0.27	
634	D6595	11		-0.52	
780	D5185	12		0.25	
862	D5185	12		0.25	
863	D5185	11.7		0.02	
902	D5185	12.4		0.56	
912	D5185	13		1.03	
962		-----		-----	
963	D5185	11.68		0.01	
974		-----		-----	
975		-----		-----	
994	D5185	11.00		-0.52	
1026		-----		-----	
1146		-----		-----	
1189	D5185	12		0.25	
1265	D6595	10.817		-0.66	
1297		-----		-----	
1372	D5185	11.99		0.25	
1435	D5185	11.697		0.02	
1660		-----		-----	
1743	D5185	11.8		0.10	
1752		-----		-----	
1875		-----		-----	
1888	D5185	11.42		-0.20	
1900		-----		-----	
6016		-----		-----	
6054		-----		-----	
6080		-----		-----	
6236		-----		-----	
6322	DIN51418	13		1.03	
6414		-----		-----	

normality	OK
n	28
outliers	0
mean (n)	11.673
st.dev. (n)	0.6248
R(calc.)	1.749
st.dev.(Horwitz)	1.2903
R(Horwitz)	3.613

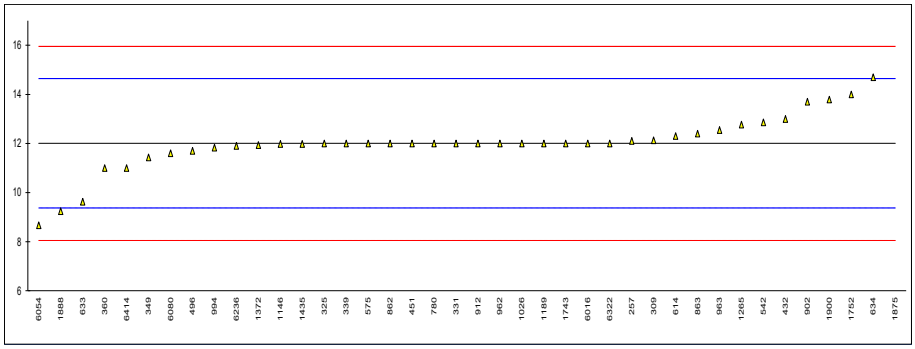


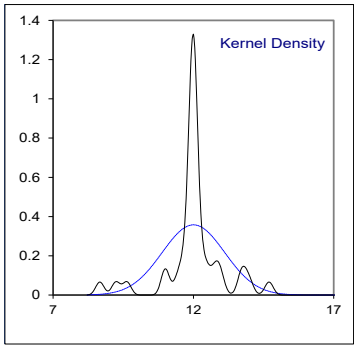


Determination of Chromium as Cr on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	12.10		0.07	
309	D5185	12.13		0.10	
325	D5185	12		0.00	
331	D5185Mod.	12		0.00	
339	INH-165	12		0.00	
349		11.43		-0.44	
360	D5185	11.0		-0.76	
432	D5185	13		0.76	
451	D5185	12		0.00	
496		11.7		-0.23	
542	D6595	12.86		0.65	
575	D6595	12		0.00	
614	D5185	12.30		0.22	
633	D6595	9.63		-1.80	
634	D6595	14.7		2.05	
780	D5185	12		0.00	
862	D5185	12		0.00	
863	D5185	12.4		0.30	
902	D5185	13.7		1.29	
912	D5185	12		0.00	
962	D5185	12		0.00	
963	D5185	12.55		0.41	
974		-----		-----	
975		-----		-----	
994	D5185	11.83		-0.13	
1026	D5185	12		0.00	
1146	D5185	11.980		-0.02	
1189	D5185	12		0.00	
1265	D6595	12.770		0.58	
1297		-----		-----	
1372	D5185	11.93		-0.06	
1435	D5185	11.981		-0.02	
1660		-----		-----	
1743	D5185	12		0.00	
1752	D6595	14.0		1.51	
1875	EN11885	19	R(0.01)	5.31	
1888	D5185	9.24		-2.10	
1900	D5185	13.790		1.36	
6016	D6595	12		0.00	
6054	IP501	8.6660		-2.53	
6080	D5185	11.6		-0.31	
6236	D5185	11.9		-0.08	
6322	DIN51418	12		0.00	
6414	D5185	11		-0.76	

normality	not OK
n	39
outliers	1
mean (n)	12.005
st.dev. (n)	1.1153
R(calc.)	3.123
st.dev.(D5185:18)	1.3174
R(D5185:18)	3.689

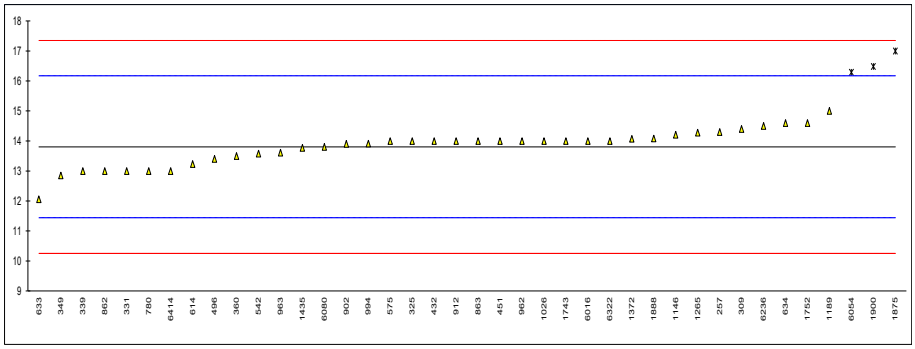


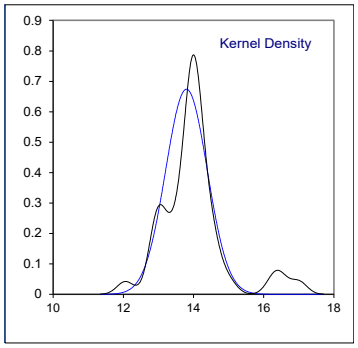


Determination of Copper as Cu on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	14.30		0.42	
309	D5185	14.40		0.51	
325	D5185	14		0.17	
331	D5185Mod.	13		-0.68	
339	INH-165	13		-0.68	
349		12.85		-0.80	
360	D5185	13.5		-0.25	
432	D5185	14		0.17	
451	D5185	14		0.17	
496		13.4		-0.34	
542	D6595	13.58		-0.19	
575	D6595	14		0.17	
614	D5185	13.23		-0.48	
633	D6595	12.06		-1.47	
634	D6595	14.6		0.68	
780	D5185	13		-0.68	
862	D5185	13		-0.68	
863	D5185	14.0		0.17	
902	D5185	13.9		0.08	
912	D5185	14		0.17	
962	D5185	14		0.17	
963	D5185	13.61		-0.16	
974		-----		-----	
975		-----		-----	
994	D5185	13.91		0.09	
1026	D5185	14		0.17	
1146	D5185	14.2088		0.34	
1189	D5185	15		1.01	
1265	D6595	14.279		0.40	
1297		-----		-----	
1372	D5185	14.07		0.23	
1435	D5185	13.769		-0.03	
1660		-----		-----	
1743	D5185	14		0.17	
1752	D6595	14.6		0.68	
1875	EN11885	17	R(0.01)	2.70	
1888	D5185	14.08		0.24	
1900	D5185	16.481	R(0.01)	2.27	
6016	D6595	14		0.17	
6054	IP501	16.2878	R(0.01)	2.10	
6080	D5185	13.8		0.00	
6236	D5185	14.5		0.59	
6322	DIN51418	14		0.17	
6414	D5185	13		-0.68	

normality	OK
n	37
outliers	3
mean (n)	13.801
st.dev. (n)	0.5921
R(calc.)	1.658
st.dev.(D5185:18)	1.1830
R(D5185:18)	3.312

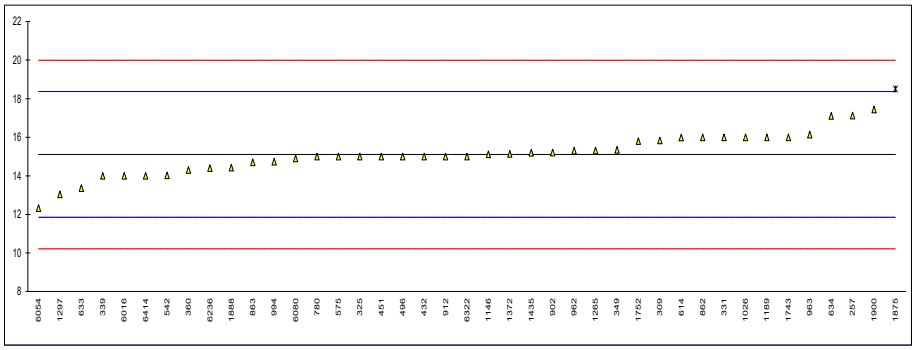


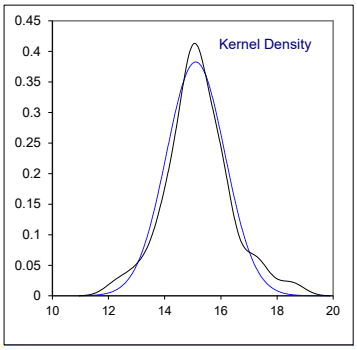


Determination of Iron as Fe on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	17.12		1.24	
309	D5185	15.83		0.44	
325	D5185	15		-0.06	
331	D5185Mod.	16		0.55	
339	INH-165	14		-0.68	
349		15.34		0.14	
360	D5185	14.3		-0.49	
432	D5185	15		-0.06	
451	D5185	15		-0.06	
496		15.0		-0.06	
542	D6595	14.02		-0.67	
575	D6595	15		-0.06	
614	D5185	15.99		0.54	
633	D6595	13.36		-1.07	
634	D6595	17.1		1.22	
780	D5185	15		-0.06	
862	D5185	16		0.55	
863	D5185	14.7		-0.25	
902	D5185	15.2		0.06	
912	D5185	15		-0.06	
962	D5185	15.3		0.12	
963	D5185	16.14		0.63	
974		-----		-----	
975		-----		-----	
994	D5185	14.73		-0.23	
1026	D5185	16		0.55	
1146	D5185	15.114		0.01	
1189	D5185	16		0.55	
1265	D6595	15.309		0.12	
1297	In house	13.037		-1.27	
1372	D5185	15.14		0.02	
1435	D5185	15.194		0.05	
1660		-----		-----	
1743	D5185	16		0.55	
1752	D6595	15.8		0.43	
1875	EN11885	18.5	ex	2.08	Excluded as many statistical outliers in other related metal analyzes
1888	D5185	14.43		-0.41	
1900	D5185	17.432		1.43	
6016	D6595	14		-0.68	
6054	IP501	12.3273		-1.70	
6080	D5185	14.9		-0.13	
6236	D5185	14.4		-0.43	
6322	DIN51418	15		-0.06	
6414	D5185	14		-0.68	

normality	OK
n	40
outliers	0 (+1ex)
mean (n)	15.105
st.dev. (n)	1.0426
R(calc.)	2.919
st.dev.(D5185:18)	1.6299
R(D5185:18)	4.564

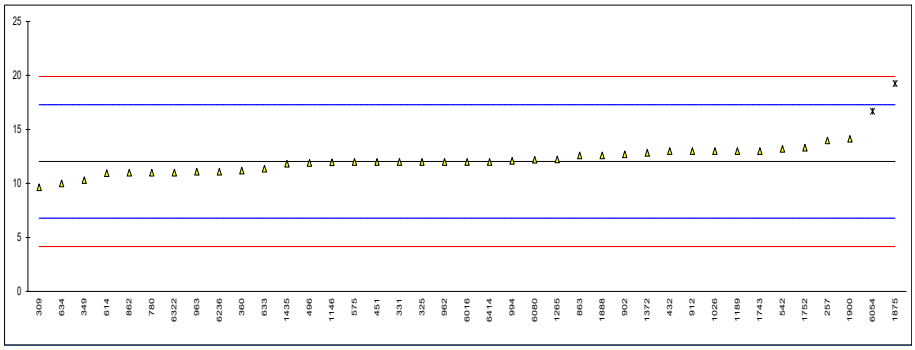


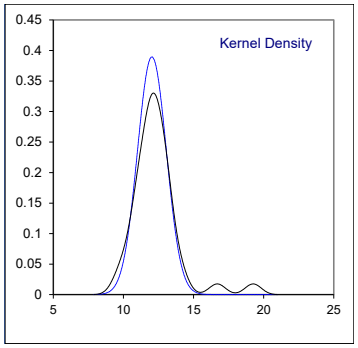


Determination of Lead as Pb on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	13.98		0.74	
309	D5185	9.64		-0.91	
325	D5185	12		-0.01	
331	D5185Mod.	12		-0.01	
339		-----		-----	
349		10.31		-0.66	
360	D5185	11.2		-0.32	
432	D5185	13		0.37	
451	D5185	12		-0.01	
496		11.9		-0.05	
542	D6595	13.20		0.44	
575	D6595	12		-0.01	
614	D5185	10.96		-0.41	
633	D6595	11.37		-0.25	
634	D6595	10		-0.78	
780	D5185	11		-0.39	
862	D5185	11		-0.39	
863	D5185	12.6		0.22	
902	D5185	12.7		0.25	
912	D5185	13		0.37	
962	D5185	12		-0.01	
963	D5185	11.10		-0.36	
974		-----		-----	
975		-----		-----	
994	D5185	12.1		0.03	
1026	D5185	13		0.37	
1146	D5185	11.959		-0.03	
1189	D5185	13		0.37	
1265	D6595	12.236		0.08	
1297		-----		-----	
1372	D5185	12.84		0.31	
1435	D5185	11.829		-0.08	
1660		-----		-----	
1743	D5185	13		0.37	
1752	D6595	13.3		0.48	
1875	EN11885	19.25	R(0.01)	2.75	
1888	D5185	12.6		0.22	
1900	D5185	14.134		0.80	
6016	D6595	12		-0.01	
6054	IP501	16.6894	R(0.01)	1.77	
6080	D5185	12.2		0.06	
6236	D5185	11.1		-0.36	
6322	DIN51418	11		-0.39	
6414	D5185	12		-0.01	

normality	OK
n	37
outliers	2
mean (n)	12.034
st.dev. (n)	1.0245
R(calc.)	2.869
st.dev.(D5185:18)	2.6237
R(D5185:18)	7.346

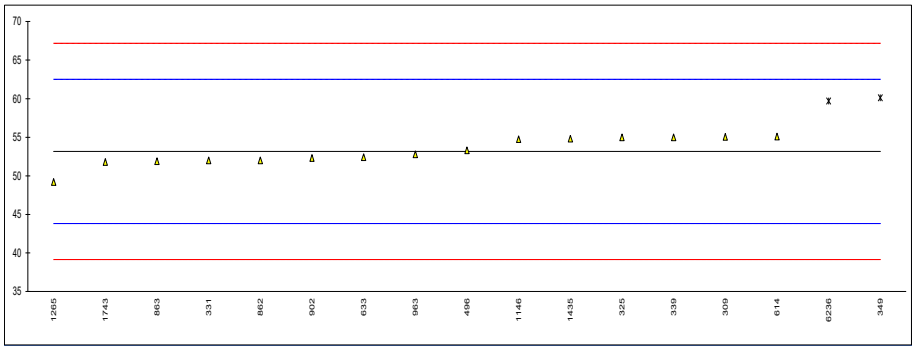


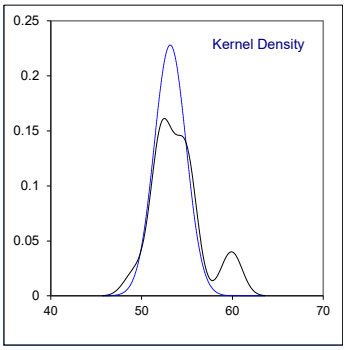


Determination of Lithium as Li on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
309	D5185	55.05		0.40	
325	D5185	55		0.39	
331	D5185Mod.	52		-0.25	
339	INH-165	55		0.39	
349		60.11	DG(0.05)	1.49	
360		-----		-----	
432		-----		-----	
451		-----		-----	
496		53.3		0.03	
542		-----		-----	
575		-----		-----	
614	D5185	55.1		0.42	
633	D6595	52.40		-0.16	
634		-----		-----	
780		-----		-----	
862	D5185	52		-0.25	
863	D5185	51.9		-0.27	
902	D5185	52.3		-0.18	
912		-----		-----	
962		-----		-----	
963	D5185	52.78		-0.08	
974		-----		-----	
975		-----		-----	
994		-----		-----	
1026		-----		-----	
1146	D5185	54.741		0.34	
1189		-----		-----	
1265	D6595	49.180		-0.85	
1297		-----		-----	
1372		-----		-----	
1435	D5185	54.815		0.35	
1660		-----		-----	
1743	D5185	51.8		-0.29	
1752		-----		-----	
1875		-----		-----	
1888		-----		-----	
1900		-----		-----	
6016		-----		-----	
6054		-----		-----	
6080		-----		-----	
6236	D5185	59.7	DG(0.05)	1.40	
6322		-----		-----	
6414		-----		-----	

normality	OK
n	15
outliers	2
mean (n)	53.158
st.dev. (n)	1.7484
R(calc.)	4.895
st.dev.(Horwitz)	4.6770
R(Horwitz)	13.095

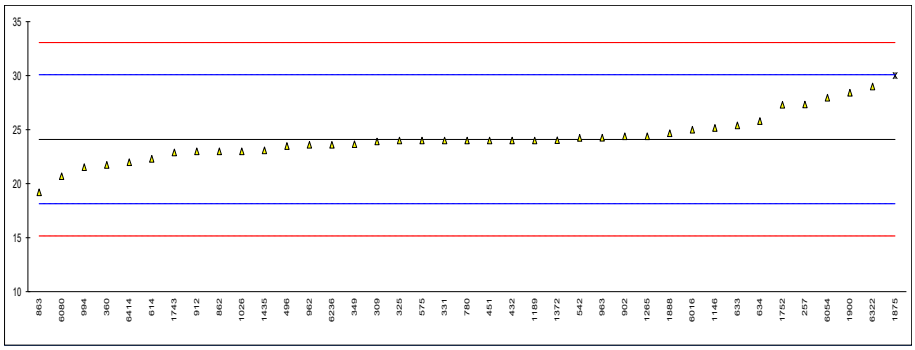


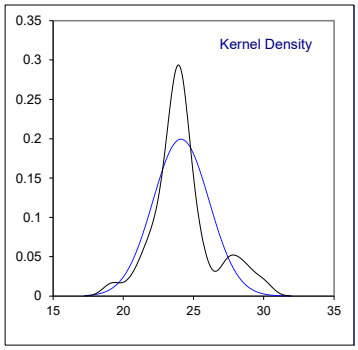


Determination of Magnesium as Mg on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	27.34		1.08	
309	D5185	23.91		-0.07	
325	D5185	24		-0.04	
331	D5185Mod.	24		-0.04	
339	INH-165	<50		-----	
349		23.66		-0.15	
360	D5185	21.74		-0.79	
432	D5185	24		-0.04	
451	D5185	24		-0.04	
496		23.48		-0.21	
542	D6595	24.25		0.05	
575	D6595	24		-0.04	
614	D5185	22.3		-0.61	
633	D6595	25.4	C	0.43	First reported 15.57
634	D6595	25.8		0.57	
780	D5185	24		-0.04	
862	D5185	23		-0.37	
863	D5185	19.2		-1.65	
902	D5185	24.4		0.10	
912	D5185	23		-0.37	
962	D5185	23.6		-0.17	
963	D5185	24.26		0.05	
974		-----		-----	
975		-----		-----	
994	D5185	21.54		-0.86	
1026	D5185	23		-0.37	
1146	D5185	25.162		0.35	
1189	D5185	24		-0.04	
1265	D6595	24.405		0.10	
1297		-----		-----	
1372	D5185	24.03		-0.03	
1435	D5185	23.092		-0.34	
1660		-----		-----	
1743	D5185	22.9		-0.41	
1752	D6595	27.3		1.07	
1875	EN11885	30	ex	1.98	Excluded as many statistical outliers in other related metal analyzes
1888	D5185	24.68		0.19	
1900	D5185	28.432		1.45	
6016	D6595	25		0.30	
6054	IP501	27.9621		1.29	
6080	D5185	20.7		-1.14	
6236	D5185	23.6		-0.17	
6322	DIN51418	29		1.64	
6414	D5185	22		-0.71	

normality	suspect
n	38
outliers	0 (+1ex)
mean (n)	24.109
st.dev. (n)	2.0009
R(calc.)	5.602
st.dev.(D5185:18)	2.9816
R(D5185:18)	8.349

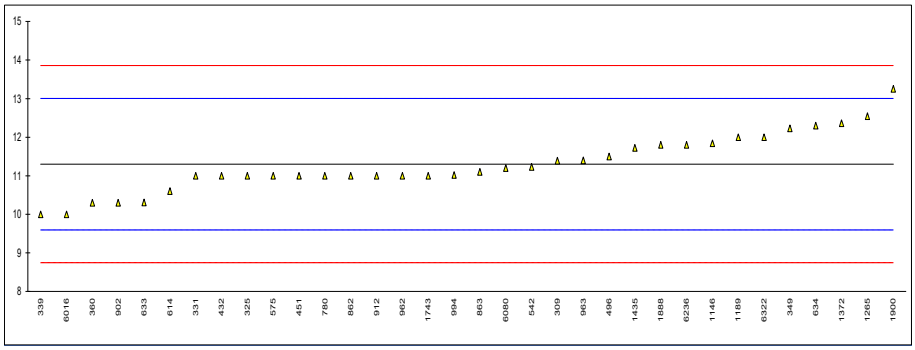


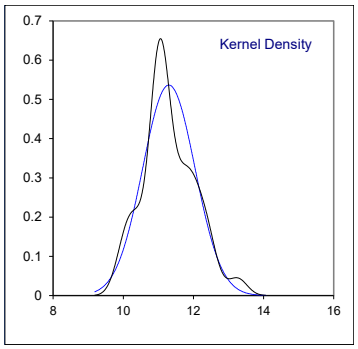


Determination of Manganese as Mn on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
309	D5185	11.39		0.11	
325	D5185	11		-0.35	
331	D5185Mod.	11		-0.35	
339	INH-165	10		-1.53	
349		12.23		1.09	
360	D5185	10.3		-1.17	
432	D5185	11		-0.35	
451	D5185	11		-0.35	
496		11.5		0.23	
542	D6595	11.23		-0.08	
575	D6595	11		-0.35	
614	D5185	10.6		-0.82	
633	D6595	10.31		-1.16	
634	D6595	12.3		1.17	
780	D5185	11		-0.35	
862	D5185	11		-0.35	
863	D5185	11.1		-0.23	
902	D5185	10.3		-1.17	
912	D5185	11		-0.35	
962	D5185	11		-0.35	
963	D5185	11.40		0.12	
974		-----		-----	
975		-----		-----	
994	D5185	11.02		-0.33	
1026		-----		-----	
1146	D5185	11.843		0.64	
1189	D5185	12		0.82	
1265	D6595	12.543		1.46	
1297		-----		-----	
1372	D5185	12.36		1.24	
1435	D5185	11.723		0.50	
1660		-----		-----	
1743	D5185	11		-0.35	
1752		-----		-----	
1875		-----		-----	
1888	D5185	11.80		0.59	
1900	D5185	13.256		2.30	
6016	D6595	10		-1.53	
6054		-----		-----	
6080	D5185	11.2		-0.12	
6236	D5185	11.8		0.59	
6322	DIN51418	12		0.82	
6414		-----		-----	

normality	OK
n	34
outliers	0
mean (n)	11.300
st.dev. (n)	0.7438
R(calc.)	2.083
st.dev.(D5185:18)	0.8521
R(D5185:18)	2.386

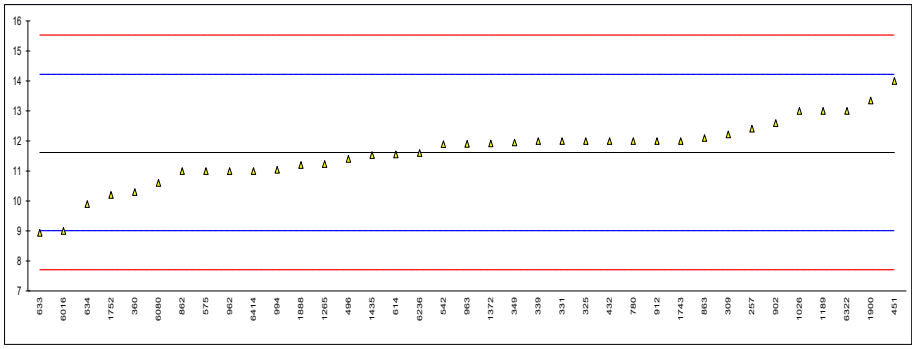


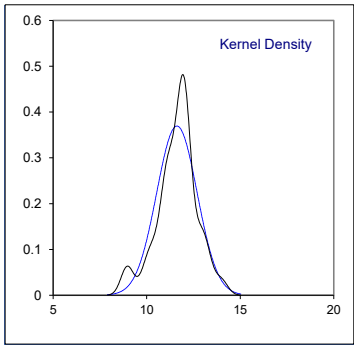


Determination of Molybdenum as Mo on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	12.41		0.61	
309	D5185	12.22		0.46	
325	D5185	12		0.29	
331	D5185Mod.	12		0.29	
339	INH-165	12		0.29	
349		11.95		0.26	
360	D5185	10.3		-1.01	
432	D5185	12		0.29	
451	D5185	14		1.83	
496		11.4		-0.17	
542	D6595	11.89		0.21	
575	D6595	11		-0.47	
614	D5185	11.55		-0.05	
633	D6595	8.94		-2.05	
634	D6595	9.9		-1.32	
780	D5185	12		0.29	
862	D5185	11		-0.47	
863	D5185	12.1		0.37	
902	D5185	12.6		0.75	
912	D5185	12		0.29	
962	D5185	11		-0.47	
963	D5185	11.90		0.22	
974		-----		-----	
975		-----		-----	
994	D5185	11.04		-0.44	
1026	D5185	13		1.06	
1146		-----		-----	
1189	D5185	13		1.06	
1265	D6595	11.235		-0.29	
1297		-----		-----	
1372	D5185	11.92		0.23	
1435	D5185	11.528		-0.07	
1660		-----		-----	
1743	D5185	12		0.29	
1752	D6595	10.2		-1.09	
1875		-----		-----	
1888	D5185	11.2		-0.32	
1900	D5185	13.352		1.33	
6016	D6595	9		-2.01	
6054		-----		-----	
6080	D5185	10.6		-0.78	
6236	D5185	11.6		-0.01	
6322	DIN51418	13		1.06	
6414	D5185	11		-0.47	

normality	OK
n	37
outliers	0
mean (n)	11.617
st.dev. (n)	1.0798
R(calc.)	3.024
st.dev.(D5185:18)	1.3039
R(D5185:18)	3.651

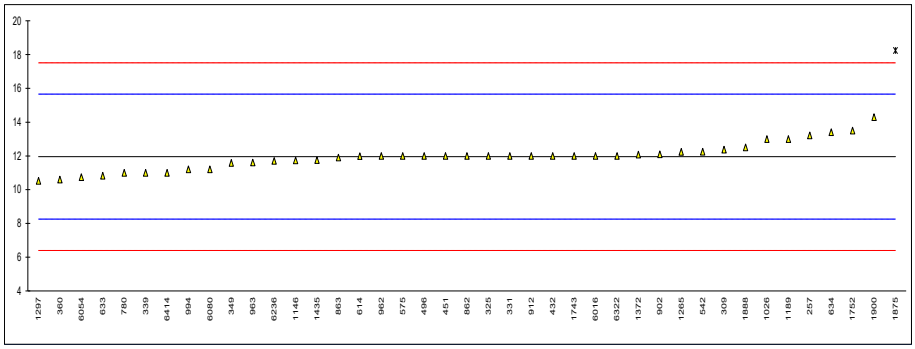


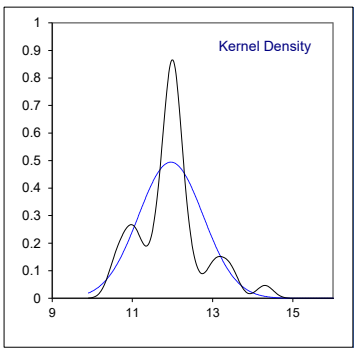


Determination of Nickel as Ni on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	13.21		0.68	
309	D5185	12.37		0.22	
325	D5185	12		0.02	
331	D5185Mod.	12		0.02	
339	INH-165	11		-0.52	
349		11.58		-0.20	
360	D5185	10.6		-0.73	
432	D5185	12		0.02	
451	D5185	12		0.02	
496		12.0		0.02	
542	D6595	12.25		0.16	
575	D6595	12		0.02	
614	D5185	11.99		0.02	
633	D6595	10.83		-0.61	
634	D6595	13.4		0.78	
780	D5185	11		-0.52	
862	D5185	12		0.02	
863	D5185	11.9		-0.03	
902	D5185	12.1		0.08	
912	D5185	12		0.02	
962	D5185	12		0.02	
963	D5185	11.61		-0.19	
974		-----		-----	
975		-----		-----	
994	D5185	11.2		-0.41	
1026	D5185	13		0.56	
1146	D5185	11.730		-0.12	
1189	D5185	13		0.56	
1265	D6595	12.244		0.15	
1297	In house	10.527		-0.77	
1372	D5185	12.08		0.07	
1435	D5185	11.753		-0.11	
1660		-----		-----	
1743	D5185	12		0.02	
1752	D6595	13.5		0.83	
1875	EN11885	18.25	R(0.01)	3.40	
1888	D5185	12.51		0.30	
1900	D5185	14.302		1.27	
6016	D6595	12		0.02	
6054	IP501	10.7380		-0.66	
6080	D5185	11.2		-0.41	
6236	D5185	11.7		-0.14	
6322	DIN51418	12		0.02	
6414	D5185	11		-0.52	

normality	OK
n	40
outliers	1
mean (n)	11.958
st.dev. (n)	0.8066
R(calc.)	2.258
st.dev.(D5185:18)	1.8525
R(D5185:18)	5.187





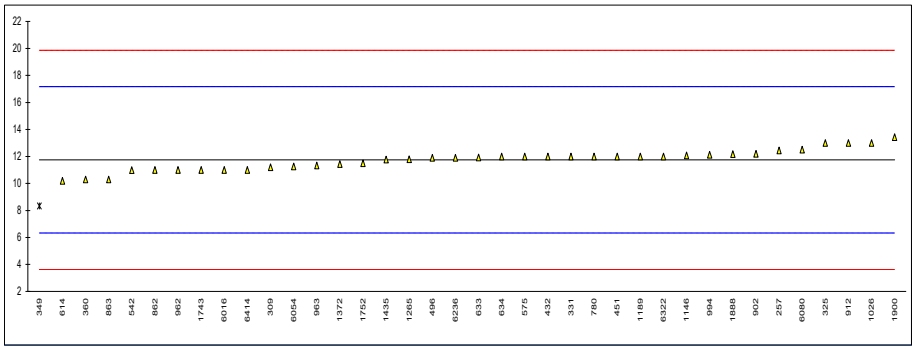
Determination of Potassium as K on sample #21216; results in mg/kg

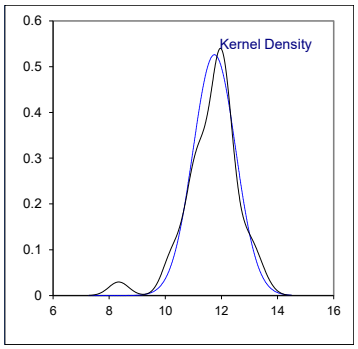
lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	0.1		-----	
309	D5185	1.18		-----	
325	D5185	<2		-----	
331	D5185Mod.	<2		-----	
339	INH-165	<50		-----	
349		0		-----	
360	D5185	0.10		-----	
432	D5185	1		-----	
451	D5185	< 1		-----	
496		0.52		-----	
542	D6595	0.14		-----	
575		-----		-----	
614	D5185	2.3		-----	
633	D6595	0.065		-----	
634	D6595	0.0		-----	
780	D5185	less 1		-----	
862	D5185	<1		-----	
863	D5185	<1		-----	
902	D5185	<40		-----	
912		-----		-----	
962		-----		-----	
963	D5185	<0.10		-----	
974		-----		-----	
975		-----		-----	
994		-----		-----	
1026		-----		-----	
1146		-----		-----	
1189		-----		-----	
1265	D6595	0.125		-----	
1297		-----		-----	
1372	D5185	0.87		-----	
1435	D5185	0.766		-----	
1660		-----		-----	
1743	D5185	0.1		-----	
1752		-----		-----	
1875		-----		-----	
1888		-----		-----	
1900	D5185	0		-----	
6016		-----		-----	
6054	IP501	0.003		-----	
6080	D5185	0.1		-----	
6236	D5185	<2		-----	
6322	DIN51418	0		-----	
6414		-----		-----	
	n	26			
	mean (n)	<10			

Determination of Silicon as Si on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	12.45		0.26	
309	D5185	11.20		-0.20	
325	D5185	13		0.46	
331	D5185Mod.	12		0.09	
339		-----		-----	
349		8.34	C,R(0.01)	-1.26	First reported 7.88
360	D5185	10.3		-0.54	
432	D5185	12		0.09	
451	D5185	12		0.09	
496		11.9		0.06	
542	D6595	10.99		-0.28	
575	D6595	12		0.09	
614	D5185	10.19		-0.58	
633	D6595	11.93	C	0.07	First reported 6.99
634	D6595	12	C	0.09	First reported 6.4
780	D5185	12		0.09	
862	D5185	11		-0.28	
863	D5185	10.3		-0.54	
902	D5185	12.2		0.17	
912	D5185	13		0.46	
962	D5185	11		-0.28	
963	D5185	11.33		-0.16	
974		-----		-----	
975		-----		-----	
994	D5185	12.13		0.14	
1026	D5185	13		0.46	
1146	D5185	12.083		0.12	
1189	D5185	12		0.09	
1265	D6595	11.790		0.01	
1297		-----		-----	
1372	D5185	11.44		-0.11	
1435	D5185	11.767		0.01	
1660		-----		-----	
1743	D5185	11		-0.28	
1752	D6595	11.5		-0.09	
1875		-----		-----	
1888	D5185	12.17		0.15	
1900	D5185	13.438		0.62	
6016	D6595	11		-0.28	
6054	IP501	11.2627		-0.18	
6080	D5185	12.5		0.28	
6236	D5185	11.9		0.06	
6322	DIN51418	12		0.09	
6414	D5185	11		-0.28	

normality	OK
n	37
outliers	1
mean (n)	11.751
st.dev. (n)	0.7584
R(calc.)	2.124
st.dev.(D5185:18)	2.7075
R(D5185:18)	7.581

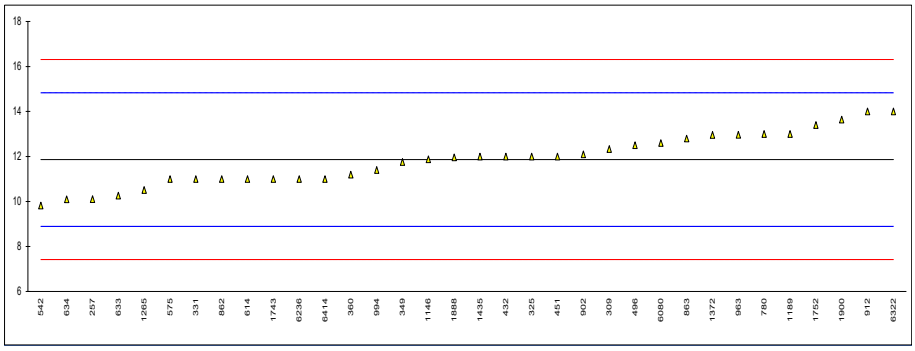


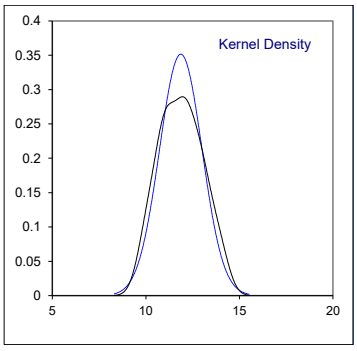


Determination of Silver as Ag on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	10.11		-1.18	
309	D5185	12.33		0.32	
325	D5185	12		0.09	
331	D5185Mod.	11		-0.58	
339		-----		-----	
349		11.76		-0.07	
360	D5185	11.2		-0.45	
432	D5185	12		0.09	
451	D5185	12		0.09	
496		12.5		0.43	
542	D6595	9.82		-1.38	
575	D6595	11		-0.58	
614	D5185	11.0		-0.58	
633	D6595	10.26		-1.08	
634	D6595	10.1		-1.19	
780	D5185	13		0.77	
862	D5185	11		-0.58	
863	D5185	12.8		0.63	
902	D5185	12.1		0.16	
912	D5185	14		1.44	
962		-----		-----	
963	D5185	12.97		0.75	
974		-----		-----	
975		-----		-----	
994	D5185	11.40		-0.31	
1026		-----		-----	
1146	D5185	11.877		0.01	
1189	D5185	13		0.77	
1265	D6595	10.510		-0.91	
1297		-----		-----	
1372	D5185	12.96		0.74	
1435	D5185	11.995		0.09	
1660		-----		-----	
1743	D5185	11		-0.58	
1752	D6595	13.4		1.04	
1875		-----		-----	
1888	D5185	11.96		0.07	
1900	D5185	13.641		1.20	
6016		-----		-----	
6054		-----		-----	
6080	D5185	12.6		0.50	
6236	D5185	11.0		-0.58	
6322	DIN51418	14		1.44	
6414	D5185	11		-0.58	

normality	OK
n	34
outliers	0
mean (n)	11.862
st.dev. (n)	1.1347
R(calc.)	3.177
st.dev.(D5185:18)	1.4827
R(D5185:18)	4.152

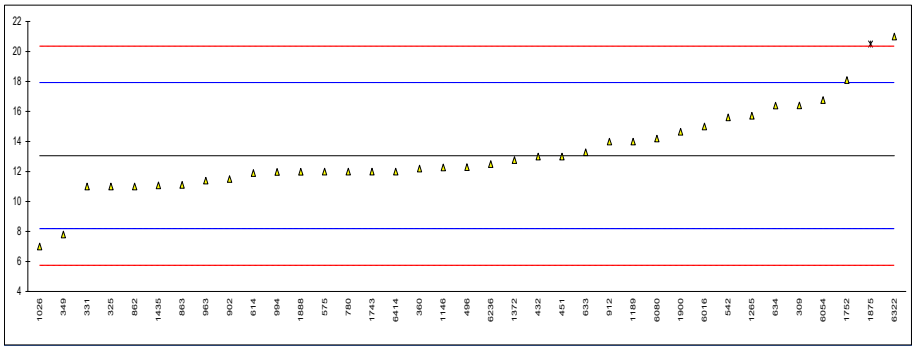


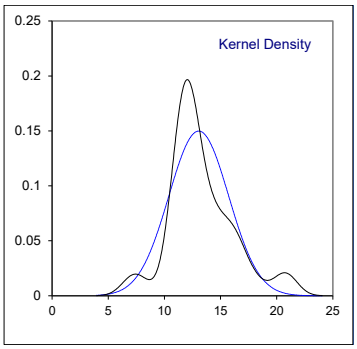


Determination of Sodium as Na on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
309	D5185	16.41		1.38	
325	D5185	11		-0.84	
331	D5185Mod.	11		-0.84	
339	INH-165	<50		-----	
349		7.80		-2.16	
360	D5185	12.2		-0.35	
432	D5185	13		-0.02	
451	D5185	13		-0.02	
496		12.3		-0.31	
542	D6595	15.61		1.05	
575	D6595	12		-0.43	
614	D5185	11.9		-0.47	
633	D6595	13.28		0.09	
634	D6595	16.4		1.37	
780	D5185	12		-0.43	
862	D5185	11		-0.84	
863	D5185	11.1		-0.80	
902	D5185	11.5		-0.64	
912	D5185	14		0.39	
962		-----		-----	
963	D5185	11.39		-0.68	
974		-----		-----	
975		-----		-----	
994	D5185	11.98		-0.44	
1026	D5185	7		-2.49	
1146	D5185	12.276		-0.32	
1189	D5185	14		0.39	
1265	D6595	15.720		1.10	
1297		-----		-----	
1372	D5185	12.76		-0.12	
1435	D5185	11.075		-0.81	
1660		-----		-----	
1743	D5185	12		-0.43	
1752	D6595	18.1		2.07	
1875	EN11885	20.5	ex	3.06	Excluded as many statistical outliers in other related metal analyzes
1888	D5185	11.99		-0.44	
1900	D5185	14.650		0.66	
6016	D6595	15		0.80	
6054	IP501	16.7665		1.53	
6080	D5185	14.2		0.47	
6236	D5185	12.5		-0.23	
6322	DIN51418	21		3.26	
6414	D5185	12		-0.43	

normality	suspect
n	36
outliers	0 (+1ex)
mean (n)	13.053
st.dev. (n)	2.6628
R(calc.)	7.456
st.dev.(D5185:18)	2.4344
R(D5185:18)	6.816

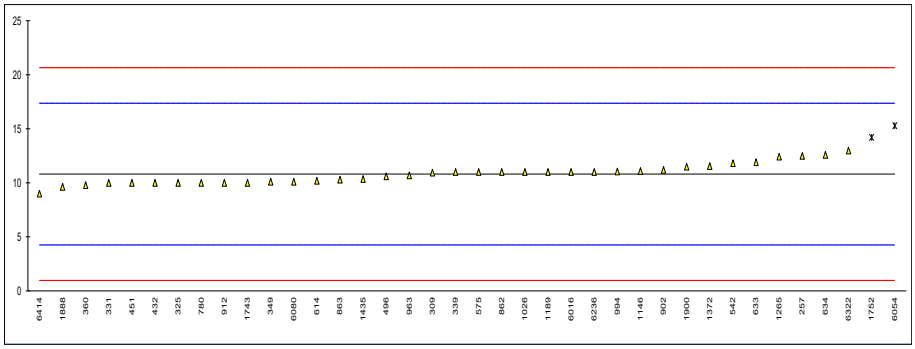


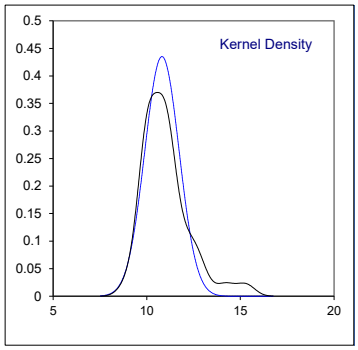


Determination of Tin as Sn on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	12.50		0.51	
309	D5185	10.94		0.04	
325	D5185	10		-0.25	
331	D5185Mod.	10		-0.25	
339	INH-165	11		0.06	
349		10.10		-0.22	
360	D5185	9.80		-0.31	
432	D5185	10		-0.25	
451	D5185	10		-0.25	
496		10.6		-0.07	
542	D6595	11.81		0.30	
575	D6595	11		0.06	
614	D5185	10.19		-0.19	
633	D6595	11.90		0.33	
634	D6595	12.6		0.54	
780	D5185	10		-0.25	
862	D5185	11		0.06	
863	D5185	10.3		-0.16	
902	D5185	11.2		0.12	
912	D5185	10		-0.25	
962		-----		-----	
963	D5185	10.69		-0.04	
974		-----		-----	
975		-----		-----	
994	D5185	11.05		0.07	
1026	D5185	11		0.06	
1146	D5185	11.096		0.09	
1189	D5185	11		0.06	
1265	D6595	12.418		0.49	
1297		-----		-----	
1372	D5185	11.55		0.22	
1435	D5185	10.359		-0.14	
1660		-----		-----	
1743	D5185	10		-0.25	
1752	D6595	14.2	R(0.05)	1.03	
1875		-----		-----	
1888	D5185	9.63		-0.36	
1900	D5185	11.493		0.21	
6016	D6595	11		0.06	
6054	IP501	15.2825	R(0.01)	1.36	
6080	D5185	10.1		-0.22	
6236	D5185	11.0		0.06	
6322	DIN51418	13		0.67	
6414	D5185	9		-0.55	

normality	OK
n	36
outliers	2
mean (n)	10.815
st.dev. (n)	0.9165
R(calc.)	2.566
st.dev.(D5185:18)	3.2821
R(D5185:18)	9.190

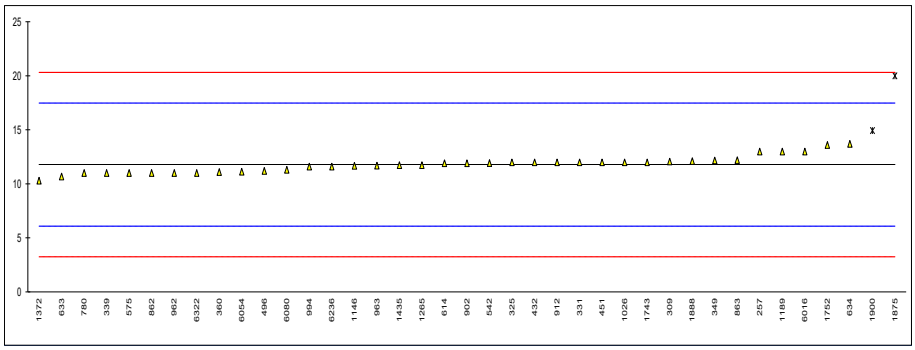


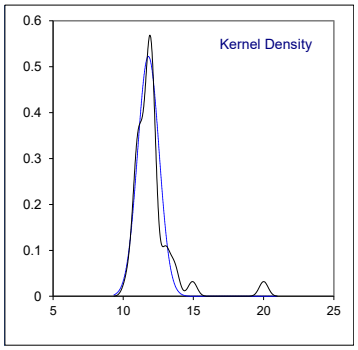


Determination of Titanium as Ti on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	13.00		0.42	
309	D5185	12.06		0.09	
325	D5185	12		0.07	
331	D5185Mod.	12		0.07	
339	INH-165	11		-0.28	
349		12.17		0.13	
360	D5185	11.1		-0.24	
432	D5185	12		0.07	
451	D5185	12		0.07	
496		11.2		-0.21	
542	D6595	11.92		0.05	
575	D6595	11		-0.28	
614	D5185	11.9		0.04	
633	D6595	10.68		-0.39	
634	D6595	13.7		0.67	
780	D5185	11		-0.28	
862	D5185	11		-0.28	
863	D5185	12.2		0.14	
902	D5185	11.9		0.04	
912	D5185	12		0.07	
962	D5185	11		-0.28	
963	D5185	11.69		-0.04	
974		-----		-----	
975		-----		-----	
994	D5185	11.6		-0.07	
1026	D5185	12		0.07	
1146	D5185	11.667		-0.04	
1189	D5185	13		0.42	
1265	D6595	11.734		-0.02	
1297		-----		-----	
1372	D5185	10.30		-0.52	
1435	D5185	11.729		-0.02	
1660		-----		-----	
1743	D5185	12		0.07	
1752	D6595	13.6		0.64	
1875	EN11885	20	R(0.01)	2.88	
1888	D5185	12.11		0.11	
1900	D5185	14.933	R(0.01)	1.10	
6016	D6595	13		0.42	
6054	IP501	11.1199		-0.24	
6080	D5185	11.3		-0.17	
6236	D5185	11.6		-0.07	
6322	DIN51418	11		-0.28	
6414		-----		-----	

normality	OK
n	37
outliers	2
mean (n)	11.791
st.dev. (n)	0.7632
R(calc.)	2.137
st.dev.(D5185:18)	2.8472
R(D5185:18)	7.972

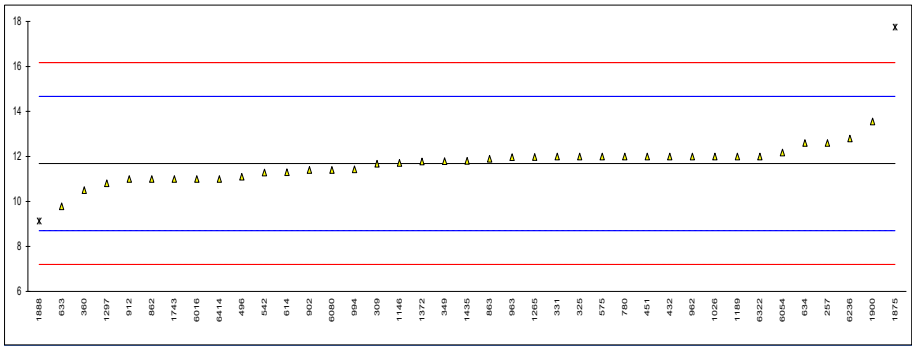


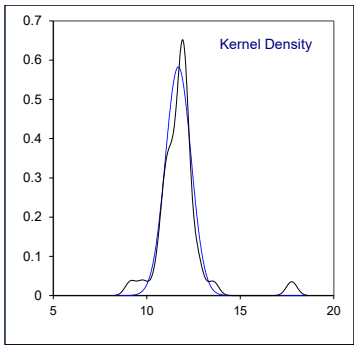


Determination of Vanadium as V on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257	D6595	12.60		0.61	
309	D5185	11.68		0.00	
325	D5185	12		0.21	
331	D5185Mod.	12		0.21	
339		-----		-----	
349		11.79		0.07	
360	D5185	10.5		-0.79	
432	D5185	12		0.21	
451	D5185	12		0.21	
496		11.1		-0.39	
542	D6595	11.29		-0.26	
575	D6595	12		0.21	
614	D5185	11.3		-0.26	
633	D6595	9.79		-1.27	
634	D6595	12.6		0.61	
780	D5185	12		0.21	
862	D5185	11		-0.46	
863	D5185	11.9		0.14	
902	D5185	11.4		-0.19	
912	D5185	11		-0.46	
962	D5185	12		0.21	
963	D5185	11.97		0.19	
974		-----		-----	
975		-----		-----	
994	D5185	11.43		-0.17	
1026	D5185	12		0.21	
1146	D5185	11.717		0.02	
1189	D5185	12		0.21	
1265	D6595	11.974		0.19	
1297	In house	10.805		-0.59	
1372	D5185	11.78		0.06	
1435	D5185	11.808		0.08	
1660		-----		-----	
1743	D5185	11		-0.46	
1752		-----		-----	
1875	EN11885	17.75	R(0.01)	4.06	
1888	D5185	9.13	C,R(0.05)	-1.71	First reported 6.09
1900	D5185	13.555		1.25	
6016	D6595	11		-0.46	
6054	IP501	12.1748		0.33	
6080	D5185	11.4		-0.19	
6236	D5185	12.8		0.75	
6322	DIN51418	12		0.21	
6414	D5185	11		-0.46	

normality	suspect
n	37
outliers	2
mean (n)	11.686
st.dev. (n)	0.6848
R(calc.)	1.918
st.dev.(D5185:18)	1.4942
R(D5185:18)	4.184

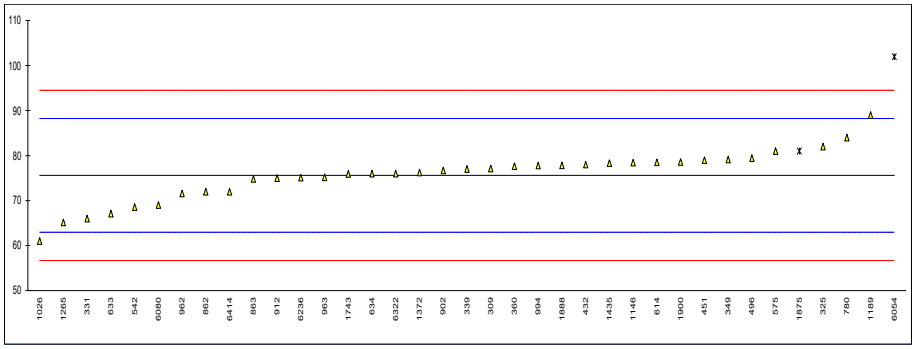


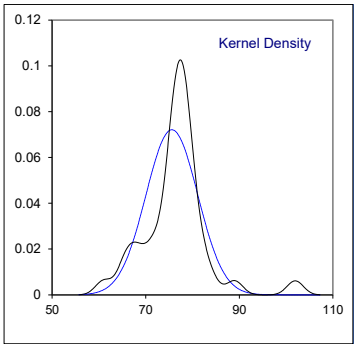


Determination of Calcium as Ca on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
309	D5185	77.13		0.24	
325	D5185	82		1.01	
331	D5185Mod.	66		-1.52	
339	INH-165	77		0.22	
349		79.15		0.56	
360	D5185	77.64		0.32	
432	D5185	78		0.38	
451	D5185	79		0.54	
496		79.46		0.61	
542	D6595	68.55		-1.12	
575	D6595	81		0.86	
614	D5185	78.5		0.46	
633	D6595	67.1		-1.35	
634	D6595	76	C	0.06	First reported 55.8
780	D5185	84		1.33	
862	D5185	72		-0.57	
863	D5185	74.8		-0.13	
902	D5185	76.7		0.17	
912	D5185	75		-0.10	
962	D5185	71.6		-0.63	
963	D5185	75.16		-0.07	
974		-----		-----	
975		-----		-----	
994	D5185	77.8		0.35	
1026	D5185	61		-2.32	
1146	D5185	78.423		0.45	
1189	D5185	89		2.12	
1265	D6595	65.145		-1.66	
1297		-----		-----	
1372	D5185	76.23		0.10	
1435	D5185	78.330		0.43	
1660		-----		-----	
1743	D5185	75.9		0.05	
1752		-----		-----	
1875	EN11885	81	ex	0.86	Excluded as many statistical outliers in other related metal analyzes
1888	D5185	77.84		0.35	
1900	D5185	78.576		0.47	
6016		-----		-----	
6054	IP501	101.972	R(0.01)	4.18	
6080	D5185	69.0		-1.05	
6236	D5185	75.1		-0.08	
6322	DIN51418	76		0.06	
6414	D5185	72		-0.57	

	normality	suspect
	n	35
	outliers	1 (+1ex)
	mean (n)	75.604
	st.dev. (n)	5.5349
	R(calc.)	15.498
	st.dev.(Horwitz)	6.3083
	R(Horwitz)	17.663
Compare		
	R(D5185:18)	4.151

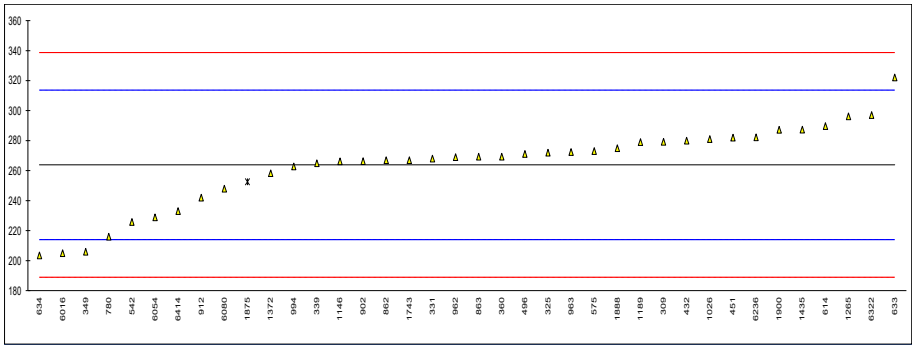


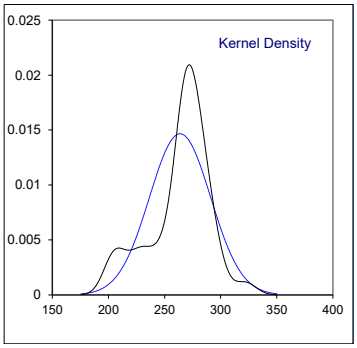


Determination of Phosphorus as P on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
309	D5185	279.2		0.61	
325	D5185	272		0.33	
331	D5185Mod.	268		0.17	
339	INH-165	265		0.05	
349		205.88		-2.32	
360	D5185	269.3		0.22	
432	D5185	280		0.65	
451	D5185	282		0.73	
496		271.1		0.29	
542	D6595	225.81		-1.53	
575	D6595	273		0.37	
614	D5185	289.7		1.04	
633	D6595	322.1		2.33	
634	D6595	203.5		-2.42	
780	D5185	216		-1.92	
862	D5185	267		0.13	
863	D5185	269.3		0.22	
902	D5185	266.3		0.10	
912	D5185	242		-0.88	
962	D5185	269		0.21	
963	D5185	272.38		0.34	
974		-----		-----	
975		-----		-----	
994	D5185	262.8		-0.04	
1026	D5185	281		0.69	
1146	D5185	266.290		0.10	
1189	D5185	279		0.61	
1265	D6595	296.23		1.30	
1297		-----		-----	
1372	D5185	258.25		-0.22	
1435	D5185	287.409		0.94	
1660		-----		-----	
1743	D5185	267		0.13	
1752		-----		-----	
1875	EN11885	252.5	ex	-0.46	Excluded as many statistical outliers in other related metal analyzes
1888	D5185	274.93		0.44	
1900	D5185	287.31		0.94	
6016	D6595	205		-2.36	
6054	IP501	228.887		-1.40	
6080	D5185	248.0		-0.64	
6236	D5185	282.2		0.74	
6322	DIN51418	297		1.33	
6414	D5185	233		-1.24	

normality	OK
n	37
outliers	0 (+1ex)
mean (n)	263.862
st.dev. (n)	27.2196
R(calc.)	76.215
st.dev.(D5185:18)	24.9459
R(D5185:18)	69.848

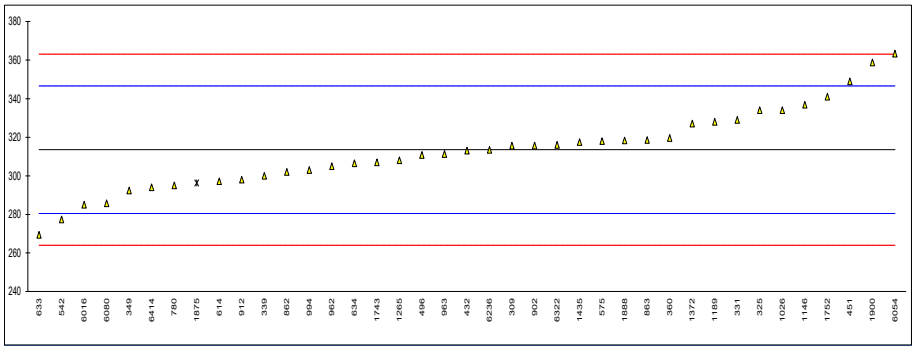


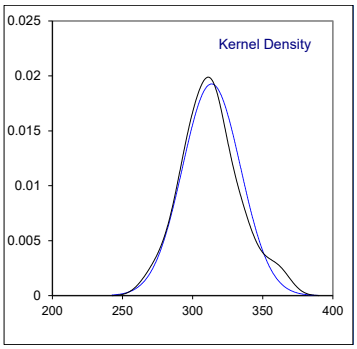


Determination of Zinc as Zn on sample #21216; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
309	D5185	315.6		0.12	
325	D5185	334		1.24	
331	D5185Mod.	329		0.94	
339	INH-165	300		-0.82	
349		292.36		-1.28	
360	D5185	319.6		0.37	
432	D5185	313		-0.03	
451	D5185	349		2.15	
496		310.8		-0.17	
542	D6595	277.33		-2.19	
575	D6595	318		0.27	
614	D5185	297.2		-0.99	
633	D6595	269.4		-2.67	
634	D6595	306.5		-0.43	
780	D5185	295		-1.12	
862	D5185	302		-0.70	
863	D5185	318.6		0.31	
902	D5185	315.7		0.13	
912	D5185	298		-0.94	
962	D5185	305		-0.52	
963	D5185	311.32		-0.13	
974		-----		-----	
975		-----		-----	
994	D5185	303		-0.64	
1026	D5185	334		1.24	
1146	D5185	336.839		1.41	
1189	D5185	328		0.88	
1265	D6595	308.07		-0.33	
1297		-----		-----	
1372	D5185	327.10		0.82	
1435	D5185	317.465		0.24	
1660		-----		-----	
1743	D5185	307		-0.40	
1752	D6595	341		1.66	
1875	EN11885	296.25	ex	-1.05	Excluded as many statistical outliers in other related metal analyzes
1888	D5185	318.35		0.29	
1900	D5185	358.82		2.74	
6016	D6595	285		-1.73	
6054	IP501	363.347		3.02	
6080	D5185	285.8		-1.68	
6236	D5185	313.4		-0.01	
6322	DIN51418	316		0.15	
6414	D5185	294		-1.18	

normality	OK
n	38
outliers	0 (+1ex)
mean (n)	313.542
st.dev. (n)	20.6986
R(calc.)	57.956
st.dev.(D5185:18)	16.5137
R(D5185:18)	46.238





APPENDIX 2

Number of participants per country

1 lab in	ARGENTINA
1 lab in	AUSTRALIA
2 labs in	AUSTRIA
1 lab in	AZERBAIJAN
3 labs in	BELGIUM
1 lab in	BOTSWANA
2 labs in	BULGARIA
1 lab in	CHILE
2 labs in	CHINA, People's Republic
1 lab in	COLOMBIA
2 labs in	COTE D'IVOIRE
1 lab in	CROATIA
1 lab in	EGYPT
4 labs in	FRANCE
3 labs in	GERMANY
2 labs in	GREECE
1 lab in	INDIA
1 lab in	IRELAND
1 lab in	ITALY
1 lab in	KAZAKHSTAN
2 labs in	MALAYSIA
1 lab in	MOROCCO
5 labs in	NETHERLANDS
1 lab in	NIGERIA
2 labs in	NORWAY
2 labs in	PHILIPPINES
3 labs in	POLAND
1 lab in	PORTUGAL
1 lab in	QATAR
1 lab in	RUSSIAN FEDERATION
3 labs in	SAUDI ARABIA
2 labs in	SLOVAKIA
1 lab in	SPAIN
1 lab in	SUDAN
1 lab in	SWEDEN
2 labs in	TANZANIA
1 lab in	TURKEY
2 labs in	UNITED ARAB EMIRATES
2 labs in	UNITED KINGDOM
2 labs in	UNITED STATES OF AMERICA

APPENDIX 3

Abbreviations

C	= final test result after checking of first reported suspect test 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
R(0.01)	= outlier in Rosner's outlier test
R(0.05)	= straggler in Rosner's outlier test
E	= calculation difference between reported test result and result calculated by iis
W	= test result withdrawn on request of participant
ex	= test result excluded from statistical evaluation
n.a.	= not applicable
n.e.	= not evaluated
n.d.	= not detected
fr.	= first reported
f+?	= possibly a false positive test result?
f-?	= possibly a false negative test result?
SDS	= Safety Data Sheet

Literature

1 iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, June 2018

2 ISO5725:86

3 ISO5725 parts 1-6:94

4 ISO13528:05

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

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

7 P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)

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

9 Analytical Methods Committee, Technical Brief, No 4, January 2001

10 P.J. Lowthian and M. Thompson, The Royal Society of Chemistry, Analyst, 127, 1359-1364, (2002)

11 W. Horwitz and R. Albert, J. AOAC Int, 79.3, 589-621, (1996)

12 Bernard Rosner, Percentage Points for a Generalized ESD Many-Outlier Procedure, Technometrics, 25(2), 165-172, (1983)

13 iis memo 1401, R.G. Visser and C. Nijssen-Wester, Estimation of reproducibility and measurement uncertainty of a viscosity test method from proficiency test data, Accred Qual Assur 20, 125-129, (2015)