Results of Proficiency Test
Hydraulic Oil (used)
November 2020

CONTENTS

Appendices:

1   INTRODUCTION

Since 2003 the Institute for Interlaboratory Studies (iis) organizes a proficiency scheme for Hydraulic Oil (used) every year. During the annual proficiency test program 2020/2021 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).

In the regular PT 57 laboratories in 35 countries registered for participation. In the PT on metals 44 laboratories in 32 countries registered for participation. In this interlaboratory study in total 59 laboratories in 36 different countries registered for participation. 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 one sample of 1L with Hydraulic Oil labelled #20211 and/or one sample of 50mL PE bottle with Hydraulic Oil (used) labelled #20212 for wear Metals round.
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 85 liters of Hydraulic Oil (used) was obtained from a local supplier. After homogenization 82 amber glass bottles of 1L were filled and labelled #20211.
The homogeneity of the subsamples was checked by determination of Density at 15°C in accordance with ISO12185 and 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 #20211-1	0.87748	67.95
Sample #20211-2	0.87748	67.99
Sample #20211-3	0.87750	68.06
Sample #20211-4	0.87745	67.90
Sample #20211-5	0.87749	68.06
Sample #20211-6	0.87750	68.06
Sample #20211-7	0.87748	68.04
Sample #20211-8	0.87744	68.09

Table 1: homogeneity test results of subsamples #20211

From the above test results the repeatabilities were calculated and compared with 0.3 times the corresponding reproducibility of the reference test 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)	0.00006	0.184
reference test method	ISO12185:96	iis memo 1401
0.3 x R (reference test method)	0.00015	0.367

Table 2: evaluation of the repeatabilities of subsamples #20211

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

A batch of approximately 3 liters of Hydraulic Oil (used) was obtained from a local supplier who added different elements. After homogenization 60 PE bottles of 50 mL were filled and labelled #20212.

The homogeneity of the subsamples was checked by the determination of Copper and Nickel in accordance with ASTM D5185 on 4 stratified randomly selected subsamples.

	Copper as Cu in mg/kg	Nickel as Ni in mg/kg
Sample #20212-1	35	9
Sample #20212-2	35	9
Sample #20212-3	35	9
Sample #20212-4	35	9

Table 3: homogeneity test results of subsamples #20212

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	0
reference test method	D5185:18	D5185:18
0.3 x R (reference test method)	2.5	1.4

Table 4: evaluation of the repeatabilities of subsamples #20212

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 7, 2020. An SDS was added to the sample package.

2.5 STABILITY OF THE SAMPLES

The stability of used Hydraulic Oil 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 #20211: Total Acid Number, Density at 15°C, Flash Point PMcc, Kinematic Viscosity at 40 and 100°C, 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 #20212 were requested to determine 23 elements from wear metals and additives: 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.

According to ISO5725 the test results per determination were submitted to Dixon's, Grubbs' or Rosner's outlier tests. 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 these 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 was projected over the Kernel Density Graph for reference.

3.3 Z-SCORES

To evaluate the performance of the participating laboratories the z-scores were calculated. As it was decided to evaluate the performance of the participants in this proficiency test (PT) against the literature requirements, e.g. ASTM, ISO reproducibilities, 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:

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

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 regular sample six participants reported the test results after the extended final reporting date and one other participant did not report any test results. For the metals sample three participants reported the test result after the extended final reporting date and two other participants did not report any test results. Not all laboratories were able to report all analyzes requested.
In total 57 participants reported 1313 numerical test results. Observed were 57 outlying test results, which is 4.3%. 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 reported test results in appendix 1. The abbreviations, used in these tables, are explained in appendix 3.

In the iis PT reports the 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 tables of appendix 1 only the test method number and year of adoption or revision will be used (e.g. ASTM D7647:10).

Unfortunately, a suitable reference test method providing the precision data is not available for all determinations. For the tests that have no available precision data the calculated reproducibility was compared against the estimated reproducibility calculated with the Horwitz equation.

Sample #20211

Total Acid Number: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D664-A:18e2 using Buffer End Point 60mL and Inflection Point 60mL. However, the calculated reproducibility is not in agreement with the precision data for Buffer End Point 125mL and Inflection Point 125mL.
It is observed that four participants reported to have used BEP (pH 11) as determination end point and six reported to have used BEP (pH 10). In method ASTM D664-A version 2018e2 the Buffer End Point has been changed to pH 10.

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

Flash Point PMcc: This determination may not be problematic depending on the test method used. Three 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 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, the target reproducibility being used is calculated from the reproducibilities found in previous iis PTs on used oils (see lit. 17).
This determination was not problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the average reproducibility found for used oils in previous iis PTs (iis memo 1401), and in this PT also in (full) agreement with the requirements of ASTM D445:19a.

Kinematic Viscosity at 100°C: See the explanation about selection of the target reproducibility at Kinematic Viscosity 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 average reproducibility found for used oils in previous iis PTs (iis memo 1401), but not in agreement with the requirements of ASTM D445:19a.

Viscosity Stabinger at 40°C: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D7042:20.

Viscosity Stabinger at 100°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 D7042:20.

Sulfur: This determination was problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D4294:16e1.

Water: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D6304:16e1.

Level of Contamination: When the data of the last four round robins are evaluated no significant differences between the test results from ISO11500 and the test results of ASTM D7647 could be found. 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 seven statistical outliers were observed over six parameters (3 for counts/mL and 4 for scale number). Only the calculated reproducibility for particles ≥4µm count/mL after rejection of the statistical outliers is in agreement with the requirements of ASTM D7647:10(2018). All others are not.

The reference method for the analyzes of wear metals is test method ASTM D5185:18. For Ba the consensus value of the group is either above the respective application range on which the requirements of ASTM D5185:18 are based. However, it was decided to use the reproducibility from ASTM D5185:18 as the calculated reproducibility (after the rejection of the statistical outliers) is in good agreement with the requirements of ASTM D5185:18. More discussion per metal is given below.

Sample #20212

Aluminum: 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 requirements of ASTM D5185:18.

Barium: 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.

Boron: 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.

Cadmium: 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 calculated with the Horwitz equation.

Chromium: 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.

Copper: This determination was not problematic. Four 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. 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.

Lithium: This determination may be problematic. No statistical outliers were observed. The calculated reproducibility is not 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. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D5185:18.

Molybdenum: 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.

Nickel: 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.

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

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

Silver: 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.

Sodium: 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 requirements of ASTM D5185:18.

Tin: 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.

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. 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.

Calcium: This determination was not problematic. Three statistical outliers were 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 in agreement with the strict requirements of ASTM D5185:18.

Phosphorus: This determination was problematic. One statistical outlier was observed and 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.

Zinc: This determination was problematic. One statistical outlier was observed and 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 or as declared by the estimated target reproducibility using the Horwitz equation 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 reproducibility derived from literature reference test methods (in casu ASTM and ISO reference test methods) are presented in the next tables.

Parameter	unit	n	average	2.8 * sd	R(lit)
Total Acid Number	mg KOH/g	43	0.43	0.18	0.24
Density at 15°C	kg/L	38	0.8776	0.0007	0.0005
Flash Point PMcc	°C	35	214.1	11.7	15.2
Kinematic Viscosity at 40°C	mm^2/s	42	68.231	0.841	1.228
Kinematic Viscosity at 100°C	mm^2/s	38	10.471	0.202	0.230
Viscosity Stabinger at 40°C	mm^2/s	18	68.251	0.615	0.857
Viscosity Stabinger at 100°C	mm^2/s	16	10.464	0.102	0.116
Sulfur	mg/kg	18	2071	322	263
Water	mg/kg	44	83.9	96.0	241.0
L. of Contamination ≥ 4 µm (c)	counts/mL	27	628	649	717
L. of Contamination ≥ 6 µm (c)	counts/mL	27	148	219	114
L. of Contamination ≥ 14 µm (c)	counts/mL	27	12.0	21.9	16.3
L. of Contamination ≥ 4 µm (c)	scale no.	26	16.4	1.9	1.7
L. of Contamination ≥ 6 µm (c)	scale no.	26	14.1	2.7	1.2
L. of Contamination ≥ 14 µm (c)	scale no.	24	10.5	3.1	2.0

Table 5: reproducibilities of tests on sample #20211

Element	unit	n	average	2.8 * sd	R(lit)
Aluminum as Al	mg/kg	40	9.3	2.7	6.8
Barium as Ba	mg/kg	35	261	66	99
Boron as B	mg/kg	31	12.0	5.7	13.3
Cadmium as Cd	mg/kg	24	9.7	1.1	3.1
Chromium as Cr	mg/kg	40	10.0	2.3	3.3
Copper as Cu	mg/kg	38	33.3	5.3	8.0
Iron as Fe	mg/kg	41	16.4	4.5	4.9
Lead as Pb	mg/kg	38	11.0	3.8	7.1
Lithium as Li	mg/kg	17	7.2	4.3	2.4
Magnesium as Mg	mg/kg	36	16.7	4.8	6.3
Manganese as Mn	mg/kg	35	10.1	2.1	2.1
Molybdenum as Mo	mg/kg	36	9.3	2.4	3.1
Nickel as Ni	mg/kg	41	9.1	1.8	4.5
Potassium as K	mg/kg	26	<10	n.e.	n.e.

Element	unit	n	average	2.8 * sd	R(lit)
Silicon as Si	mg/kg	34	11.8	4.3	7.6
Silver as Ag	mg/kg	34	7.8	1.6	2.7
Sodium as Na	mg/kg	33	11.2	4.4	6.1
Tin as Sn	mg/kg	39	10.4	3.9	9.0
Titanium as Ti	mg/kg	33	9.4	1.8	7.2
Vanadium as V	mg/kg	38	9.4	2.3	3.3
Calcium as Ca	mg/kg	36	200	31	40
Phosphorus as P	mg/kg	37	843	170	125
Zinc as Zn	mg/kg	40	358	72	53

Table 6: reproducibilities of tests on sample #20212

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 2020 WITH PREVIOUS PTS

	November 2020	November 2019	November 2018	November 2017	November 2016
Number of reporting laboratories	57	63	52	57	51
Number of test results	1313	1402	1053	1202	1168
Number of statistical outliers	57	87	49	89	29
Percentage of statistical outliers	4.3%	6.2%	4.7%	7.4%	2.5%

Table 7: comparison with previous proficiency tests

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

The performance of the determinations of the proficiency tests was compared against the requirements of the reference test methods. The conclusions are given in the following table.

Determination	November 2020	November 2019	November 2018	November 2017	November 2016
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	+/-	-	-	--	-

Determination	November 2020	November 2019	November 2018	November 2017	November 2016
L. of Contamination – scale no.	-	-	-	-	-
Aluminum as Al	++	+	+	++	++
Barium as Ba	+	++	++	+	++
Boron as B	++	++	++	++	n.e.
Cadmium as Cd *)	++	-	n.e.	+	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	+	++	+	+	++
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
*) Based on Horwitz from 2019 onwards and ASTM D5185 for earlier PTs

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 #20211; results in mg KOH/g

lab	method	value	mark	z(targ)	remarks	End Point	Volume
178	D664-A	0.40		-0.31		Inflection Point	60 mL
179	D664-A	0.45		0.27		Inflection Point	60 mL
225	D974	0.44		0.15		---	---
237		-----		-----		---	---
256		-----		-----		---	---
257		-----		-----		---	---
317	D974	0.37		-0.66		---	---
325	D664-A	0.44		0.15		---	---
331	D664Mod.	0.4		-0.31		Inflection Point	60 mL
335	ISO6618	0.37		-0.66		---	---
339		-----		-----		---	---
349	D664-A	0.40		-0.31		Inflection Point	125 mL
360	D664-A	0.412		-0.17		Inflection Point	60 mL
432		-----		-----		---	---
442		-----		-----		---	---
451	D664-A	0.34		-1.01		Buffer End Point (pH 10)	60 mL
496	D664-A	0.42		-0.08		Buffer End Point (pH 10)	60 mL
542	D664-B	0.40		-0.31		Inflection Point	125 mL
562	D664-A	0.392		-0.41		Inflection Point	60 mL
575	D664-A	0.45		0.27		Buffer End Point (pH 10)	125 mL
614	D664-A	0.39		-0.43		---	60 mL
633	D664-A	0.37		-0.66		Inflection Point	125 mL
634	D664-A	0.395		-0.37		---	---
780	D664-A	0.48		0.61		Buffer End Point (pH 10)	60 mL
862	D664-A	0.44		0.15		Inflection Point	60 mL
863	D664-A	0.39		-0.43		---	---
912	D664-A	0.5		0.85		---	---
962	D974	0.398		-0.34		Inflection Point	60 mL
963	D664-A	0.489		0.72		Inflection Point	60 mL
975	D664-A	0.53		1.19		Inflection Point	60 mL
994	D664-A	0.48		0.61		Inflection Point	125 mL
1023		0.38		-0.55		---	---
1059	ISO6619	0.55		1.42		Buffer End Point (pH 11)	60 mL
1146		-----		-----		---	---
1166	D664-A	0.3767		-0.58		Inflection Point	60 mL
1201	D664-A	0.48		0.61		Inflection Point	60 mL
1262	ISO6618	0.40		-0.31		Buffer End Point (pH 10)	125 mL
1397		-----		-----		---	---
1435	D664-A	0.392		-0.41		---	---
1531	D664-A	0.609		2.11		---	60 mL
1660		-----		-----		---	---
1740	D664-A	0.46		0.38		Inflection Point	60 mL
1743	D664-A	0.41		-0.20		Buffer End Point (pH 11)	60 mL
1788		-----		-----		---	---
1900	D664-A	0.373		-0.63		Inflection Point	60 mL
1920	D664-A	0.316		-1.29		Inflection Point	---
1957	D664-A	0.469		0.49		Buffer End Point (pH 11)	125 mL
6002	D664-A	0.418		-0.11		Buffer End Point (pH 10)	60 mL
6016	D664-A	0.358		-0.80		---	---
6054		-----		-----		---	---
6140	D974	0.3615		-0.76		---	---
6141	D664-A	0.565	C	1.60	First reported 2.165	Buffer End Point (pH 11)	60 mL
6251	D664-A	0.35		-0.89		Inflection Point	60 mL
6277		-----		-----		---	---
6320		-----		-----		---	---
6322		-----		-----		---	---
7011	D974	0.55		1.42		Inflection Point	60 mL
						Inflection Point	60 mL

normality	OK
n	43
outliers	0
mean (n)	0.4271
st.dev. (n)	0.06522
R(calc.)	0.1826
st.dev.(D664-A:18e2, BEP 60mL)	0.08629
R(D664-A:18e2, BEP 60mL)	0.2416
Compare	
R(D664-A:18e2, IP 60mL)	0.2002
R(D664-A:18e2, BEP 125mL)	0.1292
R(D664-A:18e2, IP 125mL)	0.0901
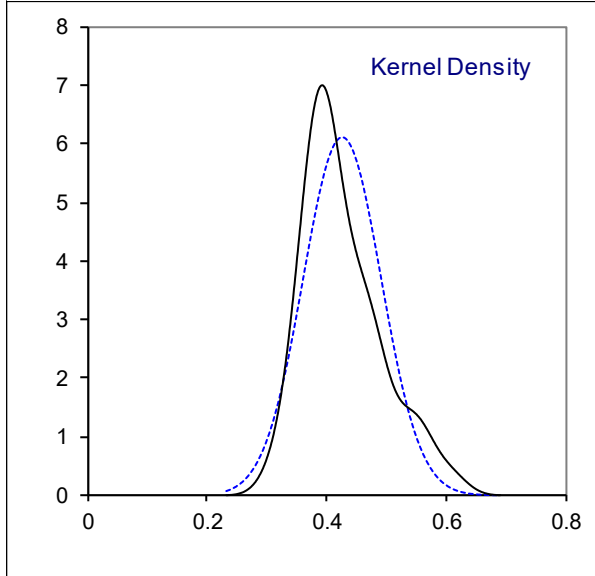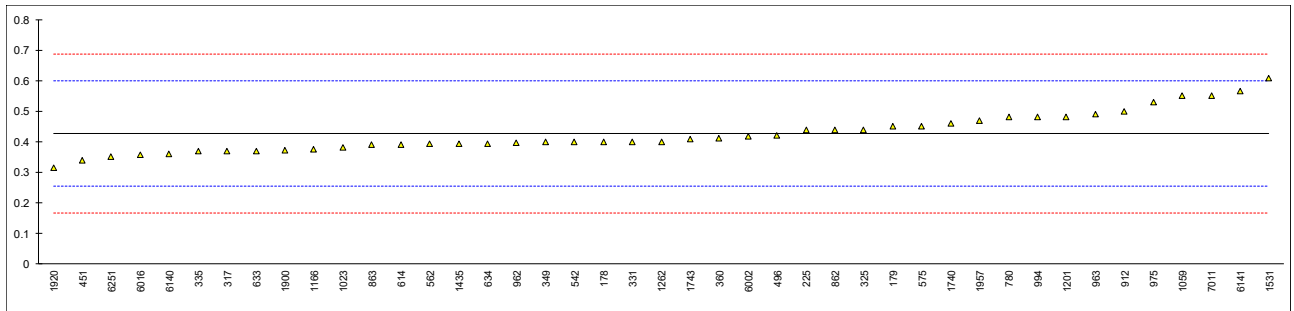
Determination of Density at 15°C on sample #20211; results in kg/L

lab	method	value	mark	z(targ)	remarks
178	D4052	0.8773		-1.40	
179	D4052	0.8775		-0.28	
225		-----		-----	
237	D4052	0.87777		1.23	
256		-----		-----	
257		-----		-----	
317	D4052	0.8775		-0.28	
325	D4052	0.8775		-0.28	
331	ISO12185	0.87750		-0.28	
335	ISO12185	0.8778		1.40	
339		-----		-----	
349	D4052	0.8774		-0.84	
360	ISO12185	0.8775		-0.28	
432	ISO12185	0.87755		0.00	
442		-----		-----	
451	D4052	0.8770		-3.08	
496	ISO12185	0.87752		-0.17	
542	D4052	0.879243	R(0.01)	9.48	
562	D4052	0.8789	R(0.01)	7.56	
575		-----		-----	
614		-----		-----	
633		-----		-----	
634	D4052	0.8775		-0.28	
780	ISO12185	0.8775		-0.28	
862	D4052	0.8775		-0.28	
863		-----		-----	
912	D1298	0.8777		0.84	
962	D4052	0.8774		-0.84	
963	D4052	0.8776		0.28	
975	D4052	0.8775		-0.28	
994	ISO12185	0.8775		-0.28	
1023	D4052	0.8775		-0.28	
1059	ISO12185	0.8775		-0.28	
1146	D4052	0.8775		-0.28	
1166		-----		-----	
1201	ISO12185	0.8776		0.28	
1262	ISO3675	0.87744		-0.62	
1397	ISO12185	0.8778		1.40	
1435	D4052	0.8772		-1.96	
1531		-----		-----	
1660		-----		-----	
1740	D7042	0.8776		0.28	
1743		0.8780		2.52	
1788	D4052	0.877435		-0.65	
1900	D4052	0.8775		-0.28	
1920		-----		-----	
1957		-----		-----	
6002	ISO12185	0.8780		2.52	
6016	D4052	0.87751	C	-0.23	Reported 877.5100 kg/L
6054	D4052	0.87736		-1.07	
6140	D7042	0.87823		3.81	
6141	D4052	0.8780		2.52	
6251	D7042	0.8773		-1.40	
6277		-----		-----	
6320		-----		-----	
6322	ISO12185	0.8765	R(0.01)	-5.88	
7011	D7042	0.8774		-0.84	

	normality	suspect	
	n	38	
	outliers	3	
	mean (n)	0.87755	
	st.dev. (n)	0.000232	
	R(calc.)	0.00065	
	st.dev.(ISO12185:96)	0.000179	
	R(ISO12185:96)	0.0005	

Kernel Density
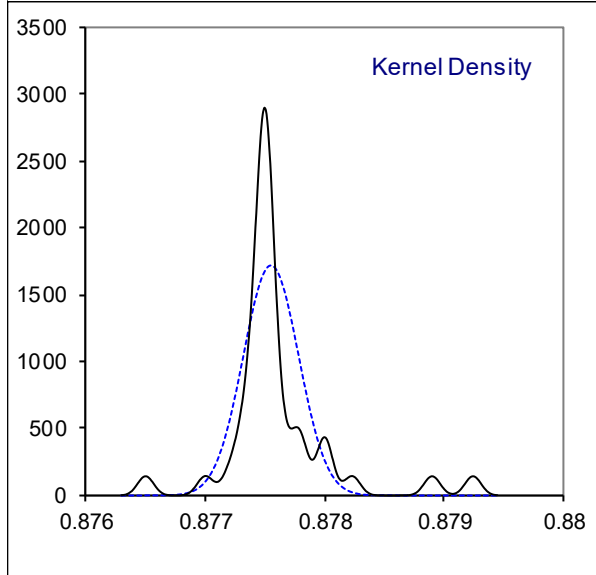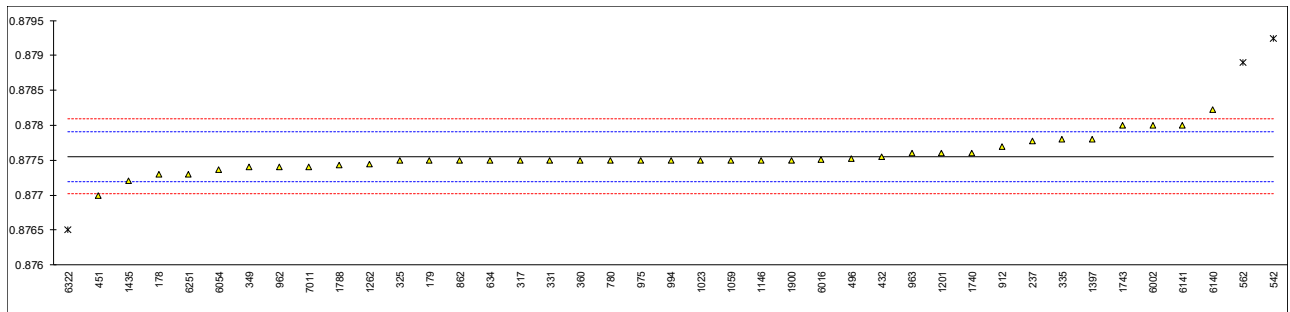
Determination of Flash Point PMcc on sample #20211; results in °C

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D93-A	216.0		0.35	
225	D93-B	220.0		1.09	
237	D93-B	216.0		0.35	
256	D3828	211.0		-0.57	
257	D3828	211.0		-0.57	
317		-----		-----	
325	D93-A	222.0		1.46	
331	D93-A	214		-0.01	
335		-----		-----	
339		-----		-----	
349	D93-A	228	R(0.05)	2.56	
360	ISO2719-A	199.0	R(0.05)	-2.78	
432		-----		-----	
442		-----		-----	
451	D93-A	213		-0.20	
496	D93-A	209.1		-0.92	
542	D7094	220		1.09	
562	D93-B	207.8		-1.16	
575		-----		-----	
614		-----		-----	
633	D93-A	214.48		0.07	
634	D93-B	218.0		0.72	
780	D93-A	206.5		-1.40	
862	D93-A	214		-0.01	
863		-----		-----	
912		-----		-----	
962	D93-A	212.0		-0.38	
963	D93-A	210.0		-0.75	
975	D93-A	210		-0.75	
994	D93-A	216.0		0.35	
1023	D93-A	219		0.91	
1059	ISO2719-A	211.5		-0.47	
1146	D93-A	215.5		0.26	
1166		-----		-----	
1201	D93-B	214.0		-0.01	
1262	D93-A	202		-2.22	
1397		-----		-----	
1435	D93-A	221.0		1.28	
1531	D93-A	140	R(0.01)	-13.65	
1660		-----		-----	
1740	D93-A	215.0		0.17	
1743	ISO2719-A	212		-0.38	
1788	D93-B	214.0		-0.01	
1900	D7094	217.20		0.58	
1920		-----		-----	
1957	D93-A	217.0		0.54	
6002	ISO2719-A	217		0.54	
6016	D6450	214.1		0.00	
6054	D93-A	214.0		-0.01	
6140	D93-A	214.5		0.08	
6141		-----		-----	
6251	D93-A	214.0		-0.01	
6277		-----		-----	
6320		-----		-----	
6322		-----		-----	
7011		-----		-----	

normality	OK	
n	35	
outliers	3	
mean (n)	214.08	
st.dev. (n)	4.193	
R(calc.)	11.74	
st.dev.(D93-A:20)	5.428	
R(D93-A:20)	15.20	
Compare		
R(D93-B:20)	10	

Kernel Density
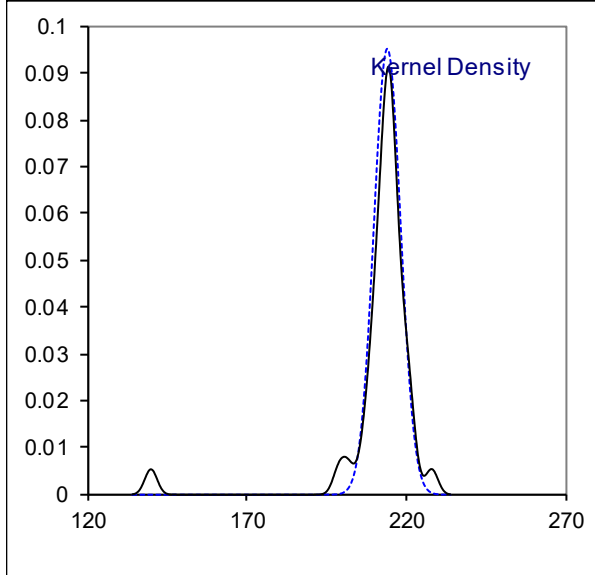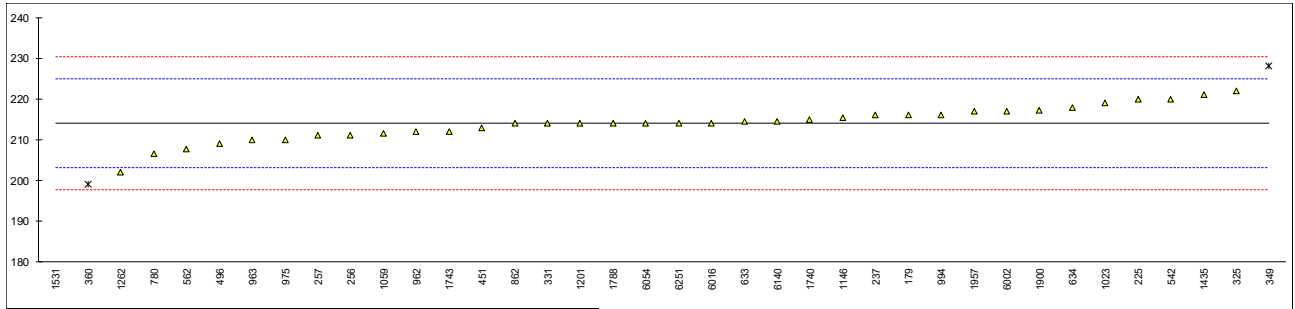
Determination of Kinematic Viscosity at 40°C on sample #20211; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
178	D445	68.4		0.38	
179	D445	68.15		-0.19	
225	D445	68.10		-0.30	
237	D445	67.575		-1.50	
256	D7279 corr to D445	67.8		-0.98	
257	D7279 corr to D445	67.75		-1.10	
317	D445	68.17		-0.14	
325	D445	68.33		0.22	
331	D7279Mod.	66.41	R(0.01)	-4.15	
335	D445	67.85	C	-0.87	First reported 66.26
339		-----		-----	
349	D445	68.18	C	-0.12	First reported 97.63
360	ISO3104	68.208		-0.05	
432	D445	68.34		0.25	
442		-----		-----	
451	D7279 corr to D445	68.33		0.22	
496	D445	68.265		0.08	
542	D7042	68.96855		1.68	
562	D7279	68.272		0.09	
575	D7279 corr to D445	68.39		0.36	
614		-----		-----	
633	D7279 corr to D445	67.977		-0.58	
634	D445	68.72		1.11	
780	D445	68.44		0.48	
862	D445	67.97		-0.60	
863	D445	68.24		0.02	
912	D445	67.66		-1.30	
962	D445	69.42	R(0.05)	2.71	
963	D445	67.94		-0.66	
975	D445	68.22		-0.03	
994	D445	68.10		-0.30	
1023	D445	68.143		-0.20	
1059	ISO3104	68.32		0.20	
1146	D445	68.54		0.70	
1166	ISO3104	68.3		0.16	
1201	D445	68.21		-0.05	
1262	ISO3104	68.275		0.10	
1397		-----		-----	
1435		-----		-----	
1531	D445	63.98	R(0.01)	-9.69	
1660		-----		-----	
1740	D445	68.29		0.13	
1743	D7279 corr to D445	68.11		-0.28	
1788	D445	68.4570		0.51	
1900	D7279 corr to D445	68.3621		0.30	
1920	D445	68.372		0.32	
1957		-----		-----	
6002	ISO3104	68.074		-0.36	
6016		-----		-----	
6054	D7279 corr to D445	68.47		0.54	
6140	D445	69.074		1.92	
6141	D445	68.4851		0.58	
6251		-----		-----	
6277		-----		-----	
6320		-----		-----	
6322		-----		-----	
7011	D7042	67.892		-0.77	

	normality	suspect
	n	42
	outliers	3
	mean (n)	68.2314
	st.dev. (n)	0.30022
	R(calc.)	0.8406
	st.dev.(iis memo1401)	0.43863
	R(iis memo 1401)	1.2282
Compare		
	R(D445:19a)	0.8549

Kernel Density
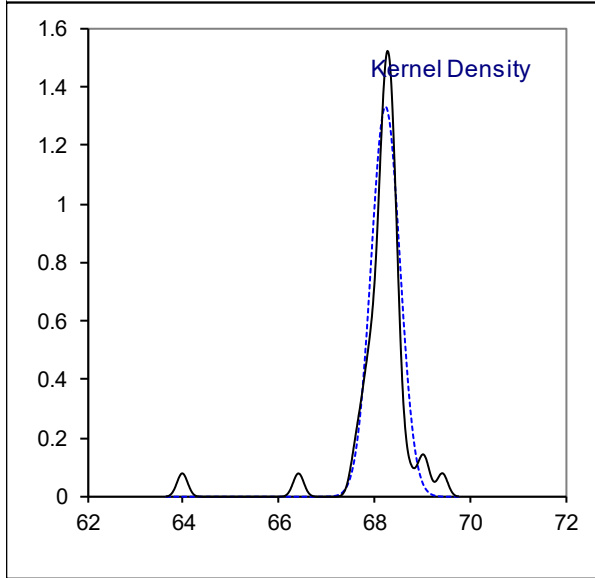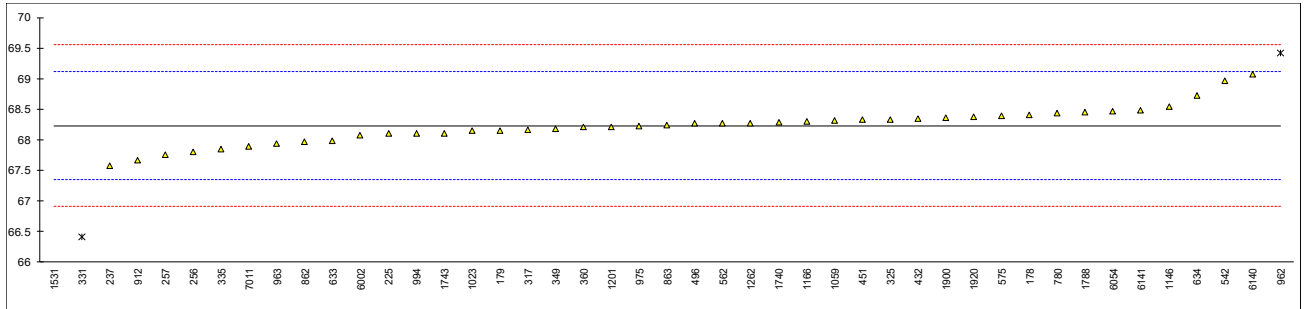
Determination of Kinematic Viscosity at 100°C on sample #20211; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
178	D445	10.50		0.35	
179	D445	10.43		-0.50	
225	D445	10.30		-2.08	
237	D445	10.454		-0.21	
256		-----		-----	
257	D7279 corr to D445	10.59		1.44	
317		-----		-----	
325	D445	10.48		0.11	
331	D7279Mod.	10.50		0.35	
335		-----		-----	
339		-----		-----	
349	D445	10.45		-0.26	
360	ISO3104	10.402		-0.84	
432	D445	10.53		0.72	
442		-----		-----	
451	D7279 corr to D445	10.46		-0.14	
496	D445	10.433		-0.46	
542	D7042	10.5548		1.02	
562	D7279	10.434		-0.45	
575	D7279 corr to D445	10.44		-0.38	
614		-----		-----	
633	D7279 corr to D445	10.337		-1.63	
634	D445	10.54		0.84	
780	D445	10.44		-0.38	
862	D445	10.41		-0.74	
863	D445	10.50		0.35	
912	D445	10.55		0.96	
962	D445	10.51		0.47	
963	D445	10.42		-0.62	
975	D445	10.47		-0.01	
994	D445	10.47		-0.01	
1023	D445	10.420		-0.62	
1059	ISO3104	10.41		-0.74	
1146	D445	10.46		-0.14	
1166		-----		-----	
1201	D445	10.42		-0.62	
1262	ISO3104	10.535		0.78	
1397		-----		-----	
1435		-----		-----	
1531	D445	10.42		-0.62	
1660		-----		-----	
1740	D445	10.47		-0.01	
1743	D7279 corr to D445	10.667		2.38	
1788	D445	10.4954		0.29	
1900	D7279 corr to D445	10.5059		0.42	
1920		-----		-----	
1957		-----		-----	
6002	ISO3104	10.394		-0.94	
6016		-----		-----	
6054	D7279 corr to D445	11.45	R(0.01)	11.90	
6140	D445	10.1627	R(0.01)	-3.75	
6141	D445	10.6277		1.90	
6251		-----		-----	
6277		-----		-----	
6320		-----		-----	
6322		-----		-----	
7011	D7042	10.474		0.03	

	normality	suspect
	n	38
	outliers	2
	mean (n)	10.4712
	st.dev. (n)	0.07200
	R(calc.)	0.2016
	st.dev.(iis memo 1401)	0.08227
	R(iis memo 1401)	0.2304
Compare		
	R(D445:19a)	0.1045

Kernel Density
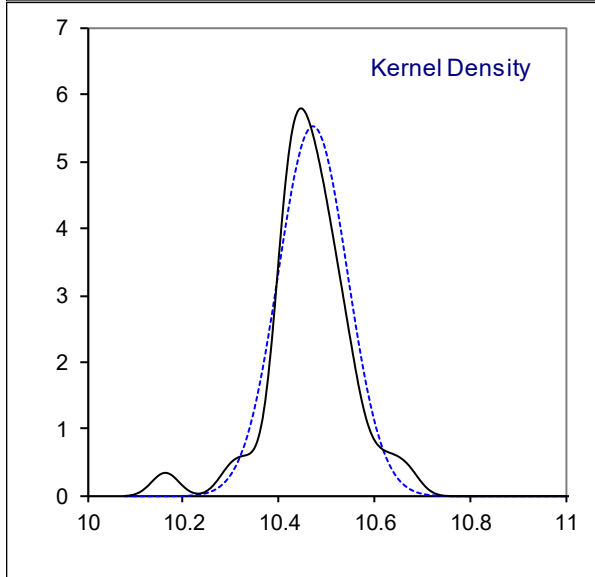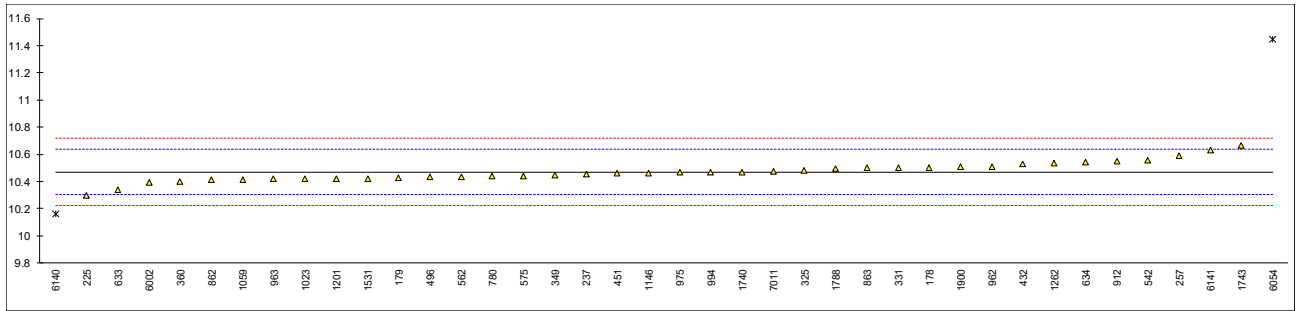
Determination of Viscosity Stabinger at 40°C on sample #20211; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D7042	68.39		0.45	
225		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
317		-----		-----	
325		-----		-----	
331		-----		-----	
335		-----		-----	
339		-----		-----	
349		-----		-----	
360	D7042	68.328		0.25	
432		-----		-----	
442		-----		-----	
451		-----		-----	
496	D7042	68.28		0.10	
542		-----		-----	
562		-----		-----	
575		-----		-----	
614		-----		-----	
633		-----		-----	
634		-----		-----	
780		-----		-----	
862		-----		-----	
863		-----		-----	
912		-----		-----	
962		-----		-----	
963	D7042	67.95		-0.98	
975	D7042	67.95		-0.98	
994	D7042	68.29		0.13	
1023		-----		-----	
1059	D7042	68.55		0.98	
1146		-----		-----	
1166		-----		-----	
1201		-----		-----	
1262	D7042	68.260		0.03	
1397	D7042	67.99		-0.85	
1435	D7042	68.49		0.78	
1531		-----		-----	
1660		-----		-----	
1740	D7042	68.25		0.00	
1743		-----		-----	
1788		-----		-----	
1900		-----		-----	
1920		-----		-----	
1957	D7042	68.010		-0.79	
6002	D7042	67.871		-1.24	
6016	D7042	68.582		1.08	
6054		-----		-----	
6140	D7042	68.4577		0.68	
6141		-----		-----	
6251	D7042	68.406		0.51	
6277	D7042	68.32		0.23	
6320		-----		-----	
6322	D7042	68.139		-0.37	
7011		-----		-----	

normality	OK	
n	18	
outliers	0	
mean (n)	68.2508	
st.dev. (n)	0.21958	
R(calc.)	0.6148	
st.dev.(D7042:20)	0.30611	
R(D7042:20)	0.8571	

Kernel Density
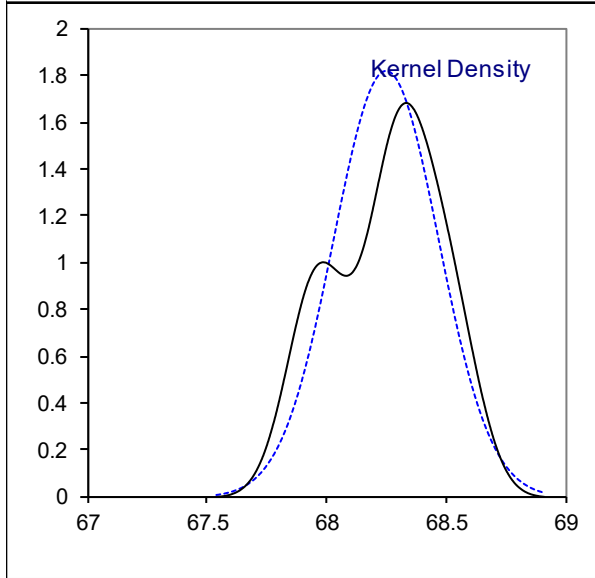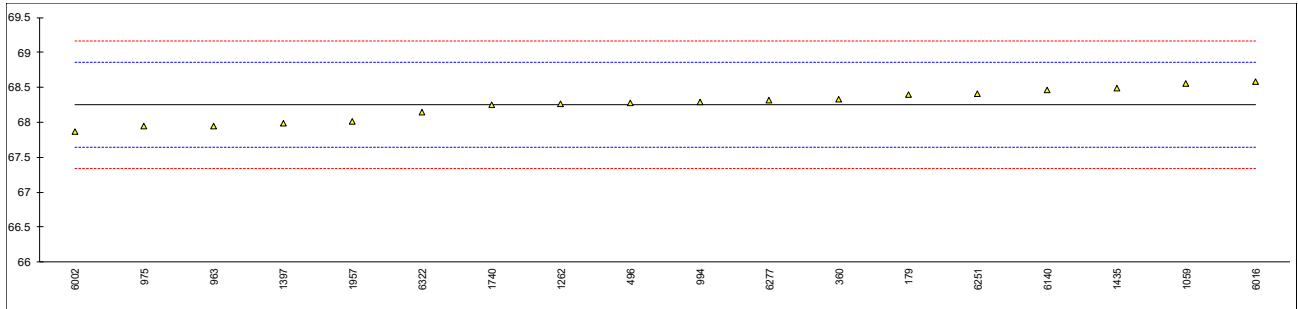
Determination of Viscosity Stabinger at 100°C on sample #20211; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D7042	10.42		-1.05	
225		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
317		-----		-----	
325		-----		-----	
331		-----		-----	
335		-----		-----	
339		-----		-----	
349		-----		-----	
360	D7042	10.408		-1.34	
432		-----		-----	
442		-----		-----	
451		-----		-----	
496	D7042	10.491		0.67	
542		-----		-----	
562		-----		-----	
575		-----		-----	
614		-----		-----	
633		-----		-----	
634		-----		-----	
780		-----		-----	
862		-----		-----	
863		-----		-----	
912		-----		-----	
962		-----		-----	
963	D7042	10.43		-0.81	
975	D7042	10.42		-1.05	
994	D7042	10.47		0.16	
1023		-----		-----	
1059	D7042	10.46		-0.08	
1146		-----		-----	
1166		-----		-----	
1201		-----		-----	
1262	D7042	10.475		0.28	
1397	D7042	10.42		-1.05	
1435	D7042	10.2705	G(0.05)	-4.67	
1531		-----		-----	
1660		-----		-----	
1740	D7042	10.48		0.40	
1743		-----		-----	
1788		-----		-----	
1900		-----		-----	
1920		-----		-----	
1957	D7042	10.627	G(0.01)	3.96	
6002	D7042	10.512		1.17	
6016	D7042	10.525		1.49	
6054		-----		-----	
6140	D7042	10.4673		0.09	
6141		-----		-----	
6251	D7042	10.514		1.22	
6277	D7042	10.465		0.04	
6320		-----		-----	
6322	D7042	10.458		-0.13	
7011		-----		-----	

normality	OK
n	16
outliers	2
mean (n)	10.4635
st.dev. (n)	0.03636
R(calc.)	0.1018
st.dev.(D7042:20)	0.04132
R(D7042:20)	0.1157

Kernel Density
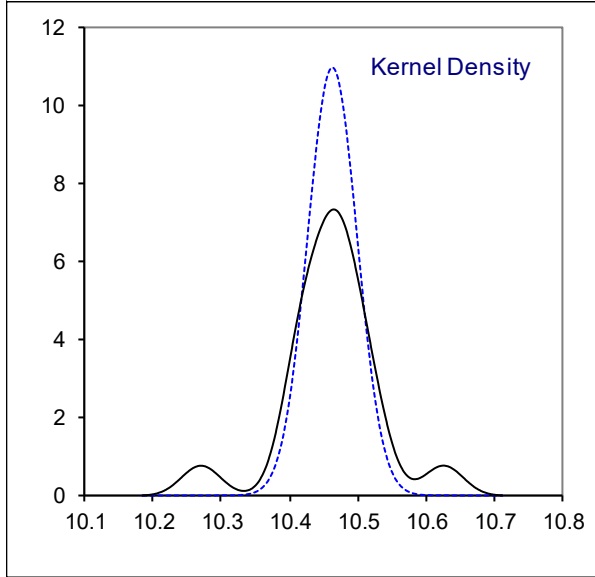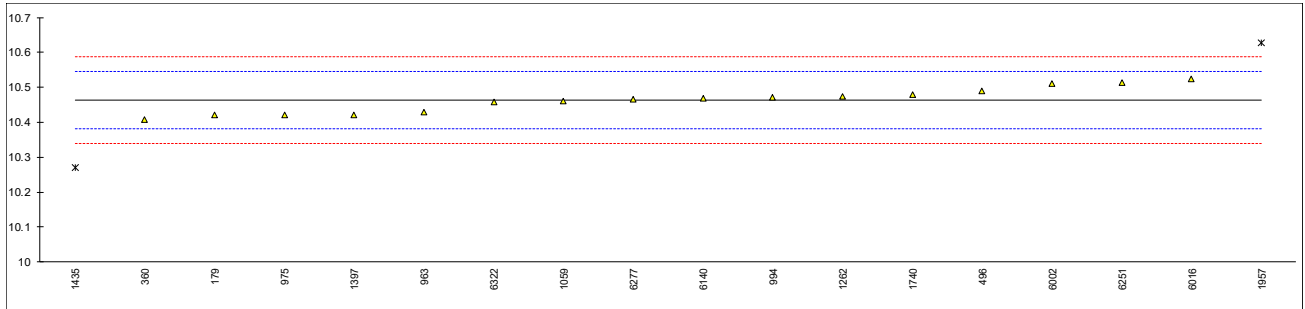
Determination of Sulfur on sample #20211; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D4294	2116		0.48	
225		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
317		-----		-----	
325	D5185	1938		-1.41	
331		-----		-----	
335		-----		-----	
339	INH-050	2025		-0.49	
349		-----		-----	
360	ISO8754	2120		0.52	
432		-----		-----	
442		-----		-----	
451		-----		-----	
496		-----		-----	
542		-----		-----	
562		-----		-----	
575		-----		-----	
614		-----		-----	
633		-----		-----	
634	D4294	2043.5		-0.29	
780	D4294	2040		-0.33	
862	D2622	2160		0.95	
863	D5185	1880		-2.03	
912	D4294	2035		-0.38	
962		-----		-----	
963	D4294	2077		0.07	
975		-----		-----	
994		-----		-----	
1023		-----		-----	
1059	ISO14596	2000		-0.75	
1146	D4294	1900		-1.82	
1166	In house	2057		-0.15	
1201	D4294	2060		-0.11	
1262	D4294	2203		1.41	
1397		-----		-----	
1435		-----		-----	
1531		-----		-----	
1660		-----		-----	
1740	D4294	2035		-0.38	
1743		-----		-----	
1788		-----		-----	
1900		-----		-----	
1920		-----		-----	
1957		-----		-----	
6002	D5185	2270	C	2.12	First reported 2994
6016		-----		-----	
6054		-----		-----	
6140	D4294	1700	G(0.05)	-3.94	
6141		-----		-----	
6251		-----		-----	
6277		-----		-----	
6320		-----		-----	
6322	DIN51418	2315		2.60	
7011		-----		-----	

normality	OK	
n	18	
outliers	1	
mean (n)	2070.8	
st.dev. (n)	114.82	
R(calc.)	321.5	
st.dev.(D4294:16e1)	94.04	
R(D4294:16e1)	263.3	
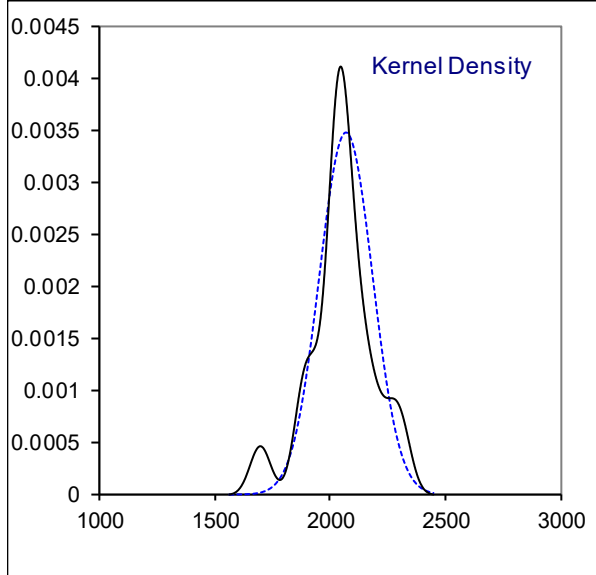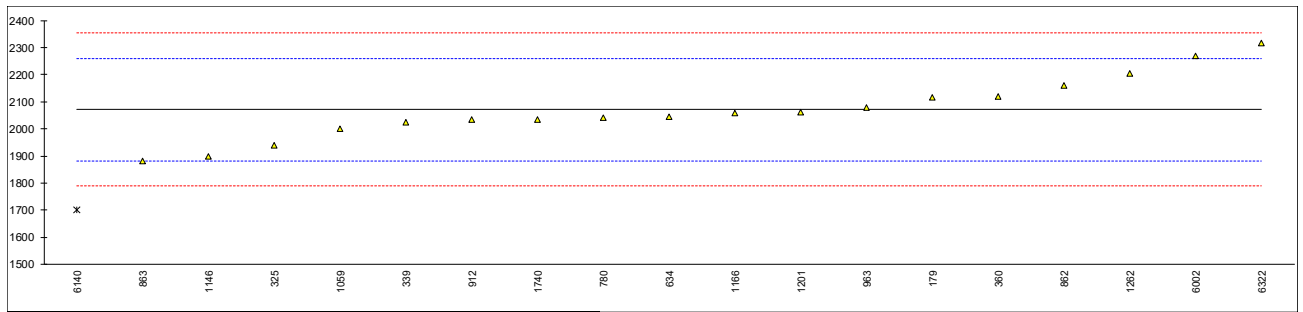
Determination of Water on sample #20211; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D6304-C	47		-0.43	
179	D6304-C	63		-0.24	
225		-----		-----	
237	D6304-C	75.35		-0.10	
256	D7889	94		0.12	
257		-----		-----	
317	D6304-A	40		-0.51	
325	D6304-C	39		-0.52	
331	KF titration	52		-0.37	
335	ISO12937	113		0.34	
339		-----		-----	
349	D6304-C	123		0.45	
360	D6304-A	67.0		-0.20	
432		-----		-----	
442	IP438	94		0.12	
451	D6304-A	118		0.40	
496	D6304-C	41		-0.50	
542	D6304-A	102.800		0.22	
562	E203	190		1.23	
575		-----		-----	
614	D6304-C	70		-0.16	
633	D6304-C	101.4		0.20	
634	D6304-A	95		0.13	
780	D6304-C	49.4		-0.40	
862	D6304-C	56.6		-0.32	
863	D6304-C	35		-0.57	
912	D6304-C	64		-0.23	
962		-----		-----	
963	D6304-A	103		0.22	
975	D6304-A	122		0.44	
994	D6304-A	70		-0.16	
1023	D6304-A	105		0.24	
1059	D6304-C	70		-0.16	
1146	D6304-C	<100		-----	
1166	D6304-C	71		-0.15	
1201	D6304-C	100		0.19	
1262	EN60814	99.9		0.19	
1397	ISO12937	160		0.88	
1435	D6304-A	102.75		0.22	
1531	D6304-A	66.2		-0.21	
1660		-----		-----	
1740	D6304-C	82		-0.02	
1743	ISO12937	60		-0.28	
1788		-----		-----	
1900	D6304-C	107		0.27	
1920	D6304-C	62		-0.25	
1957	D6304-A	47.1		-0.43	
6002	In house	75.352		-0.10	
6016	D6304	74.2		-0.11	
6054		-----		-----	
6140	D6304-C	166.7		0.96	
6141	D1553	56.39		-0.32	
6251	D6304-A	95.2		0.13	
6277		-----		-----	
6320		-----		-----	
6322	EN60814	67		-0.20	
7011		-----		-----	

normality	not OK	
n	44	
outliers	0	
mean (n)	83.940	
st.dev. (n)	34.2988	
R(calc.)	96.037	
st.dev.(D6304:16e1)	86.0786	
R(D6304:16e1)	241.020	

Kernel Density
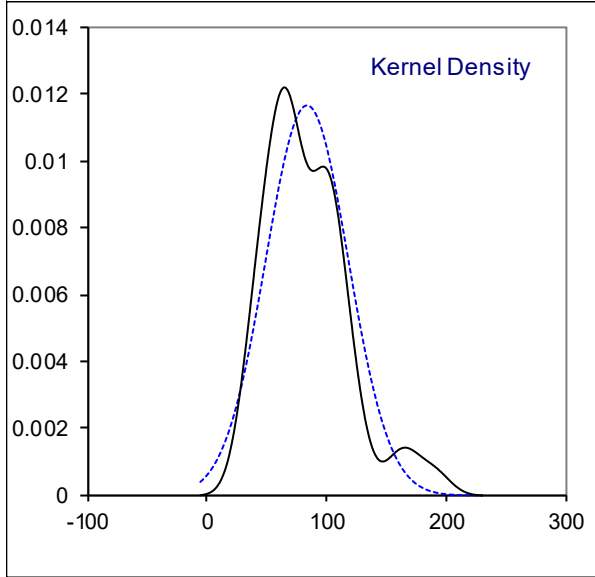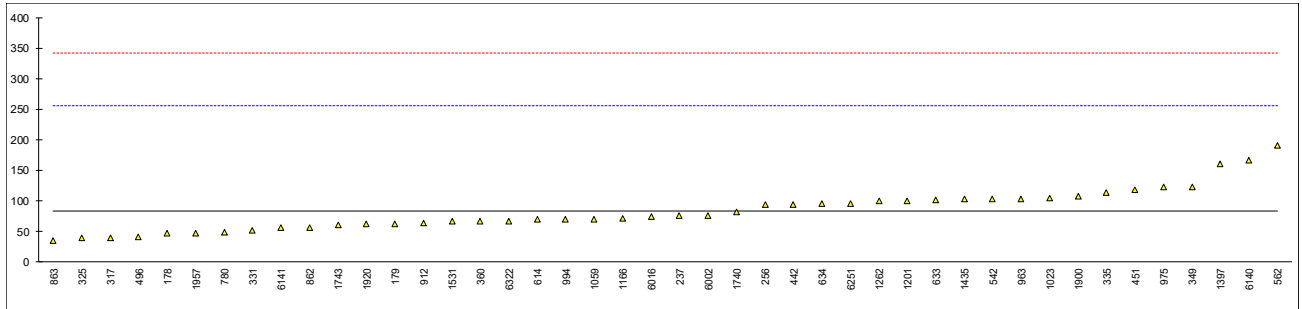
Determination of Level of Contamination on sample #20211; results in counts/mL

lab	method	≥ 4 µm (c)	mark	z(targ)	≥ 6 µm (c)	mark	z(targ)	≥ 14 µm (c)	mark	z(targ)
178	D7647	458		-0.66	75		-1.80	4		-1.37
179		-----		-----	-----		-----	-----		-----
225		-----		-----	-----		-----	-----		-----
237		-----		-----	-----		-----	-----		-----
256		-----		-----	-----		-----	-----		-----
257		-----		-----	-----		-----	-----		-----
317		-----		-----	-----		-----	-----		-----
325		-----		-----	-----		-----	-----		-----
331		-----		-----	-----		-----	-----		-----
335		-----		-----	-----		-----	-----		-----
339		-----		-----	-----		-----	-----		-----
349		-----		-----	-----		-----	-----		-----
360	ISO4406	285.3		-1.34	46.5		-2.50	5.1		-1.18
432		-----		-----	-----		-----	-----		-----
442		-----		-----	-----		-----	-----		-----
451	ISO11500	389		-0.93	77		-1.75	3		-1.54
496	D7647	978		1.37	214		1.61	0.5		-1.97
542	ISO4407	728		0.39	168.57		0.49	12.77		0.14
562	D7596	749.33		0.47	269.25		2.97	17.28		0.91
575	D7647	531		-0.38	174		0.63	9		-0.51
614		-----		-----	-----		-----	-----		-----
633	D7647	961		1.30	244		2.35	24		2.06
634	ISO11500	1083		1.78	301	C	3.75	26	C	2.40
780	ISO11500	602		-0.10	81		-1.66	8		-0.68
862	ISO11500	671		0.17	181		0.80	16		0.69
863	ISO11500	986		1.40	265		2.86	11		-0.17
912		-----		-----	-----		-----	-----		-----
962		-----		-----	-----		-----	-----		-----
963		-----		-----	-----		-----	-----		-----
975		-----		-----	-----		-----	-----		-----
994		-----		-----	-----		-----	-----		-----
1023		-----		-----	-----		-----	-----		-----
1059		-----		-----	-----		-----	-----		-----
1146	ISO11500	960		1.30	200		1.27	14		0.35
1166		598.30		-0.12	149.60		0.03	15.53		0.61
1201	D7647	320		-1.20	59		-2.20	2		-1.71
1262	ISO4407	561		-0.26	149		0.01	21		1.55
1397		308.4		-1.25	36.9		-2.74	3.5		-1.45
1435		667.27		0.15	167.40		0.47	19.10		1.22
1531		-----		-----	-----		-----	-----		-----
1660		-----		-----	-----		-----	-----		-----
1740		-----		-----	-----		-----	-----		-----
1743		-----		-----	-----		-----	-----		-----
1788		-----		-----	-----		-----	-----		-----
1900	ISO4407	643.18		0.06	258.30		2.70	30.01		3.09
1920	D7596	684.07		0.22	189.22		1.00	2.9		-1.56
1957	D7647	553.3		-0.29	77.1		-1.75	11.6		-0.06
6002	D7647	866.40	C	0.93	182.72	C	0.84	12.47	C	0.08
6016	D7596	423		-0.80	83.7		-1.59	2.5		-1.62
6054		-----		-----	-----		-----	-----		-----
6140	D7647	13340	R(0.01)	49.62	5187	R(0.01)	123.72	923	R(0.01)	156.08
6141	ISO4406	342.75		-1.11	42.07		-2.61	15.30		0.57
6251		431		-0.77	87		-1.51	16		0.69
6277		-----		-----	-----		-----	-----		-----
6320	ISO11500	440.2		-0.73	91.5		-1.40	8.8		-0.54
6322	ISO4406	736		0.42	138		-0.26	12		0.00
7011		-----		-----	-----		-----	-----		-----
	normality	OK			OK			OK		
	n	27			27			27		
	outliers	1			1			1		
	mean (n)	628.018			148.438			11.976		
	st.dev. (n)	231.8625			78.0853			7.8210		
	R(calc.)	649.215			218.639			21.899		
	st.dev.(D7647:10)	256.1953			40.7267			5.8368		
	R(D7647:10)	717.347			114.035			16.343		

Lab 634: first reported 334, 49 respectively
Lab 6002: first reported 86640, 18272, 1247 respectively

≥ 4 µm (c)

Kernel Density

≥ 6 µm (c)

Kernel Density

≥ 14 µm (c)

Kernel Density
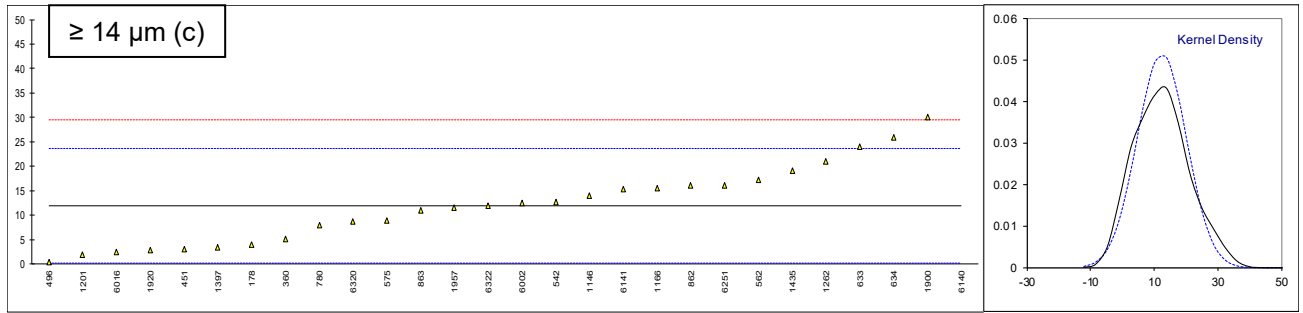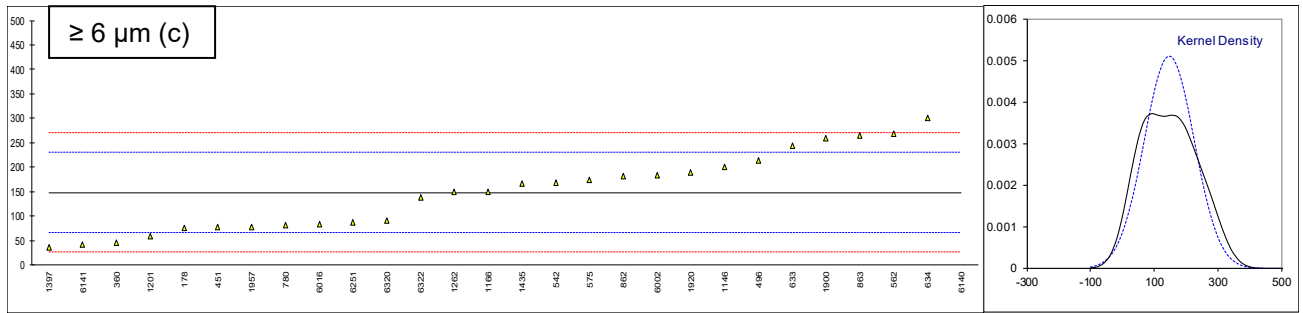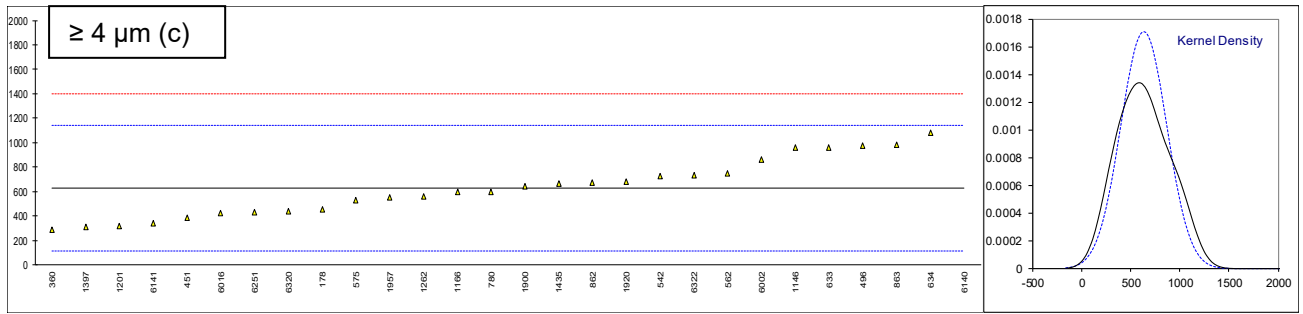
Determination of Level of Contamination acc. to ISO4406 scale on sample #20211; results in scale number

lab	method	≥ 4 µm (c)	mark	z(targ)	≥ 6 µm (c)	mark	z(targ)	≥ 14 µm (c)	mark	z(targ)
178	ISO4406	16		-0.56	13		-2.56	9		-2.08
179		-----		-----	-----		-----	-----		-----
225		-----		-----	-----		-----	-----		-----
237		-----		-----	-----		-----	-----		-----
256		-----		-----	-----		-----	-----		-----
257		-----		-----	-----		-----	-----		-----
317		-----		-----	-----		-----	-----		-----
325		-----		-----	-----		-----	-----		-----
331		-----		-----	-----		-----	-----		-----
335		-----		-----	-----		-----	-----		-----
339		-----		-----	-----		-----	-----		-----
349		-----		-----	-----		-----	-----		-----
360	ISO4406	15		-2.19	13		-2.56	10		-0.69
432		-----		-----	-----		-----	-----		-----
442		-----		-----	-----		-----	-----		-----
451	ISO4406	16		-0.56	13		-2.56	9		-2.08
496	ISO4406	17.0		1.07	14.8		1.60	5.9	R(0.05)	-6.37
542	ISO4406	17		1.07	15		2.06	11		0.69
562	ISO4406	17		1.07	15		2.06	11		0.69
575	ISO4406	16		-0.56	15		2.06	10		-0.69
614		-----		-----	-----		-----	-----		-----
633	ISO4406	17		1.07	15		2.06	12		2.08
634	ISO4406	17		1.07	15	C	2.06	12	C	2.08
780	ISO11500	16		-0.56	14		-0.25	10		-0.69
862	ISO4406	17		1.07	15		2.06	11		0.69
863	ISO4406	17		1.07	15		2.06	11		0.69
912		-----		-----	-----		-----	-----		-----
962		-----		-----	-----		-----	-----		-----
963		-----		-----	-----		-----	-----		-----
975		-----		-----	-----		-----	-----		-----
994		-----		-----	-----		-----	-----		-----
1023	ISO4406	16		-0.56	13		-2.56	8		-3.46
1059		-----		-----	-----		-----	-----		-----
1146		-----		-----	-----		-----	-----		-----
1166	ISO4406	16		-0.56	14		-0.25	11		0.69
1201	ISO4406	16		-0.56	13		-2.56	>8		-----
1262	ISO4406	16		-0.56	14		-0.25	12		2.08
1397		15		-2.19	12		-4.87	9		-2.08
1435		17		1.07	15		2.06	11		0.69
1531		-----		-----	-----		-----	-----		-----
1660		-----		-----	-----		-----	-----		-----
1740	ISO4406	15		-2.19	13		-2.56	10		-0.69
1743		-----		-----	-----		-----	-----		-----
1788		-----		-----	-----		-----	-----		-----
1900	ISO4406	17		1.07	15		2.06	12		2.08
1920	ISO4406	17		1.07	15		2.06	9		-2.08
1957		-----		-----	-----		-----	-----		-----
6002	D7647	17		1.07	15		2.06	11		0.69
6016		-----		-----	-----		-----	-----		-----
6054		-----		-----	-----		-----	-----		-----
6140	ISO4406	21	R(0.01)	7.58	20	R(0.01)	13.60	17	R(0.01)	9.00
6141	ISO4406	16		-0.56	13		-2.56	11		0.69
6251	ISO4406	16		-0.56	14		-0.25	11		0.69
6277		-----		-----	-----		-----	-----		-----
6320	ISO4406	16		-0.56	14		-0.25	10		-0.69
6322	ISO4406	17		1.07	14		-0.25	11		0.69
7011		-----		-----	-----		-----	-----		-----
	normality	OK			OK			OK		
	n	26			26			24		
	outliers	1			1			2		
	mean (n)	16.35			14.11			10.50		
	st.dev. (n)	0.689			0.945			1.103		
	R(calc.)	1.93			2.65			3.09		
	st.dev.(D7647:10)	0.614			0.433			0.722		
	R(D7647:10)	1.72			1.21			2.02		

Lab 634: first reported 16, 13 respectively

≥ 4 μm (c)

Kernel Density

≥ 6 μm (c)

Kernel Density

≥ 14 μm (c)

Kernel Density
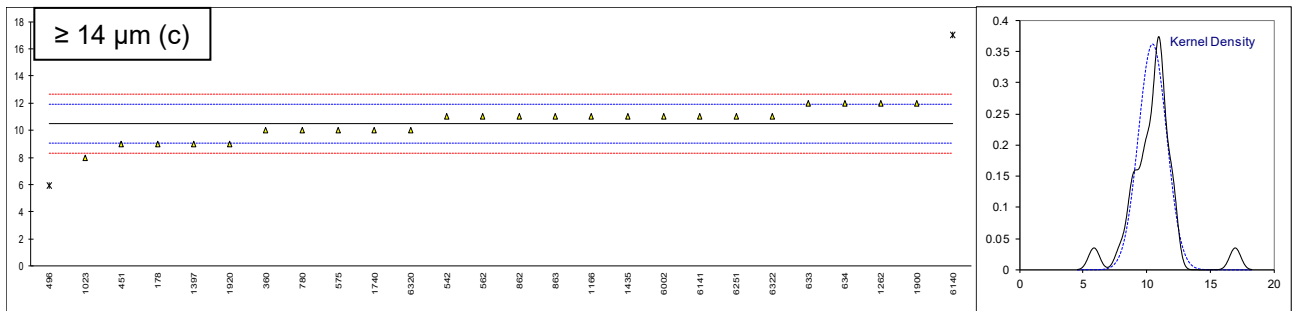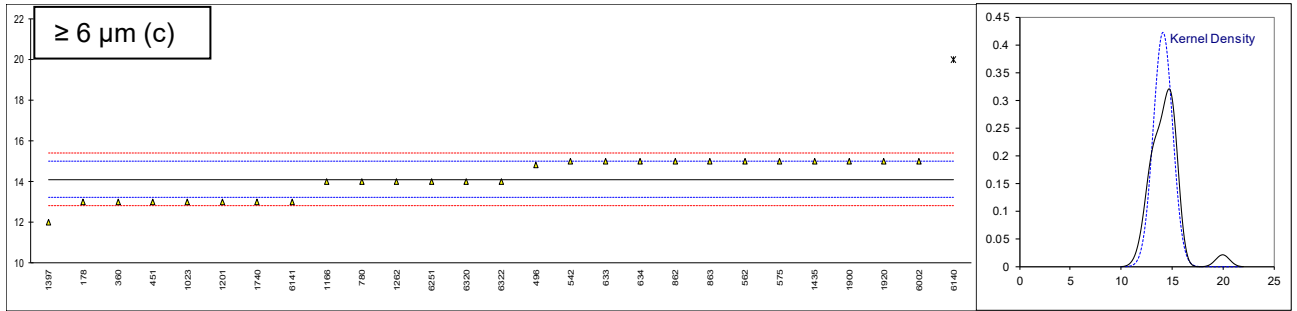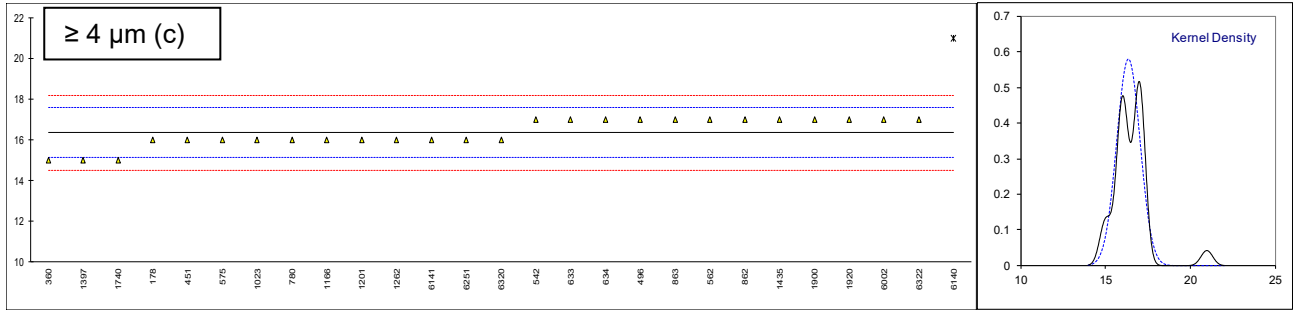
Determination of Aluminum as Al on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	9		-0.11	
179	D5185	7.69	C	-0.65	First reported 5
237		-----		-----	
256		11.66		0.99	
257		11.14		0.78	
325	D5185	9		-0.11	
331	D5185Mod.	10		0.31	
339	INH-165	9.5		0.10	
349	D5185	8		-0.52	
360	D5185	9.17		-0.04	
432	D5185	9.31		0.02	
451	D5185	8.4		-0.35	
496	D5185	9.64		0.16	
542	D5185	11.003		0.72	
575	D6595	8.1		-0.48	
614	D5185	9.336		0.03	
633	D6595	10.24		0.41	
634	D6595	11.5		0.93	
780	D5185	9.6		0.14	
862	D5185	9		-0.11	
863	D5185	9		-0.11	
912	D5185	8		-0.52	
962	D5185	9.2		-0.02	
963	D5185	8.81		-0.18	
975		8.7		-0.23	
994	D5185	8.6		-0.27	
1059	In house	8		-0.52	
1146	D5185	9		-0.11	
1166	In house	10		0.31	
1201	D5185	9		-0.11	
1262	D5185	9.10		-0.06	
1372	D5185	10.48	ex	0.51	Excluded as many statistical outliers in other related metal analyzes
1435	D5185	9		-0.11	
1660		-----		-----	
1740	D6595	9.0		-0.11	
1743	D5185	9.3		0.02	
1900	D5185	10.77		0.63	
1957	D5185	9.927		0.28	
6002	D5185	9.00		-0.11	
6016	D5185	9.1		-0.06	
6054	D5185	7.936		-0.55	
6140		9.29		0.01	
6284	D5185	8.2426		-0.42	
6322	DIN51418	4	R(0.01)	-2.17	

normality	OK	
n	40	
outliers	1 (+1ex)	
mean (n)	9.257	
st.dev. (n)	0.9632	
R(calc.)	2.697	
st.dev.(D5185:18)	2.4205	
R(D5185:18)	6.777	Application range 6 -40 mg/kg
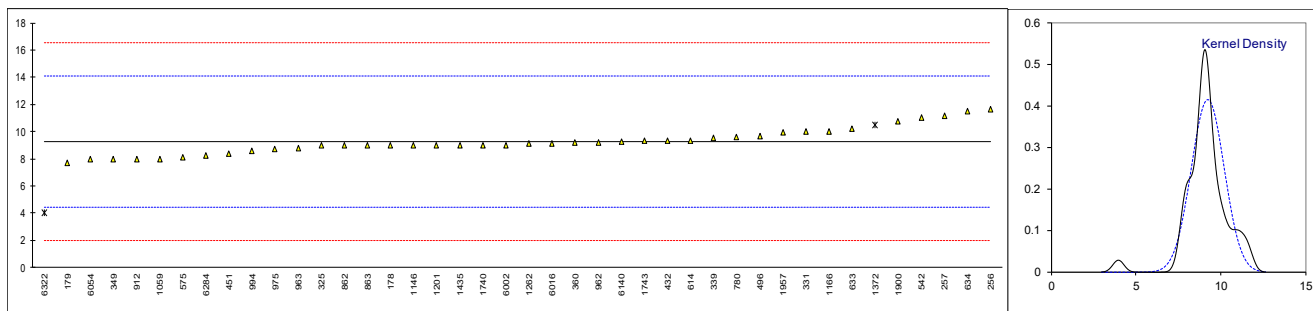
Determination of Barium as Ba on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	269		0.23	
179	D5185	206		-1.56	
237		-----		-----	
256		-----		-----	
257		-----		-----	
325	D5185	265		0.11	
331	D5185Mod.	287		0.74	
339	INH-165	262.0		0.03	
349	D5185	234		-0.77	
360	D5185	260.7		-0.01	
432	D5185	263.12		0.06	
451	D5185	279.5		0.52	
496	D5185	277		0.45	
542	D5185	242.447		-0.53	
575	D6595	357	R(0.05)	2.72	
614	D5185	269.6		0.24	
633	D6595	370.56	R(0.05)	3.11	
634	D6595	217		-1.25	
780	D5185	272		0.31	
862	D5185	258		-0.09	
863	D5185	257		-0.11	
912	D5185	263		0.06	
962	D5185	270		0.25	
963	D5185	271.88		0.31	
975		264		0.08	
994	D5185	251		-0.28	
1059		-----		-----	
1146	D5185	280		0.54	
1166		-----		-----	
1201	D5185	253		-0.23	
1262	D5185	277.6		0.47	
1372	D5185	368.70	R(0.05)	3.05	
1435	D5185	251		-0.28	
1660		-----		-----	
1740	D6595	250		-0.31	
1743	D5185	279		0.51	
1900	D5185	332.02		2.01	
1957	D5185	264.378		0.09	
6002	D5185	238.7		-0.63	
6016	D5185	277		0.45	
6054	D5185	203.325		-1.64	
6140		272.1		0.31	
6284	D5185	272.96		0.34	
6322	DIN51418	246		-0.43	

	normality	not OK
	n	35
	outliers	3
	mean (n)	261.038
	st.dev. (n)	23.5135
	R(calc.)	65.838
	st.dev.(D5185:18)	35.2421
	R(D5185:18)	98.678	Application range 0.5 – 4 mg/kg
Compare		
	R(Horwitz)	50.609
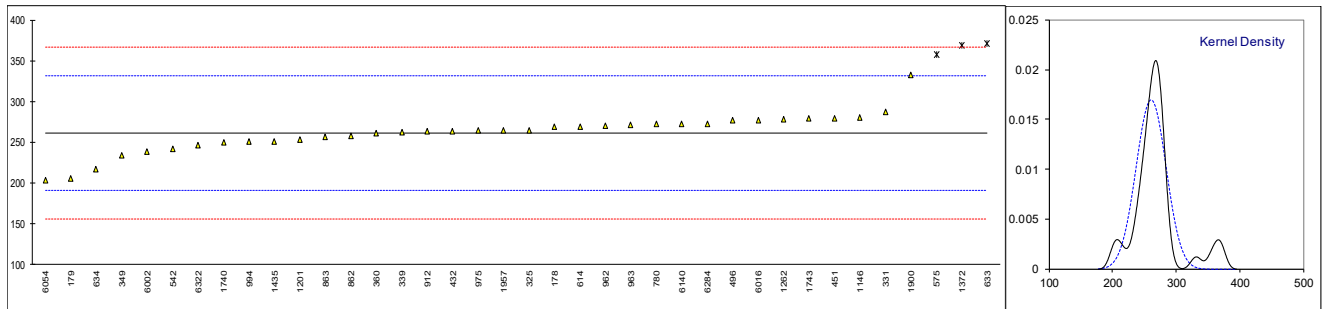
Determination of Boron as B on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	15		0.63	
179	D5185	9		-0.63	
237		-----		-----	
256		-----		-----	
257		-----		-----	
325	D5185	12		0.00	
331	D5185Mod.	13		0.21	
339	INH-165	<50		-----	
349	D5185	14		0.42	
360	D5185	9.58		-0.51	
432	D5185	11.80		-0.04	
451	D5185	9.4		-0.54	
496	D5185	17.8		1.22	
542	D5185	14.637		0.56	
575	D6595	12		0.00	
614	D5185	12.32		0.07	
633	D6595	21.82	R(0.05)	2.07	
634	D6595	10		-0.42	
780	D5185	13.6		0.34	
862	D5185	11		-0.21	
863	D5185	10		-0.42	
912	D5185	11		-0.21	
962		-----		-----	
963	D5185	11.24		-0.16	
975		11		-0.21	
994	D5185	11.6		-0.08	
1059		-----		-----	
1146		-----		-----	
1166		-----		-----	
1201	D5185	12		0.00	
1262	D5185	10.4		-0.33	
1372	D5185	19.28	R(0.05)	1.53	
1435	D5185	14		0.42	
1660		-----		-----	
1740	D6595	11.4		-0.12	
1743	D5185	14		0.42	
1900	D5185	9.536		-0.52	
1957	D5185	14.866		0.60	
6002	D5185	10.47		-0.32	
6016	D5185	10.0		-0.42	
6054		-----		-----	
6140		13.56		0.33	
6284	D5185	11.432		-0.12	
6322		-----		-----	

normality	OK		
n	31		
outliers	2		
mean (n)	11.988		
st.dev. (n)	2.0408		
R(calc.)	5.714		
st.dev.(D5185:18)	4.7596		
R(D5185:18)	13.327	Application range 4 -30 mg/kg	
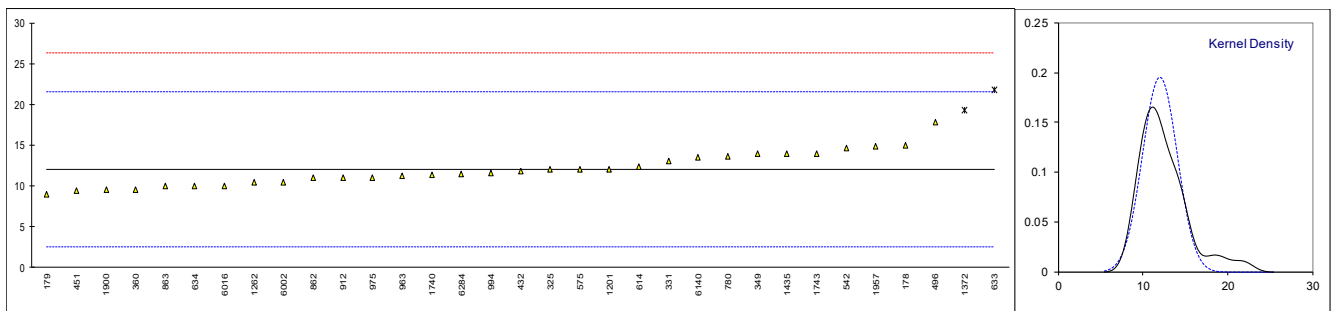
Determination of Cadmium as Cd on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257		10.13		0.36	
325		-----		-----	
331	D5185Mod.	10		0.24	
339	INH-165	9		-0.67	
349	D5185	9		-0.67	
360	D5185	9.45		-0.26	
432	D5185	9.63		-0.10	
451	D5185	9.5		-0.21	
496	D5185	10.4		0.60	
542	D5185	12.653	R(0.01)	2.64	
575		-----		-----	
614	D5185	9.476		-0.23	
633	D6595	12.43	R(0.01)	2.44	
634	D6595	9.2		-0.48	
780	D5185	9.8		0.06	
862	D5185	9		-0.67	
863	D5185	10		0.24	
912	D5185	10		0.24	
962		-----		-----	
963	D5185	9.75		0.01	
975		-----		-----	
994	D5185	10.1		0.33	
1059		-----		-----	
1146		-----		-----	
1166		-----		-----	
1201		-----		-----	
1262	D5185	10.0		0.24	
1372		14.98	R(0.01)	4.74	
1435	D5185	10		0.24	
1660		-----		-----	
1740		-----		-----	
1743	D5185	9.79		0.05	
1900		-----		-----	
1957		-----		-----	
6002	D6595	10.16		0.38	
6016	D5185	9.5		-0.21	
6054		-----		-----	
6140		9.70		-0.03	
6284	D5185	10.0722		0.30	
6322	DIN51418	10		0.24	

normality	OK
n	24
outliers	3
mean (n)	9.736
st.dev. (n)	0.3974
R(calc.)	1.113
st.dev.(Horwitz)	1.1059
R(Horwitz)	3.097
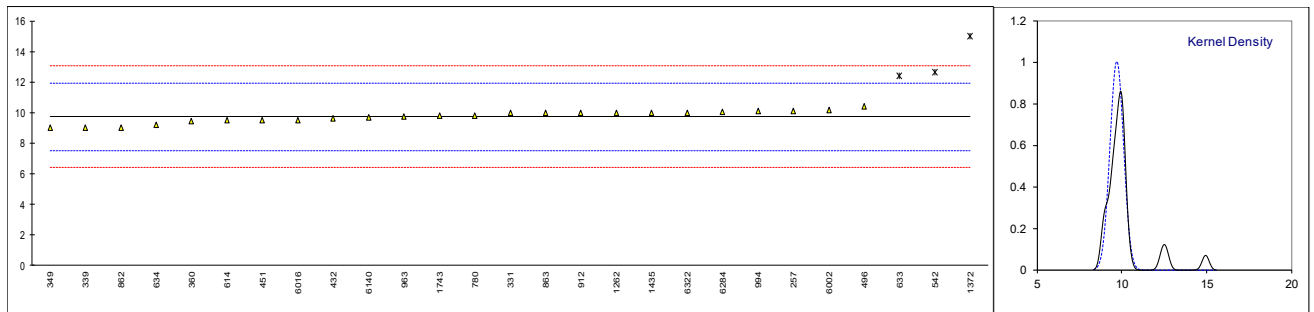
Determination of Chromium as Cr on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	10		0.03	
179	D5185	8		-1.67	
237		-----		-----	
256		10.18		0.18	
257		10.19		0.19	
325	D5185	11		0.88	
331	D5185Mod.	11		0.88	
339	INH-165	10		0.03	
349	D5185	9		-0.82	
360	D5185	9.66		-0.26	
432	D5185	10.36		0.33	
451	D5185	10.0		0.03	
496	D5185	10.53		0.48	
542	D5185	11.277		1.11	
575	D6595	10		0.03	
614	D5185	9.752		-0.18	
633	D6595	8.96		-0.86	
634	D6595	13	R(0.05)	2.58	
780	D5185	9.6		-0.31	
862	D5185	9		-0.82	
863	D5185	10		0.03	
912	D5185	10		0.03	
962	D5185	9.8		-0.14	
963	D5185	9.61		-0.30	
975		9.7		-0.23	
994	D5185	9.8		-0.14	
1059	In house	11		0.88	
1146	D5185	10		0.03	
1166	In house	10		0.03	
1201	D5185	9		-0.82	
1262	D5185	9.55		-0.36	
1372	D5185	15.70	R(0.01)	4.87	
1435	D5185	10		0.03	
1660		-----		-----	
1740	D6595	9.5		-0.40	
1743	D5185	9.8		-0.14	
1900	D5185	11.969		1.70	
1957	D5185	12.282		1.97	
6002	D5185	9.05		-0.78	
6016	D5185	10.3		0.28	
6054	D5185	9.450		-0.44	
6140		10.32		0.30	
6284	D5185	10.1082		0.12	
6322	DIN51418	9		-0.82	

normality	suspect	
n	40	
outliers	2	
mean (n)	9.969	
st.dev. (n)	0.8133	
R(calc.)	2.277	
st.dev.(D5185:18)	1.1762	
R(D5185:18)	3.293	Application range 1 – 40 mg/kg
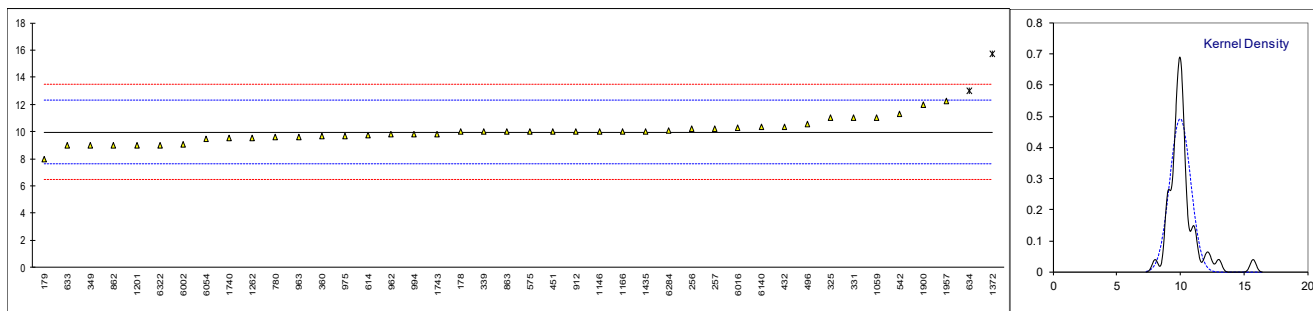
Determination of Copper as Cu on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	34		0.24	
179	D5185	25	R(0.01)	-2.91	
237		-----		-----	
256		29.94		-1.18	
257		31.36		-0.68	
325	D5185	34		0.24	
331	D5185Mod.	35		0.59	
339	INH-165	32.5		-0.28	
349	D5185	29		-1.51	
360	D5185	32.4		-0.32	
432	D5185	34.26		0.33	
451	D5185	33.0		-0.11	
496	D5185	35.0		0.59	
542	D5185	37.513		1.47	
575	D6595	57	C,R(0.01)	8.30	First reported 45
614	D5185	34.26		0.33	
633	D6595	36.43		1.09	
634	D6595	35.5		0.77	
780	D5185	33.8		0.17	
862	D5185	34		0.24	
863	D5185	33		-0.11	
912	D5185	33		-0.11	
962	D5185	33		-0.11	
963	D5185	34.25		0.33	
975		30.98		-0.82	
994	D5185	32.6		-0.25	
1059	In house	35		0.59	
1146	D5185	34		0.24	
1166	In house	34		0.24	
1201	D5185	32		-0.46	
1262	D5185	31.3		-0.70	
1372	D5185	46.20	R(0.01)	4.51	
1435	D5185	34		0.24	
1660		-----		-----	
1740	D6595	34		0.24	
1743	D5185	34		0.24	
1900	D5185	41.331	R(0.01)	2.81	
1957	D5185	31.510		-0.63	
6002	D5185	34.63		0.46	
6016	D5185	34.7		0.49	
6054	D5185	28.203		-1.79	
6140		35.25		0.68	
6284	D5185	32.376		-0.33	
6322	DIN51418	32		-0.46	

normality	OK	
n	38	
outliers	4	
mean (n)	33.310	
st.dev. (n)	1.9041	
R(calc.)	5.331	
st.dev.(D5185:18)	2.8551	
R(D5185:18)	7.994	Application range 2 – 160 mg/kg
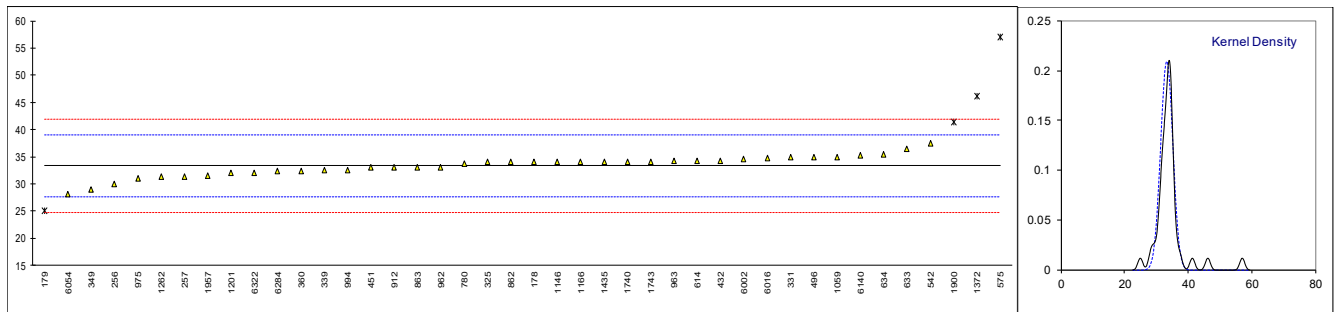
Determination of Iron as Fe on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	17		0.34	
179	D5185	14		-1.38	
237		-----		-----	
256		16.00		-0.24	
257		16.77		0.21	
325	D5185	17		0.34	
331	D5185Mod.	18		0.91	
339	INH-165	16		-0.24	
349	D5185	14		-1.38	
360	D5185	15.2		-0.70	
432	D5185	15.80		-0.35	
451	D5185	13.4		-1.73	
496	D5185	17.47		0.61	
542	D5185	16.477		0.04	
575	D6595	19		1.49	
614	D5185	17.49		0.62	
633	D6595	19.79		1.94	
634	D6595	19.5		1.77	
780	D5185	16.5		0.05	
862	D5185	16.5		0.05	
863	D5185	16		-0.24	
912	D5185	14		-1.38	
962	D5185	16.87		0.26	
963	D5185	16.48		0.04	
975		14.87		-0.89	
994	D5185	16.8		0.22	
1059	In house	14		-1.38	
1146	D5185	16		-0.24	
1166	In house	20		2.06	
1201	D5185	15		-0.81	
1262	D5185	16.0		-0.24	
1372	D5185	18.98	ex	1.47	Excluded as many statistical outliers in other related metal analyzes
1435	D5185	16		-0.24	
1660		-----		-----	
1740	D6595	16.4		-0.01	
1743	D5185	16		-0.24	
1900	D5185	19.168		1.58	
1957	D5185	14.199		-1.27	
6002	D5185	15.03		-0.79	
6016	D5185	17		0.34	
6054	D5185	18.031		0.93	
6140		17.20		0.45	
6284	D5185	15.944		-0.27	
6322	DIN51418	16		-0.24	

normality	OK	
n	41	
outliers	0 (+1ex)	
mean (n)	16.412	
st.dev. (n)	1.6175	
R(calc.)	4.529	
st.dev.(D5185:18)	1.7417	
R(D5185:18)	4.877	Application range 2 – 140 mg/kg
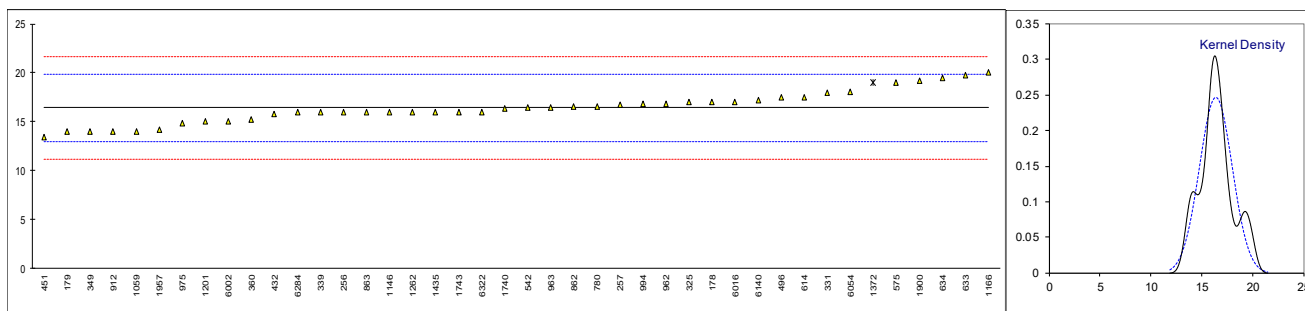
Determination of Lead as Pb on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	12		0.41	
179	D5185	9		-0.77	
237		-----		-----	
256		-----		-----	
257		-----		-----	
325	D5185	13		0.80	
331	D5185Mod.	11		0.02	
339		-----		-----	
349	D5185	8		-1.16	
360	D5185	10.9		-0.02	
432	D5185	10.54		-0.16	
451	D5185	11.7		0.29	
496	D5185	11.6		0.25	
542	D5185	14.023		1.21	
575	D6595	12		0.41	
614	D5185	11.06		0.04	
633	D6595	12.73		0.70	
634	D6595	11		0.02	
780	D5185	10.2		-0.30	
862	D5185	10		-0.38	
863	D5185	11		0.02	
912	D5185	11		0.02	
962	D5185	10.9		-0.02	
963	D5185	10.81		-0.06	
975		10.68		-0.11	
994	D5185	9.9		-0.42	
1059	In house	13		0.80	
1146	D5185	10		-0.38	
1166	In house	10		-0.38	
1201	D5185	11		0.02	
1262	D5185	11.5		0.21	
1372	D5185	12.15	ex	0.47	Excluded as many statistical outliers in other related metal analyzes
1435	D5185	10		-0.38	
1660		-----		-----	
1740	D6595	10.5		-0.18	
1743	D5185	11		0.02	
1900	D5185	12.762		0.71	
1957	D5185	12.983		0.80	
6002	D5185	9.89		-0.42	
6016	D5185	11		0.02	
6054	D5185	9.611		-0.53	
6140		11.59		0.25	
6284	D5185	11.53		0.23	
6322	DIN51418	7		-1.56	

normality	suspect	
n	38	
outliers	0 (+1ex)	
mean (n)	10.958	
st.dev. (n)	1.3702	
R(calc.)	3.837	
st.dev.(D5185:18)	2.5392	
R(D5185:18)	7.110	Application range 10 – 160 mg/kg
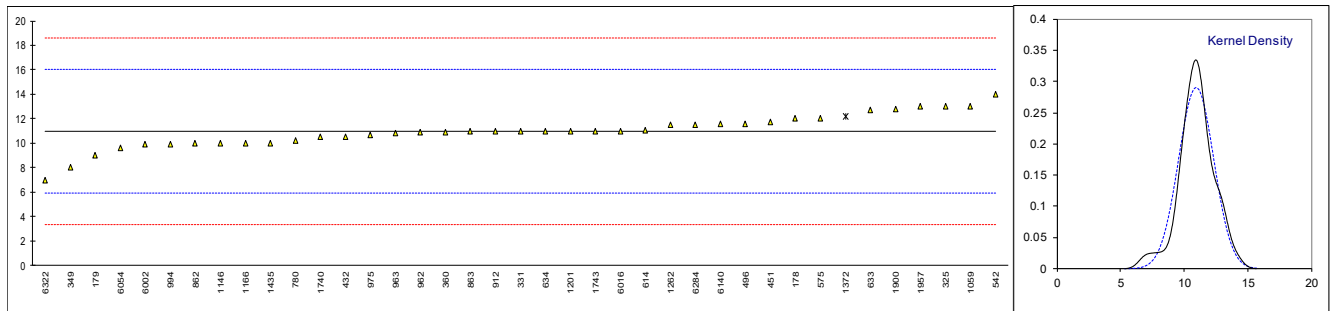
Determination of Lithium as Li on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
325		-----		-----	
331	D5185Mod.	7		-0.23	
339	INH-165	<50		-----	
349	D5185	5		-2.57	
360		-----		-----	
432		-----		-----	
451	D5185	6.1		-1.28	
496	D5185	7.26		0.07	
542	D5185	9.767		3.00	
575		-----		-----	
614	D5185	6.385		-0.95	
633	D6595	9.19		2.33	
634		-----		-----	
780		-----		-----	
862	D5185	5.5		-1.98	
863	D5185	6		-1.40	
912		-----		-----	
962		-----		-----	
963		-----		-----	
975		-----		-----	
994		-----		-----	
1059		-----		-----	
1146	D5185	6		-1.40	
1166		-----		-----	
1201		-----		-----	
1262		-----		-----	
1372		-----		-----	
1435	D5185	7		-0.23	
1660		-----		-----	
1740	D6595	8		0.94	
1743	D5185	6.40		-0.93	
1900		-----		-----	
1957	D5185	6.495		-0.82	
6002	D6595	10.42	C	3.77	First reported 14.42
6016	D5185	8.8		1.87	
6054		-----		-----	
6140		7.04		-0.18	
6284		-----		-----	
6322		-----		-----	

normality	OK
n	17
outliers	0
mean (n)	7.197
st.dev. (n)	1.5380
R(calc.)	4.306
st.dev.(Horwitz)	0.8556
R(Horwitz)	2.396
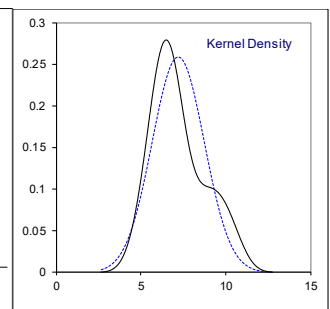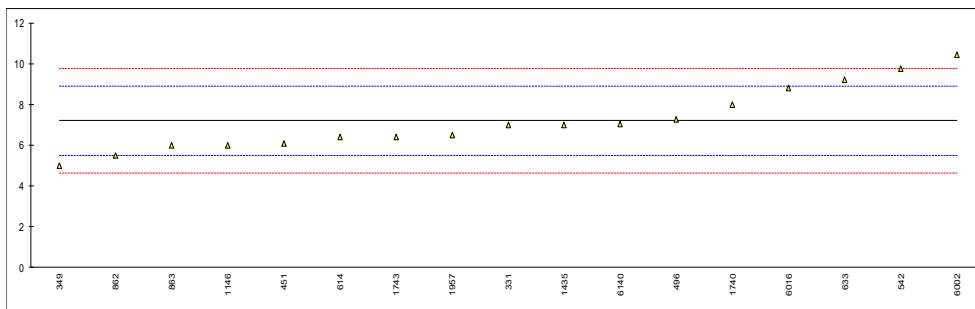
Determination of Magnesium as Mg on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	18		0.60	
179	D5185	13		-1.63	
237		-----		-----	
256		-----		-----	
257		-----		-----	
325	D5185	17		0.16	
331	D5185Mod.	18		0.60	
339	INH-165	<50		-----	
349	D5185	15		-0.74	
360	D5185	16.41		-0.11	
432	D5185	16.50		-0.07	
451	D5185	13.9		-1.23	
496	D5185	17.00		0.16	
542	D5185	16.950		0.13	
575	D6595	20		1.49	
614	D5185	16.32		-0.15	
633	D6595	12.83		-1.70	
634	D6595	20		1.49	
780	D5185	16.7		0.02	
862	D5185	16.5		-0.07	
863	D5185	16		-0.29	
912	D5185	16		-0.29	
962	D5185	16.8		0.07	
963	D5185	16.25		-0.18	
975		17.26		0.27	
994	D5185	15.9		-0.33	
1059		-----		-----	
1146	D5185	17		0.16	
1166		-----		-----	
1201	D5185	15		-0.74	
1262	D5185	15.46		-0.53	
1372	D5185	18.38	ex	0.77	Excluded as many statistical outliers in other related metal analyzes
1435	D5185	16		-0.29	
1660		-----		-----	
1740	D6595	17		0.16	
1743	D5185	16.6		-0.02	
1900	D5185	19.002		1.05	
1957	D5185	15.110		-0.69	
6002	D5185	16.97		0.14	
6016	D5185	15.7		-0.42	
6054	D5185	17.855		0.54	
6140		17.34		0.31	
6284	D5185	17.064		0.18	
6322	DIN51418	21		1.94	

normality	suspect	
n	36	
outliers	0 (+1ex)	
mean (n)	16.651	
st.dev. (n)	1.7033	
R(calc.)	4.769	
st.dev.(D5185:18)	2.2422	
R(D5185:18)	6.278	Application range 5 – 1700 mg/kg
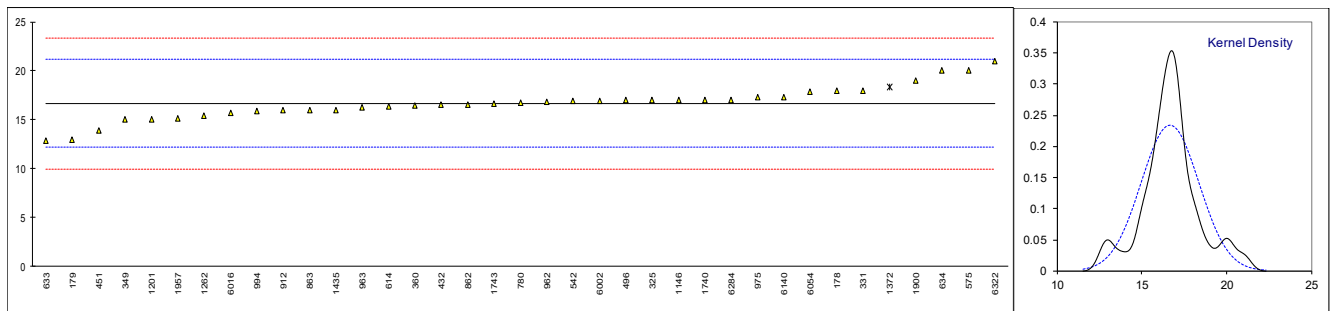
Determination of Manganese as Mn on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
325	D5185	10		-0.07	
331	D5185Mod.	11		1.28	
339	INH-165	10		-0.07	
349	D5185	8		-2.77	
360	D5185	9.54		-0.69	
432	D5185	10.10		0.06	
451	D5185	10.2		0.20	
496	D5185	11.00		1.28	
542	D5185	12.837	R(0.05)	3.76	
575	D6595	9.6		-0.61	
614	D5185	9.899		-0.21	
633	D6595	9.89		-0.22	
634	D6595	12		2.63	
780	D5185	9.3		-1.02	
862	D5185	10		-0.07	
863	D5185	10		-0.07	
912	D5185	10		-0.07	
962	D5185	10.08		0.04	
963	D5185	9.71		-0.46	
975		9.8		-0.34	
994	D5185	9.5		-0.75	
1059	In house	10		-0.07	
1146	D5185	10		-0.07	
1166		-----		-----	
1201	D5185	10		-0.07	
1262	D5185	9.58		-0.64	
1372	D5185	15.18	R(0.01)	6.92	
1435	D5185	10		-0.07	
1660		-----		-----	
1740	D6595	10		-0.07	
1743	D5185	9.8		-0.34	
1900	D5185	11.964		2.58	
1957	D5185	11.523		1.98	
6002	D5185	8.69		-1.84	
6016	D5185	10		-0.07	
6054	D5185	10.478		0.57	
6140		10.19		0.18	
6284	D5185	10.0368		-0.02	
6322	DIN51418	10		-0.07	

normality	not OK	
n	35	
outliers	2	
mean (n)	10.054	
st.dev. (n)	0.7590	
R(calc.)	2.125	
st.dev.(D5185:18)	0.7406	
R(D5185:18)	2.074	Application range 5 – 700 mg/kg
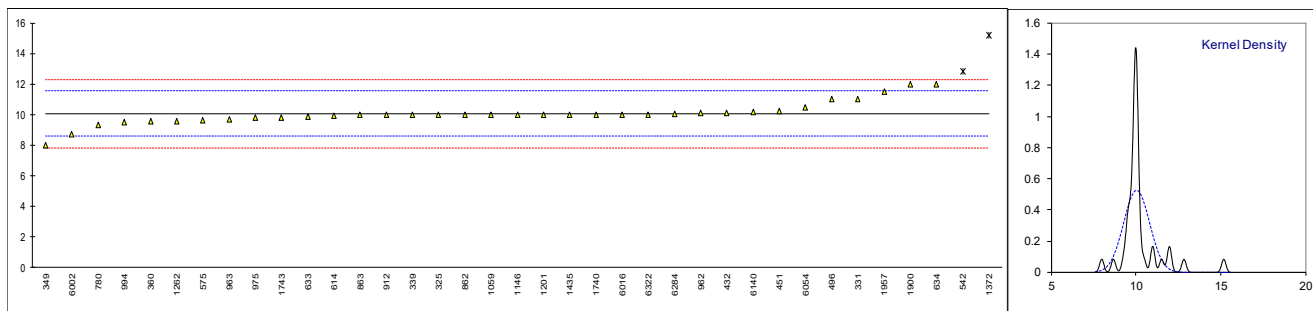
Determination of Molybdenum as Mo on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	10		0.58	
179	D5185	8		-1.21	
237		-----		-----	
256		-----		-----	
257		10.15		0.72	
325	D5185	7		-2.10	
331	D5185Mod.	10		0.58	
339	INH-165	9		-0.31	
349	D5185	8		-1.21	
360	D5185	9.39		0.04	
432	D5185	9.71		0.32	
451	D5185	10.0		0.58	
496	D5185	10.1		0.67	
542	D5185	10.367		0.91	
575	D6595	9.5		0.14	
614	D5185	9.302		-0.04	
633	D6595	9.34		-0.01	
634	D6595	8		-1.21	
780	D5185	8.9		-0.40	
862	D5185	9		-0.31	
863	D5185	10		0.58	
912	D5185	9		-0.31	
962	D5185	9.2		-0.13	
963	D5185	8.96		-0.35	
975		9.0		-0.31	
994	D5185	9.1		-0.22	
1059	In house	11		1.48	
1146		-----		-----	
1166		-----		-----	
1201	D5185	9		-0.31	
1262	D5185	10.4		0.94	
1372	D5185	15.43	R(0.01)	5.44	
1435	D5185	8		-1.21	
1660		-----		-----	
1740	D6595	9.3		-0.04	
1743	D5185	9.7		0.31	
1900	D5185	11.311		1.76	
1957	D5185	8.891		-0.41	
6002	D5185	9.11		-0.21	
6016	D5185	9.6		0.22	
6054	D5185	6.099	R(0.05)	-2.91	
6140		9.52		0.15	
6284	D5185	9.7064		0.32	
6322	DIN51418	2	R(0.01)	-6.58	

normality	OK	
n	36	
outliers	3	
mean (n)	9.349	
st.dev. (n)	0.8657	
R(calc.)	2.424	
st.dev.(D5185:18)	1.1175	
R(D5185:18)	3.129	Application range 5 – 200 mg/kg
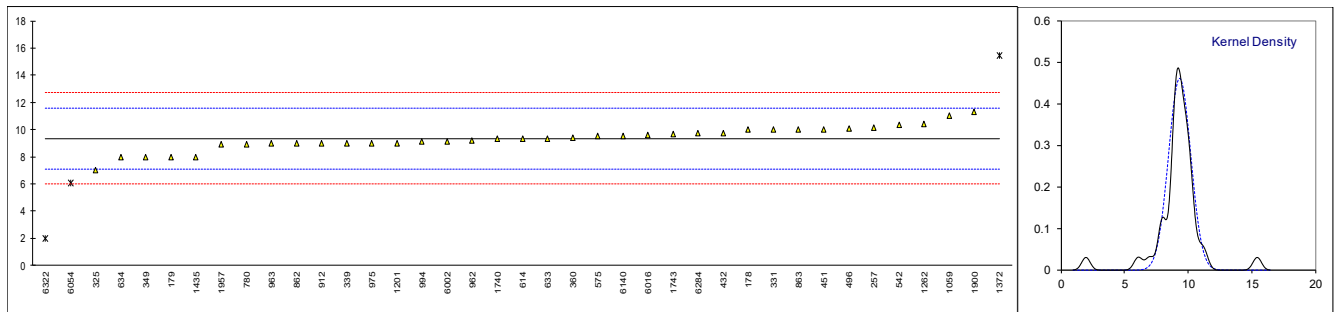
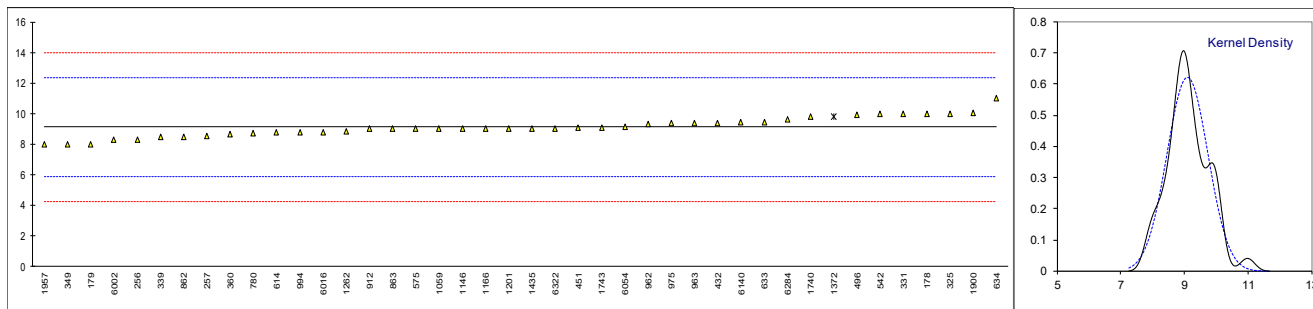## Determination of Nickel as Ni on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	10		0.55	
179	D5185	8		-0.69	
237		-----		-----	
256		8.30		-0.50	
257		8.53		-0.36	
325	D5185	10		0.55	
331	D5185Mod.	10		0.55	
339	INH-165	8.5		-0.38	
349	D5185	8		-0.69	
360	D5185	8.68		-0.27	
432	D5185	9.40		0.18	
451	D5185	9.1		-0.01	
496	D5185	9.93		0.50	
542	D5185	9.983		0.54	
575	D6595	9.0		-0.07	
614	D5185	8.789		-0.20	
633	D6595	9.44		0.20	
634	D6595	11		1.16	
780	D5185	8.7		-0.26	
862	D5185	8.5		-0.38	
863	D5185	9		-0.07	
912	D5185	9		-0.07	
962	D5185	9.3		0.11	
963	D5185	9.38		0.16	
975		9.37		0.16	
994	D5185	8.8		-0.20	
1059	In house	9		-0.07	
1146	D5185	9		-0.07	
1166	In house	9		-0.07	
1201	D5185	9		-0.07	
1262	D5185	8.85		-0.16	
1372	D5185	9.83	ex	0.44	Excluded as many statistical outliers in other related metal analyzes
1435	D5185	9		-0.07	
1660		-----		-----	
1740	D6595	9.8		0.42	
1743	D5185	9.1		-0.01	
1900	D5185	10.041		0.57	
1957	D5185	7.963		-0.71	
6002	D5185	8.28		-0.52	
6016	D5185	8.8		-0.20	
6054	D5185	9.155		0.02	
6140		9.43		0.19	
6284	D5185	9.6348		0.32	
6322	DIN51418	9		-0.07	

normality	OK	
n	41	
outliers	0 (+1ex)	
mean (n)	9.116	
st.dev. (n)	0.6423	
R(calc.)	1.799	
st.dev.(D5185:18)	1.6175	
R(D5185:18)	4.529	Application range 5 – 40 mg/kg

Determination of Potassium as K on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
325	D5185	<2		-----	
331	D5185Mod.	1		-----	
339	INH-165	<50		-----	
349	D5185	0		-----	
360	D5185	< 1.0		-----	
432	D5185	2.05		-----	
451	D5185	0.6		-----	
496	D5185	1.14		-----	
542	D5185	0.390		-----	
575		-----		-----	
614	D5185	1.294		-----	
633	D6595	0.47		-----	
634	D6595	1		-----	
780	D5185	1.1		-----	
862	D5185	<1		-----	
863	D5185	1		-----	
912		-----		-----	
962		-----		-----	
963		-----		-----	
975		-----		-----	
994		-----		-----	
1059		-----		-----	
1146		-----		-----	
1166	In house	2		-----	
1201		-----		-----	
1262		-----		-----	
1372	D5185	10.70		-----	
1435	D5185	2		-----	
1660		-----		-----	
1740	D6595	<1		-----	
1743	D5185	0		-----	
1900	D5185	0		-----	
1957	D5185	-63.693		-----	
6002	D5185	1.97		-----	
6016	D5185	<1		-----	
6054	D5185	2.0917		-----	
6140		0.0		-----	
6284	D5185	0.8034		-----	
6322	DIN51418	0		-----	
	n	26			
	mean (n)	<10			

Determination of Silicon as Si on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	12		0.07	
179	D5185	10		-0.67	
237		-----		-----	
256		-----		-----	
257		-----		-----	
325	D5185	13		0.44	
331	D5185Mod.	13		0.44	
339		-----		-----	
349	D5185	9		-1.04	
360	D5185	10.8		-0.37	
432	D5185	12.16		0.13	
451	D5185	11.6		-0.08	
496	D5185	12.7		0.33	
542	D5185	13.937		0.78	
575	D6595	13		0.44	
614	D5185	11.83		0.01	
633	D6595	17.48	R(0.05)	2.09	
634	D6595	15		1.17	
780	D5185	11.8		-0.01	
862	D5185	11		-0.30	
863	D5185	12		0.07	
912	D5185	19	R(0.05)	2.65	
962	D5185	10.4		-0.52	
963	D5185	10.88		-0.35	
975		11.4		-0.15	
994	D5185	12.6		0.29	
1059	In house	11		-0.30	
1146	D5185	12		0.07	
1166	In house	16		1.54	
1201	D5185	11		-0.30	
1262	D5185	10.8		-0.37	
1372	D5185	21.35	R(0.05)	3.51	
1435	D5185	11		-0.30	
1660		-----		-----	
1740	D6595	12.2		0.14	
1743	D5185	13		0.44	
1900	D5185	13.902		0.77	
1957	D5185	8.343		-1.28	
6002	D5185	10.93		-0.33	
6016	D5185	10		-0.67	
6054		-----		-----	
6140		11.47		-0.13	
6284	D5185	3.8799	C,R(0.05)	-2.92	First reported 0
6322	DIN51418	12		0.07	

normality	suspect
n	34
outliers	4
mean (n)	11.816
st.dev. (n)	1.5494
R(calc.)	4.338
st.dev.(D5185:18)	2.7134
R(D5185:18)	7.597

Application range 8 – 50 mg/kg
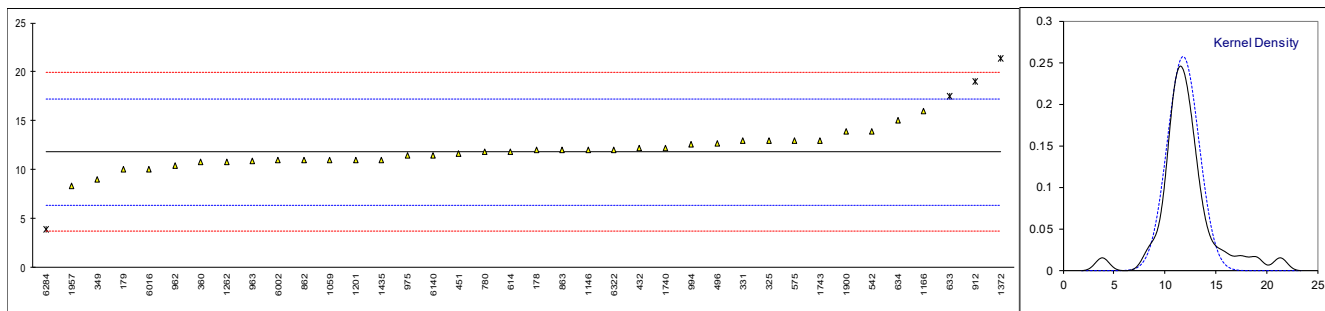
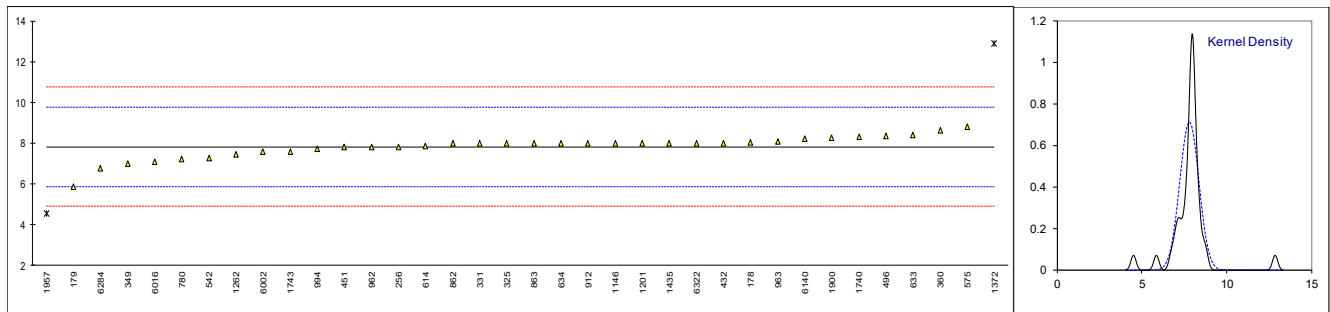## Determination of Silver as Ag on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	8.06		0.24	
179	D5185	5.88		-1.99	
237		-----		-----	
256		7.82		0.00	
257		-----		-----	
325	D5185	8		0.18	
331	D5185Mod.	8		0.18	
339		-----		-----	
349	D5185	7		-0.84	
360	D5185	8.63		0.83	
432	D5185	8.01		0.19	
451	D5185	7.8		-0.02	
496	D5185	8.37		0.56	
542	D5185	7.283		-0.55	
575	D6595	8.8		1.00	
614	D5185	7.873		0.05	
633	D6595	8.38		0.57	
634	D6595	8		0.18	
780	D5185	7.2		-0.64	
862	D5185	8		0.18	
863	D5185	8		0.18	
912	D5185	8		0.18	
962	D5185	7.8		-0.02	
963	D5185	8.07		0.25	
975		-----		-----	
994	D5185	7.7		-0.12	
1059		-----		-----	
1146	D5185	8		0.18	
1166		-----		-----	
1201	D5185	8		0.18	
1262	D5185	7.43		-0.40	
1372	D5185	12.87	R(0.01)	5.16	
1435	D5185	8		0.18	
1660		-----		-----	
1740	D6595	8.3		0.49	
1743	D5185	7.6		-0.23	
1900	D5185	8.261		0.45	
1957	D5185	4.532	R(0.01)	-3.36	
6002	D5185	7.59		-0.24	
6016	D5185	7.1		-0.74	
6054		-----		-----	
6140		8.23		0.42	
6284	D5185	6.7676		-1.08	
6322	DIN51418	8		0.18	

|		
normality	not OK	
n	34	
outliers	2	
mean (n)	7.822	
st.dev. (n)	0.5590	
R(calc.)	1.565	
st.dev.(D5185:18)	0.9778	
R(D5185:18)	2.738	Application range 0.5 – 50 mg/kg

Determination of Sodium as Na on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	12		0.36	
179	D5185	8		-1.47	
237		-----		-----	
256		15.34		1.88	
257		-----		-----	
325	D5185	10		-0.56	
331	D5185Mod.	11		-0.10	
339	INH-165	<50		-----	
349	D5185	10	C	-0.56	First reported 47
360	D5185	10.2		-0.47	
432	D5185	10.95		-0.12	
451	D5185	10.3		-0.42	
496	D5185	11.9		0.31	
542	D5185	14.463		1.48	
575	D6595	10		-0.56	
614	D5185	10.57		-0.30	
633	D6595	11.14		-0.04	
634	D6595	15		1.73	
780	D5185	9.9		-0.60	
862	D5185	11		-0.10	
863	D5185	10		-0.56	
912		-----		-----	
962	D5185	10.9		-0.15	
963	D5185	10.75		-0.21	
975		-----		-----	
994	D5185	10.8		-0.19	
1059		-----		-----	
1146	D5185	11		-0.10	
1166		-----		-----	
1201	D5185	11		-0.10	
1262	D5185	9.13		-0.96	
1372	D5185	16.58	ex	2.45	Excluded as many statistical outliers in other related metal analyzes
1435	D5185	10		-0.56	
1660		-----		-----	
1740	D6595	11.5		0.13	
1743	D5185	11		-0.10	
1900	D5185	13.678		1.12	
1957	D5185	11.201		-0.01	
6002	D5185	11.27		0.02	
6016	D5185	13		0.81	
6054		-----		-----	
6140		11.30		0.04	
6284	D5185	11.964		0.34	
6322	DIN51418	0	R(0.01)	-5.13	

|		
normality	not OK	
n	33	
outliers	1 (+1ex)	
mean (n)	11.220	
st.dev. (n)	1.5787	
R(calc.)	4.420	
st.dev.(D5185:18)	2.1864	
R(D5185:18)	6.122	Application range 7 – 70 mg/kg
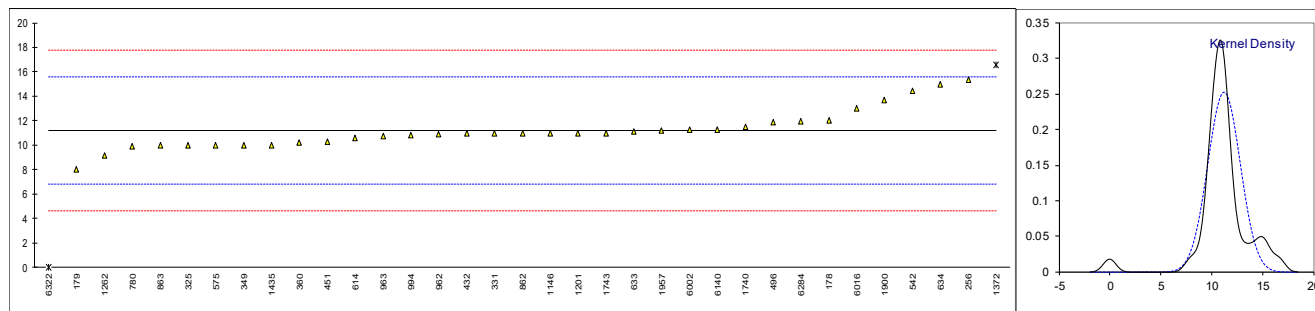
Determination of Tin as Sn on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	12		0.50	
179	D5185	9		-0.44	
237		-----		-----	
256		-----		-----	
257		9.58		-0.26	
325	D5185	11		0.19	
331	D5185Mod.	12		0.50	
339	INH-165	11		0.19	
349	D5185	8		-0.75	
360	D5185	10.9		0.15	
432	D5185	10.66		0.08	
451	D5185	10.3		-0.03	
496	D5185	10.9		0.15	
542	D5185	11.433		0.32	
575	D6595	10		-0.13	
614	D5185	10.27		-0.04	
633	D6595	13.49		0.96	
634	D6595	9		-0.44	
780	D5185	10.2		-0.06	
862	D5185	10		-0.13	
863	D5185	11		0.19	
912	D5185	10		-0.13	
962	D5185	9.9		-0.16	
963	D5185	9.79		-0.19	
975		9.9		-0.16	
994	D5185	10.8		0.12	
1059	In house	15		1.43	
1146	D5185	10		-0.13	
1166	In house	10		-0.13	
1201	D5185	10		-0.13	
1262	D5185	10.6		0.06	
1372	D5185	15.99	ex	1.74	Excluded as many statistical outliers in other related metal analyzes
1435	D5185	10		-0.13	
1660		-----		-----	
1740	D6595	10.2		-0.06	
1743	D5185	11		0.19	
1900	D5185	11.114		0.22	
1957	D5185	9.494		-0.28	
6002	D5185	9.39		-0.32	
6016	D5185	10		-0.13	
6054		-----		-----	
6140		11.38		0.30	
6284	D5185	10.474		0.02	
6322	DIN51418	6		-1.37	

|			
	normality	not OK	
	n	39	
	outliers	0 (+1ex)	
	mean (n)	10.404	
	st.dev. (n)	1.3992	
	R(calc.)	3.918	
	st.dev.(D5185:18)	3.2043	
	R(D5185:18)	8.972	Application range 10 – 40 mg/kg
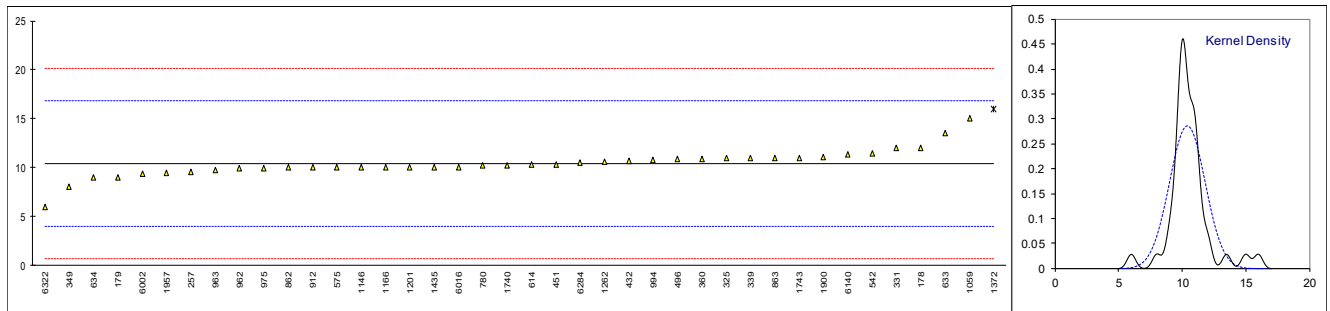
Determination of Titanium as Ti on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
237		-----		-----	
256		-----		-----	
257		-----		-----	
325	D5185	10		0.22	
331	D5185Mod.	10		0.22	
339	INH-165	9		-0.17	
349	D5185	8		-0.56	
360	D5185	9.12		-0.12	
432	D5185	9.49		0.02	
451	D5185	9.3		-0.05	
496	D5185	9.94		0.20	
542	D5185	11.133		0.67	
575	D6595	9.9		0.18	
614	D5185	9.383		-0.02	
633	D6595	10.69		0.49	
634	D6595	10		0.22	
780	D5185	8.7		-0.28	
862	D5185	9		-0.17	
863	D5185	9		-0.17	
912	D5185	9		-0.17	
962	D5185	9.1		-0.13	
963	D5185	9.36		-0.03	
975		-----		-----	
994	D5185	9.0		-0.17	
1059		-----		-----	
1146	D5185	9		-0.17	
1166		-----		-----	
1201	D5185	9		-0.17	
1262	D5185	8.38		-0.41	
1372	D5185	14.37	R(0.01)	1.93	
1435	D5185	10		0.22	
1660		-----		-----	
1740	D6595	9.6		0.07	
1743	D5185	9.8		0.15	
1900	D5185	11.793	R(0.05)	0.92	
1957	D5185	9.883		0.18	
6002	D5185	9.54		0.04	
6016	D5185	9.6		0.07	
6054	D5185	9.399		-0.01	
6140		9.95		0.20	
6284	D5185	8.8108		-0.24	
6322	DIN51418	9		-0.17	

normality	OK	
n	33	
outliers	2	
mean (n)	9.427	
st.dev. (n)	0.6306	
R(calc.)	1.766	
st.dev.(D5185:18)	2.5629	
R(D5185:18)	7.176	Application range 5 – 40 mg/kg
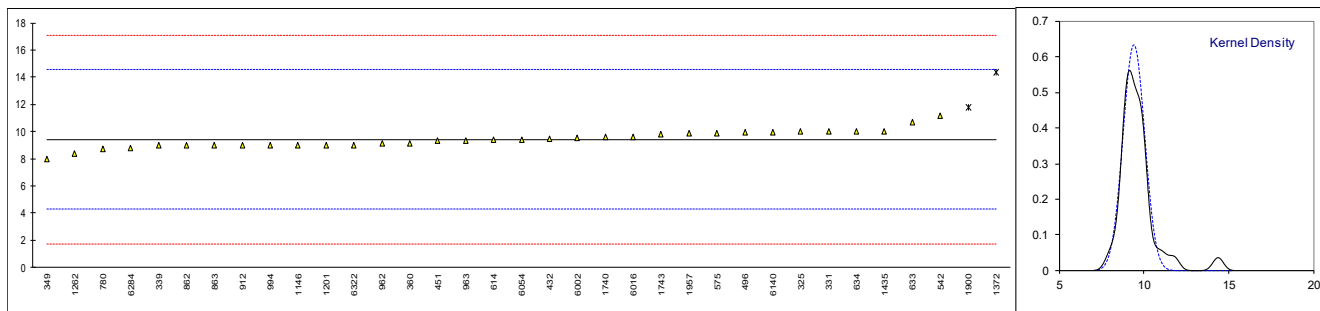
Determination of Vanadium as V on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	9		-0.35	
179	D5185	7		-2.05	
237		-----		-----	
256		-----		-----	
257		-----		-----	
325	D5185	11		1.34	
331	D5185Mod.	10		0.50	
339		-----		-----	
349	D5185	8		-1.20	
360	D5185	9.06		-0.30	
432	D5185	9.48		0.05	
451	D5185	9.3		-0.10	
496	D5185	9.72		0.26	
542	D5185	10.227		0.69	
575	D6595	9.8		0.33	
614	D5185	9.268		-0.13	
633	D6595	8.64		-0.66	
634	D6595	12		2.19	
780	D5185	9.2		-0.18	
862	D5185	9		-0.35	
863	D5185	10		0.50	
912	D5185	9		-0.35	
962	D5185	10.0		0.50	
963	D5185	9.65		0.20	
975		9.3		-0.10	
994	D5185	8.9		-0.44	
1059	In house	9		-0.35	
1146	D5185	9		-0.35	
1166	In house	9		-0.35	
1201	D5185	9		-0.35	
1262	D5185	8.70		-0.61	
1372	D5185	10.06	ex	0.55	Excluded as many statistical outliers in other related metal analyzes
1435	D5185	9		-0.35	
1660		-----		-----	
1740	D6595	9.8		0.33	
1743	D5185	9.4		-0.01	
1900	D5185	10.938		1.29	
1957	D5185	10.419		0.85	
6002	D5185	9.07		-0.29	
6016	D5185	9.4		-0.01	
6054	D5185	9.645		0.19	
6140		9.71		0.25	
6284	D5185	9.2048		-0.18	
6322	DIN51418	9		-0.35	

normality	not OK	
n	38	
outliers	0 (+1ex)	
mean (n)	9.417	
st.dev. (n)	0.8373	
R(calc.)	2.345	
st.dev.(D5185:18)	1.1784	
R(D5185:18)	3.299	Application range 1 – 50 mg/kg
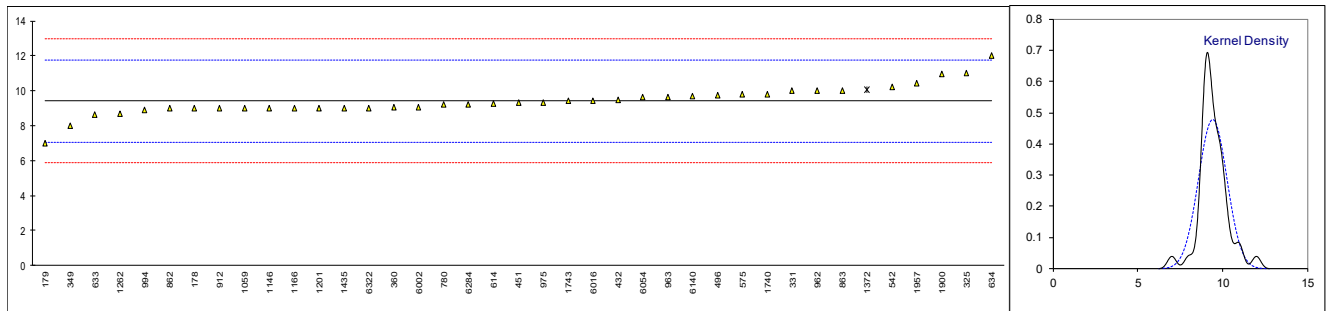
Determination of Calcium as Ca on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	208		0.56	
179	D5185	205.58	C	0.39	First reported 146
237		-----		-----	
256		-----		-----	
257		-----		-----	
325	D5185	221		1.46	
331	D5185Mod.	208		0.56	
339	INH-165	212		0.83	
349	D5185	179		-1.46	
360	D5185	203.4		0.24	
432	D5185	202.76		0.19	
451	D5185	193	C	-0.48	First reported 70.6
496	D5185	204.1		0.29	
542	D5185	148.193	R(0.05)	-3.59	
575	D6595	184		-1.11	
614	D5185	201.8		0.13	
633	D6595	174.47		-1.77	
634	D6595	160	R(0.05)	-2.77	
780	D5185	205		0.35	
862	D5185	197		-0.21	
863	D5185	200		0.00	
912	D5185	201		0.07	
962	D5185	193		-0.48	
963	D5185	191.07		-0.62	
975		201.4		0.10	
994	D5185	201		0.07	
1059	In house	191		-0.62	
1146	D5185	210		0.69	
1166	In house	200		0.00	
1201	D5185	189		-0.76	
1262	D5185	181.7		-1.27	
1372	D5185	208.40	ex	0.58	Excluded as many statistical outliers in other related metal analyzes
1435	D5185	204		0.28	
1660		-----		-----	
1740	D6595	200		0.00	
1743	D5185	205		0.35	
1900	D5185	238.18	R(0.05)	2.65	
1957	D5185	188.100		-0.82	
6002	D5185	195.67		-0.30	
6016	D5185	204		0.28	
6054	D5185	229.178	C	2.03	First reported 251.405
6140		206.5		0.45	
6284	D5185	214.66		1.02	
6322	DIN51418	194		-0.42	

|		
	normality	OK
	n	36
	outliers	3 (+1ex)
	mean (n)	199.983
	st.dev. (n)	11.1440
	R(calc.)	31.203
	st.dev.(Horwitz)	14.4138
	R(Horwitz)	40.359
Compare		
	R(D5185:18)	14.702

Application range 40 – 9000 mg/kg
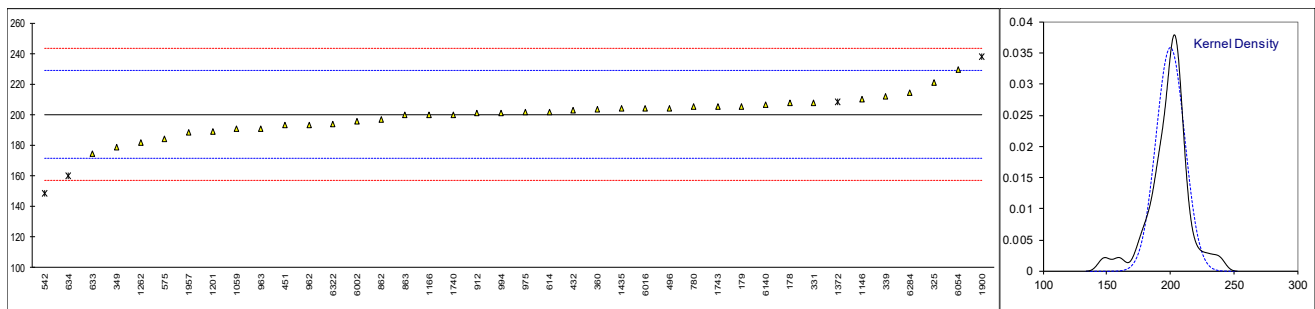
Determination of Phosphorus as P on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	852		0.20	
179	D5185	705		-3.10	
237		-----		-----	
256		-----		-----	
257		-----		-----	
325	D5185	879		0.81	
331	D5185Mod.	896		1.19	
339	INH-165	837		-0.14	
349	D5185	731		-2.51	
360	D5185	818.5		-0.55	
432	D5185	797.70		-1.02	
451	D5185	794.6		-1.09	
496	D5185	849.5		0.14	
542	D5185	1121.667	R(0.01)	6.25	
575	D6595	861		0.40	
614	D5185	818.4		-0.55	
633	D6595	981.22		3.10	
634	D6595	941		2.20	
780	D5185	861		0.40	
862	D5185	806		-0.83	
863	D5185	816		-0.61	
912	D5185	781		-1.39	
962	D5185	827		-0.36	
963	D5185	834.87		-0.18	
975		834		-0.20	
994	D5185	815		-0.63	
1059	In house	784		-1.32	
1146	D5185	850		0.16	
1166	In house	954	C	2.49	First reported 1016
1201	D5185	789		-1.21	
1262	D5185	835.0		-0.18	
1372	D5185	788.40	ex	-1.23	Excluded as many statistical outliers in other related metal analyzes
1435	D5185	832		-0.25	
1660		-----		-----	
1740	D6595	785		-1.30	
1743	D5185	827		-0.36	
1900	D5185	946.97		2.33	
1957	D5185	869.327		0.59	
6002	D5185	787		-1.26	
6016	D5185	913		1.57	
6054		-----		-----	
6140		840.4		-0.06	
6284	D5185	916.68		1.65	
6322	DIN51418	927		1.88	

|		
normality	OK	
n	37	
outliers	1 (+1ex)	
mean (n)	843.059	
st.dev. (n)	60.6768	
R(calc.)	169.895	
st.dev.(D5185:18)	44.5902	
R(D5185:18)	124.853	Application range10 – 1000 mg/kg
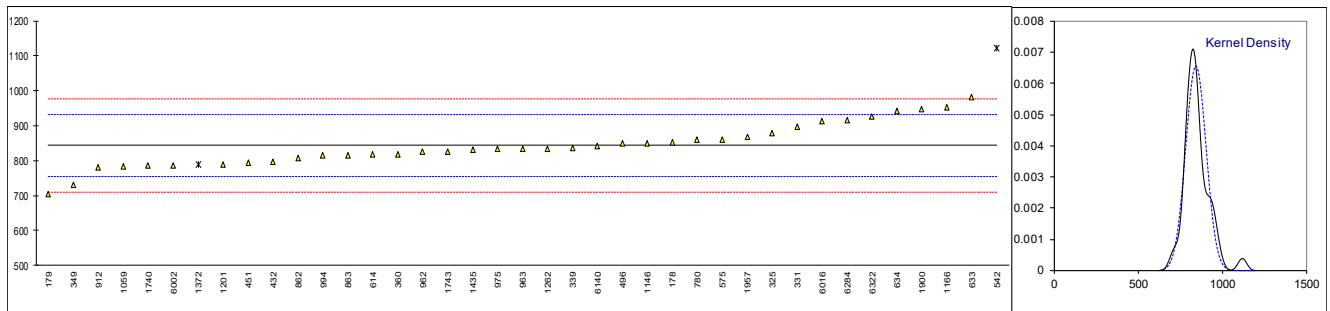
Determination of Zinc as Zn on sample #20212; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	377		1.01	
179	D5185	295		-3.28	
237		-----		-----	
256		311.83		-2.40	
257		379.65		1.15	
325	D5185	371		0.70	
331	D5185Mod.	398		2.11	
339	INH-165	336		-1.14	
349	D5185	308		-2.60	
360	D5185	347.8		-0.52	
432	D5185	344.57		-0.69	
451	D5185	392.8		1.84	
496	D5185	355.12		-0.13	
542	D5185	395.857		2.00	
575	D6595	374	C	0.86	First reported 441
614	D5185	342.5		-0.79	
633	D6595	419.37		3.23	
634	D6595	374		0.86	
780	D5185	349		-0.45	
862	D5185	350.5		-0.38	
863	D5185	345		-0.66	
912	D5185	358		0.02	
962	D5185	348		-0.51	
963	D5185	355.57		-0.11	
975		363		0.28	
994	D5185	353		-0.24	
1059	In house	336		-1.14	
1146	D5185	370		0.65	
1166	In house	382		1.27	
1201	D5185	335		-1.19	
1262	D5185	407.1		2.59	
1372	D5185	372.90	ex	0.80	Excluded as many statistical outliers in other related metal analyzes
1435	D5185	347		-0.56	
1660		-----		-----	
1740	D6595	360		0.12	
1743	D5185	357		-0.04	
1900	D5185	458.13	R(0.05)	5.26	
1957	D5185	370.685		0.68	
6002	D5185	333		-1.29	
6016	D5185	350		-0.40	
6054	D5185	339.242		-0.97	
6140		376.0		0.96	
6284	D5185	360.22		0.13	
6322	DIN51418	339		-0.98	

	normality	OK	
	n	40	
	outliers	1 (+1ex)	
	mean (n)	357.670	
	st.dev. (n)	25.6995	
	R(calc.)	71.959	
	st.dev.(D5185:18)	19.0876	
	R(D5185:18)	53.445	Application range 60 – 1000 mg/kg
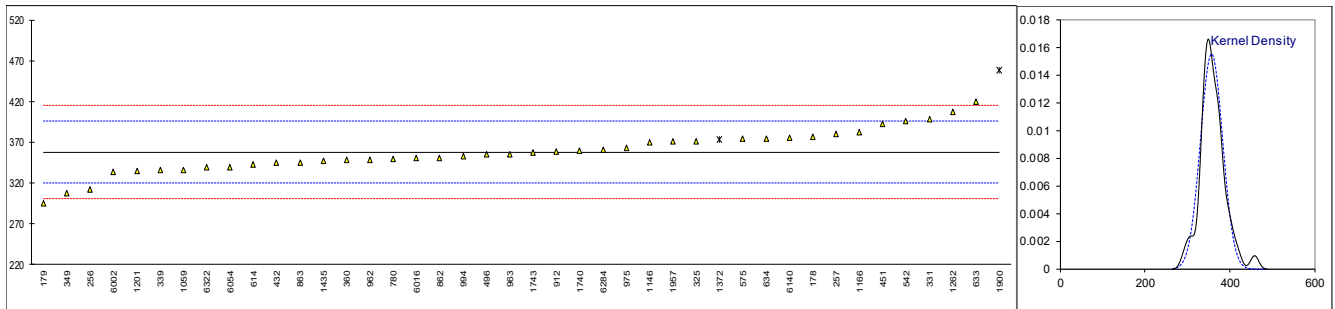
APPENDIX 2

Number of participants per country

1 lab in ARGENTINA

1 lab in AUSTRALIA

1 lab in AUSTRIA

1 lab in AZERBAIJAN

2 labs in BELGIUM

3 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

2 labs in EGYPT

4 labs in FRANCE

2 labs in GERMANY

2 labs in GREECE

1 lab in INDIA

1 lab in IRAN, Islamic Republic of

1 lab in ITALY

1 lab in KAZAKHSTAN

2 labs in MALAYSIA

3 labs in NETHERLANDS

1 lab in NIGERIA

2 labs in NORWAY

1 lab in OMAN

2 labs in PHILIPPINES

2 labs in POLAND

1 lab in PORTUGAL

1 lab in QATAR

1 lab in RUSSIAN FEDERATION

3 labs in SAUDI ARABIA

1 lab in SLOVENIA

1 lab in SPAIN

2 labs in SWEDEN

2 labs in TANZANIA

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
SDS   = Safety Data Sheet

Literature

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3   ASTM E1301:95(2003)
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11   P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)
12   J.N. Miller, Analyst, 118, 455, (1993)
13   Analytical Methods Committee, Technical Brief, No 4, January 2001
14   P.J. Lowthian and M. Thompson, The Royal Society of Chemistry, Analys, 127, 1359-1364 (2002)
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16   Horwitz, R. Albert, J. AOAC Int, 79, 3, 589, (1996)
17   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)