

**Results of Proficiency Test
Hydraulic Fluid (fresh)
November 2016**

Organised by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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1 INTRODUCTION

Since 2003, the Institute for Interlaboratory Studies organizes a proficiency test for the analyses on used Hydraulic Fluid every year. In 2014 it was decided to organize a proficiency test for the analyses on fresh Hydraulic Fluid next to used Hydraulic Fluid. This decision was based on the outcome of a questionnaire that was sent to all participants in 2014. During the annual program 2016/2017, it was decided to continue the round robin for the analyses on fresh Hydraulic Fluid. In this third interlaboratory study on fresh Hydraulic Fluid, 47 laboratories from 35 different countries did register for participation. See appendix 2 for the number of participants per country. In this report, the test results of the 2016 interlaboratory study on fresh Hydraulic Fluid are presented and discussed. This report can also be downloaded from the iis website www.iisnl.com.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organiser of this proficiency test (PT). Sample analyses for fit-for-use and homogeneity testing were subcontracted to an ISO/IEC 17025 accredited laboratory. It was decided to send one sample of one litre of fresh oil, labelled #16240. Participants were requested to report rounded and unrounded test results. The unrounded test results were preferably used for statistical evaluation.

2.1 QUALITY SYSTEM

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, has implemented a quality system based on IEC/ISO17043:2010 (R007). 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 organisation of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of April 2014 (iis-protocol, version 3.3). This protocol can be downloaded from 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

The necessary bulk material was obtained from a local supplier. The approximately 150 litre of the bulk material was homogenised. After homogenisation, 73 amber glass bottles of 1 litre were filled and labelled #16240. The homogeneity of the subsamples #16240 was checked by determination of Density in accordance with ASTM D4052 and Viscosity at 40°C according to ASTM D445 on 8 stratified randomly selected samples.

	<i>Density at 15 °C in kg/L</i>	<i>Viscosity at 40 °C in mm²/s</i>
Sample #16240-1	0.87238	31.75
Sample #16240-2	0.87238	31.75
Sample #16240-3	0.87237	31.76
Sample #16240-4	0.87238	31.79
Sample #16240-5	0.87238	31.75
Sample #16240-6	0.87238	31.78
Sample #16240-7	0.87238	31.77
Sample #16240-8	0.87238	31.77

Table 1: homogeneity test results of subsamples #16240

From the test results of table 1, the repeatabilities (r) were calculated and compared with 0.3 times the corresponding reproducibility (R) of the reference test methods in agreement with the procedure of ISO 13528, Annex B2 in the next table:

	<i>Density at 15 °C in kg/L</i>	<i>Viscosity at 40 °C in mm²/s</i>
r (observed)	0.00001	0.04
reference test method	D4052:15	D445:15a
0.3 x R (ref. test method)	0.00015	0.12

Table 2: repeatabilities of subsamples #16240

Each calculated repeatability was less than 0.3 times the corresponding reproducibility of the reference test methods. Therefore, homogeneity of the subsamples #16240 was assumed.

To each of the participating laboratories one sample of 1 litre amber glass bottle, labelled #16240, was sent on October 26, 2016.

2.5 STABILITY OF THE SAMPLES

The stability of fresh Hydraulic Fluid, packed in amber glass bottles was checked. The material was found sufficiently stable for the period of the proficiency test.

2.6 ANALYSES

The participants were asked to determine on sample #16240; Acid Number (total), Copper Corrosion (3hrs at 50°C), Density at 15°C, Flash Point PMcc, Foam Characteristics (Foam Tendency, Foam Stability), Kinematic Viscosity at 40°C and at 100°C, Viscosity Index, Viscosity Stabinger at 40°C and at 100°C, Pour Point (manual and automated), Sulphur, Water content (by KF), Water Separability at 54°C and Calcium, Phosphorus and Zinc.

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 results more, but report as much significant figures as possible. It was also requested not to report 'less than' results, which are above the detection limit, because such results cannot be used for meaningful statistical calculations.

To get comparable test results a detailed report form, on which the units were prescribed as well as the required reference test methods and a letter of instructions were prepared and made available on the data entry portal www.kpmd.co.uk/sgs-iis/. The laboratories were also requested to confirm the sample receipt on the same data entry portal. A SDS was added to the sample.

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 reanalysis). Additional or corrected test results are used for data analysis and 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 April 2014 (iis-protocol, version 3.3).

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. Not all data sets proved to have a normal distribution, in which cases the statistical evaluation of the test results should be used with due care.

According to ISO 5725 the original test results per determination were submitted to Dixon's, Grubbs' and/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. When the uncertainty passed the evaluation, no remarks are made in the report. However, when the uncertainty failed the evaluation it is mentioned in the report and it will have consequences for the evaluation of the test results.

Finally, the reproducibilities were calculated from the standard deviations by multiplying them with a factor of 2.8.

3.2 GRAPHICS

In order to visualise the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for 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, EN or ISO reproducibilities, the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the variation of this interlaboratory study. The target standard deviation was calculated from the literature reproducibility by division with 2.8.

When a laboratory did use a test method with a reproducibility that is significantly different from the reproducibility of the reference test method used in this report, it is strongly advised to recalculate the z-score, while using the reproducibility of the actual test method used, this in order to evaluate whether the reported test result is fit-for-use.

The z-scores were calculated according to:

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

The $z_{(\text{target})}$ scores are listed in the test result tables in 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

In this proficiency test, problems were encountered with the dispatch of the samples. Participants in Saudi Arabia received the samples late due to problems with clearance of the sample at customs. One participant reported the test results after the final reporting date and four participants did not report any test results at all. Not all laboratories were able to report all analyses requested.

The 43 reporting participants sent in 597 numerical test results. Observed were 30 outlying test results, which is 5.0% of the numerical test results. In proficiency studies, outlier percentages of 3% - 7.5% are quite normal.

4.1 EVALUATION PER TEST

In this section, the results are discussed per test. The different test methods that are reported by the laboratories are taken into account for explaining the observed differences when possible and applicable. These test methods are also mentioned in the tables in appendix 1 together with the original data. The abbreviations used in these tables are listed in appendix 3.

In the iis PT reports, test methods are referred to with a number (e.g. D2270) and an added designation for the year that the test method was adopted or revised (e.g. D2270:10). If applicable, a designation in parentheses is added to designate the year of reapproval (e.g. D2270:10(2016)). In the tables of Appendix 1 only the test method number and year of adoption or revision will be used.

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

Acid Number (total): This determination was not problematic. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in good agreement with the requirements of ASTM D664-A:11ae1.

Copper Corrosion: This determination was not problematic. All participants agreed on a test result of 1 (1A/1B).

Density at 15°C: This determination was not problematic. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D4052:15.

Flash Point PMcc: This determination was not problematic. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D93-A:16a.

Foaming Characteristics (Tendency and Stability): This determination was very problematic. In total five statistical outliers were observed over six parameters. The calculated reproducibilities in the Foam Tendency determination for sequences I and III are not at all in agreement with the requirements of ASTM D892:13e1. Therefore no z-scores were calculated for sequences I and III. However, the calculated reproducibility of sequence II after rejection of the statistical outliers is in agreement with the requirements of ASTM D892:13e1. For Foam stability also no z-scores were calculated. Almost all participants reported 0 ml.

This determination is very sensitive in maintenance and execution.

Therefore extra information was asked (sample pre-treatment and type of diffuser), but no conclusion could be drawn based on this information.

In ASTM D892:13e1 many tips and tricks are given in the test method part X1. Possible sources for the large variation are the cleaning and checking of the air diffuser, air tubes and test cylinders, the amount of air used during the test, the way an aliquot of the sample is taken (pre-warmed to remove any thermal history and gently homogenisation of the sample) and the way that the foam height is read in the test cylinder. According to the test method the foam layer should completely cover the (oil) surface. It is assumed that the way that the foam height is read will be one of the major sources that contributes to the overall variation.

Kinematic Viscosity at 40°C: This determination was not problematic. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in good agreement with the requirements of ASTM D445:15a.

Kinematic Viscosity at 100°C: This determination was problematic for a number of participants. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in full agreement with the requirements of ASTM D445:15a.

- Viscosity Index This determination was very problematic. One statistical outlier was observed and one another test result was excluded due to a calculation error. The calculated reproducibility after rejection of the suspect data is not at all in agreement with the requirements of ASTM D2270:10(2016).
- Viscosity Stabinger at 40°C: This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in good agreement with the requirements of ASTM D7042:16e3.
- Viscosity Stabinger at 100°C: This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in full agreement with the requirements of ASTM D7042:16e3.
- Pour Point (manual): This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in full agreement with the requirements of ASTM D97:16.
- Pour Point (automated): This determination was problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirements of ASTM D5950:14.
- Sulphur: This determination was problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D4294:16e1.
- Water content: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D6304:16e1.
- Water Separability at 54°C: This determination was not problematic. In total one statistical outlier was observed over six parameters. The calculated reproducibilities for “time to reach ≤ 3ml emulsion” and “time to reach 37ml water” are both in good agreement with the requirements of ASTM D1401:12e1.
- Calcium: Almost all reported test results are below the application range (40 – 9000 mg/kg) of ASTM D5185:13e1. Therefore no significant conclusions were drawn.
- Phosphorus: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D5185:13e1.
- Zinc: 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 D5185:13e1.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the relevant reference test method and the reproducibility as found for the group of participating laboratories. The target reproducibilities derived from literature reference test methods (R (lit)) and the calculated reproducibilities ($2.8 * sd$) are compared in the next table;

Parameter	unit	n	mean	2.8 * sd	R (lit)
Acid Number (total)	mg KOH/g	32	0.59	0.15	0.22
Copper Corrosion, 3 hrs at 50°C	rating	19	1	n.a.	n.a.
Density at 15°C	kg/L	33	0.8724	0.0004	0.0005
Flash Point PMcc	°C	27	177.8	9.2	12.6
Foam Tendency Seq. I	ml	16	58	200	(33)
Foam Tendency Seq. II	ml	15	18.0	11.6	16.1
Foam Tendency Seq. III	ml	16	1.9	11.3	(0.8)
Foam Stability Seq. I	ml	17	0	0	(0)
Foam Stability Seq. II	ml	17	0	0	(0)
Foam Stability Seq. III	ml	17	0	0	(0)
Kinematic viscosity at 40°C	mm ² /s	31	31.872	0.247	0.389
Kinematic viscosity at 100°C	mm ² /s	30	6.128	0.084	0.085
Viscosity Index		32	143.5	4.3	2.0
Viscosity Stabinger at 40°C	mm ² /s	17	31.845	0.303	0.461
Viscosity Stabinger at 100°C	mm ² /s	17	6.128	0.087	0.088
Pour Point (manual)	°C	17	-40.5	9.5	9.0
Pour Point (automated), 1°C int.	°C	10	-44.6	6.1	4.5
Sulphur	mg/kg	20	2957	396	331
Water content (by KF)	mg/kg	31	64.1	92.3	205.1
Water Separability at 54°C, distilled water					
- Time ≤ 3 ml emulsion	min	17	14.3	14.1	20.0
- Time 37 ml water	min	15	14.3	8.8	20.0
- Time to reach complete break	min	14	16.4	8.3	n.a.
- Volume Oil phase	ml	15	40.1	1.3	n.a.
- Volume Water phase	ml	16	39.3	3.2	n.a.
- Volume Emulsion phase	ml	16	0.6	3.4	n.a.
Calcium as Ca	mg/kg	22	10.5	4.2	(0.3)
Phosphorus as P	mg/kg	27	308	55	75
Zinc as Zn	mg/kg	29	288	55	42

Table 3: reproducibilities of tests on sample #16240

Without further statistical calculations, it could be concluded that for many tests there is a good compliance of the group of participating laboratories with the relevant reference test methods. The problematic tests and the figures reported between brackets in table 3 have been discussed in paragraph 4.1.

4.3 COMPARISON OF THE PROFICIENCY TEST OF NOVEMBER 2016 WITH THE PREVIOUS PTs.

	<i>November 2016</i>	<i>November 2015</i>	<i>November 2014</i>
Number of reporting labs	43	45	29
Number of test results reported	597	569	346
Statistical outliers	30	26	19
Percentage outliers	5.0%	4.6%	5.5%

Table 4: comparison with previous proficiency tests

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

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

Determination	<i>November 2016</i>	<i>November 2015</i>	<i>November 2014</i>
Acid Number (total)	+	++	++
Density at 15°C	+	-	+/-
Flash Point PMcc	+	+	-
Foam Tendency Seq. I	n.e.	--	--
Foam Tendency Seq. II	+	+/-	--
Foam Tendency Seq. III	n.e.	--	--
Foam Stability Seq. I	n.e.	n.e.	n.e.
Foam Stability Seq. II	n.e.	n.e.	n.e.
Foam Stability Seq. III	n.e.	n.e.	n.e.
Kinematic viscosity at 40°C	+	+/-	+/-
Kinematic viscosity at 100°C	+/-	+	--
Viscosity Index	--	+	--
Viscosity Stabinger at 40°C	+	+	++
Viscosity Stabinger at 100°C	+/-	+	+
Pour Point (manual)	+/-	+/-	+
Pour Point (automated), 1°C int.	-	+	+
Sulphur	-	+	+
Water content (by KF)	++	++	++
Water Separability ≤ 3ml	+	++	++
Water Separability 37ml water	++	++	++
Calcium as Ca	n.e.	n.e.	n.e.
Phosphorus as P	+	+	++
Zinc as Zn	-	n.e.	n.e.

Table 5: comparison determinations against the reference test method

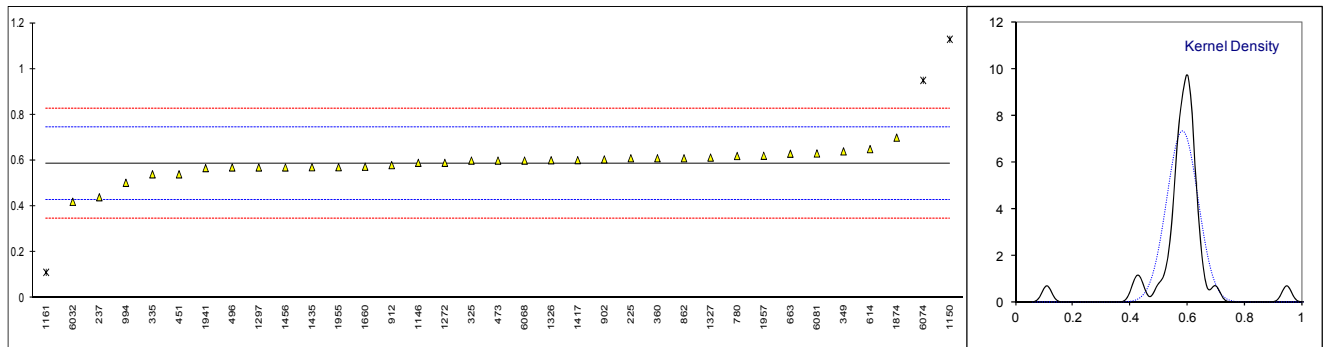
- ++: group performed much better than the reference test method
- + : group performed better than the reference test method
- +/-: group performance equals the reference test method
- : group performed worse than the reference test method
- : group performed much worse than the reference test method

APPENDIX 1

Determination of Acid Number (Total) on sample #16240; results in mg KOH/g

lab	method	value	mark	z(targ)	remarks
173		----		----	
225	D974	0.61		0.31	
237	D664-A	0.44		-1.82	
255		----		----	
325	D664-A	0.60		0.18	
335	ISO6618	0.54		-0.57	
349	D664-A	0.64		0.68	
360	D974	0.610		0.31	
432		----		----	
445		----		----	
451		0.54		-0.57	
473	D664-A	0.6		0.18	
496	D664-A	0.57		-0.20	
614	D664-A	0.65		0.81	
663	D664-A	0.63		0.56	
780	D664-A	0.62		0.43	
862	D664-A	0.61		0.31	
902	D664-A	0.605		0.24	
912	D664-A	0.58		-0.07	
962		----		----	
963		----		----	
994	D664-A	0.503		-1.03	
1011		----		----	
1146	D664-A	0.590		0.06	
1150	INH-1752	1.129	C,R(0.01)	6.81	first reported: 1.219
1161	D664-A	0.112	C,R(0.01)	-5.93	first reported: 0.152
1272	ISO6618	0.590		0.06	
1297	D664-A	0.57		-0.20	
1326	D664-A	0.6015		0.20	
1327	D664-A	0.613		0.34	
1417	IP177	0.602		0.21	
1435	D664-A	0.571		-0.18	
1456	D974	0.57		-0.20	
1660	IEC62021-1	0.573		-0.16	
1682		----		----	
1748		----		----	
1797		----		----	
1874	E2412	0.7		1.43	
1941	ISO6619	0.567		-0.23	
1955	D664-A	0.571		-0.18	
1957	D664-A	0.621		0.44	
1981		----		----	
6016		----		----	
6032	D664-A	0.42		-2.07	
6068	ISO6618	0.6		0.18	
6074	D664-A	0.95	C,R(0.01)	4.56	first reported: 0.94
6081	D664-A	0.631		0.57	

normality not OK
n 32
outliers 3
mean (n) 0.5856
st.dev. (n) 0.05449
R(calc.) 0.1526
R(D664:11ae1) 0.2236



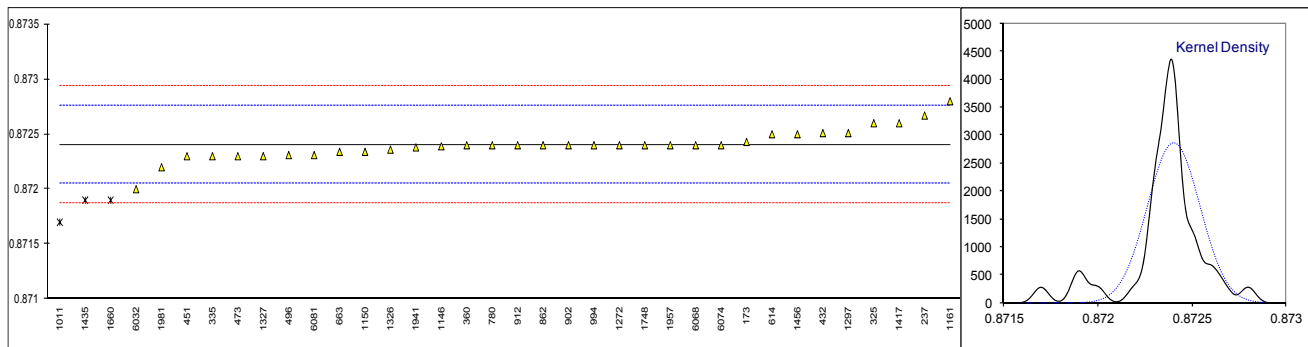
Determination of Copper Corrosion 3hrs/50°C on sample #16240; results in rating

lab	method	value	mark	z(targ)	remarks
173		----		----	
225		----		----	
237		----		----	
255		----		----	
325	D130	1A		----	
335		----		----	
349		----		----	
360	D130	1A		----	
432		----		----	
445		----		----	
451		----		----	
473		----		----	
496	ISO2160	1A		----	
614		----		----	
663		----		----	
780	D130	1a		----	
862	D130	1a		----	
902		----		----	
912	D130	1a		----	
962		----		----	
963		----		----	
994	D130	1a		----	
1011	D130	1a		----	
1146		----		----	
1150	ISO2160	1a		----	
1161		----		----	
1272		----		----	
1297	D130	1A		----	
1326		----		----	
1327	D130	1b		----	
1417	IP154	1A		----	
1435		----		----	
1456	D130	1A		----	
1660		----		----	
1682		----		----	
1748	D130	1a		----	
1797	ISO2160	1a		----	
1874		----		----	
1941	ISO2160	1a		----	
1955		----		----	
1957		----		----	
1981	D130	1a		----	
6016		----		----	
6032		----		----	
6068	ISO2160	1a		----	
6074	D130	1a		----	
6081		----		----	
	normality	n.a.			
	n	19			
	outliers	0			
	mean (n)	1 (1A/1B)			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	R(target)	n.a.			

Determination of Density at 15°C on sample #16240; results in kg/L

lab	method	value	mark	z(targ)	remarks
173	D4052	0.87243		0.14	
225		----		----	
237	D4052	0.87267		1.49	
255		----		----	
325	D4052	0.8726		1.09	
335	D4052	0.8723		-0.59	
349		----		----	
360	D4052	0.8724		-0.03	
432	ISO12185	0.87251		0.59	
445		----		----	
451	D4052	0.8723	C	-0.59	first reported: 872.3 kg/L
473	D4052	0.8723	C	-0.59	first reported: 872.3 kg/L
496	D4052	0.87231		-0.53	
614	D4052	0.8725		0.53	
663	D4052	0.87234		-0.36	
780	D4052	0.8724	C	-0.03	reported: 872.4 kg/L
862	D4052	0.8724		-0.03	
902	D4052	0.8724		-0.03	
912	D4052	0.8724		-0.03	
962		----		----	
963		----		----	
994	D4052	0.8724		-0.03	
1011	D4052	0.8717	R(0.05)	-3.95	
1146	D4052	0.87239		-0.08	
1150	ISO12185	0.87234		-0.36	
1161	ISO3675	0.8728	C	2.21	first reported: 872.2 kg/L
1272	ISO12185	0.8724	C	-0.03	first reported: 872.40 kg/L
1297	D4052	0.87251	C	0.59	first reported: 8725.1 kg/L
1326	D4052	0.87236		-0.25	
1327	D4052	0.8723		-0.59	
1417	IP365	0.8726	C	1.09	first reported: 872.6 kg/L
1435	D4052	0.8719	R(0.05)	-2.83	
1456	D4052	0.8725		0.53	
1660	D7042	0.8719	R(0.05)	-2.83	
1682		----		----	
1748	D4052	0.8724	C	-0.03	first reported: 872.4 kg/L
1797		----		----	
1874		----		----	
1941	D4052	0.87238		-0.14	
1955		----	W	----	first reported: 0.8730
1957	D4052	0.8724		-0.03	
1981	D4052	0.8722	C	-1.15	first reported: 872.2 kg/L
6016		----		----	
6032	D4052	0.8720		-2.27	
6068	ISO12185	0.8724	C	-0.03	first reported: 872.4 kg/L
6074	D4052	0.87240		-0.03	
6081	D4052	0.87231	C	-0.53	first reported: 872.31 kg/L

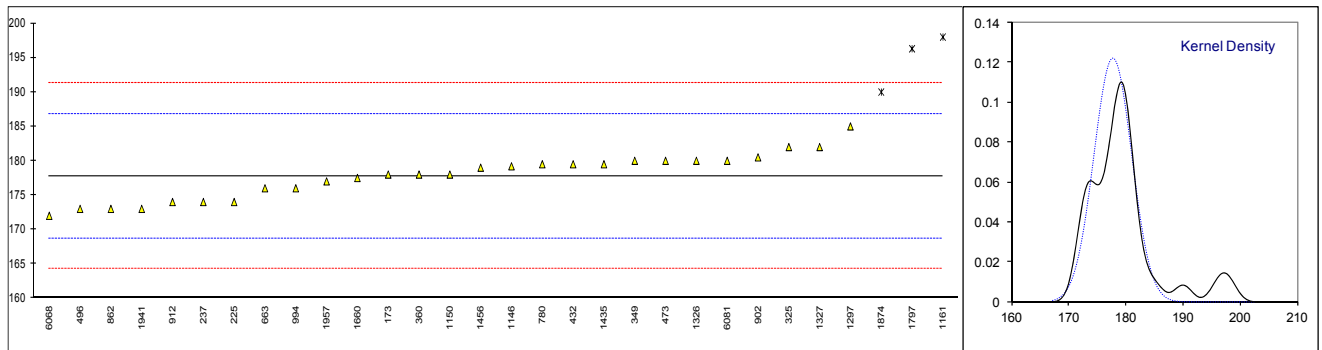
normality not OK
n 33
outliers 3
mean (n) 0.872405
st.dev. (n) 0.0001395
R(calc.) 0.000391
R(D4052:15) 0.000500



Determination of Flash Point PMcc on sample #16240; results in °C

lab	method	value	mark	z(targ)	remarks
173	D93-A	178.0		0.05	
225	D93-A	174.0		-0.84	
237	D93-A	174.0		-0.84	
255		----		----	
325	D93-A	182		0.94	
335		----		----	
349	D93-A	180		0.50	
360	D93-A	178.0		0.05	
432	D93-A	179.5		0.38	
445		----		----	
451		----		----	
473	D93-A	180.0		0.50	
496	D93-A	173.0		-1.06	
614		----		----	
663	D93-A	176.0		-0.39	
780	D93-A	179.5		0.38	
862	D93-A	173.0		-1.06	
902	D93-A	180.5		0.61	
912	D93-A	174		-0.84	
962		----		----	
963		----		----	
994	D93-A	176.0		-0.39	
1011		----		----	
1146	D93-A	179.2		0.32	
1150	ISO2719-A	178		0.05	
1161	ISO2592	198	C,R(0.01)	4.49	first reported: 203.0
1272		----		----	
1297	D93-B	185		1.60	
1326	D93-A	180.0		0.50	
1327	D93-A	182.0		0.94	
1417		----		----	
1435	D93-A	179.5		0.38	
1456	D93-A	179		0.27	
1660	D93-A	177.5		-0.06	
1682		----		----	
1748		----		----	
1797	ISO2592	196.3	C,R(0.01)	4.11	first reported: 198.3
1874	D92	190	R(0.05)	2.71	
1941	ISO2719-A	173		-1.06	
1955		----		----	
1957	D93-A	177		-0.17	
1981		----		----	
6016		----		----	
6032		----		----	
6068	ISO2719-A	172.0		-1.28	
6074	D92	----	W	----	first reported: 200
6081	D93-A	180.0		0.50	

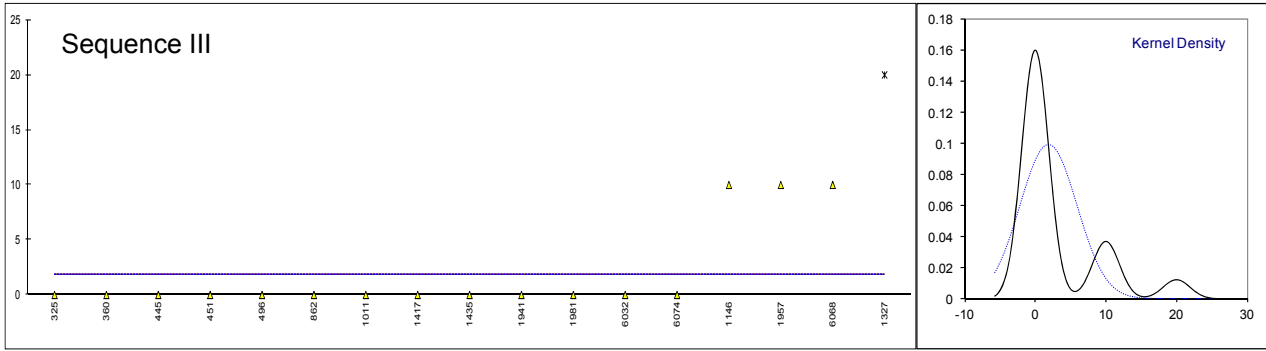
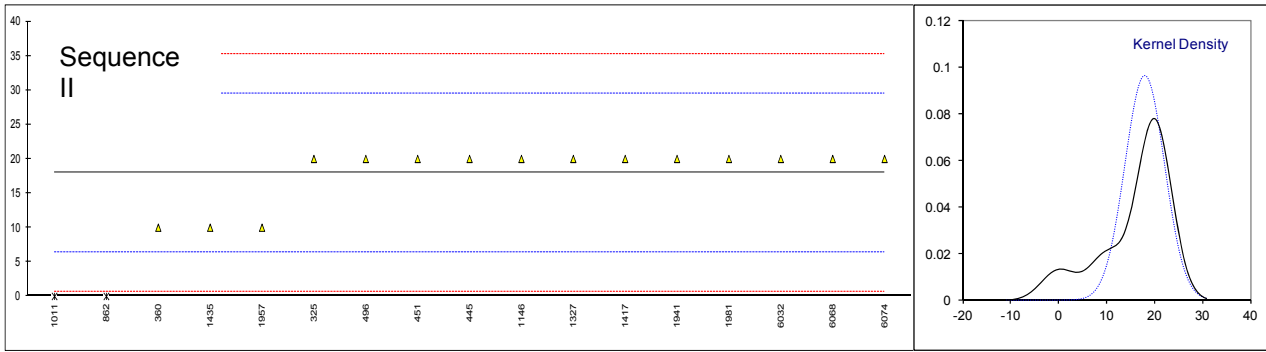
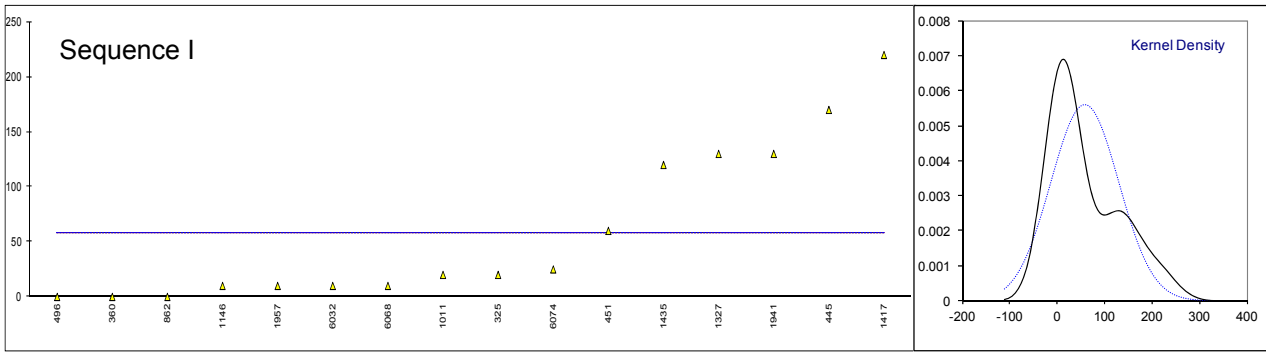
normality OK
n 27
outliers 3
mean (n) 177.77
st.dev. (n) 3.277
R(calc.) 9.18
R(D93-A:16a) 12.62



Determination of Foaming Characteristics, Foaming Tendency (at end of 5 min blowing period) on sample #16240; results in ml

lab	method	Sample	Diffuser	Seq. I	mark	z(targ)	Seq. II	mark	z(targ)	Seq. III	mark	z(targ)
173				----		----	----		----	----		----
225				----		----	----		----	----		----
237				----		----	----		----	----		----
255				----		----	----		----	----		----
325	D892	As received	Metal/SS	20		----	20		0.35	0		----
335				----		----	----		----	----		----
349				----		----	----		----	----		----
360	ISO6247	As received	Non-metal	0		----	10		-1.39	0		----
432				----		----	----		----	----		----
445	D892	Agitated	Metal/SS	170		----	20		0.35	0		----
451	D892	As received	Non-metal	60		----	20	C	0.35	0		----
473				----		----	----		----	----		----
496	D892	As received	Metal/SS	0		----	20		0.35	0		----
614				----		----	----		----	----		----
663				----		----	----		----	----		----
780				----		----	----		----	----		----
862	D892	As received	Metal/SS	0		----	0	DG(0.01)	-3.13	0		----
902				----		----	----		----	----		----
912				----		----	----		----	----		----
962				----		----	----		----	----		----
963				----		----	----		----	----		----
994				----		----	----		----	----		----
1011	D892	Agitated	Metal/SS	20		----	0	DG(0.01)	-3.13	0		----
1146	ISO6247	As received	Metal/SS	10		----	20		0.35	10		----
1150				----		----	----		----	----		----
1161				----		----	----		----	----		----
1272				----		----	----		----	----		----
1297				----		----	----		----	----		----
1326				----		----	----		----	----		----
1327	D892	As received	Non-metal	130		----	20		0.35	20	G(0.01)	----
1417	D892	As received	Metal/SS	220		----	20		0.35	0		----
1435	ISO6247	Agitated		120		----	10		-1.39	0		----
1456				----		----	----		----	----		----
1660				----		----	----		----	----		----
1682				----		----	----		----	----		----
1748				----		----	----		----	----		----
1797				----		----	----		----	----		----
1874				----		----	----		----	----		----
1941	ISO6247	As received	Metal/SS	130		----	20		0.35	0		----
1955				----		----	----		----	----		----
1957	D892	As received	Non-metal	10		----	10		-1.39	10		----
1981	D892		Metal/SS	----	W	----	20		0.35	0		----
6016				----		----	----		----	----		----
6032	D892			10		----	20		0.35	0		----
6068	ISO6247	Agitated	Metal/SS	10		----	20		0.35	10		----
6074	D892	Agitated	Non-metal	25	C	----	20		0.35	0		----
6081				----		----	----		----	----		----
	normality			suspect			OK			not OK		
	n			16			15			16		
	outliers			0			2			1		
	mean (n)			58.438			18.000			1.875		
	st.dev. (n)			71.3143			4.1404			4.0311		
	R(calc.)			199.680			11.593			11.287		
	R(D892:13e1)			(32.897)			16.120			(0.825)		

Lab 451 first reported: 60
 Lab 1981 first reported: 250
 Lab 6074 first reported: 250
 Lab 1327 possibly a false positive test result for sequence III?



Determination of Foaming Characteristics, Foaming Stability (at end of 10 min settling period) on sample #16240; results in ml

lab	method	Sample	Diffuser	Seq. I	mark	z(targ)	Seq. II	mark	z(targ)	Seq. III	mark	z(targ)
173				----		----	----		----	----		----
225				----		----	----		----	----		----
237				----		----	----		----	----		----
255				----		----	----		----	----		----
325	D892	As received	Metal/SS	0		----	0		----	0		----
335				----		----	----		----	----		----
349				----		----	----		----	----		----
360	ISO6247	As received	Non-metal	0		----	0		----	0		----
432				----		----	----		----	----		----
445	D892	Agitated	Metal/SS	0		----	0		----	0		----
451	D892	As received	Non-metal	0		----	0		----	0		----
473				----		----	----		----	----		----
496	D892	As received	Metal/SS	0		----	0		----	0		----
614				----		----	----		----	----		----
663				----		----	----		----	----		----
780				----		----	----		----	----		----
862	D892	As received	Metal/SS	0		----	0		----	0		----
902				----		----	----		----	----		----
912				----		----	----		----	----		----
962				----		----	----		----	----		----
963				----		----	----		----	----		----
994				----		----	----		----	----		----
1011	D892	Agitated	Metal/SS	0		----	20	G(0.01)	----	20	G(0.01)	----
1146	ISO6247	As received	Metal/SS	0		----	0		----	0		----
1150				----		----	----		----	----		----
1161				0		----	0		----	0		----
1272				----		----	----		----	----		----
1297				----		----	----		----	----		----
1326				----		----	----		----	----		----
1327	D892	As received	Non-metal	0		----	0		----	0		----
1417	D892	As received	Metal/SS	0		----	0		----	0		----
1435	ISO6247	Agitated		0		----	0		----	0		----
1456				----		----	----		----	----		----
1660				----		----	----		----	----		----
1682				----		----	----		----	----		----
1748				----		----	----		----	----		----
1797				----		----	----		----	----		----
1874				----		----	----		----	----		----
1941	ISO6247	As received	Metal/SS	0		----	0		----	0		----
1955				----		----	----		----	----		----
1957	D892	As received	Non-metal	0		----	0		----	0		----
1981	D892		Metal/SS	----	W	----	0		----	0		----
6016				----		----	----		----	----		----
6032	D892			0		----	0		----	0		----
6068	ISO6247	Agitated	Metal/SS	0		----	0		----	0		----
6074	D892	Agitated	Non-metal	0		----	0		----	0		----
6081				----		----	----		----	----		----
	normality			n.a.			n.a.			n.a.		
	n			17			17			17		
	outliers			0			1			1		
	mean (n)			0			0			0		
	st.dev. (n)			0			0			0		
	R(calc.)			0			0			0		
	R(D892:13e1)			(0)			(0)			(0)		

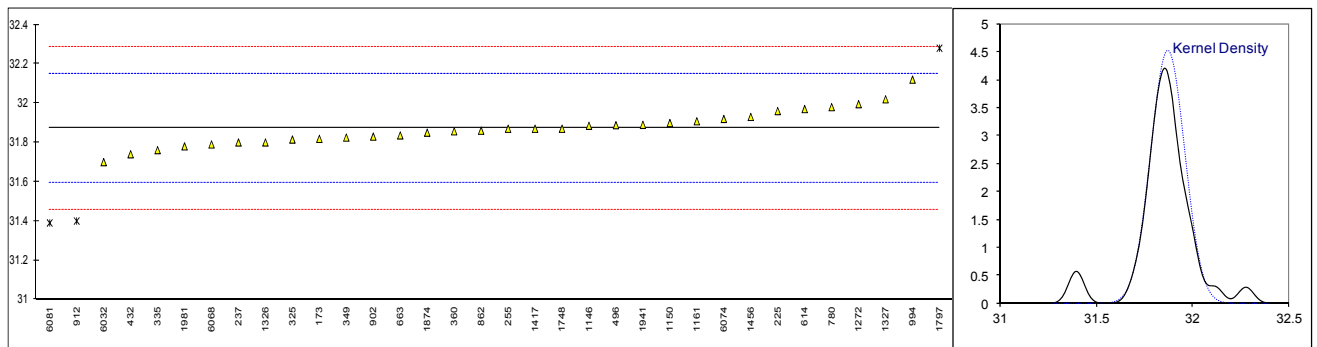
Lab 1011 possibly a false positive test result for sequences II and III?

Lab 1981 first reported: 0

Determination of Kinematic Viscosity at 40°C on sample #16240; results in mm²/s

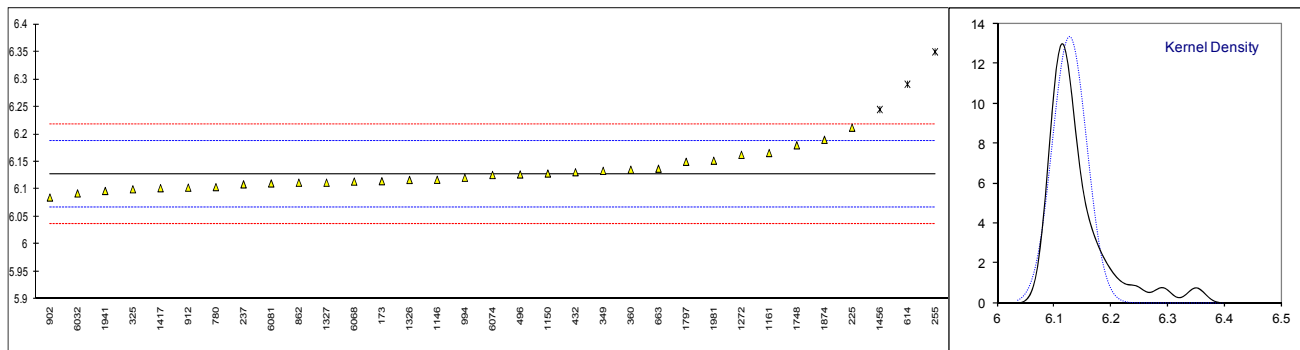
lab	method	value	mark	z(targ)	remarks
173	D445	31.8186		-0.39	
225	D445	31.96		0.63	
237	D445	31.80		-0.52	
255	D7279corr	31.87		-0.02	
325	D445	31.815		-0.41	
335	D445	31.761		-0.80	
349	D445	31.825		-0.34	
360	ISO3104	31.857		-0.11	
432	D445	31.74		-0.95	
445		----		----	
451		----		----	
473		----		----	
496	D445	31.888		0.11	
614	D445	31.97		0.70	
663	D445	31.836		-0.26	
780	D445	31.98		0.78	
862	D445	31.86		-0.09	
902	D445	31.83		-0.30	
912	D445	31.40	R(0.01)	-3.40	
962		----		----	
963		----		----	
994	D445	32.12		1.78	
1011		----		----	
1146	D445	31.885		0.09	
1150	ISO3104	31.8990		0.19	
1161	ISO3104	31.908		0.26	
1272	ISO3104	31.995		0.88	
1297		----		----	
1326	D445	31.80		-0.52	
1327	D445	32.02		1.06	
1417	D445	31.87		-0.02	
1435		----		----	
1456	D445	31.93		0.42	
1660		----		----	
1682		----		----	
1748	D445	31.87		-0.02	
1797	ISO3104	32.28	R(0.01)	2.94	
1874	D445	31.85		-0.16	
1941	ISO3104	31.89		0.13	
1955		----		----	
1957		----		----	
1981	D445	31.78		-0.66	
6016		----		----	
6032	D7279	31.70		-1.24	
6068	ISO3104	31.79		-0.59	
6074	D445	31.92		0.34	
6081	D445	31.39	C,R(0.01)	-3.47	first reported: 31.384696

normality OK
n 31
outliers 3
mean (n) 31.8722
st.dev. (n) 0.08815
R(calc.) 0.2468
R(D445:15a) 0.3888



Determination of Kinematic Viscosity at 100°C on sample #16240; results in mm²/s

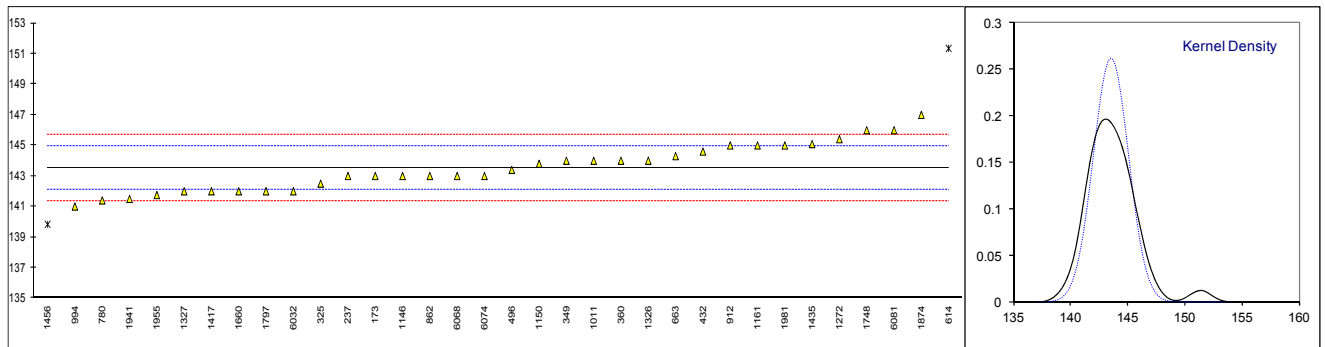
lab	method	value	mark	z(targ)	remarks
173	D445	6.1147		-0.44	
225	D445	6.212		2.78	
237	D445	6.109		-0.63	
255	D7279corr	6.35	R(0.01)	7.35	
325	D445	6.100		-0.93	
335		----		----	
349	D445	6.1335		0.18	
360	ISO3104	6.1356		0.25	
432	D445	6.131		0.10	
445		----		----	
451		----		----	
473		----		----	
496	D445	6.1270		-0.04	
614	D445	6.291	R(0.01)	5.39	
663	D445	6.1374		0.31	
780	D445	6.104		-0.80	
862	D445	6.112		-0.53	
902	D445	6.085		-1.43	
912	D445	6.103		-0.83	
962		----		----	
963		----		----	
994	D445	6.121		-0.24	
1011		----		----	
1146	D445	6.1173		-0.36	
1150	ISO3104	6.1287		0.02	
1161	ISO3104	6.166	C	1.25	first reported: 6.237
1272	ISO3104	6.1627		1.15	
1297		----		----	
1326	D445	6.117		-0.37	
1327	D445	6.112		-0.53	
1417	D445	6.102		-0.86	
1435		----		----	
1456	D445	6.245	R(0.05)	3.87	
1660		----		----	
1682		----		----	
1748	D445	6.18	C	1.72	first reported: 6.222
1797	ISO3104	6.150		0.73	
1874	D445	6.19		2.05	
1941	ISO3104	6.097		-1.03	
1955		----		----	
1957		----		----	
1981	D445	6.152		0.79	
6016		----		----	
6032	D7279	6.0925		-1.18	
6068	ISO3104	6.114		-0.47	
6074	D445	6.126		-0.07	
6081	D445	6.11067		-0.58	
normality		not OK			
n		30			
outliers		3			
mean (n)		6.1281			
st.dev. (n)		0.02998			
R(calc.)		0.0839			
R(D445:15a)		0.0846			



Determination of Viscosity Index on sample #16240; unit less results

lab	method	value	mark	z(targ)	remarks
173	D2270	143		-0.73	
225		----		----	
237	D2270	143		-0.73	
255		----		----	
325	D2270	142.5		-1.43	
335		----		----	
349	D2270	144		0.67	
360	ISO2909	144.0		0.67	
432	D2270	144.6		1.51	
445		----		----	
451		----		----	
473		----		----	
496	D2270	143.4		-0.17	
614	D2270	151.352	R(0.01)	10.96	
663	D2270	144.3		1.09	
780	D2270	141.4		-2.97	
862	D2270	143		-0.73	
902		----		----	
912	D2270	145		2.07	
962		----		----	
963		----		----	
994	D2270	141		-3.53	
1011	D2270	144		0.67	
1146	D2270	143		-0.73	
1150	ISO2909	143.8		0.39	
1161	D2270	145	C	2.07	first reported: 149
1272	ISO2909	145.41		2.64	
1297		----		----	
1326	D2270	144		0.67	
1327	D2270	142		-2.13	
1417	D2270	142		-2.13	
1435	D2270	145.09		2.19	
1456	D2270	139.8344066	ex, E	-5.16	iis calculated: 150
1660	D2270	142		-2.13	
1682		----		----	
1748	D2270	146	C	3.47	first reported: 148.48
1797	ISO2909	142		-2.13	
1874	D2270	147		4.87	
1941	ISO2909	141.5		-2.83	
1955	D7042	141.75		-2.48	
1957		----		----	
1981	D2270	145		2.07	
6016		----		----	
6032	D2270	142		-2.13	
6068	ISO2909	143		-0.73	
6074	D2270	143		-0.73	
6081	D2270	146		3.47	

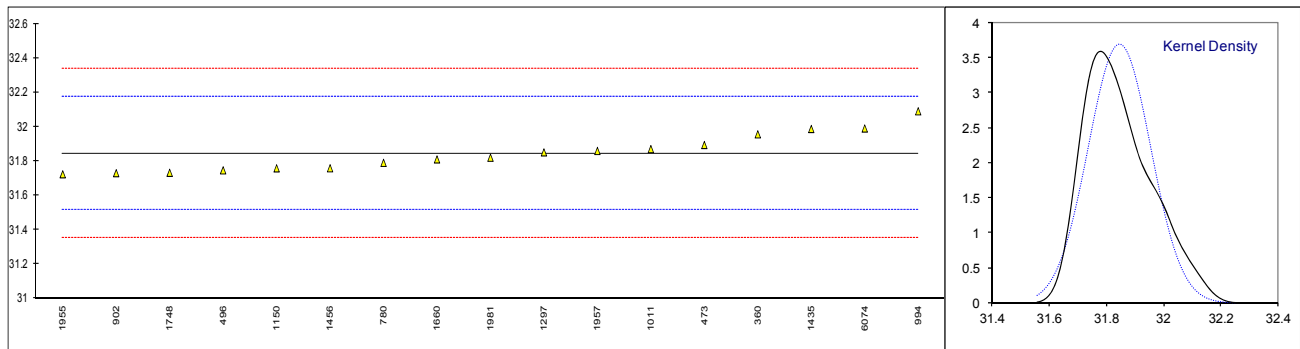
normality OK
n 32
outliers 1+1ex
mean (n) 143.52
st.dev. (n) 1.525
R(calc.) 4.27
R(D2270:10) 2.00



Determination of Viscosity Stabinger at 40°C on sample #16240; results in mm²/s

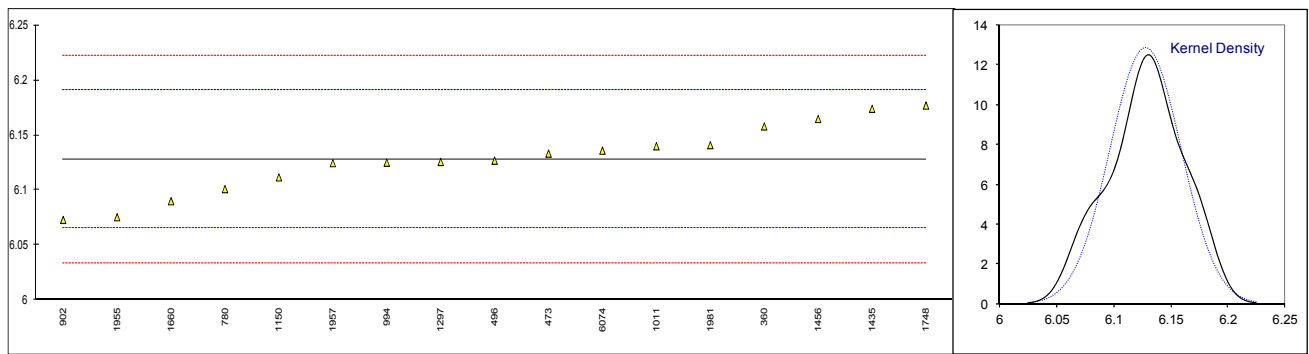
lab	method	value	mark	z(targ)	remarks
173		----		----	
225		----		----	
237		----		----	
255		----		----	
325		----		----	
335		----		----	
349		----		----	
360	D7042	31.956		0.67	
432		----		----	
445		----		----	
451		----		----	
473	D7042	31.894		0.30	
496	D7042	31.7465		-0.60	
614		----		----	
663		----		----	
780	D7042	31.79		-0.33	
862		----		----	
902	D7042	31.73		-0.70	
912		----		----	
962		----		----	
963		----		----	
994	D7042	32.09		1.49	
1011	D7042	31.87		0.15	
1146		----		----	
1150	D7042	31.7581		-0.53	
1161		----		----	
1272		----		----	
1297	D7042	31.851		0.04	
1326		----		----	
1327		----		----	
1417		----		----	
1435	D7042	31.987		0.86	
1456	D7042	31.7585		-0.53	
1660	D7042	31.81		-0.21	
1682		----		----	
1748	D7042	31.732		-0.69	
1797		----		----	
1874		----		----	
1941		----		----	
1955	D7042	31.7235		-0.74	
1957	D7042	31.859		0.08	
1981	D7042	31.82		-0.15	
6016		----		----	
6032		----		----	
6068		----		----	
6074	D7042	31.99		0.88	
6081		----		----	

normality OK
n 17
outliers 0
mean (n) 31.8450
st.dev. (n) 0.10816
R(calc.) 0.3028
R(D7042:16e3) 0.4614



Determination of Viscosity Stabinger at 100°C on sample #16240; results in mm²/s

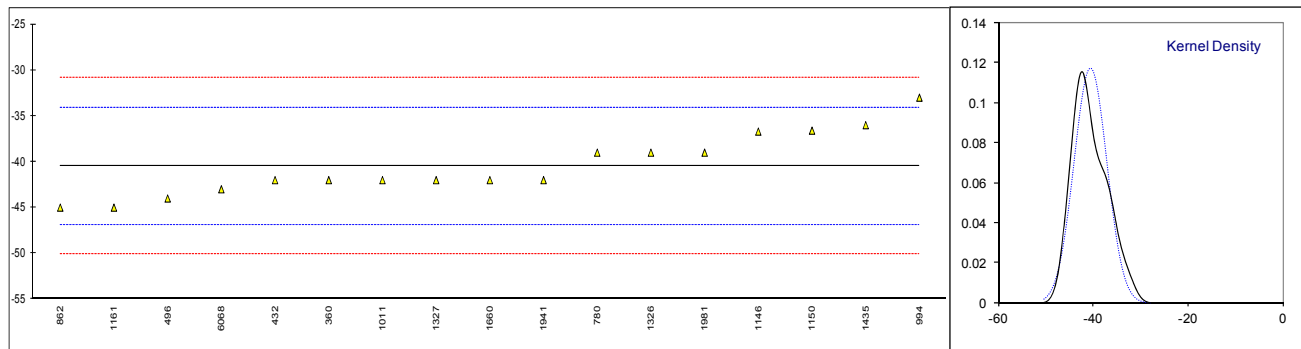
lab	method	value	mark	z(targ)	remarks
173		----		----	
225		----		----	
237		----		----	
255		----		----	
325		----		----	
335		----		----	
349		----		----	
360	D7042	6.1580		0.95	
432		----		----	
445		----		----	
451		----		----	
473	D7042	6.1333		0.17	
496	D7042	6.1269		-0.04	
614		----		----	
663		----		----	
780	D7042	6.101		-0.86	
862		----		----	
902	D7042	6.073		-1.75	
912		----		----	
962		----		----	
963		----		----	
994	D7042	6.125		-0.10	
1011	D7042	6.140		0.38	
1146		----		----	
1150	D7042	6.1117		-0.52	
1161		----		----	
1272		----		----	
1297	D7042	6.1257		-0.08	
1326		----		----	
1327		----		----	
1417		----		----	
1435	D7042	6.174		1.46	
1456	D7042	6.1648		1.17	
1660	D7042	6.09		-1.21	
1682		----		----	
1748	D7042	6.177		1.55	
1797		----		----	
1874		----		----	
1941		----		----	
1955	D7042	6.0754		-1.67	
1957	D7042	6.1246		-0.11	
1981		6.141		0.41	
6016		----		----	
6032		----		----	
6068		----		----	
6074	D7042	6.136		0.25	
6081		----		----	
normality		OK			
n		17			
outliers		0			
mean (n)		6.12808			
st.dev. (n)		0.031058			
R(calc.)		0.08696			
R(D7042:16e3)		0.08820			



Determination of Pour Point, manual on sample #16240; results in °C

lab	method	value	mark	z(targ)	remarks
173		----		----	
225		----		----	
237	D97	<-24		----	
255		----		----	
325		----		----	
335		----		----	
349		----		----	
360	D97	-42		-0.47	
432	D97	-42		-0.47	
445		----		----	
451		----		----	
473		----		----	
496	D97	-44		-1.09	
614		----		----	
663	D97	<-39		----	
780	D97	-39		0.46	
862	D97	-45		-1.40	
902		----		----	
912		----		----	
962		----		----	
963		----		----	
994	D97	-33		2.33	
1011	D97	-42		-0.47	
1146	ISO3016	-36.7		1.18	
1150	ISO3016	-36.6		1.21	
1161	D97	-45		-1.40	
1272		----		----	
1297		----		----	
1326	D97	-39		0.46	
1327	D97	-42		-0.47	
1417		----		----	
1435	ISO3016	-36		1.40	
1456		----		----	
1660	D97	-42		-0.47	
1682		----		----	
1748		----		----	
1797		----		----	
1874		----		----	
1941	ISO3016	-42		-0.47	
1955		----		----	
1957		----		----	
1981	D97	-39		0.46	
6016		----		----	
6032		----		----	
6068	ISO3016	-43		-0.78	
6074		----		----	
6081		----		----	

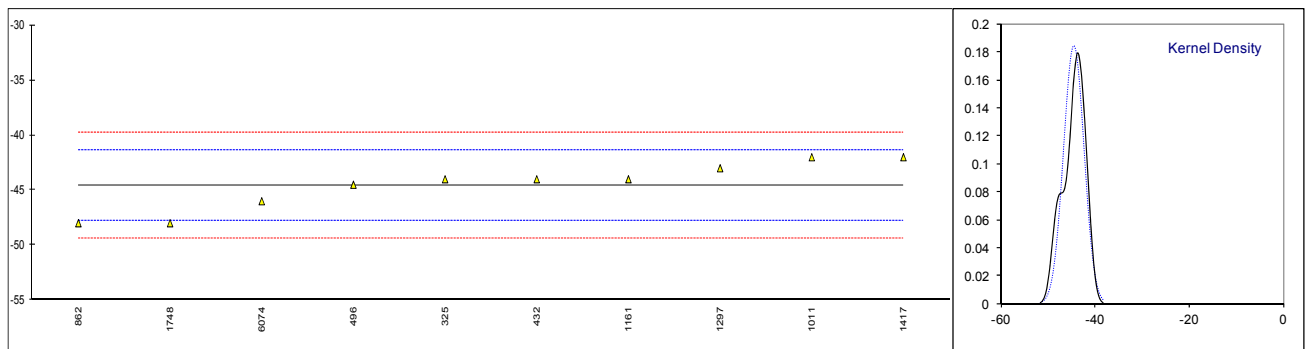
normality OK
n 17
outliers 0
mean (n) -40.49
st.dev. (n) 3.404
R(calc.) 9.53
R(D97:16) 9.00



Determination of Pour Point, automated, 1°C interval on sample #16240; results in °C

lab	method	value	mark	z(targ)	remarks
173		----		----	
225		----		----	
237		----		----	
255		----		----	
325	D5950	-44		0.34	
335		----		----	
349		----		----	
360		----		----	
432	D5950	-44		0.34	
445		----		----	
451		----		----	
473		----		----	
496		-44.5		0.03	
614		----		----	
663		----		----	
780		----		----	
862	D5950	-48		-2.15	
902		----		----	
912		----		----	
962		----		----	
963		----		----	
994		----		----	
1011	D6892	-42		1.59	
1146		----		----	
1150		----		----	
1161	D6749	-44		0.34	
1272		----		----	
1297	D5950	-43.0		0.96	
1326		----		----	
1327		----		----	
1417	D5950	-42		1.59	
1435		----		----	
1456		----		----	
1660		----		----	
1682		----		----	
1748	D5950	-48		-2.15	
1797		----		----	
1874		----		----	
1941		----		----	
1955		----		----	
1957		----		----	
1981		----		----	
6016		----		----	
6032		----		----	
6068		----		----	
6074	D5949	-46		-0.90	
6081		----		----	

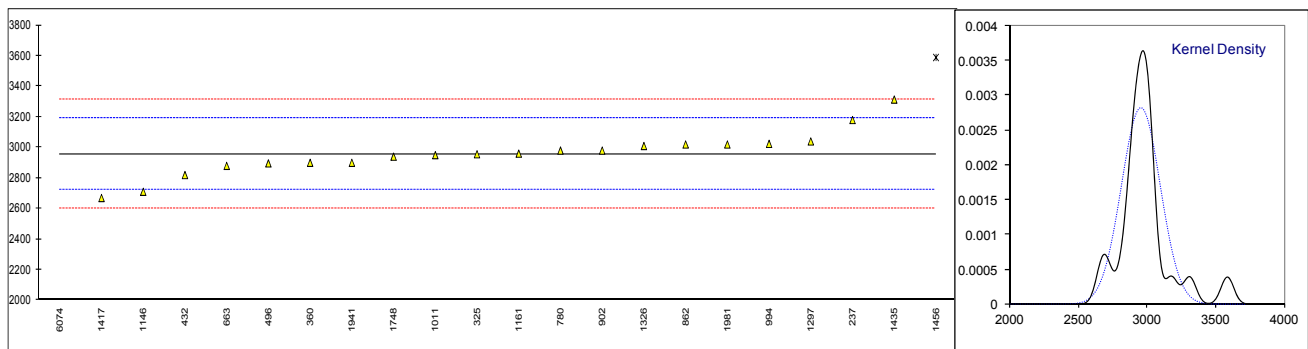
normality OK
n 10
outliers 0
mean (n) -44.55
st.dev. (n) 2.166
R(calc.) 6.06
R(D5950:14) 4.50



Determination of Sulphur on sample #16240; results in mg/kg

lab	method	value	mark	z(targ)	remarks
173		----		----	
225		----		----	
237	D4294	3180		1.88	
255		----		----	
325	D5185corr.	2956		-0.01	
335		----		----	
349		----		----	
360	ISO8754	2900		-0.49	
432	D4951	2820		-1.16	
445		----		----	
451		----		----	
473		----		----	
496	D2622	2896		-0.52	
614		----		----	
663	D5453	2880		-0.65	
780	D4294	2980		0.19	
862	D2622	3020		0.53	
902	D4294	2980		0.19	
912		----		----	
962		----		----	
963		----		----	
994	D4294	3024		0.56	
1011	D6481	2950		-0.06	
1146	D4294	2710		-2.09	
1150		----		----	
1161	ISO8754	2960		0.02	
1272		----		----	
1297	D4294	3040		0.70	
1326	D4294	3010		0.44	
1327		----		----	
1417	IP336	2669.5		-2.43	
1435	D5185	3314		3.01	
1456	D5185	3589.5	R(0.01)	5.34	
1660		----		----	
1682		----		----	
1748	D6481	2940		-0.15	
1797		----		----	
1874		----		----	
1941	ISO8754	2900	C	-0.49	first reported: 2465
1955		----		----	
1957		----		----	
1981	D4294	3020		0.53	
6016		----		----	
6032		----		----	
6068		----		----	
6074	D2622	1000	C,R(0.01)	-16.54	first reported: 0.1 mg/kg
6081		----		----	

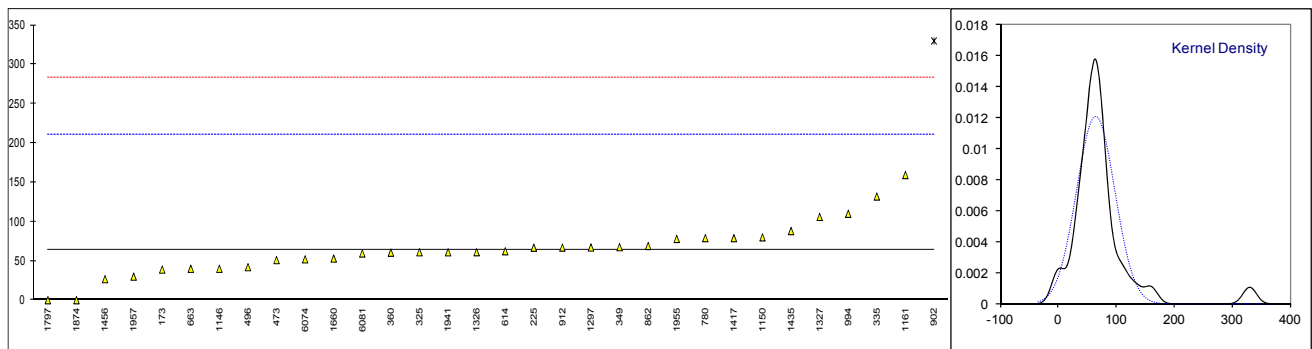
normality suspect
n 20
outliers 2
mean (n) 2957.48
st.dev. (n) 141.289
R(calc.) 395.61
R(D4294:16e1) 331.32



Determination of Water Content by KF on sample #16240; results in mg/kg

lab	method	value	mark	z(targ)	remarks
173	D6304-C	39		-0.34	
225	D6304-A	66.84		0.04	
237		----		----	
255		----		----	
325	D6304-C	61		-0.04	
335	D6304-A	132		0.93	
349	D6304-A	67.5		0.05	
360	D6304-A	60.5		-0.05	
432		----		----	
445		----		----	
451		----		----	
473	D6304-C	51		-0.18	
496	D6304-C	42		-0.30	
614	D6304-C	62.3		-0.02	
663	D6304-C	40		-0.33	
780	D6304-A	79		0.20	
862	D6304-C	69		0.07	
902	D6304-A	330.0	C,R(0.01)	3.63	first reported: 360.91
912	D6304-C	67		0.04	
962		----		----	
963		----		----	
994	D6304-A	110		0.63	
1011		----		----	
1146	D6304-C	40		-0.33	
1150	ISO12937	80		0.22	
1161	D6304-A	159.334		1.30	
1272		----		----	
1297	D6304-A	67.1		0.04	
1326	D6304-A	61.1		-0.04	
1327	D6304-C	106		0.57	
1417	D6304-A	79		0.20	
1435	D1744	88		0.33	
1456	D6304-A	26.74		-0.51	
1660	IEC60814	53		-0.15	
1682		----		----	
1748		----		----	
1797	D95	0		-0.88	
1874	E2412	0		-0.88	
1941	D6304-C	61		-0.04	
1955	D6304-A	78		0.19	
1957	D6304-C	30		-0.47	
1981		----		----	
6016		----		----	
6032		----		----	
6068		----		----	
6074	D6304-A	52		-0.17	
6081	D6304-A	59.4800		-0.06	

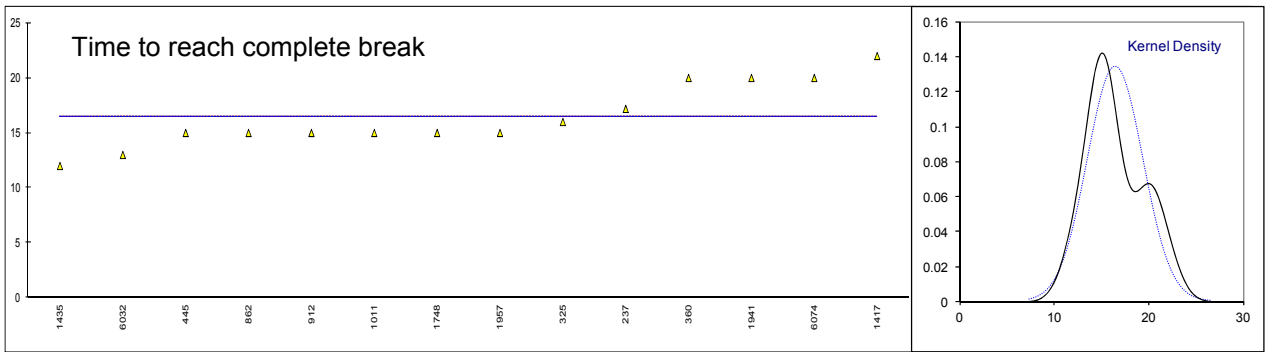
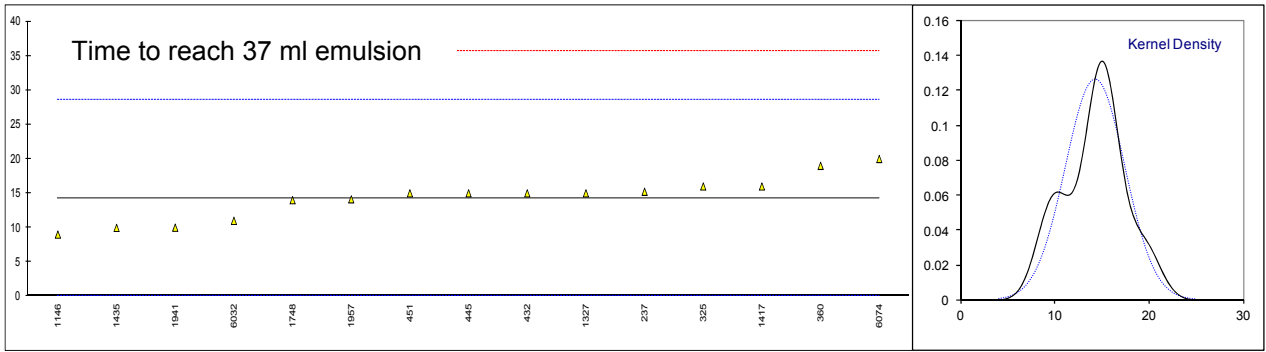
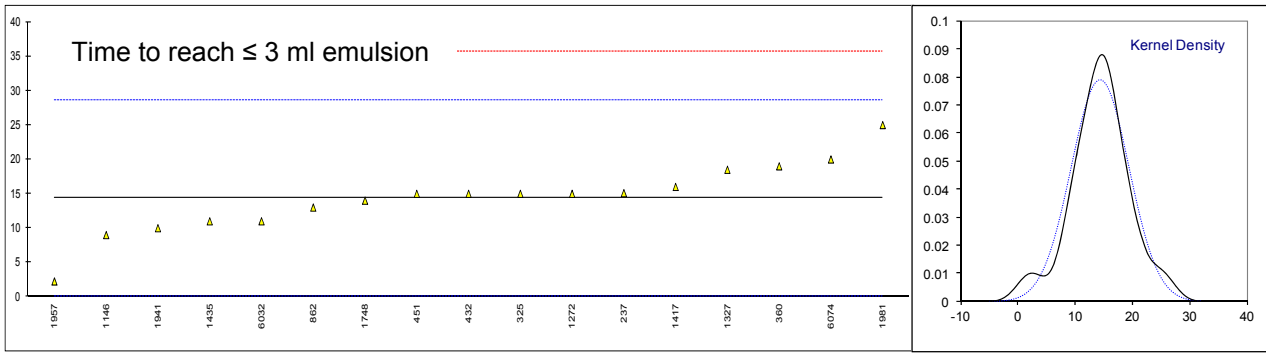
normality suspect
n 31
outliers 1
mean (n) 64.126
st.dev. (n) 32.9784
R(calc.) 92.340
R(D6304:16e1) 205.065



Determination of Water Separability at 54 °C, distilled water on sample #16240; results in min.

lab	method	≤3 ml emul.	mark	z(targ)	37 ml water	mark	z(targ)	compl. break	mark	z(targ)	aborted
173		----		----	----		----	----		----	
225		----		----	----		----	----		----	
237		15.10		0.11	15.23		0.13	17.19		----	NO
255		----		----	----		----	----		----	
325	D1401	15		0.09	16		0.24	16		----	NO
335		----		----	----		----	----		----	
349		----		----	----		----	----		----	
360	ISO6614	19		0.65	19		0.66	20		----	NO
432	D1401	15		0.09	15		0.10	>30		----	YES
445	D1401	----		----	15		0.10	15		----	
451		15		0.09	15		0.10	----		----	NO
473		----		----	----		----	----		----	
496		----		----	----		----	----		----	
614		----		----	----		----	----		----	
663		----		----	----		----	----		----	
780		----		----	----		----	----		----	
862	D1401	13		-0.19	----		----	15		----	YES *)
902		----		----	----		----	----		----	
912		----		----	----		----	15		----	NO
962		----		----	----		----	----		----	
963		----		----	----		----	----		----	
994		----		----	----		----	----		----	
1011	D1401	----		----	----		----	15		----	
1146		9		-0.75	9		-0.74	----		----	NO
1150		----		----	----		----	----		----	
1161		----		----	----		----	----		----	
1272	ISO6614	15		0.09	----		----	----		----	NO
1297		----		----	----		----	----		----	
1326		----		----	----		----	----		----	
1327	D1401	18.5		0.58	15.0		0.10	----		----	YES
1417	D1401	16		0.23	16		0.24	22		----	NO
1435	ISO6614	11		-0.47	9.97		-0.60	12.00		----	NO
1456		----		----	----		----	----		----	
1660		----		----	----		----	----		----	
1682		----		----	----		----	----		----	
1748	D1401	14		-0.05	14		-0.04	15		----	YES *)
1797		----		----	----		----	----		----	
1874		----		----	----		----	----		----	
1941	D1401	10		-0.61	10		-0.60	20		----	NO
1955		----		----	----		----	----		----	
1957	D1401	2.25		-1.69	14.13		-0.02	15		----	NO
1981		25		1.49	----		----	----		----	
6016		----		----	----		----	----		----	
6032	D1401	11		-0.47	11		-0.46	13		----	NO
6068		----		----	----		----	----		----	
6074	D1401	20		0.79	20		0.80	20		----	NO
6081		----		----	----		----	----		----	
normality		suspect			OK			OK			
n		17			15			14			
outliers		0			0			0			
mean (n)		14.34			14.29			16.44			
st.dev. (n)		5.047			3.157			2.957			
R(calc.)		14.13			8.84			8.28			
R(D1401:12e1)		20.00			20.00			n.a.			

*) Lab 862 and 1748 reported both that the test had been aborted but also a complete break before 30 min.

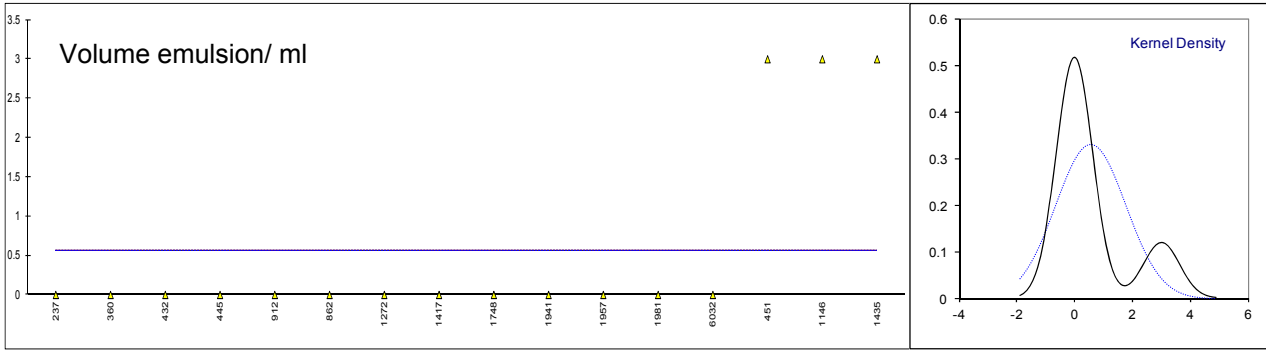
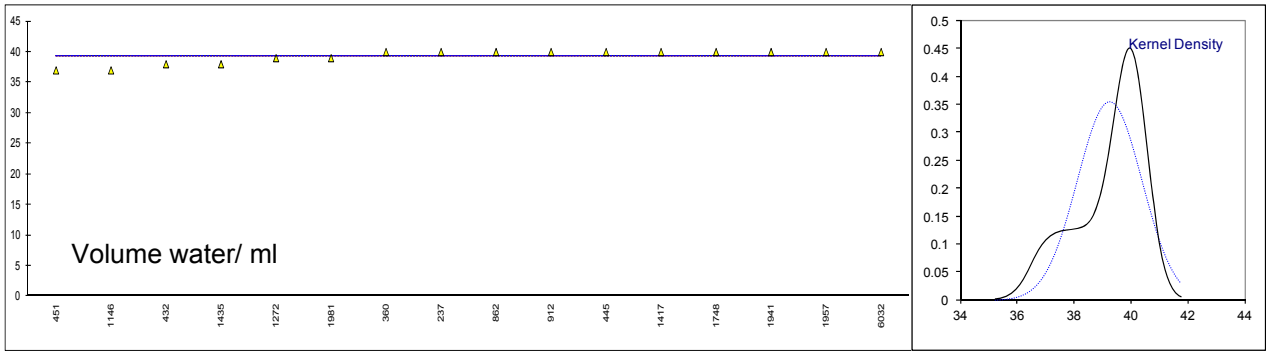
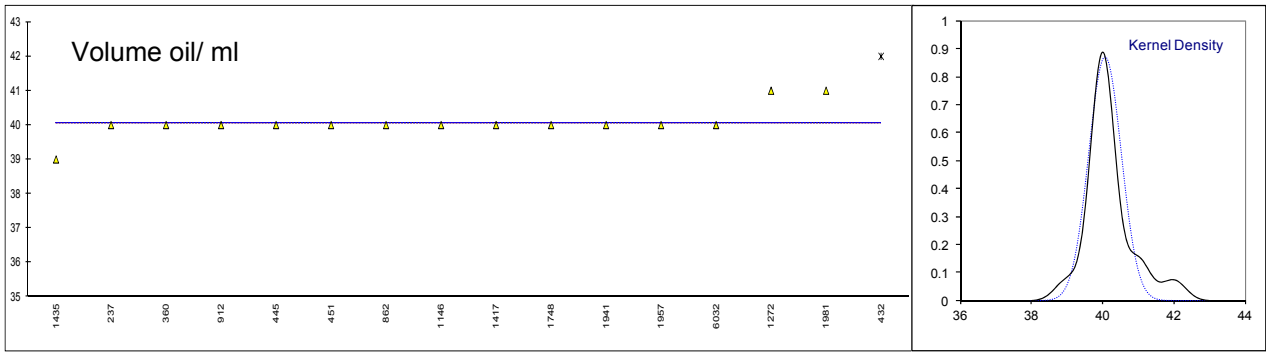


Determination of Water Separability at 54 °C on sample #16240; results in ml.

--- Continued ---

lab	method	oil	mark	z(targ)	water	mark	z(targ)	emulsion	mark	z(targ)	aborted
173		----		----	----		----	----		----	
225		----		----	----		----	----		----	
237		40		----	40		----	0		----	NO
255		----		----	----		----	----		----	
325	D1401	----		----	----		----	----		----	NO
335		----		----	----		----	----		----	
349		----		----	----		----	----		----	
360	ISO6614	40		----	40		----	0		----	NO
432	D1401	42	G(0.05)	----	38		----	0		----	YES
445	D1401	40		----	40		----	0		----	
451		40		----	37		----	3		----	NO
473		----		----	----		----	----		----	
496		----		----	----		----	----		----	
614		----		----	----		----	----		----	
663		----		----	----		----	----		----	
780		----		----	----		----	----		----	
862	D1401	40		----	40		----	0		----	YES
902		----		----	----		----	----		----	
912		40		----	40		----	0		----	NO
962		----		----	----		----	----		----	
963		----		----	----		----	----		----	
994		----		----	----		----	----		----	
1011	D1401	----		----	----		----	----		----	
1146		40		----	37		----	3		----	NO
1150		----		----	----		----	----		----	
1161		----		----	----		----	----		----	
1272	ISO6614	41.0		----	39.0		----	0.0		----	NO
1297		----		----	----		----	----		----	
1326		----		----	----		----	----		----	
1327	D1401	----		----	----		----	----		----	YES
1417	D1401	40		----	40		----	0		----	NO
1435	ISO6614	39		----	38		----	3		----	NO
1456		----		----	----		----	----		----	
1660		----		----	----		----	----		----	
1682		----		----	----		----	----		----	
1748	D1401	40		----	40		----	0		----	YES
1797		----		----	----		----	----		----	
1874		----		----	----		----	----		----	
1941	D1401	40		----	40		----	0		----	NO
1955		----		----	----		----	----		----	
1957	D1401	40		----	40		----	0		----	NO
1981		41		----	39		----	0		----	
6016		----		----	----		----	----		----	
6032	D1401	40		----	40		----	0		----	NO
6068		----		----	----		----	----		----	
6074	D1401	----		----	----		----	----		----	NO
6081		----		----	----		----	----		----	
normality		not OK			OK			not OK			
n		15			16			16			
outliers		1			0			0			
mean (n)		40.07			39.25			0.563			
st.dev. (n)		0.458			1.125			1.2093			
R(calc.)		1.28			3.15			3.386			
R(target)		n.a.			n.a.			n.a.			

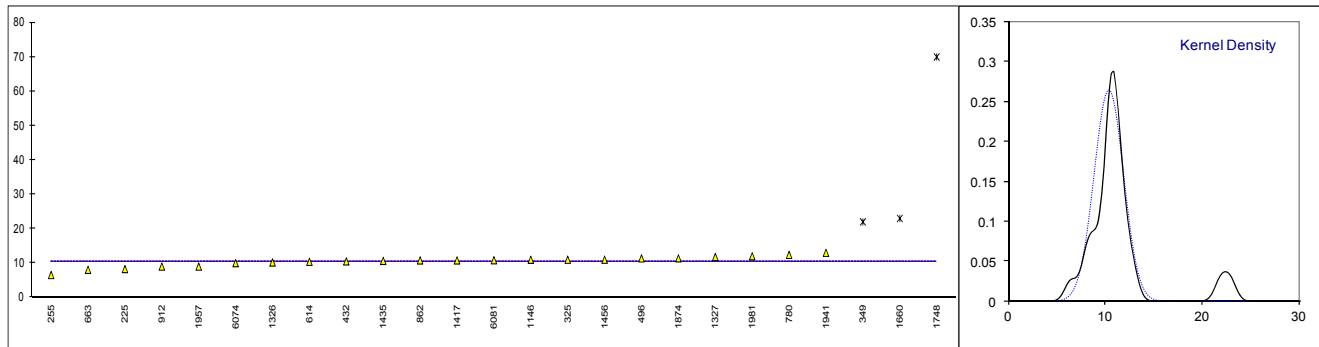
Lab 432 possibly a false positive test result for oil phase?



Determination of Calcium (Ca) on sample #16240; results in mg/kg.

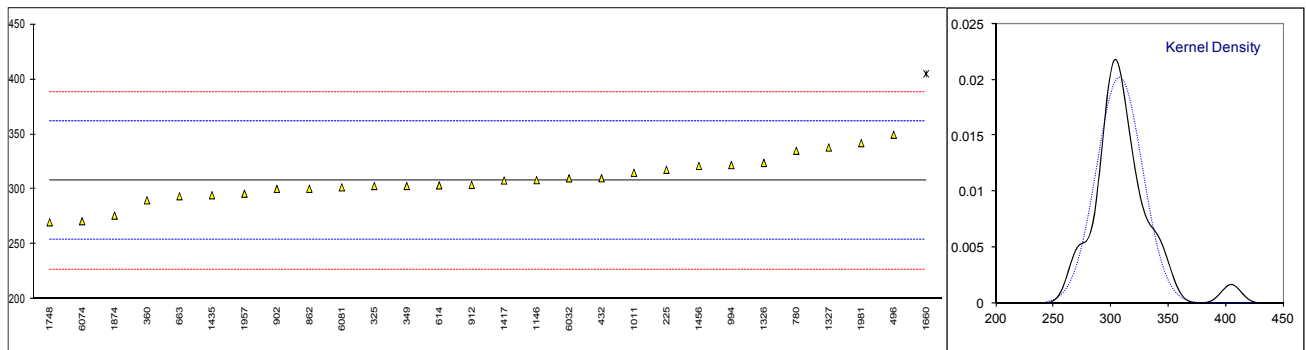
lab	method	value	mark	z(targ)	remarks
173		----		----	
225	D6595	8.282		----	
237		----		----	
255	INH-01	6.54		----	
325	D5185	11		----	
335		----		----	
349	D5185	22	C,R(0.01)	----	first reported: 35; possibly a false positive test result?
360	D5185	< 40		----	
432	D4951	10.52		----	
445		----		----	
451		----		----	
473		----		----	
496	D5185	11.39		----	
614	D5185	10.4		----	
663	D5185	8.06		----	
780	D5185	12.4		----	
862	D5185	10.8		----	
902	D5185	<40		----	
912	D5185	9		----	
962		----		----	
963		----		----	
994	D5185	<40		----	
1011		----		----	
1146	In house	10.99		----	
1150		----		----	
1161		----		----	
1272		----		----	
1297		----		----	
1326		10.2		----	
1327	D5185	11.8		----	
1417	D5185	10.8		----	
1435	D5185	10.66		----	
1456	D5185	11.0		----	
1660	D4951	23	R(0.01)	----	possibly a false positive test result?
1682		----		----	
1748	D6481	70	C,R(0.01)	----	first reported: 40; possibly a false positive test result?
1797		----		----	
1874	D6595	11.40		----	
1941	D4628	13	C	----	first reported: 16
1955		----		----	
1957	D5185	9		----	
1981	D4951	12		----	
6016		----		----	
6032		----		----	
6068		----		----	
6074	D6595	10		----	
6081		10.85		----	

normality suspect Application range: 40-9000 mg/kg
n 22
outliers 3
mean (n) 10.459
st.dev. (n) 1.5093
R(calc.) 4.226
R(D5185:13e1) (0.317)



Determination of Phosphorus (P) on sample #16240; results in mg/kg.

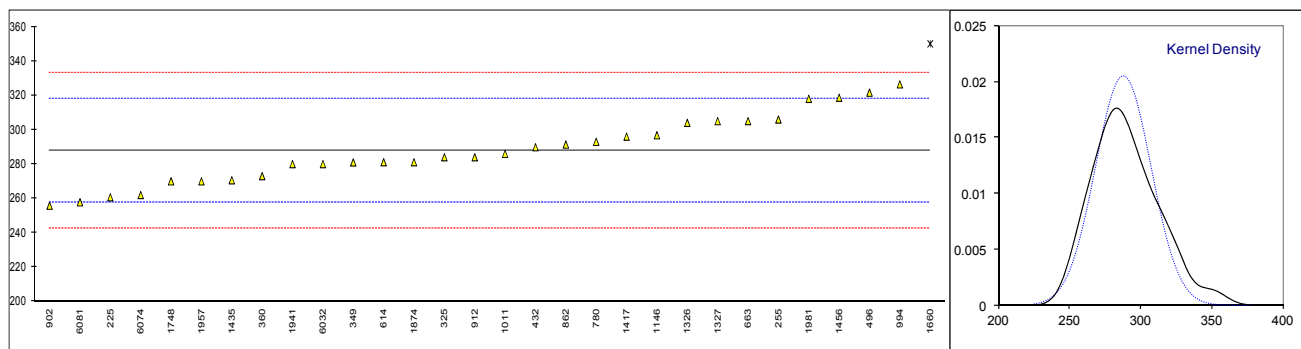
lab	method	value	mark	z(targ)	remarks
173		----		----	
225	D6595	317.70		0.37	
237		----		----	
255		----		----	
325	D5185	303		-0.18	
335		----		----	
349	D5185	303		-0.18	
360	D5185	290		-0.66	
432	D4951	310.1		0.09	
445		----		----	
451		----		----	
473		----		----	
496	D5185	349.55		1.55	
614	D5185	303.6		-0.15	
663	D5185	293.67		-0.52	
780	D5185	335		1.01	
862	D5185	300.5		-0.27	
902	D5185	300.31		-0.28	
912	D5185	304		-0.14	
962		----		----	
963		----		----	
994	D5185	322.0		0.53	
1011	D5185	315		0.27	
1146	In house	308.3		0.02	
1150		----		----	
1161		----		----	
1272		----		----	
1297		----		----	
1326		324		0.60	
1327	D5185	338		1.12	
1417	D5185	308		0.01	
1435	D5185	294.6		-0.49	
1456	D5185	321.25		0.50	
1660	D4951	405	R(0.01)	3.61	
1682		----		----	
1748	D6481	270		-1.40	
1797		----		----	
1874	D6595	276.10		-1.17	
1941		----		----	
1955		----		----	
1957	D5185	296		-0.44	
1981	D4951	342		1.27	
6016		----		----	
6032	D6595	310		0.08	
6068		----		----	
6074	D6595	271		-1.36	
6081		301.8		-0.22	
normality		OK			
n		27			
outliers		1			
mean (n)		307.721			
st.dev. (n)		19.8176			
R(calc.)		55.489			
R(D5185:13e1)		75.431			



Determination of Zinc (Zn) on sample #16240; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
173		----		----	
225	D5185	260.72		-1.81	
237		----		----	
255	INH-01	305.97		1.20	
325	D5185	284		-0.26	
335		----		----	
349	D5185	281		-0.46	
360	D5185	273		-0.99	
432	D4951	289.8		0.13	
445		----		----	
451		----		----	
473		----		----	
496	D5185	321.60		2.24	
614	D5185	281.1		-0.45	
663	D5185	305.04		1.14	
780	D5185	293		0.34	
862	D5185	291.4		0.23	
902	D5185	255.8		-2.13	
912	D5185	284		-0.26	
962		----		----	
963		----		----	
994	D5185	326.4		2.56	
1011	D5185	286		-0.13	
1146	In house	296.8		0.59	
1150		----		----	
1161		----		----	
1272		----		----	
1297		----		----	
1326		304		1.07	
1327	D5185	305		1.14	
1417	D5185	296		0.54	
1435	D5185	270.6		-1.15	
1456	D5185	318.625		2.04	
1660	D4951	350	R(0.05)	4.13	
1682		----		----	
1748	D6481	270		-1.19	
1797		----		----	
1874	D6595	281.10		-0.45	
1941	D4828	280	C	-0.52	first reported: 220
1955		----		----	
1957	D5185	270		-1.19	
1981	D4951	318		2.00	
6016		----		----	
6032	D6595	280		-0.52	
6068		----		----	
6074	D6595	262		-1.72	
6081		257.8		-2.00	

normality OK
n 29
outliers 1
mean (n) 287.888
st.dev. (n) 19.4878
R(calc.) 54.566
R(D5185:13e1) 42.094



APPENDIX 2**Number of participants per country**

1 lab in ALGERIA
2 labs in AUSTRALIA
1 lab in AUSTRIA
1 lab in AZERBAIJAN
2 labs in BELGIUM
2 labs in BULGARIA
3 labs in CHINA, People's Republic
1 lab in COTE D'IVOIRE
1 lab in FRANCE
1 lab in GERMANY
1 lab in GREECE
1 lab in INDIA
1 lab in ISRAEL
1 lab in ITALY
1 lab in JORDAN
1 lab in KAZAKHSTAN
2 labs in MALAYSIA
1 lab in MEXICO
1 lab in NETHERLANDS
1 lab in NIGERIA
1 lab in NORWAY
1 lab in PERU
1 lab in POLAND
1 lab in PORTUGAL
1 lab in ROMANIA
1 lab in RUSSIAN FEDERATION
2 labs in SAUDI ARABIA
2 labs in SERBIA
1 lab in SOUTH KOREA
1 lab in SPAIN
1 lab in TANZANIA
1 lab in THAILAND
3 labs in TURKEY
3 labs in UNITED KINGDOM
1 lab 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	= probably an error in calculations
U	= test result probably reported in a different unit
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:

- 1 iis Interlaboratory Studies, Protocol for the Organization, Statistics and Evaluation, April 2014
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- 4 ISO 5725:86
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- 11 P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)
- 12 J.N. Miller, Analyst, 118, 455, (1993)
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