



Institute for  
Interlaboratory Studies

# Results of Proficiency Test Hydrotreated Vegetable Oil (HVO100) July 2023

**Organized by:** Institute for Interlaboratory Studies  
Spijkenisse, the Netherlands

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**Report:** iis23G09 == revised ==

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## SUMMARY OF CHANGES

This revised report replaces the original report iis23G09 of October 2023.

iis received a question from a participant about the evaluation of the test results of FAME in this sample. The participants reported a variety of test results from 0.0 and <0.05 to results up to 0.15 %V/V. This means that the data is inconclusive and iis decided not to evaluate this parameter. This was described in paragraph 4.1 as follows: "iis decided to calculate no z-scores because a part of the reported test values are slightly above the application range and the other part of the test values were reported as smaller than value or below the application range". The report has been revised to reflect this statement better.

It has no effect on the reported test results since no z-scores were calculated for this parameter.

The following pages in this report has been revised:

- Paragraph 4.1 FAME: removed "This determination may not be problematic. Almost all reporting participants agreed on a value close to the application range of EN14078-A:14" on page 10 (page 9 in the original report).
- Appendix 1 FAME: removed "n is 5" and "mean (n) is <0.05" on page 36 (page 35 in the original report).

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## 1 INTRODUCTION

On the request of a number of participants the Institute of Interlaboratory Studies (iis) decided to organize a proficiency scheme for the analysis of Hydrotreated Vegetable Oil (HVO100) based on the scope of the latest version of EN15940 for the first time.

In this interlaboratory study 29 laboratories in 14 countries registered for participation, see appendix 2 for the number of participants per country. In this report the results of the Hydrotreated Vegetable Oil (HVO100) proficiency test are presented and discussed. This report is also electronically available through the iis website [www.iisnl.com](http://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.

It was decided to send two identical samples of Hydrotreated Vegetable Oil in a 1 L bottle and a 0.5 L bottle both labelled #23110.

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 ISO/IEC17043:2010. 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](http://www.iisnl.com), from the FAQ page.

### 2.3 CONFIDENTIALITY STATEMENT

All data presented in this report must be regarded as confidential and for use by the participating companies only. Disclosure of the information in this report is only allowed by means of the entire report. Use of the contents of this report for third parties is only allowed by written permission of the Institute for Interlaboratory Studies. Disclosure of the identity of one or more of the participating companies will be done only after receipt of a written agreement of the companies involved.

## 2.4 SAMPLES

A batch of approximately 200 liters of Hydrotreated Vegetable Oil (HVO100) was obtained from a local supplier. After homogenization 45 amber glass bottles of 1 L and 45 amber glass bottles of 0.5 L were filled and labelled #23110.

The homogeneity of the subsamples was checked by the determination of Density at 15 °C in accordance with ISO12185 and Water accordance with ISO12937 on 8 stratified randomly selected subsamples.

	Density at 15 °C in kg/m <sup>3</sup>	Water in mg/kg
sample #23110-1	781.90	23.4
sample #23110-2	781.90	23.8
sample #23110-3	781.90	23.3
sample #23110-4	781.89	23.8
sample #23110-5	781.90	23.8
sample #23110-6	781.89	23.5
sample #23110-7	781.90	23.2
sample #23110-8	781.90	23.3

Table 1: homogeneity test results of subsamples #23110

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/m <sup>3</sup>	Water in mg/kg
r (observed)	0.01	0.7
reference test method	ISO12185:96	ISO12937:00
0.3 x R (reference test method)	0.15	10.0

Table 2: evaluation of the repeatabilities of subsamples #23110

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

To each of the participating laboratories one 1 L and one 0.5 L bottle labelled #23110 was sent on June 21, 2023. An SDS was added to the sample package.

## 2.5 STABILITY OF THE SAMPLES

The stability of Hydrotreated Vegetable Oil was checked. The material was found sufficiently stable for the period of the proficiency test.

## 2.6 ANALYZES

The participants were requested to determine: Acid Value, Total Acid Number, Ash content, Cloud Point, Cold Filter Plugging Point (CFPP), Carbon Residue (micro method) on 10% distillation residue; Copper Corrosion 3 hrs at 50 °C; Density at 15 °C; Flash Point PMcc; Flash Point recc; Iodine Value; Kinematic Viscosity at 40 °C; Oxidation Stability Induction period; Pour Point; Sulfated Ash; Sulfur; Water; Water and Sediment; Distillation at 760 mmHg (IBP, 10%rec, 50%rec, 90%rec, 95%rec, FBP, Vol. 250 °C, Vol. 350 °C); FAME; Lubricity by HFRR at 60 °C; Manganese as Mn; Total Aromatic Hydrocarbons.

It was explicitly requested to treat the sample as if it was a routine sample 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/](http://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](http://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/](http://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 result tables in appendix 1. Test results that came in after the deadline were not taken into account in this screening for suspect data and thus these participants were not requested for checks.

### 3.1 STATISTICS

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5). For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded test results. Test results reported as '<... ' or '>... ' were not used in the statistical evaluation.

First, the normality of the distribution of the various data sets per determination was checked by means of the Lilliefors-test, a variant of the Kolmogorov-Smirnov test and by the calculation of skewness and kurtosis. Evaluation of the three normality indicators in combination with the visual evaluation of the graphic Kernel density plot, lead to judgement of the normality being either 'unknown', 'OK', 'suspect' or 'not OK'. After removal of outliers, this check was repeated. If a data set does not have a normal distribution, the (results of the) statistical evaluation should be used with due care.

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

According to ISO13528 all (original received or corrected) results per determination were submitted to outlier tests. In the iis procedure for proficiency tests, outliers are detected prior to calculation of the mean, standard deviation and reproducibility. For small data sets, Dixon (up to 20 test results) or Grubbs (up to 40 test results) outlier tests can be used. For larger data sets (above 20 test results) Rosner's outlier test can be used. Outliers are marked by D(0.01) for the Dixon's test, by G(0.01) or DG(0.01) for the Grubbs' test and by R(0.01) for the Rosner's test. Stragglers are marked by D(0.05) for the Dixon's test, by G(0.05) or DG(0.05) for the Grubbs' test and by R(0.05) for the Rosner's test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.

For each assigned value the uncertainty was determined in accordance with ISO13528. Subsequently the calculated uncertainty was evaluated against the respective requirement based on the target reproducibility in accordance with ISO13528. In this PT, the criterion of ISO13528, paragraph 9.2.1. was met for all evaluated tests, therefore, the uncertainty of all assigned values may be negligible and need not be included in the PT report.

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

### 3.2 GRAPHICS

In order to visualize the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for one determination (see appendix 1). On the Y-axis the reported test results are plotted. The corresponding laboratory numbers are on the X-axis. The straight horizontal line presents the consensus value (a trimmed mean). The four striped lines, parallel to the consensus value line, are the +3s, +2s, -2s and -3s target reproducibility limits of the selected reference test method. Outliers and other data, which were excluded from the calculations, are represented as a cross. Accepted data are represented as a triangle.

Furthermore, Kernel Density Graphs were made. This is a method for producing a smooth density approximation to a set of data that avoids some problems associated with histograms. Also, a normal Gauss curve (dotted line) was projected over the Kernel Density Graph (smooth line) for reference. The Gauss curve is calculated from the consensus value and the corresponding standard deviation.

### 3.3 Z-SCORES

To evaluate the performance of the participating laboratories the z-scores were calculated. As it was decided to evaluate the performance of the participants in this proficiency test (PT) against the literature requirements (derived from e.g. ISO or ASTM test methods), the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the variation in this interlaboratory study.

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

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

The z-scores were calculated according to:

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

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

In this proficiency test no problems were encountered with the dispatch of the samples. Two participants did not report any test results, all other participants reported the test results in time. Not all participants did report all tests requested.

In total 27 participants reported 426 numerical test results. Observed were 9 outlying test results, which is 2.1%. In proficiency tests 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 TEST

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

In the iis PT reports ASTM test methods are referred to with a number (e.g. D664) and if appropriate an indication of sub test method (e.g. D664-B) and an added designation for the year that the test method was adopted or revised (e.g. D664-B:18e2).

##### **sample #23110**

Acid Value: This determination was not problematic. All reporting participants agreed on a value near or below to the application range of EN14104:21. Therefore, no z-scores are calculated.

Total Acid Number: This determination was not problematic. All reporting participants agreed on a value near or below to the application range of ASTM D664-B:18e2. Therefore, no z-scores are calculated.

Ash content: This determination was not problematic. All reporting participants agreed on a value near or below the application range of ISO6245:01. Therefore, no z-scores are calculated.

Cloud Point: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ISO3015:19.

Cold Filter Plugging Point: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of EN116:15.

Carbon Residue (micron method) on 10% distillation residue: This determination was not problematic. All reporting participants agreed on a value near or below to the application range of ISO10370:14. Therefore, no z-scores are calculated.

Copper Corrosion 3 hrs. at 50 °C: This determination was not problematic. All reporting participants agreed on a test result of 1(1a/1b).

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

Flash Point PMcc: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ISO2719-C:16.

Flash Point recc: Only two participants reported a test result. Therefore, no z-scores are calculated.

Iodine Value: Only three participants reported a test result. Therefore, no z-scores are calculated.

Kinematic Viscosity at 40 °C: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ISO3104-A:21.

Oxidation Stability: This determination was not problematic. Almost all participants agreed on a test result > 48 hours.

Pour Point: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ISO3016:19.

Sulfated Ash: Only three participants reported a test result. Therefore, no z-scores are calculated.

Sulfur: This determination was not problematic. All reporting participants agreed on a value near or below to the application range of ISO20846:19. Therefore, no z-scores are calculated.

Water: 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 ISO12937:00.

Water and Sediment: This determination was not problematic. All reporting participants agreed on a test result near or below the detection limit.

Distillation at 760 mmHg: This determination was not problematic for 10%, 50%, 90%, 95% recovered and volume 250 °C but it was problematic for IBP and FBP. No statistical outliers were observed over the seven parameters. The calculated reproducibilities for 10%, 50%, 90%, 95% recovered and volume 250°C are in agreement with the requirements of ISO3405-A:19. The Final Boiling Point is below 350 °C, Therefore, the parameter volume at 350 °C could not be reported. For IBP and FBP the calculated reproducibility is not in agreement with the requirements of ISO3405-A:19.

FAME: iis decided to calculate no z-scores because a part of the reported test values are slightly above the application range and the other part of the test values were reported as smaller than value or below the application range.

Lubricity by HFRR at 60 °C: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ISO12156-1-A:18.

Please note, a new version of test method ISO12156-1 has been published in September of 2023.

Manganese as Mn: This determination was not problematic. All reporting participants agreed on a value near or below to the application range of EN16576:14. Therefore, no z-scores are calculated.

Total Aromatic Hydrocarbons: This determination was problematic. No statistical outliers were observed. The calculated reproducibility is not in agreement with the requirements of EN12916:19+A1:22).

#### 4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the reference test method and the reproducibility as found for the group of participating laboratories. The number of significant test results, the average, the calculated reproducibility (2.8 \* standard deviation) and the target reproducibility derived from reference methods are presented in the next table.

Parameter	unit	n	average	2.8 * sd	R(lit)
Acid Value	mg KOH/g	8	<0.10	n.e.	n.e.
Total Acid Number	mg KOH/g	14	<0.10	n.e.	n.e.
Ash content	%M/M	10	<0.001	n.e.	n.e.
Cloud Point	°C	23	-18.1	2.9	4
Cold Filter Plugging Point	°C	23	-19.5	2.0	4.2
Carbon Residue (micro method)	%M/M	16	<0.10	n.e.	n.e.
Copper Corrosion, 3 hrs at 50 °C		19	1(1a/1b)	n.a.	n.a.
Density at 15 °C	kg/m <sup>3</sup>	23	781.9	0.3	0.5
Flash Point PMcc	°C	25	72.0	3.1	14.7
Flash Point recc	°C	2	n.e.	n.e.	n.e.
Iodine Value	g I <sub>2</sub> /100 g	3	n.e.	n.e.	n.e.
Kinematic Viscosity at 40 °C	mm <sup>2</sup> /s	21	2.950	0.020	0.027
Oxidation Stab. Induction period	hours	8	>48	n.e.	n.e.
Pour Point	°C	18	-19.5	5	9
Sulfated Ash	%M/M	3	<0.005	n.e.	n.e.
Sulfur	mg/kg	24	<3.0	n.e.	n.e.
Water	mg/kg	18	28.9	12.6	37.0
Water and Sediment	%V/V	5	<0.01	n.e.	n.e.
Initial Boiling Point	°C	24	168.5	27.1	9.3
10% recovered	°C	24	257.5	3.6	5.7
50% recovered	°C	24	282.8	1.9	3.0

Parameter	unit	n	average	2.8 * sd	R(lit)
90% recovered	°C	24	295.1	2.1	4.4
95% recovered	°C	24	301.2	4.0	6.6
Final Boiling Point	°C	24	314.0	13.2	7.1
Volume at 250 °C	%V/V	23	7.1	1.4	2.7
Volume at 350 °C	%V/V	6	n.e.	n.e.	n.e.
FAME	%V/V	5	<0.05	n.e	n.e
Lubricity by HFRR at 60 °C	µm	16	435.2	70.3	80
Manganese as Mn	mg/L	6	<0.5	n.e	n.e
Total Aromatic Hydrocarbons	%M/M	14	1.04	0.60	0.53

Table 3: reproducibilities of tests on sample #23110

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

#### 4.3 OVERVIEW OF THE PROFICIENCY TEST OF JULY 2023

	July 2023
Number of reporting laboratories	27
Number of test results	426
Number of statistical outliers	9
Percentage of statistical outliers	2.1%

Table 4: overview of the proficiency test

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

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

Parameter	July 2023
Acid Value	n.e.
Total Acid Number	n.e.
Ash content	n.e.
Cloud Point	+
Cold Filter Plugging Point	++
Carbon Residue (micro method)	n.e.
Density at 15 °C	+
Flash Point PMcc	++
Flash Point recc	n.e.
Iodine Value	n.e.

Parameter	July 2023
Kinematic Viscosity at 40 °C	+
Oxidation Stab. Induction period	n.e.
Pour Point	+
Sulfated Ash	n.e.
Sulfur	n.e.
Water	++
Distillation at 760 mmHg	+
FAME	n.e.
Lubricity by HFRR at 60 °C	+
Manganese as Mn	n.e.
Total Aromatic Hydrocarbons	-

Table 5: overview of determinations to the reference test methods

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 Acid Value on sample #23110; results in mg KOH/g**

lab	method	value	mark	z(targ)	remarks
311	EN14104	<0.10		----	
328		----		----	
334		----		----	
335		----		----	
338		----		----	
467		----		----	
1026		----		----	
1039		----		----	
1059	EN14104	0.06		----	
1135	EN14104	0.035		----	
1191		----		----	
1205		----		----	
1218		----		----	
1299		----		----	
1300	EN14104	0.032		----	
1468	EN14104	0.03		----	
1491		----		----	
1569	EN14104	<0.10		----	
1740		----		----	
1776		----		----	
1953		----		----	
6185		----		----	
6262	EN14104	0.05		----	
6406		----		----	
6444		----		----	
6446		----		----	
6499		----		----	
6505		----		----	
6519	D3232	0.034		----	
n		8			
mean (n)		<0.10			Application range EN14104:21: 0.10 – 1.00 mg KOH/g

## Determination of Total Acid Number on sample #23110; results in mg KOH/g

lab	method	value	mark	z(targ)	remarks
311	D974	<0.10		----	
328		----		----	
334	D664-B	0.036		----	
335		----		----	
338		----		----	
467		----		----	
1026	D664-B	<0.05		----	
1039	D664-A	0.04		----	
1059	ISO6619	0.07		----	
1135	D664-B	0.035		----	
1191	D3242	0.03		----	
1205		----		----	
1218		----		----	
1299	D664-B	<0.100		----	
1300	D664-B	0.0354		----	
1468		----		----	
1491	D664-B	0.039		----	
1569		----		----	
1740	D664-B	0.05		----	
1776	D664-B	0.01		----	
1953		----		----	
6185		----		----	
6262	D664-B	0.04		----	
6406		----		----	
6444		----		----	
6446		----		----	
6499		----		----	
6505		----		----	
6519	D3232	0.034		----	
n		14			
mean (n)		<0.10			Application range ASTM D664-B:18e2: 0.10 – 150 mg KOH/g

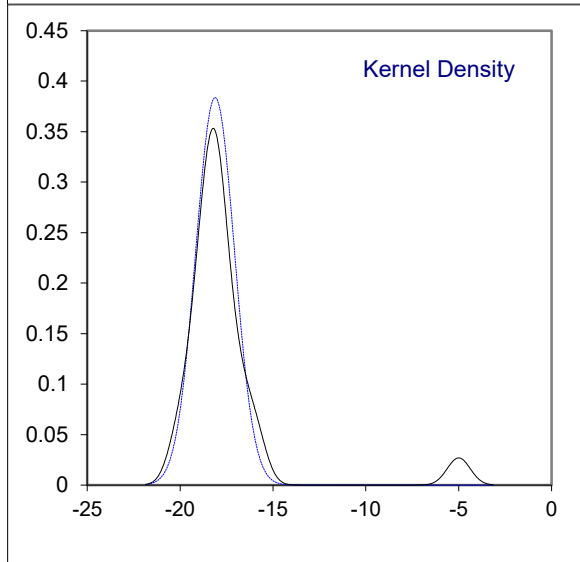
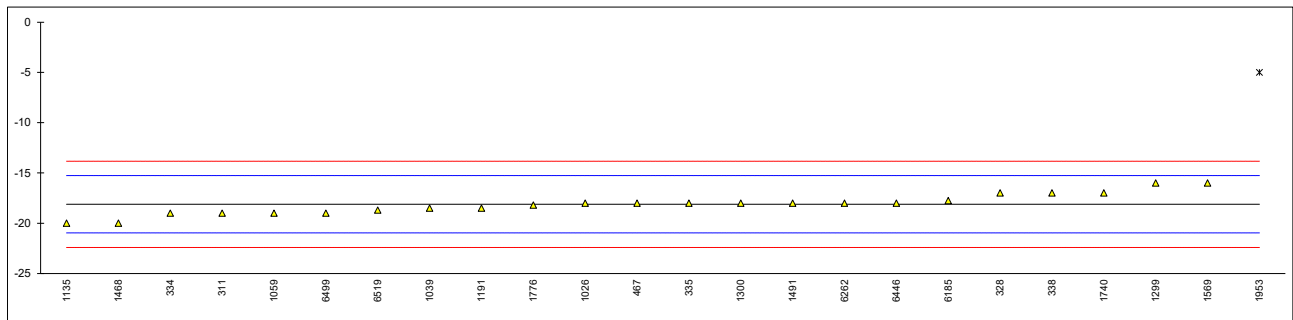
Determination of Ash content on sample #23110; results in %M/M

lab	method	value	mark	z(targ)	remarks
311	ISO6245	<0.001		----	
328		----		----	
334	ISO6245	<0.001		----	
335		----		----	
338		----		----	
467	ISO6245	<0,001		----	
1026	ISO6245	<0.01		----	
1039	ISO6245	<0.001		----	
1059	ISO6245	<0,001		----	
1135	ISO6245	<0.001		----	
1191	ISO6245	0.000099338		----	
1205		----		----	
1218		----		----	
1299		----		----	
1300	ISO6245	0.0007		----	
1468	ISO6245	<0,001		----	
1491		----		----	
1569	ISO6245	<0.005		----	
1740	ISO6245	0.0014		----	
1776		----		----	
1953		----		----	
6185		----		----	
6262	D482	0.0000		----	
6406		----		----	
6444		----		----	
6446		----		----	
6499		----		----	
6505		----		----	
6519		----		----	
	n	10			
	mean (n)	<0.001			Application range ISO6245:01: 0.001 – 0.180 %M/M



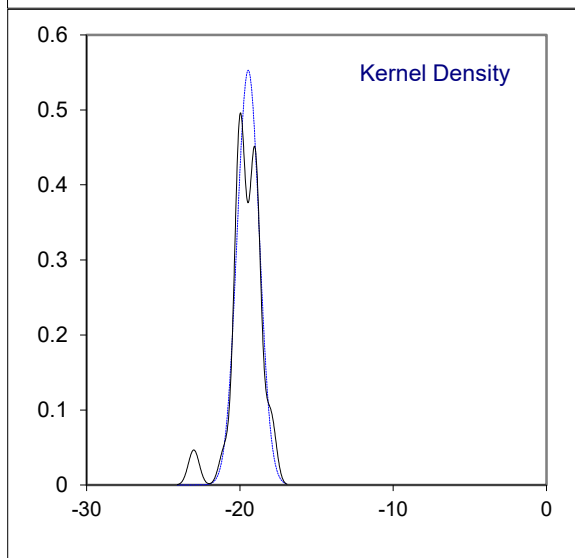
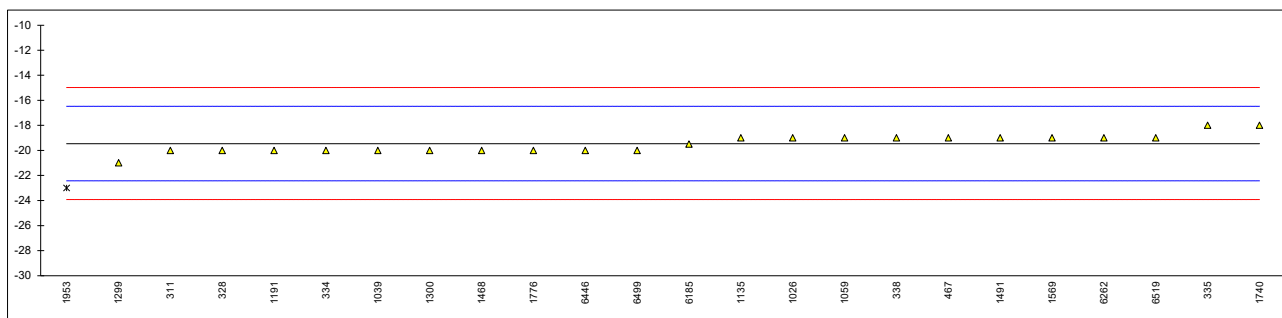
Determination of Cloud Point on sample #23110; results in °C

lab	method	value	mark	z(targ)	remarks
311	D2500	-19		-0.62	
328	ISO3015	-17		0.78	
334	ISO3015	-19		-0.62	
335	ISO3015	-18		0.08	
338	ISO3015	-17		0.78	
467	ISO3015	-18		0.08	
1026	D5773	-18		0.08	
1039	ISO3015	-18.5		-0.27	
1059	ISO3015	-19		-0.62	
1135	EN23015	-20		-1.32	
1191	D5773	-18.5		-0.27	
1205		----		----	
1218		----		----	
1299	D2500	-16		1.48	
1300	ISO3015	-18		0.08	
1468	ISO3015	-20		-1.32	
1491	ISO3015	-18		0.08	
1569	EN23015	-16		1.48	
1740	ISO3015	-17		0.78	
1776	ISO3015	-18.2		-0.06	
1953	D7683	-5	R(0.01)	9.18	
6185	D7683	-17.75		0.26	
6262	D2500	-18		0.08	
6406		----		----	
6444		----		----	
6446	ISO3015	-18		0.08	
6499	D2500	-19		-0.62	
6505		----		----	
6519	D5771	-18.7		-0.41	
normality		OK			
n		23			
outliers		1			
mean (n)		-18.12			
st.dev. (n)		1.040			
R(calc.)		2.91			
st.dev.(ISO3015:19)		1.429			
R(ISO3015:19)		4			



Determination of Cold Filter Plugging Point (CFPP) on sample #23110; results in °C

lab	method	value	mark	z(targ)	remarks
311	EN116	-20		-0.37	
328	EN116	-20		-0.37	
334	EN116	-20		-0.37	
335	EN116	-18		0.98	
338	EN116	-19		0.31	
467	EN116	-19		0.31	
1026	EN16329	-19		0.31	
1039	EN116	-20		-0.37	
1059	EN116	-19		0.31	
1135	EN116	-19		0.31	
1191	EN116	-20		-0.37	
1205		----		----	
1218		----		----	
1299	EN116	-21		-1.04	
1300	EN116	-20		-0.37	
1468	EN116	-20		-0.37	
1491	EN116	-19		0.31	
1569	EN116	-19		0.31	
1740	EN116	-18		0.98	
1776	EN116	-20		-0.37	
1953	EN116	-23	R(0.01)	-2.38	
6185	EN116	-19.5		-0.03	
6262	EN116	-19		0.31	
6406		----		----	
6444		----		----	
6446	EN116	-20		-0.37	
6499	D6371	-20		-0.37	
6505		----		----	
6519	EN116	-19		0.31	
normality		OK			
n		23			
outliers		1			
mean (n)		-19.46			
st.dev. (n)		0.722			
R(calc.)		2.02			
st.dev.(EN116:15)		1.488			
R(EN116:15)		4.17			



Determination of Carbon Residue (micro method) on 10% distillation residue on sample #23110;  
results in %M/M

lab	method	value	mark	z(targ)	remarks
311	ISO10370	<0.10		----	
328	ISO10370	<0.10		----	
334	ISO10370	<0.1		----	
335		----		----	
338		----		----	
467		----		----	
1026	ISO10370	0.01		----	
1039	ISO10370	<0.1		----	
1059	ISO10370	<0,01		----	
1135	ISO10370	<0.01		----	
1191	ISO10370	0		----	
1205		----		----	
1218		----		----	
1299	D4530	<0.01		----	
1300	ISO10370	0.0117		----	
1468	ISO10370	0.01		----	
1491		----		----	
1569	ISO10370	<0.10		----	
1740	ISO10370	0.016		----	
1776		----		----	
1953		----		----	
6185	D4530	0.0029		----	
6262	D4530	0.0		----	
6406		----		----	
6444		----		----	
6446	ISO10370	0.00		----	
6499		----		----	
6505		----		----	
6519		----		----	
	n	16			
	mean (n)	<0.10			Application range ASTM ISO 10370:14: 0.10 – 30.0 %M/M

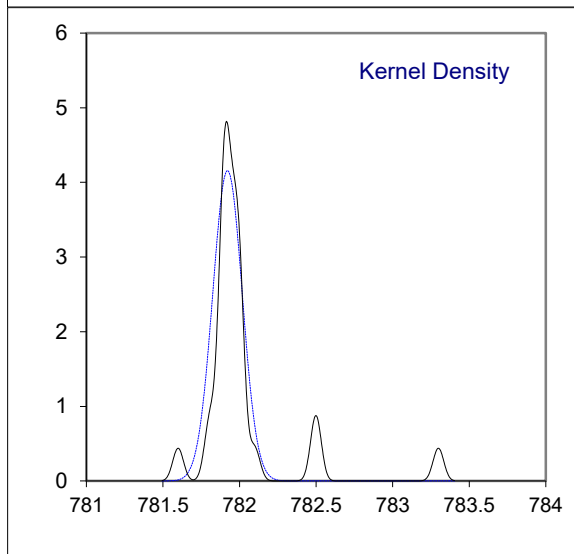
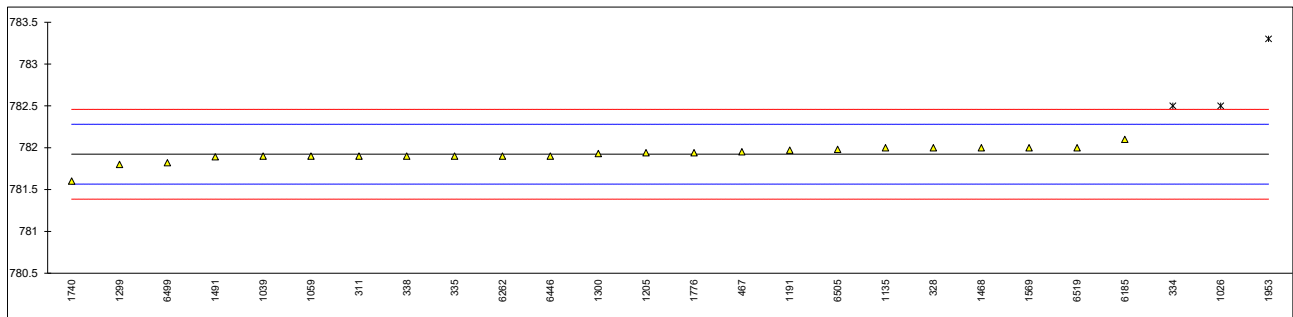
Determination of Copper Corrosion 3 hrs at 50 °C on sample #23110

lab	method	value	mark	z(targ)	remarks
311	D130	1A		----	
328	D130	1		----	
334	ISO2160	1		----	
335	ISO2160	1b		----	
338		----		----	
467	ISO2160	1a		----	
1026	ISO2160	1A		----	
1039	ISO2160	1A		----	
1059	ISO2160	1a		----	
1135	D130	1A		----	
1191	ISO2160	1a		----	
1205		----		----	
1218		----		----	
1299	D130	1A		----	
1300	ISO2160	1A		----	
1468		----		----	
1491	ISO2160	1a		----	
1569	ISO2160	1a		----	
1740	D130	1A		----	
1776		----		----	
1953	ISO2160	1 A		----	
6185	D130	1A		----	
6262	D130	1A		----	
6406		----		----	
6444		----		----	
6446	D130	1A		----	
6499		----		----	
6505		----		----	
6519		----		----	
	n	19			
	mean (n)	1 (1a/1b)			

Determination of Density at 15 °C on sample #23110; results in kg/m<sup>3</sup>

lab	method	value	mark	z(targ)	remarks
311	ISO12185	781.9		-0.13	
328	ISO12185	782.0		0.43	
334	ISO12185	782.5	R(0.01)	3.23	
335	ISO12185	781.9		-0.13	
338	ISO12185	781.9		-0.13	
467	ISO12185	781.95		0.15	
1026	D4052	782.5	R(0.01)	3.23	
1039	ISO12185	781.9		-0.13	
1059	ISO12185	781.9		-0.13	
1135	ISO12185	782.0		0.43	
1191	ISO12185	781.97		0.27	
1205	ISO12185	781.94		0.10	
1218		----		----	
1299	D4052	781.8		-0.69	
1300	ISO12185	781.93		0.04	
1468	ISO12185	782.0		0.43	
1491	ISO12185	781.89		-0.18	
1569	ISO12185	782.0		0.43	
1740	ISO12185	781.6	C	-1.81	First reported 782.6
1776	ISO12185	781.94		0.10	
1953	In house	783.3	R(0.01)	7.71	
6185	D4052	782.1		0.99	
6262	D4052	781.9	C	-0.13	First reported 0.7824kg/l
6406		----		----	
6444		----		----	
6446	ISO12185	781.9	C	-0.13	First reported 78.9
6499	D4052	781.82		-0.57	
6505	ISO12185	781.98		0.32	
6519	ISO12185	782.0	C	0.43	First reported 781.1

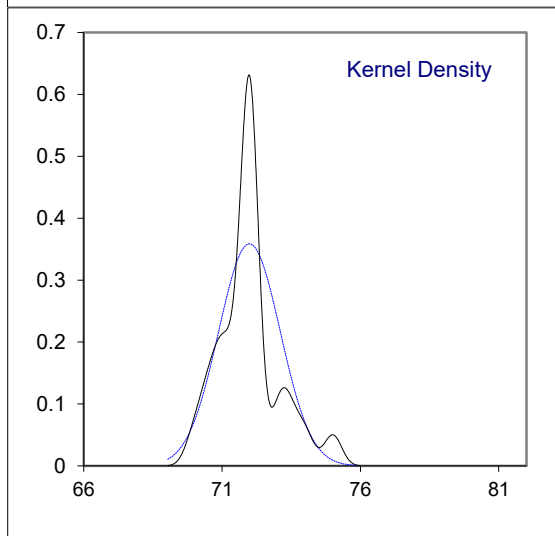
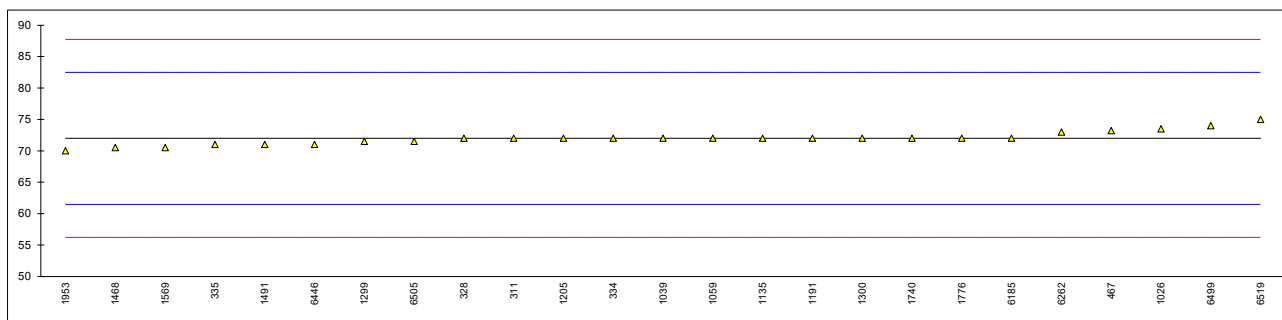
normality not OK  
n 23  
outliers 3  
mean (n) 781.92  
st.dev. (n) 0.096  
R(calc.) 0.27  
st.dev.(ISO12185:96) 0.179  
R(ISO12185:96) 0.5



Determination of Flash Point PMcc on sample #23110; results in °C

lab	method	value	mark	z(targ)	remarks
311	ISO2719-A	72.0		0.00	
328	ISO2719-A	72.0		0.00	
334	ISO2719-A	72.0		0.00	
335	ISO2719-A	71.0		-0.19	
338		----		----	
467	ISO2719-A	73.2		0.23	
1026	ISO2719-A	73.5		0.29	
1039	ISO2719-A	72.0		0.00	
1059	ISO2719-A	72.0		0.00	
1135	ISO2719-A	72.0		0.00	
1191	ISO2719-A	72.0		0.00	
1205	D93-A	72.0		0.00	
1218		----		----	
1299	D93-A	71.5		-0.09	
1300	ISO2719-A	72.0		0.00	
1468	ISO2719-A	70.5		-0.28	
1491	ISO2719-A	71.0		-0.19	
1569	ISO2719-A	70.5		-0.28	
1740	ISO2719-A	72.0		0.00	
1776	ISO2719-A	72.0		0.00	
1953	ISO2719-A	70		-0.38	
6185	D93-A	72.0		0.00	
6262	ISO2719-A	73.0		0.19	
6406		----		----	
6444		----		----	
6446	ISO2719-A	71.0		-0.19	
6499	D93-A	74		0.38	
6505	ISO2719-A	71.5		-0.09	
6519	ISO2719-A	75		0.57	

normality suspect  
n 25  
outliers 0  
mean (n) 71.99  
st.dev. (n) 1.112  
R(calc.) 3.11  
st.dev.(ISO2719-C:16) 5.250  
R(ISO2719-C:16) 14.7



## Determination of Flash Point recc on sample #23110; results in °C

lab	method	value	mark	z(targ)	remarks
311		----		----	
328		----		----	
334		----		----	
335		----		----	
338		----		----	
467		----		----	
1026		----		----	
1039		----		----	
1059	ISO3679	75.0		----	
1135		----		----	
1191		----		----	
1205		----		----	
1218		----		----	
1299		----		----	
1300	ISO3679	74.25		----	
1468		----		----	
1491		----		----	
1569		----		----	
1740		----		----	
1776		----		----	
1953		----		----	
6185		----		----	
6262		----		----	
6406		----		----	
6444		----		----	
6446		----		----	
6499		----		----	
6505		----		----	
6519		----		----	

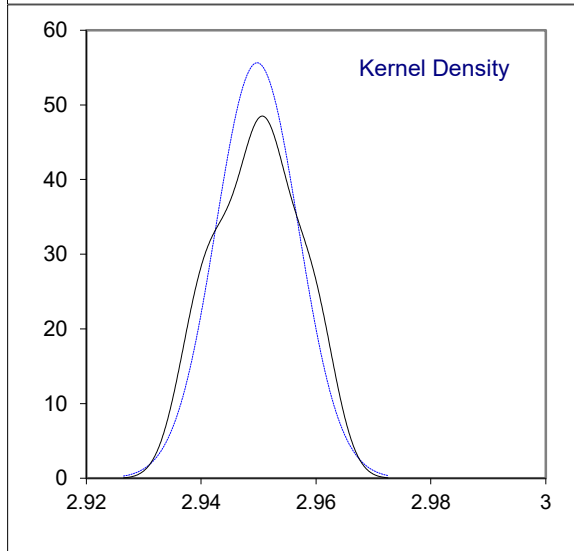
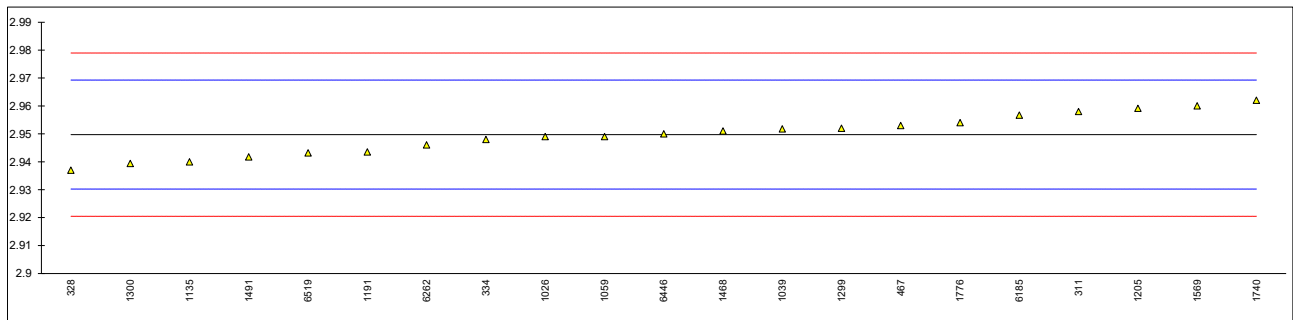
Determination of Iodine Value on sample #23110; results in g I<sub>2</sub>/100 g

lab	method	value	mark	z(targ)	remarks
311		----		----	
328		----		----	
334		----		----	
335		----		----	
338		----		----	
467		----		----	
1026		----		----	
1039		----		----	
1059		----		----	
1135		----		----	
1191		----		----	
1205		----		----	
1218		----		----	
1299	EN14111	0.9		----	
1300	EN14111	0.468		----	
1468	EN14111	3.00		----	
1491		----		----	
1569		----		----	
1740		----		----	
1776		----		----	
1953		----		----	
6185		----		----	
6262		----		----	
6406		----		----	
6444		----		----	
6446		----		----	
6499		----		----	
6505		----		----	
6519		----		----	



Determination of Kinematic Viscosity at 40 °C on sample #23110; results in mm<sup>2</sup>/s

lab	method	value	mark	z(targ)	remarks
311	D445	2.958		0.85	
328	ISO3104-A	2.937		-1.31	
334	ISO3104-A	2.948		-0.18	
335		----		----	
338		----		----	
467	D7042	2.9530	C	0.34	First reported 3.9530
1026	D445	2.949		-0.08	
1039	ISO3104-B	2.9518		0.21	
1059	ISO3104-B	2.949		-0.08	
1135	ISO3104-A	2.940		-1.00	
1191	ISO3104-B	2.9435		-0.64	
1205	D7042	2.9591		0.96	
1218		----		----	
1299	D445	2.952		0.23	
1300	ISO3104-A	2.9394		-1.06	
1468	EN16896	2.951		0.13	
1491	D7042	2.9417		-0.82	
1569	ISO3104-B	2.960		1.05	
1740	ISO3104-A	2.962		1.26	
1776	D7042	2.9540		0.44	
1953		----		----	
6185	ISO3104-A	2.9567		0.71	
6262	D445	2.946		-0.38	
6406		----		----	
6444		----		----	
6446	ISO3104-A	2.950		0.03	
6499		----		----	
6505		----		----	
6519	ISO3104-A	2.9432	C	-0.67	First reported 2.990
normality		OK			
n		21			
outliers		0			
mean (n)		2.9497			
st.dev. (n)		0.00717			
R(calc.)		0.0201			
st.dev.(ISO3104-A:21)		0.00975			
R(ISO3104-A:21)		0.0273			

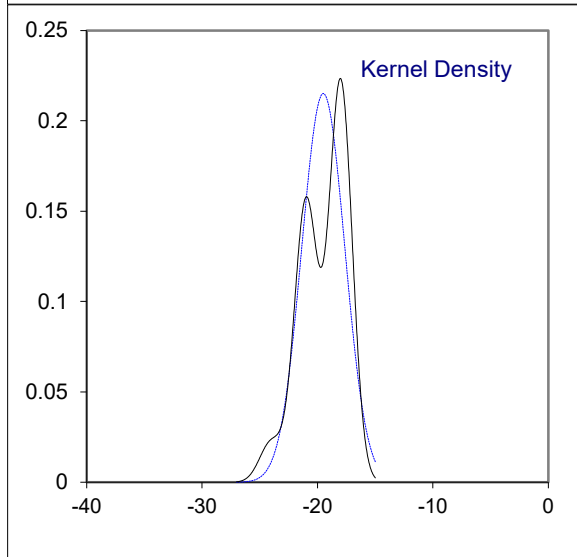
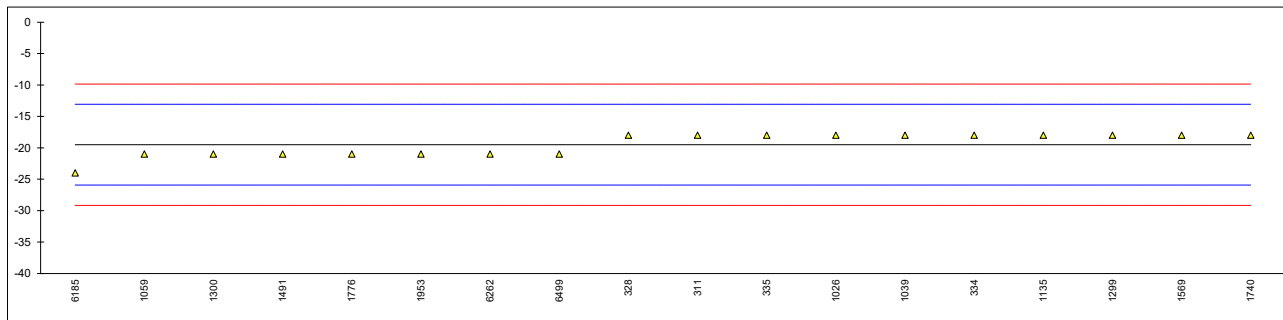


## Determination of Oxidation Stability Induction period on sample #23110; results in hours

lab	method	value	mark	z(targ)	remarks
311	EN15751	>48		----	
328	EN15751	>48		----	
334		----		----	
335		----		----	
338		----		----	
467		----		----	
1026	EN15751	44.56		----	
1039		----		----	
1059	EN15751	>48,0		----	
1135	EN15751	>48		----	
1191		----		----	
1205		----		----	
1218		----		----	
1299	EN15751	42.0		----	
1300	EN15751	>48		----	
1468	EN15751	>48		----	
1491		----		----	
1569		----		----	
1740	EN15751	>48		----	
1776		----		----	
1953		----		----	
6185		----		----	
6262	EN15751	>20		----	
6406		----		----	
6444		----		----	
6446	EN15751	55		----	
6499		----		----	
6505		----		----	
6519		----		----	
	n	8			
	mean (n)	>48			

Determination of Pour Point on sample #23110; results in °C

lab	method	value	mark	z(targ)	remarks
311	D97-manual	-18		0.47	
328	ISO3016-manual	-18		0.47	
334	ISO3016-automatic	-18		0.47	
335	ISO3016-automatic	-18		0.47	
338		----		----	
467		----		----	
1026	D5950	-18		0.47	
1039	ISO3016-manual	-18		0.47	
1059	ISO3016-automatic	-21		-0.47	
1135	ISO3016-manual	-18		0.47	
1191		----		----	
1205		----		----	
1218		----		----	
1299	D97-manual	-18		0.47	
1300	ISO3016-manual	-21		-0.47	
1468		----		----	
1491	ISO3016-manual	-21		-0.47	
1569	D5950	-18		0.47	
1740	ISO3016-manual	-18		0.47	
1776	D5950	-21		-0.47	
1953	D6749	-21		-0.47	
6185	D6749	-24		-1.40	
6262	ISO3016-manual	-21		-0.47	
6406		----		----	
6444		----		----	
6446		----		----	
6499	D6749	-21		-0.47	
6505		----		----	
6519		----		----	
normality		OK			
n		18			
outliers		0			
mean (n)		-19.5			
st.dev. (n)		1.86			
R(calc.)		5.2			
st.dev.(ISO3016:19)		3.21			
R(ISO3016:19)		9			



Determination of Sulfated Ash on sample #23110; results in %M/M

lab	method	value	mark	z(targ)	remarks
311		----		----	
328		----		----	
334		----		----	
335		----		----	
338		----		----	
467		----		----	
1026		----		----	
1039		----		----	
1059	ISO3987	<0.005		----	
1135	D874	<0.005		----	
1191		----		----	
1205		----		----	
1218		----		----	
1299		----		----	
1300	D874	0.00185		----	
1468		----		----	
1491		----		----	
1569		----		----	
1740		----		----	
1776		----		----	
1953		----		----	
6185		----		----	
6262		----		----	
6406		----		----	
6444		----		----	
6446		----		----	
6499		----		----	
6505		----		----	
6519		----		----	
	n	3			
	mean (n)	<0.005			Application range D875:23 < 0.005 %M/M

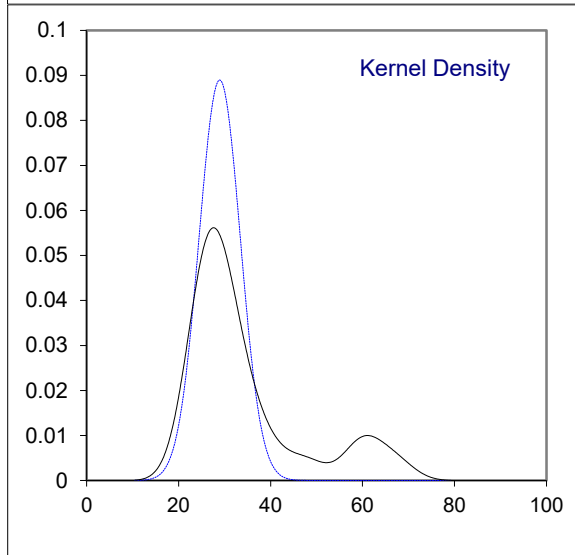
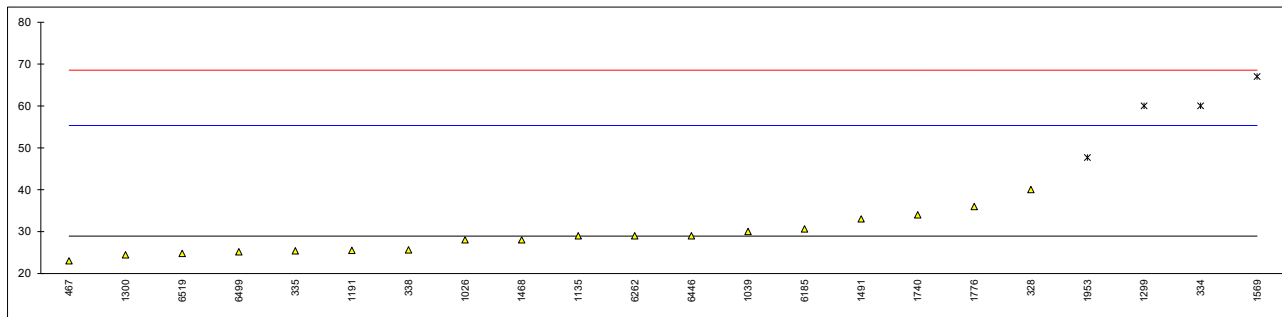
## Determination of Sulfur on sample #23110; results in mg/kg

lab	method	value	mark	z(targ)	remarks
311	ISO20846	<3.0		----	
328	ISO20846	<3		----	
334	ISO20846	0.5		----	
335	ISO20846	0.476		----	
338	ISO20846	0.381		----	
467	ISO20846	<1		----	
1026	ISO20846	<3.0		----	
1039	ISO20884	<3.0		----	
1059	ISO20846	<1,0		----	
1135	ISO20846	0.4		----	
1191	ISO20846	0.4		----	
1205	ISO20846	0.78		----	
1218		----		----	
1299		----		----	
1300	ISO20846	0.486		----	
1468	ISO20846	<1		----	
1491	ISO20846	0.4		----	
1569	ISO20846	0.51		----	
1740	ISO20846	<3		----	
1776	ISO20846	<3,0		----	
1953	D4294	0		----	
6185	D5453	0.8656		----	
6262	ISO20846	0.26		----	
6406		----		----	
6444	D5453	0.3		----	
6446		----		----	
6499	D7220	<0,1		----	
6505		----		----	
6519	ISO20846	0.4		----	
	n	24			
	mean (n)	<3.0			Application range ISO20846:19: 3 – 45 mg/kg

Determination of Water on sample #23110; results in mg/kg

lab	method	value	mark	z(targ)	remarks
311	ISO12937	<30		-----	
328	ISO12937	40		0.84	
334	ISO12937	60	R(0.01)	2.35	
335	ISO12937	25.4		-0.27	
338	ISO12937	25.6		-0.25	
467	ISO12937	23		-0.45	
1026	ISO12937	28		-0.07	
1039	ISO12937	30		0.08	
1059	ISO12937	<30		-----	
1135	ISO12937	29		0.01	
1191	ISO12937	25.5		-0.26	
1205		-----		-----	
1218		-----		-----	
1299	ISO12937	60	R(0.01)	2.35	
1300	ISO12937	24.47		-0.34	
1468	ISO12937	28		-0.07	
1491	ISO12937	33		0.31	
1569	ISO12937	67	R(0.01)	2.88	
1740	ISO12937	34		0.38	
1776	ISO12937	36		0.54	
1953	ISO12937	47.67	R(0.05)	1.42	
6185	E203	30.6225		0.13	
6262	ISO12937	29		0.01	
6406		-----		-----	
6444		-----		-----	
6446	ISO12937	29		0.01	
6499	D6304-A.20	25.18		-0.28	
6505		-----		-----	
6519	ISO12937	24.8		-0.31	

normality suspect  
n 18  
outliers 4  
mean (n) 28.92  
st.dev. (n) 4.486  
R(calc.) 12.56  
st.dev.(ISO12937:00) 13.208  
R(ISO12937:00) 36.98

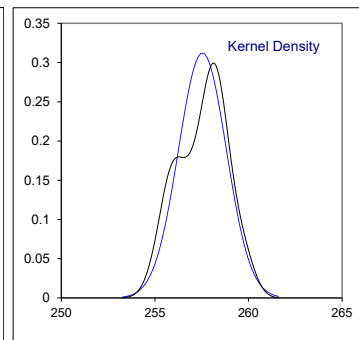
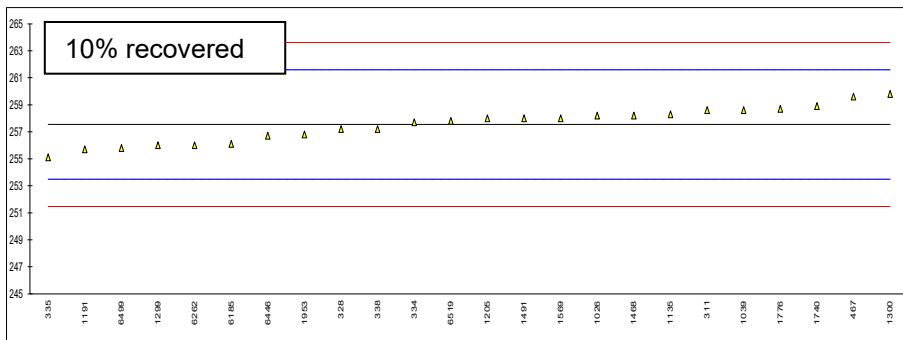
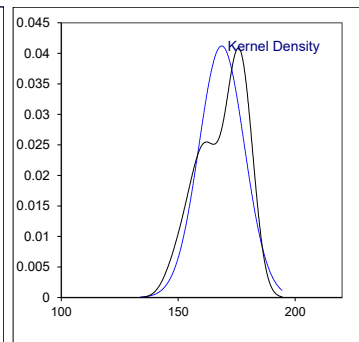
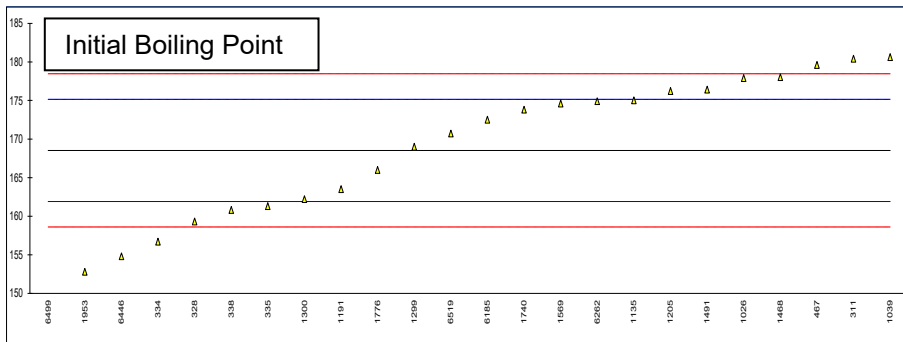


## Determination of Water and Sediment on sample #23110; results in %V/V

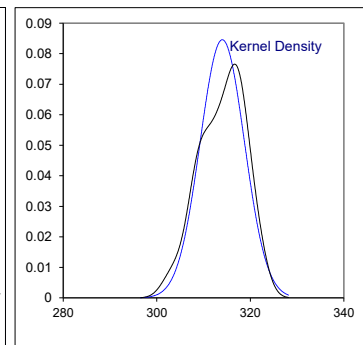
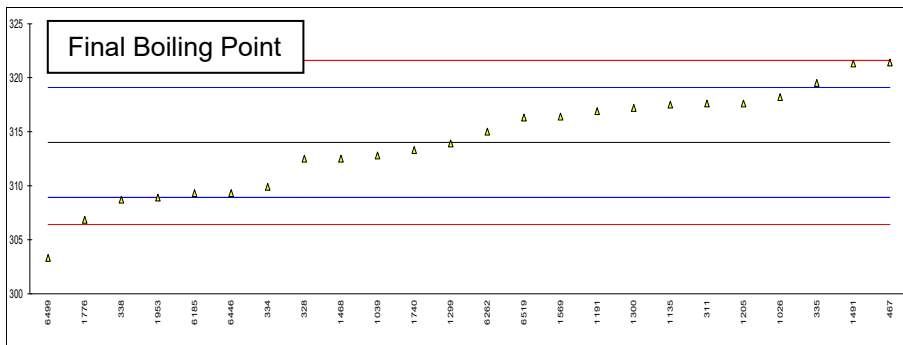
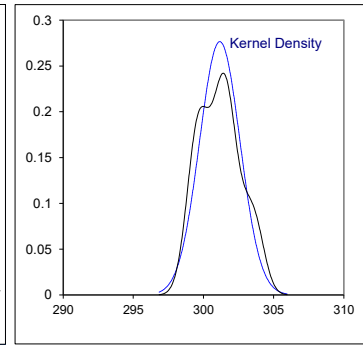
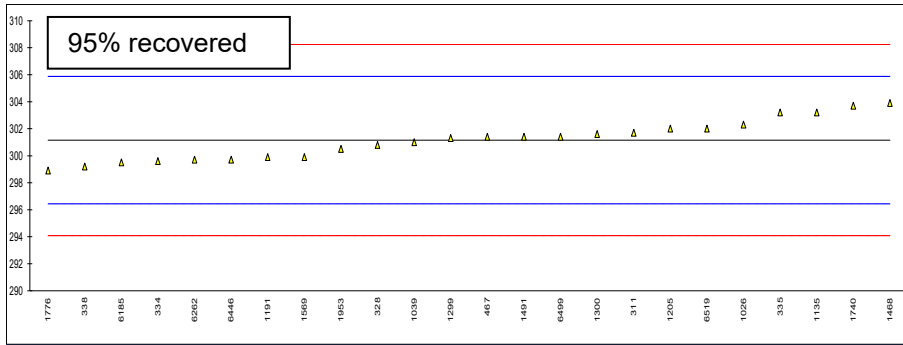
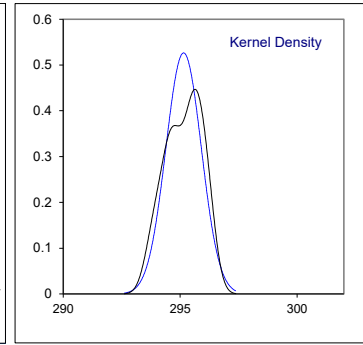
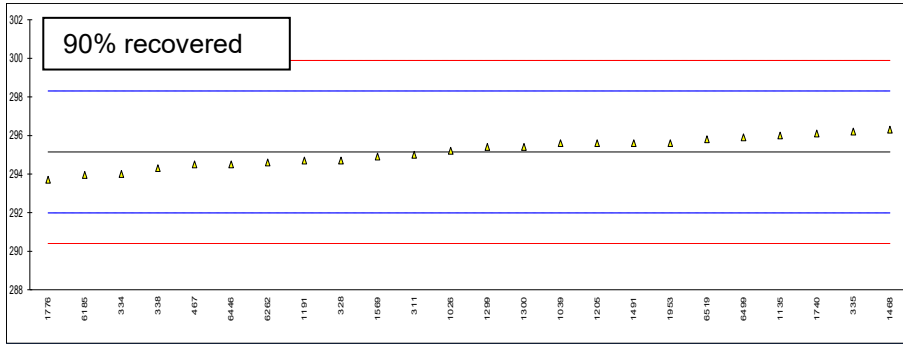
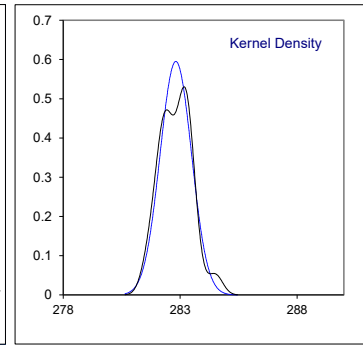
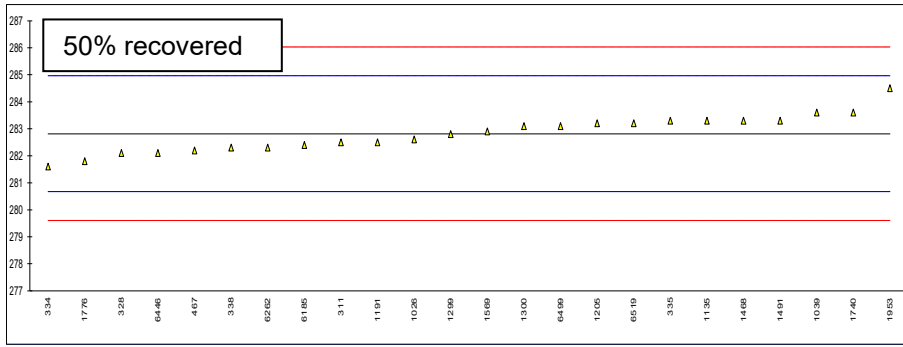
lab	method	value	mark	z(targ)	remarks
311		----		----	
328		----		----	
334	D2709	<0.01		----	
335		----		----	
338		----		----	
467		----		----	
1026		----		----	
1039		----		----	
1059		----		----	
1135	D2709	<0.01		----	
1191		----		----	
1205		----		----	
1218		----		----	
1299	D2709	<0.010		----	
1300	D2709	0.005		----	
1468		----		----	
1491		----		----	
1569		----		----	
1740	D2709	<0.01		----	
1776		----		----	
1953		----		----	
6185		----		----	
6262		----		----	
6406		----		----	
6444		----		----	
6446		----		----	
6499		----		----	
6505		----		----	
6519		----		----	
	n	5			
	mean (n)	<0.01			

Determination of Distillation at 760 mmHg on sample #23110; results in °C

lab	method	IBP	10%rec	50%rec	90%rec	95%rec	FBP
311	D86-automated	180.4	258.6	282.5	295.0	301.7	317.6
328	ISO3405	159.3	257.2	282.1	294.7	300.8	312.5
334	ISO3405-automated	156.7	257.7	281.6	294.0	299.6	309.9
335	D86-automated	161.3	255.1	283.3	296.2	303.2	319.5
338	ISO3405-automated	160.8	257.2	282.3	294.3	299.2	308.7
467	D86-automated	179.6	259.6	282.2	294.5	301.4	321.4
1026	ISO3405-automated	177.9	258.2	282.6	295.2	302.3	318.2
1039	ISO3405-automated	180.6	258.6	283.6	295.6	301.0	312.8
1059		----	----	----	----	----	----
1135	ISO3405-automated	175.0	258.3	283.3	296.0	303.2	317.5
1191	ISO3405-automated	163.5	255.7	282.5	294.7	299.9	316.9
1205		176.2	258.0	283.2	295.6	302.0	317.6
1218		----	----	----	----	----	----
1299	D86-automated	169.0	256.0	282.8	295.4	301.3	313.9
1300	ISO3405-automated	162.2	259.8	283.1	295.4	301.6	317.2
1468	ISO3405-automated	178.0	258.2	283.3	296.3	303.9	312.5
1491		176.4	258.0	283.3	295.6	301.4	321.3
1569	ISO3405-automated	174.6	258.0	282.9	294.9	299.9	316.4
1740	ISO3405-automated	173.8	258.9	283.6	296.1	303.7	313.3
1776	ISO3405-automated	166.0	258.7	281.8	293.7	298.9	306.85
1953		152.8	256.8	284.5	295.6	300.5	308.9
6185		172.5	256.1	282.4	293.95	299.5	309.3
6262	D86-automated	174.9	256.0	282.3	294.6	299.7	315.0
6406		----	----	----	----	----	----
6444		----	----	----	----	----	----
6446	ISO3405-automated	154.8	256.7	282.1	294.5	299.7	309.3
6499	D86-automated	147.7	255.8	283.1	295.9	301.4	303.3
6505		----	----	----	----	----	----
6519	ISO3405-automated	170.7	257.8	283.2	295.8	302.0	316.3
normality		OK	OK	OK	OK	OK	OK
n		24	24	24	24	24	24
outliers		0	0	0	0	0	0
mean (n)		168.53	257.54	282.82	295.15	301.16	314.01
st.dev. (n)		9.677	1.279	0.670	0.757	1.442	4.718
R(calc.)		27.10	3.58	1.88	2.12	4.04	13.21
st.dev. (ISO3405-A:19)		3.310	2.024	1.071	1.581	2.363	2.536
R(ISO3405-A:19)		9.27	5.67	3.00	4.43	6.62	7.10





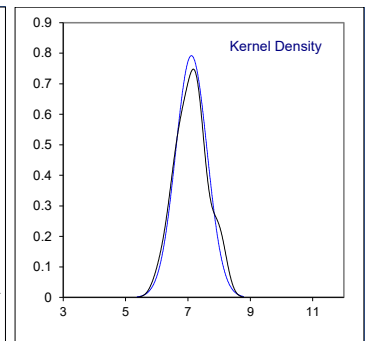
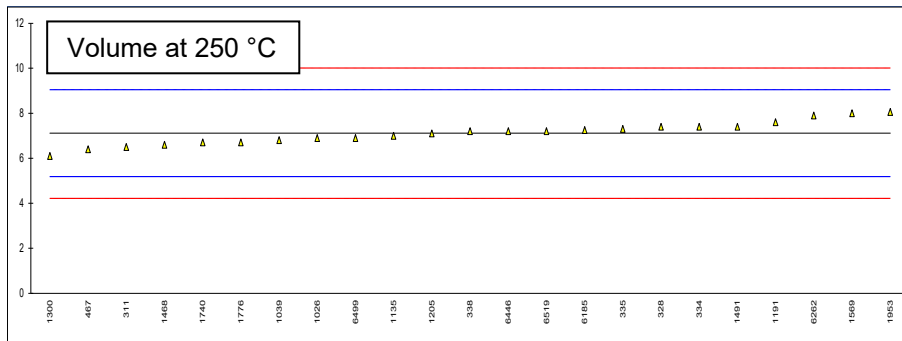


z-scores Distillation at 760 mmHg on sample #23110

lab	IBP	10%rec	50%rec	90%rec	95%rec	FBP
311	3.59	0.52	-0.30	-0.09	0.23	1.42
328	-2.79	-0.17	-0.67	-0.28	-0.15	-0.59
334	-3.57	0.08	-1.14	-0.73	-0.66	-1.62
335	-2.18	-1.21	0.45	0.67	0.86	2.17
338	-2.33	-0.17	-0.48	-0.54	-0.83	-2.09
467	3.34	1.02	-0.58	-0.41	0.10	2.92
1026	2.83	0.33	-0.20	0.03	0.48	1.65
1039	3.65	0.52	0.73	0.29	-0.07	-0.48
1059	----	----	----	----	----	----
1135	1.95	0.37	0.45	0.54	0.86	1.38
1191	-1.52	-0.91	-0.30	-0.28	-0.53	1.14
1205	2.32	0.23	0.36	0.29	0.36	1.42
1218	----	----	----	----	----	----
1299	0.14	-0.76	-0.02	0.16	0.06	-0.04
1300	-1.91	1.12	0.26	0.16	0.19	1.26
1468	2.86	0.33	0.45	0.73	1.16	-0.59
1491	2.38	0.23	0.45	0.29	0.10	2.88
1569	1.83	0.23	0.08	-0.16	-0.53	0.94
1740	1.59	0.67	0.73	0.60	1.08	-0.28
1776	-0.76	0.57	-0.95	-0.92	-0.96	-2.82
1953	-4.75	-0.37	1.57	0.29	-0.28	-2.01
6185	1.20	-0.71	-0.39	-0.76	-0.70	-1.86
6262	1.92	-0.76	-0.48	-0.35	-0.62	0.39
6406	----	----	----	----	----	----
6444	----	----	----	----	----	----
6446	-4.15	-0.42	-0.67	-0.41	-0.62	-1.86
6499	-6.29	-0.86	0.26	0.48	0.10	-4.22
6505	----	----	----	----	----	----
6519	0.66	0.13	0.36	0.41	0.36	0.90

Determination of Distillation at 760 mmHg on sample #23110; result in %V/V

lab	method	Vol at 250°C	mark	z(targ)	Vol at 350°C	mark	z(targ)	remark
311	D86-automated	6.5		-0.64	----		----	
328	ISO3405	7.4		0.30	----		----	
334	ISO3405-automated	7.4		0.30	----		----	
335	D86-automated	7.3		0.19	----		----	
338	ISO3405-automated	7.2		0.09	----		----	
467	D86-automated	6.4		-0.74	----		----	
1026	ISO3405-automated	6.9		-0.22	----		----	
1039	ISO3405-automated	6.8		-0.33	----		----	
1059		----		----	----		----	
1135	ISO3405-automated	7.0		-0.12	>98.6		----	
1191	ISO3405-automated	7.6		0.50	>98.4		----	
1205		7.1		-0.01	100.0		----	
1218		----		----	----		----	
1299		----		----	----		----	
1300	ISO3405-automated	6.1		-1.05	----		----	
1468	ISO3405-automated	6.6		-0.53	----		----	
1491		7.4		0.30	----		----	
1569	ISO3405-automated	8.0		0.92	100.0		----	
1740	ISO3405-automated	6.7		-0.43	----		----	
1776	ISO3405-automated	6.7		-0.43	>98.0		----	
1953		8.06		0.98	----		----	
6185		7.25		0.14	----		----	
6262	D86-automated	7.9		0.82	N.D.		----	
6406		----		----	----		----	
6444		----		----	----		----	
6446	ISO3405-automated	7.2		0.09	----		----	
6499	D86-automated	6.9		-0.22	----		----	
6505		----		----	----		----	
6519	ISO3405-automated	7.2		0.09	>97.3		----	
	normality	OK						
	n	23						
	outliers	0						
	mean (n)	7.11						
	st.dev. (n)	0.504						
	R(calc.)	1.41						
	st.dev.(ISO3405-A:19)	0.964						
	R(ISO3405-A:19)	2.70						



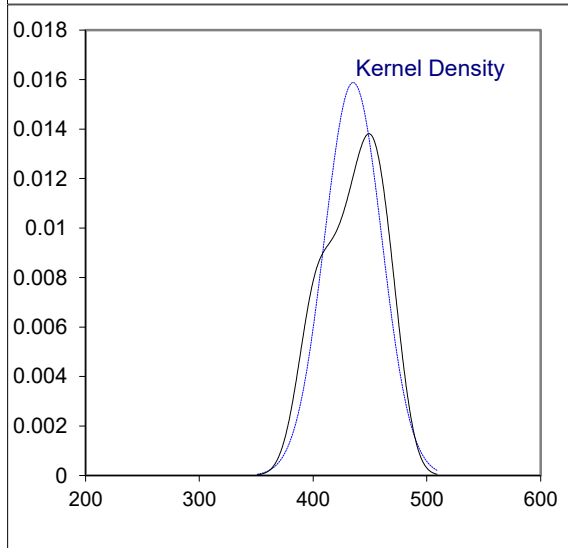
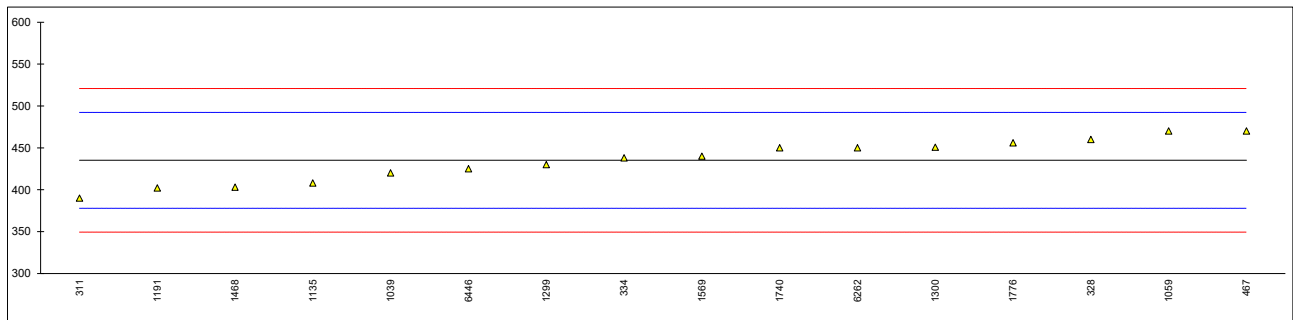
Determination of Fatty Acid Methyl Esters (FAME) on sample #23110; result in %V/V

lab	method	value	mark	z(targ)	remarks
311		----		----	
328	EN14078-A	0.13		----	
334	EN14078-A	0.06		----	
335	EN14078-A	0.07		----	
338		----		----	
467		----		----	
1026	EN14078-A	0.0		----	
1039	EN14078-B	0.09		----	
1059	EN14078-A	<0,05		----	
1135	EN14078-A	0.10		----	
1191		----		----	
1205	D7371	< LOD		----	
1218		----		----	
1299	EN14078-A	<0.05		----	
1300	EN14078-A	0.120		----	
1468	EN14078-A	<0,08		----	
1491	EN14078-A	0.0886		----	
1569	EN14078-B	<3.0		----	
1740	EN14078-A	<0.05		----	
1776		----		----	
1953	In house	0.15		----	
6185	EN14078-A	0.15		----	
6262	EN14078-A	0.09		----	
6406		----		----	
6444		----		----	
6446	EN14078-A	0.1		----	
6499	EN14078-A	0.0		----	
6505		----		----	
6519		----		----	

Application range EN14078-A:14: 0.05 – 3 %V/V

Determination of Lubricity by HFRR at 60 °C on sample #23110; result in  $\mu\text{m}$

lab	method	value	mark	z(targ)	Corrected?	remarks
311	ISO12156-1-A	390		-1.58	No	
328	ISO12156-1-A	460		0.87	Yes	
334	ISO12156-1-B	438		0.10		
335		----		----		
338		----		----		
467	ISO12156-1-A	470		1.22	Yes	
1026		----		----		
1039	ISO12156-1-B	420		-0.53	No	
1059	ISO12156-1-A	470		1.22	No	
1135	ISO12156-1-A	408		-0.95		
1191	ISO12156-1-A	402		-1.16		
1205		----		----		
1218		----		----		
1299	ISO12156-1-B	430		-0.18		
1300	ISO12156-1-A	450.6		0.54	No	
1468	ISO12156-1-B	403		-1.13	No	
1491		----		----		
1569	ISO12156-1-B	440		0.17	Yes	
1740	ISO12156-1-B	450		0.52	No	
1776	ISO12156-1-A	456		0.73	Yes	
1953		----		----		
6185		----		----		
6262	D6079	450		0.52	No	
6406		----		----		
6444		----		----		
6446	ISO12156-1-A	425		-0.36		
6499		----		----		
6505		----		----		
6519		----		----		
normality		OK				
n		16				
outliers		0				
mean (n)		435.16				
st.dev. (n)		25.113				
R(calc.)		70.32				
st.dev.(ISO12156-1-A:18)		28.571				
R(ISO12156-1-A:18)		80				



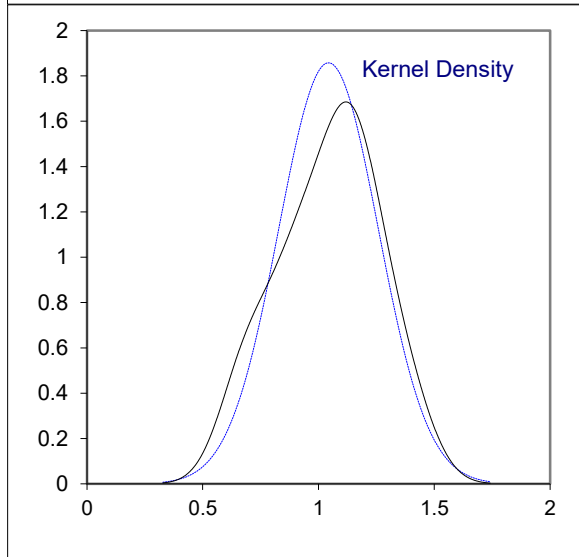
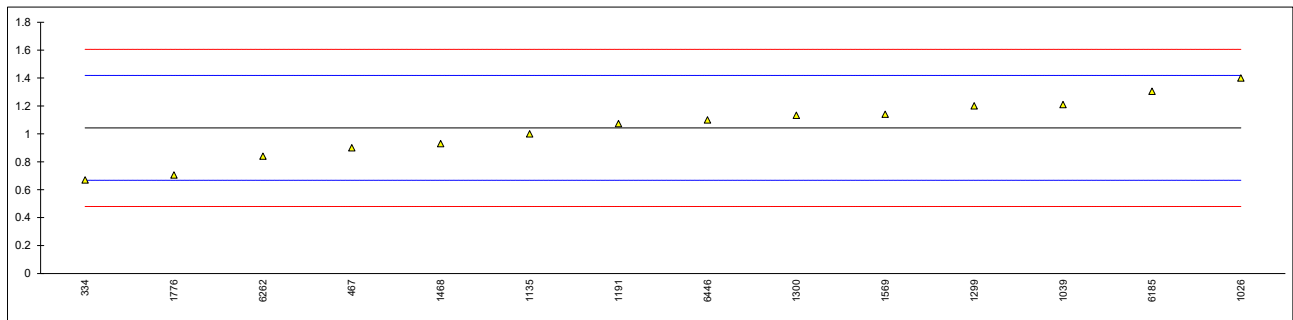
## Determination of Manganese as Mn on sample #23110; result in mg/L

lab	method	value	mark	z(targ)	remarks
311		----		----	
328		----		----	
334	EN16576	<0.5		----	
335		----		----	
338		----		----	
467	EN16576	<0,5		----	
1026		----		----	
1039		----		----	
1059		----		----	
1135		----		----	
1191	D6379	0.002346		----	
1205		----		----	
1218		----		----	
1299		----		----	
1300	EN16576	0.02		----	
1468	EN16576	<0,1		----	
1491		----		----	
1569		----		----	
1740		----		----	
1776		----		----	
1953		----		----	
6185		----		----	
6262	EN16576	<0.1		----	
6406		----		----	
6444		----		----	
6446		----		----	
6499		----		----	
6505		----		----	
6519		----		----	
	n	6			
	mean (n)	<0.5			Application range EN16576:14: 0.5 – 7.0 mg/L

Determination of Total Aromatic Hydrocarbons on sample #23110; result in %M/M

lab	method	value	mark	z(targ)	remarks
311		----		----	
328		----		----	
334	EN12916	0.67		-1.99	
335		----		----	
338		----		----	
467	EN12916	0.9		-0.76	
1026	EN12916	1.4		1.90	
1039	D6379	1.21		0.89	
1059	EN12916	<0,9		----	
1135	EN12916	1.0		-0.23	
1191	EN12916	1.073		0.16	
1205		----		----	
1218		----		----	
1299	EN12916	1.2		0.84	
1300	EN12916	1.132		0.47	
1468	EN12916	0.93		-0.60	
1491		----		----	
1569	EN12916	1.14		0.52	
1740		----		----	
1776	EN12916	0.7046		-1.80	
1953		----		----	
6185	IP391	1.3047		1.39	
6262	EN12916	0.84		-1.08	
6406		----		----	
6444		----		----	
6446	EN12916	1.1		0.30	
6499		----		----	
6505		----		----	
6519		----		----	

normality OK  
 n 14  
 outliers 0  
 mean (n) 1.043  
 st.dev. (n) 0.2148  
 R(calc.) 0.601  
 st.dev.(EN12916:19+A1:22) 0.1877  
 R(EN12916:19+A1:22) 0.526



## **APPENDIX 2**

### **Number of participants per country**

1 lab in AUSTRIA  
3 labs in BELGIUM  
1 lab in ESTONIA  
2 labs in FINLAND  
4 labs in FRANCE  
1 lab in GERMANY  
1 lab in GREECE  
1 lab in IRELAND  
7 labs in NETHERLANDS  
1 lab in PORTUGAL  
1 lab in SLOVENIA  
2 labs in SPAIN  
2 labs in SWEDEN  
2 labs in UNITED KINGDOM



## APPENDIX 3

### Abbreviations

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

### Literature

- 1 iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, June 2018
- 2 ISO5725:86
- 3 ISO5725 parts 1-6:94
- 4 ISO13528:05
- 5 M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)
- 6 W.J. Youden and E.H. Steiner, Statistical Manual of the AOAC, (1975)
- 7 P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)
- 8 J.N. Miller, Analyst, 118, 455, (1993)
- 9 Analytical Methods Committee, Technical Brief, No 4, January 2001
- 10 P.J. Lowthian and M. Thompson, The Royal Society of Chemistry, Analyst, 127, 1359-1364, (2002)
- 11 W. Horwitz and R. Albert, J. AOAC Int, 79, 3, 589-621, (1996)
- 12 Bernard Rosner, Percentage Points for a Generalized ESD Many-Outlier Procedure, Technometrics, 25(2), 165-172, (1983)