Institute for
Interlaboratory Studies

# Results of Proficiency Test
# Vacuum Gasoil (VGO)
# November 2023


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

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**Report:** iis23G08

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**CONTENTS**

# 1 INTRODUCTION

Since 2013 the Institute for Interlaboratory Studies (iis) organizes a proficiency scheme for the analysis of Vacuum Gasoil (VGO) based on the latest version of ISO8217 every year. During the annual proficiency testing program of 2023 it was decided to continue the round robin for the analysis of Vacuum Gasoil (VGO).

In this interlaboratory study registered for participation:
- 56 laboratories in 26 countries for regular analyzes in VGO iis23G08
- 40 laboratories in 23 countries on metal analyzes in VGO iis23G08M

In total 56 laboratories in 26 countries registered for participation in one or two proficiency tests, see appendix 2 for the number of participants per country. In this report the results of the Vacuum Gasoil (VGO) proficiency tests are presented and discussed. This report is also electronically available through the iis website www.iisnl.com.

# 2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organizer of this proficiency test (PT). Sample analyzes for fit-for-use and homogeneity testing were subcontracted to a laboratory that has performed the tests in accordance with for ISO/IEC17043 relevant requirements of ISO/IEC17025.
In this proficiency test the participants received, depending on the registration, from one up to two different samples of Vacuum Gasoil, see table below.

| Sample ID | PT ID | Quantity | Purpose |
|---|---|---|---|
| #23250 | iis23G08 | 1x 1 L | Regular analyzes |
| #23251 | iis23G08M | 1x 250 mL | Metal analyzes |

Table 1: Vacuum Gasoil samples used in PT iis23G08 and iis23G08M.

The participants were requested to report rounded and unrounded test results. The unrounded test results were preferably used for statistical evaluation.

## 2.1 ACCREDITATION

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, is accredited in agreement with ISO/IEC17043:2010 (R007), since January 2000, by the Dutch Accreditation Council (Raad voor Accreditatie). This PT falls under the accredited scope. This ensures strict adherence to protocols for sample preparation and statistical evaluation and 100% confidentiality of participant’s data. Feedback from the participants on the reported data is encouraged and customer’s satisfaction is measured on regular basis by sending out questionnaires.

## 2.2 PROTOCOL

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5). This protocol is electronically available through the iis website www.iisnl.com, from the FAQ page.

## 2.3 CONFIDENTIALITY STATEMENT

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

## 2.4 SAMPLES

For the preparation of the sample for the regular analyzes in Vacuum Gasoil a batch of approximately 100 liters of Vacuum Gasoil was obtained from a third party. After homogenization 80 amber glass bottles of 1 L were filled and labelled #23250.
The homogeneity of the subsamples was checked by determination of Density at 15 °C in accordance with ISO12185 on 8 stratified randomly selected subsamples.

| | Density at 15 °C in kg/m$^3$ |
|---|---|
| sample #23250-1 | 911.6 |
| sample #23250-2 | 911.6 |
| sample #23250-3 | 911.7 |
| sample #23250-4 | 911.7 |
| sample #23250-5 | 911.7 |
| sample #23250-6 | 911.7 |
| sample #23250-7 | 911.7 |
| sample #23250-8 | 911.7 |

Table 2: homogeneity test results of subsamples #23250

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

| | Density at 15 °C in kg/m$^3$ |
|---|---|
| r (observed) | 0.13 |
| reference test method | ISO12185:96 |
| 0.3 x R (reference test method) | 0.45 |

Table 3: evaluation of the repeatability of subsamples #23250

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

For the preparation of the sample for the metal analyzes in Vacuum Gasoil a batch of approximately 20 liters of Vacuum Gasoil was obtained from a third party. To this batch detectable levels of Calcium, Vanadium and Nickel were added. After homogenization 75 PE bottles of 250 mL were filled and labelled #23251.
The homogeneity of the subsamples was checked by determination of Nickel and Vanadium in accordance with IP501 on 8 stratified randomly selected subsamples.

| | Nickel in mg/kg | Vanadium in mg/kg |
|---|---|---|
| sample #23251-1 | 12.6 | 10.5 |
| sample #23251-2 | 12.6 | 10.9 |
| sample #23251-3 | 12.1 | 10.7 |
| sample #23251-4 | 13.5 | 11.3 |
| sample #23251-5 | 12.6 | 10.8 |
| sample #23251-6 | 13.8 | 10.8 |
| sample #23251-7 | 12.6 | 10.6 |
| sample #23251-8 | 13.0 | 11.3 |

Table 4: homogeneity test results of subsamples #23251

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

| | Nickel in mg/kg | Vanadium in mg/kg |
|---|---|---|
| r (observed) | 1.6 | 0.8 |
| reference test method | IP621:16 | IP621:16 |
| 0.3 x R (reference test method) | 2.5 | 1.3 |

Table 5: evaluation of the repeatabilities of subsamples #23251

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

Depending on the registration of the participant the appropriate set of PT samples was sent on November 8, 2023. An SDS was added to the sample package.

## 2.5 STABILITY OF THE SAMPLES

The stability of Vacuum Gasoil packed in amber glass bottles and PE bottles was checked. The material was found sufficiently stable for the period of the proficiency test.

### 2.6 ANALYZES

The participants were requested to determine on sample #23250: Total Acid Number, Aniline Point, Asphaltenes, Carbon Residue (micro method), Density at 15 °C, Flash Point PMcc, Kinematic Viscosity at 50 °C and 100 °C, Nitrogen, Pour Point (Manual and Automated), Total Sulfur, Simulated Distillation and Distillation at 10 mmHg (IBP, 10% rec, 30% rec, 50% rec, 70% rec, 90% rec and FBP).
On sample #23251 it was requested to determine: Aluminum, Silicon, Sum Aluminum and Silicon, Arsenic, Copper, Iron, Nickel, Sodium, Vanadium and Calcium.
It was also requested to report some analytical details on the determination of Total Acid Number.

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

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

## 3 RESULTS

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

Directly after the deadline, a reminder was sent to those laboratories that had not reported test results at that moment. Shortly after the deadline, the available test results were screened for suspect data. A test result was called suspect in case the Huber Elimination Rule (a robust outlier test) found it to be an outlier. The laboratories that produced these suspect data were asked to check the reported test results (no reanalyzes). Additional or corrected test results are used for data analysis and the original test results are placed under 'Remarks' in the result tables in appendix 1. Test results that came in after the deadline were not taken into account in this screening for suspect data and thus these participants were not requested for checks.

### 3.1 STATISTICS

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report ‘iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation’ of June 2018 (iis-protocol, version 3.5).

For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded test results. Test results reported as '<…' or '>…' were not used in the statistical evaluation.

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

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

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

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

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

### 3.2 GRAPHICS

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

Furthermore, Kernel Density Graphs were made. This is a method for producing a smooth density approximation to a set of data that avoids some problems associated with histograms. Also, a normal Gauss curve (dotted line) was projected over the Kernel Density

Graph (smooth line) for reference. The Gauss curve is calculated from the consensus value and the corresponding standard deviation.

### 3.3 Z-SCORES

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

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

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

The z-scores were calculated according to:

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

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

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

| | | | |
|---|---|---|---|
| | $\lvert z \rvert$ | < 1 | good |
| 1 < | $\lvert z \rvert$ | < 2 | satisfactory |
| 2 < | $\lvert z \rvert$ | < 3 | questionable |
| 3 < | $\lvert z \rvert$ | | unsatisfactory |

## 4 EVALUATION

In this proficiency test some problems were encountered with the dispatch of the samples. The reporting time on the data entry portal was extended with another week.
In the Vacuum Gasoil regular round robin ten participants reported test results after the extended reporting date and six other participants did not report any test results.
In the Vacuum Gasoil Metals round robin seven participants reported test results after the extended reporting date and five other participants did not report any test results.
Not all participants were able to report all tests requested.
In total 51 participants reported 898 numerical test results. Observed were 46 outlying test results, which is 5.1%. 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 SAMPLE AND PER TEST

In this section the reported test results are discussed per sample and per test. The test methods which were used by the various laboratories were taken into account for explaining the observed differences when possible and applicable. These test methods are also in the tables together with the original data 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. D4530) and an added designation for the year that the test method was adopted or revised (e.g. D4530:15). When a method has been reapproved an “R” will be added and the year of approval (e.g. D4530:15R20).

Although VGO is an important feedstock for cracking installations there are only a few analytical test methods specifically designed for the analysis of VGO. Most parameters are to be determined by using methods that are intended for residual fuel oil and blending components. Where applicable precision data for Fuel Oil is used.

**sample #23250**

Total Acid Number: The majority of the laboratories reported to use Inflection Point with titration volume of 125 mL. Therefore, the z-scores are calculated with the reproducibility of ASTM D664-A:18e2 for Inflection Point at titration volume 125 mL.
The group of participants had difficulty to meet the target requirements. Six statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D664-A:18e2 for IP at 125 mL and BEP at 60 mL and 125 mL. However, calculated reproducibility is in agreement with the requirements of ASDTM D664-A:18e2 for IP at 60 mL. The mean is below the application range of ASTM D664:18e2, therefore no z-scores are calculated.

Aniline Point: The group of participants had difficulty to meet the target requirements. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D611:23.

Asphaltenes: The group of participants met the target requirements. All reporting participants agreed on a level <0.5 %M/M which is below the application range of test method IP143:04R21. Therefore, no z-scores are calculated.

Carbon Residue (micro method): The group of participants met the target requirements. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D4530:15R20.

Density at 15 °C: The group of participants met the target requirements. 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: The group of participants met the target requirements. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with requirements of ASTM D93-B:20.

Kinematic Viscosity at 50 °C: The group of participants met the target requirements. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D445:23.

Kinematic Viscosity at 100 °C: The group of participants met the target requirements. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D445:23.

Nitrogen: The group of participants met the target requirements. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with ASTM D5762:18a.

Pour Point Manual: The group of participants met the target requirements. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with ASTM D97:17bR22.

Pour Point Automated: The group of participants had difficulty to meet the target requirements. No statistical outliers were observed. The calculated reproducibility is not in agreement with ASTM D5950:14R20.

Total Sulfur: The group of participants met the target requirements. Five statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D4294:21.

Simulated Distillation: The group of participants met the target requirements. Over seven parameters nine statistical outliers were observed and one other test result was excluded. All the calculated reproducibilities after rejection of the suspect data are in agreement with the requirements of ASTM D6352:19e1.

Distillation at 10 mmHg as AET: The group of participants met the target requirements. Over seven parameters four statistical outliers were observed. Allmost all calculated reproducibilities after rejection of the statistical outliers are in agreement with the requirements of ASTM D1160:18, except for 90% recovered.

**sample #23251**

Aluminum as Al: The group of participants may have had difficulty to meet the target requirements. No statistical outliers were observed. The calculated reproducibility is not in agreement with the requirements of IP501:05R19. The mean is below the application range of IP501:05R19, therefore no z-scores are calculated.

Silicon as Si: The group of participants may have had difficulty to meet the target requirements. Four statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of IP501:05R19. The mean is below the application range of IP501:05R19, therefore no z-scores are calculated.

Sum Aluminum and Silicon: The group of participants may have had difficulty to meet the target requirements. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of IP501:05R19. The mean is below the application range of IP501:05R19, therefore no z-scores are calculated.

Arsenic as As: All reporting participants agreed on a level <10 mg/kg. Therefore, no z-scores are calculated.

Copper as Cu: The group of participants met the target requirements. No statistical outliers were observed. The calculated reproducibility is in agreement with IP621:16.

Iron as Fe: The group of participants met the target requirements. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical ouliers is in agreement with the requirements of IP621:16.

Nickel as Ni: The group of participants met the target requirements. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of IP621:16.

Sodium as Na: The group of participants met the target requirements. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of IP621:16.

Vanadium as V: The group of participants met the target requirements. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of IP621:16.

Calcium as Ca: The group of participants met the target requirements. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of IP621:16.

### 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) |
|---|---|---|---|---|---|
| Total Acid Number | mg KOH/g | 21 | 0.042 | 0.027 | (0.008) |
| Aniline Point | °C | 19 | 89.4 | 2.2 | 1 |
| Asphaltenes | %M/M | 33 | <0.5 | n.e. | n.e. |
| Carbon Residue (micro method) | %M/M | 29 | 0.15 | 0.07 | 0.15 |
| Density at 15 °C | kg/m$^3$ | 45 | 912.2 | 1.2 | 1.5 |
| Flash Point PMcc | °C | 36 | 192.1 | 6.7 | 10 |
| Kinematic Viscosity at 50 °C | mm$^2$/s | 45 | 37.92 | 1.65 | 3.21 |
| Kinematic Viscosity at 100 °C | mm$^2$/s | 39 | 7.442 | 0.189 | 0.898 |
| Nitrogen | mg/kg | 27 | 1071 | 251 | 285 |
| Pour Point Manual | °C | 38 | 38.1 | 5.1 | 9 |
| Pour Point Automated 3 °C int. | °C | 10 | 36.5 | 8.8 | 6.1 |
| Total Sulfur | %M/M | 38 | 0.041 | 0.004 | 0.009 |
| Simulated Distillation | | | | | |
| Initial Boiling Point | °C | 11 | 263.9 | 17.8 | 49.1 |
| Temp 10% recovered | °C | 10 | 361.0 | 3.3 | 7.1 |
| Temp 30% recovered | °C | 10 | 407.5 | 3.5 | 5.9 |
| Temp 50% recovered | °C | 10 | 438.3 | 4.6 | 6.4 |
| Temp 70% recovered | °C | 11 | 474.1 | 6.4 | 7.2 |
| Temp 90% recovered | °C | 11 | 525.5 | 6.2 | 10.5 |
| Final Boiling Point | °C | 11 | 604.4 | 21.3 | 38.1 |
| Distillation at 10 mmHg as AET | | | | | |
| Initial Boiling Point | °C | 21 | 282.7 | 41.3 | 49.4 |
| Temp 10% recovered | °C | 24 | 381.1 | 12.5 | 17.3 |
| Temp 30% recovered | °C | 24 | 419.3 | 7.4 | 11.3 |
| Temp 50% recovered | °C | 24 | 445.3 | 8.0 | 10.8 |
| Temp 70% recovered | °C | 24 | 476.8 | 9.8 | 9.6 |
| Temp 90% recovered | °C | 24 | 526.7 | 17.8 | 10.3 |
| Final Boiling Point | °C | 21 | 548.5 | 16.9 | 26.9 |

Table 6: reproducibilities of tests on sample #23250
For results between brackets no z-scores are calculated.

| Parameter | unit | n | average | 2.8 * sd | R(lit) |
|---|---|---|---|---|---|
| Aluminum as Al | mg/kg | 24 | 4.2 | 1.9 | (1.4) |
| Silicon as Si | mg/kg | 17 | 2.1 | 1.2 | (0.7) |
| Sum Aluminum and Silicon | mg/kg | 20 | 6.4 | 3.1 | (1.6) |
| Arsenic as As | mg/kg | 3 | <10 | n.e. | n.e. |
| Copper as Cu | mg/kg | 23 | 1.5 | 0.7 | 2.2 |
| Iron as Fe | mg/kg | 31 | 3.4 | 1.2 | 3.9 |
| Nickel as Ni | mg/kg | 35 | 12.4 | 3.8 | 8.1 |
| Sodium as Na | mg/kg | 32 | 2.9 | 1.3 | 4.0 |
| Vanadium as V | mg/kg | 35 | 11.9 | 1.9 | 4.7 |
| Calcium as Ca | mg/kg | 30 | 10.1 | 2.8 | 2.9 |

Table 7: reproducibilities of tests on sample #23251
For results between brackets no z-scores are calculated.

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

### 4.3 COMPARISON OF THE PROFICIENCY TEST OF NOVEMBER 2023 WITH PREVIOUS PTS

| | November 2023 | November 2022 | December 2021 | December 2020 | December 2019 |
|---|---|---|---|---|---|
| Number of reporting laboratories | 51 | 57 | 63 | 64 | 63 |
| Number of test results | 898 | 1048 | 1276 | 1172 | 1211 |
| Number of statistical outliers | 46 | 47 | 35 | 37 | 69 |
| Percentage of statistical outliers | 5.1% | 4.5% | 2.7% | 3.2% | 5.7% |

Table 8: comparison with previous proficiency tests

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

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

| Parameter | November 2023 | November 2022 | December 2021 | December 2020 | December 2019 |
|---|---|---|---|---|---|
| Total Acid Number | (--) | +/- | - | - | - |
| Aniline Point | -- | - | -- | - | -- |
| Asphaltenes | n.e. | n.e. | n.e. | n.e. | n.e. |
| Carbon Residue (micro method) | ++ | - | - | - | + |
| Density at 15 °C | + | + | +/- | + | +/- |
| Flash Point PMcc | + | + | + | + | + |
| Kinematic Viscosity at 50 °C | + | ++ | + | ++ | ++ |
| Kinematic Viscosity at 100 °C | ++ | ++ | ++ | ++ | ++ |
| Nitrogen | ++ | + | + | - | + |

| Parameter | November 2023 | November 2022 | December 2021 | December 2020 | December 2019 |
|---|---|---|---|---|---|
| Pour Point Manual | + | - | + | ++ | + |
| Pour Point Automated 3 °C int. | - | - | +/- | +/- | - |
| Total Sulfur | ++ | - | + | +/- | +/- |
| Simulated Distillation | + | + | + | - | - |
| Distillation at 10 mmHg as AET | + | + | + | +/- | +/- |
| Aluminum as Al | (-) | + | + | +/- | +/- |
| Silicon as Si | (--) | -- | -- | -- | - |
| Sum Aluminum and Silicon | +/- | +/- | -- | - | +/- |
| Arsenic as As | n.e. | n.e. | n.e. | n.e. | -- |
| Copper as Cu | ++ | n.e. | n.e. | +/- | ++ |
| Iron as Fe | ++ | ++ | +/- | +/- | +/- |
| Nickel as Ni | ++ | ++ | + | + | + |
| Sodium as Na | ++ | + | + | +/- | +/- |
| Vanadium as V | ++ | + | ++ | ++ | +/- |
| Calcium as Ca | +/- | n.e. | - | n.e. | +/- |

Table 9: comparison of determinations to the reference test methods

For results between brackets no z-scores are calculated.

The following performance categories were used:

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

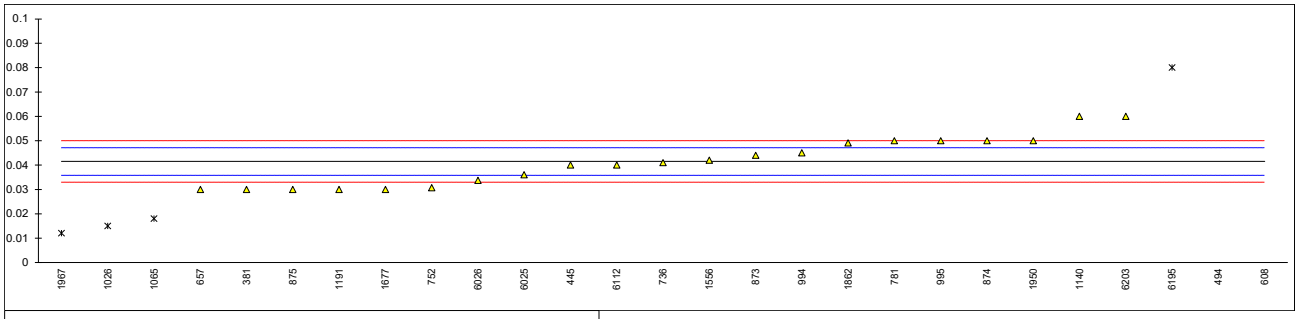
**APPENDIX 1**

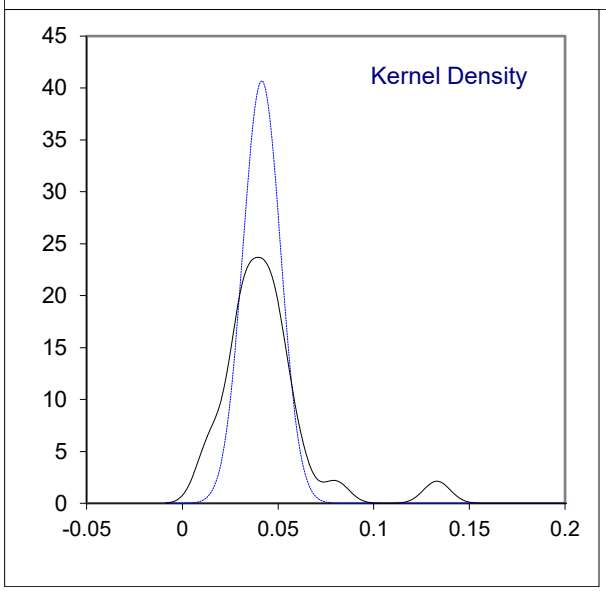
Determination of Total Acid Number on sample #23250; results in mg KOH/g

| lab | method | value | mark | z(targ) | End Point | volume | remarks |
|---|---|---|---|---|---|---|---|
| 52 | D664-A | <0.10 | | ----- | --- | --- | |
| 62 | D664-A | <0.10 | | ----- | Inflection Point | 125 mL | |
| 120 | | ----- | | ----- | --- | --- | |
| 140 | D664-A | <0.10 | | ----- | Inflection Point | 60 mL | |
| 150 | D664-A | <0.1 | C | ----- | Inflection Point | 125 mL | First reported 1.5 |
| 154 | | ----- | | ----- | --- | --- | |
| 158 | D664-A | <0.10 | | ----- | Inflection Point | 125 mL | |
| 159 | | ----- | | ----- | --- | --- | |
| 171 | D664-A | <0.10 | | ----- | --- | --- | |
| 225 | | ----- | | ----- | --- | --- | |
| 311 | D664-A | <0.10 | | ----- | Inflection Point | 125 mL | |
| 313 | | ----- | | ----- | --- | --- | |
| 323 | D664-A | < 0.10 | | ----- | --- | --- | |
| 333 | | ----- | | ----- | --- | --- | |
| 356 | | ----- | | ----- | --- | --- | |
| 381 | D664-A | 0.03 | | ----- | --- | --- | |
| 445 | D664-A | 0.040 | | ----- | Inflection Point | 60 mL | |
| 494 | D664-A | 0.133 | R(0.01) | ----- | Buffer End Point pH 10 | 60 mL | |
| 608 | D664-A | 0.35 | R(0.01) | ----- | Inflection Point | 125 mL | |
| 657 | D664-A | 0.03 | | ----- | Inflection Point | 125 mL | |
| 710 | | ----- | | ----- | --- | --- | |
| 736 | D664-A | 0.041 | | ----- | Inflection Point | 125 mL | |
| 750 | | ----- | | ----- | --- | --- | |
| 752 | D664-A | 0.0307 | | ----- | Inflection Point | 60 mL | |
| 753 | | ----- | | ----- | --- | --- | |
| 778 | | ----- | | ----- | --- | --- | |
| 781 | D664-A | 0.05 | | ----- | Inflection Point | 125 mL | |
| 785 | | ----- | | ----- | --- | --- | |
| 798 | | ----- | | ----- | --- | --- | |
| 823 | | ----- | | ----- | --- | --- | |
| 872 | | ----- | | ----- | --- | --- | |
| 873 | D664-A | 0.044 | | ----- | Buffer End Point pH 10 | 125 mL | |
| 874 | D664-A | 0.050 | | ----- | Buffer End Point pH 10 | 125 mL | |
| 875 | D664-A | 0.03 | | ----- | --- | --- | |
| 994 | D664-A | 0.045 | | ----- | Inflection Point | 60 mL | |
| 995 | D664-A | 0.05 | | ----- | Inflection Point | 125 mL | |
| 1026 | D664-A | 0.015 | R(0.05) | ----- | --- | --- | |
| 1065 | D664-A | 0.018 | R(0.05) | ----- | --- | --- | |
| 1081 | | ----- | | ----- | --- | --- | |
| 1140 | IP177 | 0.06 | | ----- | Inflection Point | 60 mL | |
| 1191 | ISO6618 | 0.03 | | ----- | --- | --- | |
| 1205 | | ----- | | ----- | --- | --- | |
| 1357 | | ----- | | ----- | --- | --- | |
| 1372 | | ----- | | ----- | --- | --- | |
| 1556 | D664-A | 0.042 | | ----- | --- | --- | |
| 1677 | D664-A | 0.03 | | ----- | Inflection Point | 125 mL | |
| 1862 | D664-A | 0.0491 | C | ----- | Inflection Point | 125 mL | First reported 0.491 |
| 1950 | D664-A | 0.05 | | ----- | Inflection Point | 125 mL | |
| 1967 | D664-A | 0.012 | R(0.05) | ----- | Buffer End Point pH 10 | 125 mL | |
| 6024 | | ----- | | ----- | --- | --- | |
| 6025 | D664-A | 0.036 | | ----- | Inflection Point | 125 mL | |
| 6026 | D664-A | 0.0337 | | ----- | Inflection Point | 125 mL | |
| 6112 | D664-A | 0.04 | | ----- | --- | --- | |
| 6195 | D664-A | 0.08 | R(0.05) | ----- | Inflection Point | 125 mL | |
| 6203 | D664-A | 0.06 | | ----- | Inflection Point | 125 mL | |
| 6447 | | ----- | | ----- | Inflection Point | 125 mL | |
| | | | | | --- | --- | |

| | | |
|---|---|---|
| | normality | OK |
| | n | 21 |
| | outliers | 6 |
| | mean (n) | 0.0415 |
| | st.dev. (n) | 0.00981 |
| | R(calc.) | 0.0275 |
| | st.dev.(D664-A:18e2 IP 125 mL) | (0.00283) |
| | R(D664-A:18e2 IP 125 mL) | (0.0079) |
| Compare | | |
| | R(D664-A:18e2 IP 60 mL) | (0.0296) |
| | R(D664-A:18e2 BEP 125 mL) | (0.0111) |
| | R(D664-A:18e2 BEP 60 mL) | (0.0248) |

Application range ASTM D664: 0.1 – 150 mg KOH/g

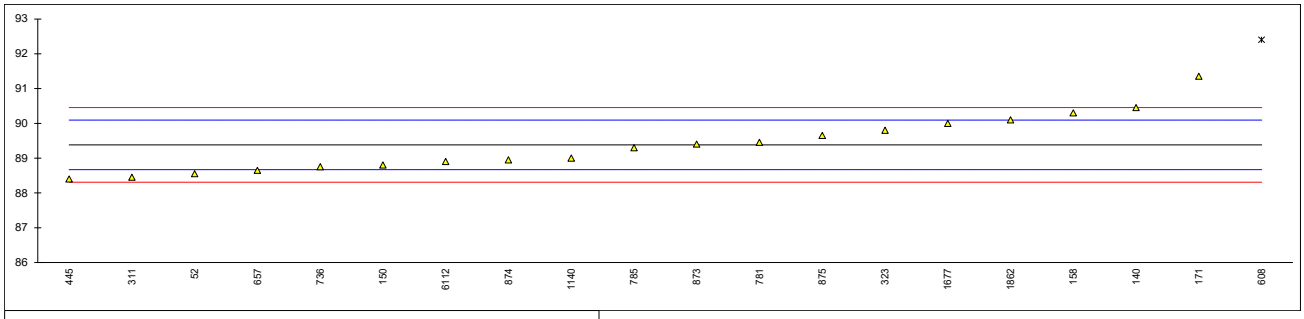

0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1967
1026
1065
657
381
875
1191
1677
752
6026
6025
445
6112
736
1556
873
994
1862
781
995
874
1950
1140
6203
6195
494
608

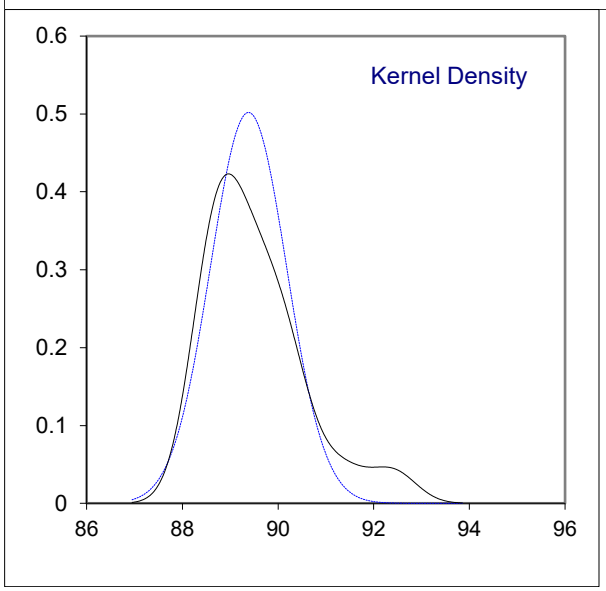

Kernel Density
45
40
35
30
25
20
15
10
5
0
-0.05
0
0.05
0.1
0.15
0.2

## Determination of Aniline Point on sample #23250; results in °C

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | D611-E | 88.55 | | -2.33 | |
| 62 | | ----- | | ----- | |
| 120 | | ----- | | ----- | |
| 140 | D611-E | 90.45 | | 2.99 | |
| 150 | D611-E | 88.80 | | -1.63 | |
| 154 | | ----- | | ----- | |
| 158 | D611-E | 90.30 | C | 2.57 | First reported 91.45 |
| 159 | | ----- | | ----- | |
| 171 | D611-E | 91.35 | | 5.51 | |
| 225 | | ----- | | ----- | |
| 311 | D611-E | 88.45 | | -2.61 | |
| 313 | | ----- | | ----- | |
| 323 | D611-A | 89.80 | | 1.17 | |
| 333 | | ----- | | ----- | |
| 356 | | ----- | | ----- | |
| 381 | | ----- | | ----- | |
| 445 | D611-A | 88.40 | | -2.75 | |
| 494 | | ----- | | ----- | |
| 608 | D611-A | 92.4 | R(0.05) | 8.45 | |
| 657 | D611-B | 88.65 | | -2.05 | |
| 710 | | ----- | | ----- | |
| 736 | D611-E | 88.75 | | -1.77 | |
| 750 | | ----- | | ----- | |
| 752 | | ----- | | ----- | |
| 753 | | ----- | | ----- | |
| 778 | | ----- | | ----- | |
| 781 | D611-E | 89.45 | | 0.19 | |
| 785 | D611-E | 89.3 | | -0.23 | |
| 798 | | ----- | | ----- | |
| 823 | | ----- | | ----- | |
| 872 | | ----- | | ----- | |
| 873 | D611-E | 89.40 | | 0.05 | |
| 874 | D611-E | 88.95 | | -1.21 | |
| 875 | D611-E | 89.65 | | 0.75 | |
| 994 | | ----- | | ----- | |
| 995 | | ----- | | ----- | |
| 1026 | | ----- | | ----- | |
| 1065 | | ----- | | ----- | |
| 1081 | | ----- | | ----- | |
| 1140 | D611-E | 89.0 | | -1.07 | |
| 1191 | | ----- | | ----- | |
| 1205 | | ----- | | ----- | |
| 1357 | | ----- | | ----- | |
| 1372 | | ----- | | ----- | |
| 1556 | | ----- | | ----- | |
| 1677 | D611-A | 90.00 | | 1.73 | |
| 1862 | D611-B | 90.10 | | 2.01 | |
| 1950 | | ----- | | ----- | |
| 1967 | | ----- | | ----- | |
| 6024 | | ----- | | ----- | |
| 6025 | | ----- | | ----- | |
| 6026 | | ----- | | ----- | |
| 6112 | D611-E | 88.9 | | -1.35 | |
| 6195 | D611-A | N/A | | ----- | |
| 6203 | | ----- | | ----- | |
| 6447 | | ----- | | ----- | |

| | |
|---|---|
| normality | OK |
| n | 19 |
| outliers | 1 |
| mean (n) | 89.382 |
| st.dev. (n) | 0.7950 |
| R(calc.) | 2.226 |
| st.dev.(D611:23) | 0.3571 |
| R(D611:23) | 1 |


93
92
91
90
89
88
87
86
445
311
52
657
736
150
6112
874
1140
785
873
781
875
323
1677
1862
158
140
171
608


Kernel Density
0.6
0.5
0.4
0.3
0.2
0.1
0
86
88
90
92
94
96

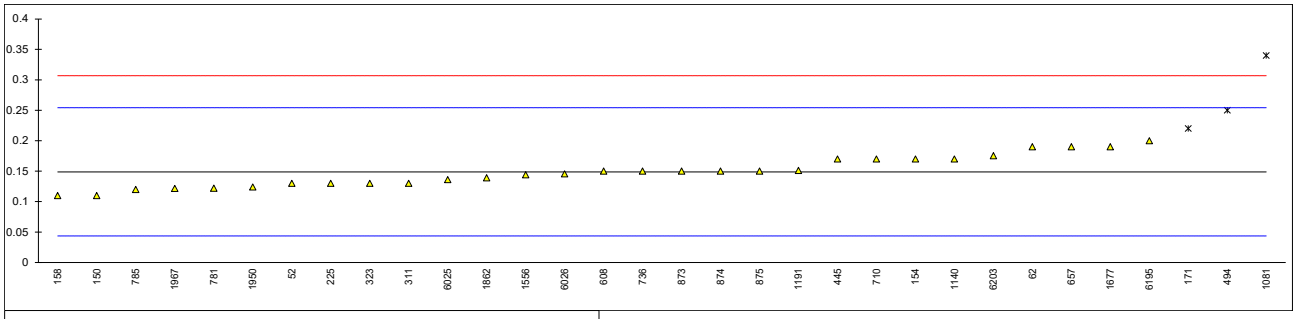
## Determination of Asphaltenes on sample #23250; results in %M/M

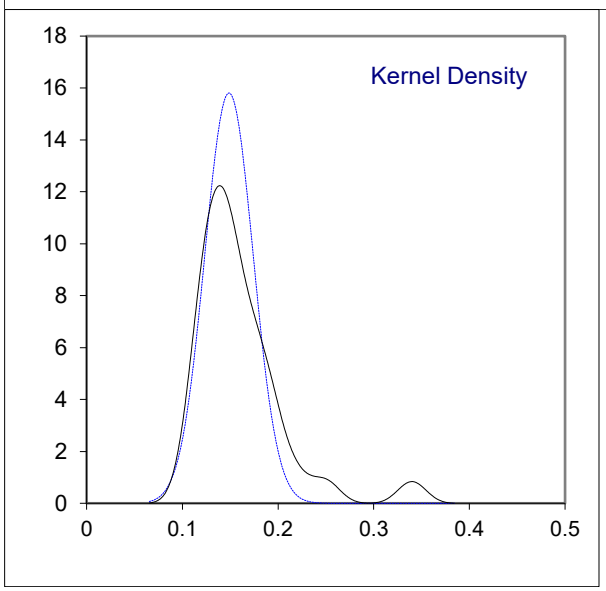
| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | IP143 | <0.05 | | ----- | |
| 62 | | ----- | | ----- | |
| 120 | IP143 | 0.02 | C | ----- | First reported 0.25 |
| 140 | IP143 | <0.05 | | ----- | |
| 150 | D6560 | <0.05 | | ----- | |
| 154 | IP143 | <0.05 | | ----- | |
| 158 | D6560 | <0.05 | | ----- | |
| 159 | | ----- | | ----- | |
| 171 | IP143 | <0.05 | | ----- | |
| 225 | | ----- | | ----- | |
| 311 | | ----- | | ----- | |
| 313 | | ----- | | ----- | |
| 323 | IP143 | < 0.50 | | ----- | |
| 333 | | ----- | | ----- | |
| 356 | IP143 | Less 0.50 | | ----- | |
| 381 | INH-642 | 0.017 | | ----- | |
| 445 | IP143 | 0.06 | | ----- | |
| 494 | IP143 | 0.022 | | ----- | |
| 608 | D6560 | 0.04 | | ----- | |
| 657 | IP143 | 0.02 | | ----- | |
| 710 | | ----- | | ----- | |
| 736 | IP143 | <0.5 | | ----- | |
| 750 | | ----- | | ----- | |
| 752 | INH-642 | 0.02036 | | ----- | |
| 753 | | ----- | | ----- | |
| 778 | | ----- | | ----- | |
| 781 | IP143 | 0.02 | | ----- | |
| 785 | IP143 | 0.05 | | ----- | |
| 798 | | ----- | | ----- | |
| 823 | | ----- | | ----- | |
| 872 | | ----- | | ----- | |
| 873 | IP143 | Less 0.5 | | ----- | |
| 874 | IP143 | <0.50 | | ----- | |
| 875 | IP143 | < 0.50 | | ----- | |
| 994 | IP143 | <0.5 | | ----- | |
| 995 | IP143 | <0.5 | | ----- | |
| 1026 | | ----- | | ----- | |
| 1065 | D6560 | 0.02 | | ----- | |
| 1081 | | ----- | | ----- | |
| 1140 | IP143 | 0.37 | | ----- | |
| 1191 | | ----- | | ----- | |
| 1205 | | ----- | | ----- | |
| 1357 | | ----- | | ----- | |
| 1372 | | ----- | | ----- | |
| 1556 | IP143 | 0.03 | | ----- | |
| 1677 | IP143 | 0.04 | | ----- | |
| 1862 | IP143 | 0.04 | | ----- | |
| 1950 | IP143 | <0.50 | | ----- | |
| 1967 | In house | 0.0265 | C | ----- | Reported 265 %M/M (probably unit error) |
| 6024 | | ----- | | ----- | |
| 6025 | | ----- | | ----- | |
| 6026 | In house | 0.0294 | | ----- | |
| 6112 | | ----- | | ----- | |
| 6195 | IP143 | 0.32 | | ----- | |
| 6203 | IP143 | 0.01228 | | ----- | |
| 6447 | | ----- | | ----- | |
| | | | | ----- | |
| | n | 33 | | | |
| | mean (n) | <0.5 | | | Application range: IP143 : 0.50 – 30 %M/M |

Determination of Carbon Residue (micro method) on sample #23250; results in %M/M

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | D4530 | 0.13 | | -0.36 | |
| 62 | D4530 | 0.19 | C | 0.78 | First reported 0.43 |
| 120 | | ----- | | ----- | |
| 140 | D4530 | <0.10 | | ----- | |
| 150 | D4530 | 0.11 | | -0.74 | |
| 154 | D4530 | 0.17 | | 0.40 | |
| 158 | D4530 | 0.11 | | -0.74 | |
| 159 | | ----- | | ----- | |
| 171 | D4530 | 0.22 | DG(0.05) | 1.35 | |
| 225 | D4530 | 0.13 | | -0.36 | |
| 311 | D4530 | 0.13 | | -0.36 | |
| 313 | | ----- | | ----- | |
| 323 | D4530 | 0.13 | | -0.36 | |
| 333 | | ----- | | ----- | |
| 356 | | ----- | | ----- | |
| 381 | | ----- | | ----- | |
| 445 | D4530 | 0.17 | | 0.40 | |
| 494 | D4530 | 0.25 | DG(0.05) | 1.92 | |
| 608 | D4530 | 0.15 | | 0.02 | |
| 657 | D4530 | 0.19 | | 0.78 | |
| 710 | ISO10370 | 0.17 | | 0.40 | |
| 736 | D4530 | 0.15 | | 0.02 | |
| 750 | | ----- | | ----- | |
| 752 | | ----- | | ----- | |
| 753 | | ----- | | ----- | |
| 778 | | ----- | | ----- | |
| 781 | D4530 | 0.122 | | -0.51 | |
| 785 | D4530 | 0.12 | | -0.55 | |
| 798 | | ----- | | ----- | |
| 823 | | ----- | | ----- | |
| 872 | | ----- | | ----- | |
| 873 | D4530 | 0.15 | | 0.02 | |
| 874 | D4530 | 0.15 | | 0.02 | |
| 875 | D4530 | 0.15 | | 0.02 | |
| 994 | | ----- | | ----- | |
| 995 | | ----- | | ----- | |
| 1026 | | ----- | | ----- | |
| 1065 | | ----- | | ----- | |
| 1081 | ISO10370 | 0.34 | G(0.01) | 3.63 | |
| 1140 | D4530 | 0.17 | | 0.40 | |
| 1191 | ISO10370 | 0.15103 | | 0.04 | |
| 1205 | | ----- | | ----- | |
| 1357 | | ----- | | ----- | |
| 1372 | | ----- | | ----- | |
| 1556 | ISO10370 | 0.144 | | -0.09 | |
| 1677 | D4530 | 0.19 | | 0.78 | |
| 1862 | D4530 | 0.139 | | -0.19 | |
| 1950 | D4530 | 0.124 | | -0.47 | |
| 1967 | D4530 | 0.1215 | | -0.52 | |
| 6024 | | ----- | | ----- | |
| 6025 | D4530 | 0.136 | | -0.25 | |
| 6026 | ISO10370 | 0.1456 | | -0.06 | |
| 6112 | | ----- | | ----- | |
| 6195 | D4530 | 0.2 | | 0.97 | |
| 6203 | D4530 | 0.1752 | | 0.50 | |
| 6447 | | ----- | | ----- | |

| | |
|---|---|
| normality | OK |
| n | 29 |
| outliers | 3 |
| mean (n) | 0.1489 |
| st.dev. (n) | 0.02525 |
| R(calc.) | 0.0707 |
| st.dev.(D4530:15R20) | 0.05264 |
| R(D4530:15R20) | 0.1474 |

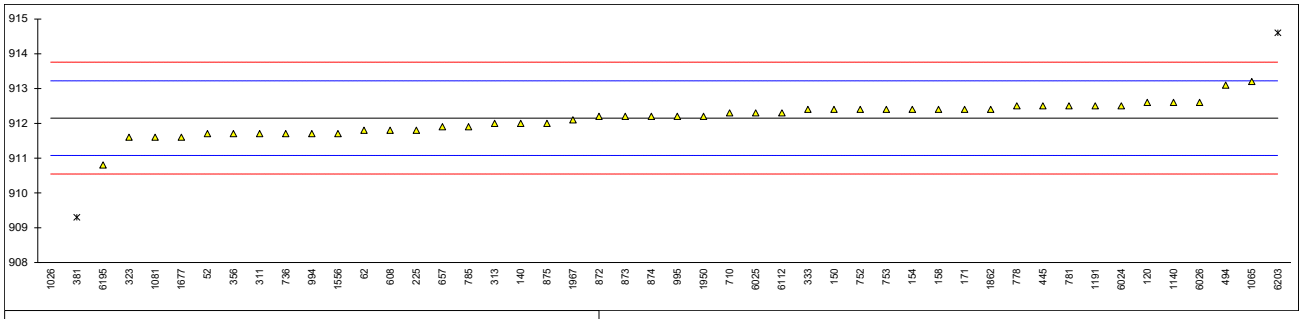

0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
158
150
785
1967
781
1950
52
225
323
311
6025
1862
1556
6026
608
736
873
874
875
1191
445
710
154
1140
6203
62
657
1677
6195
171
494
1081

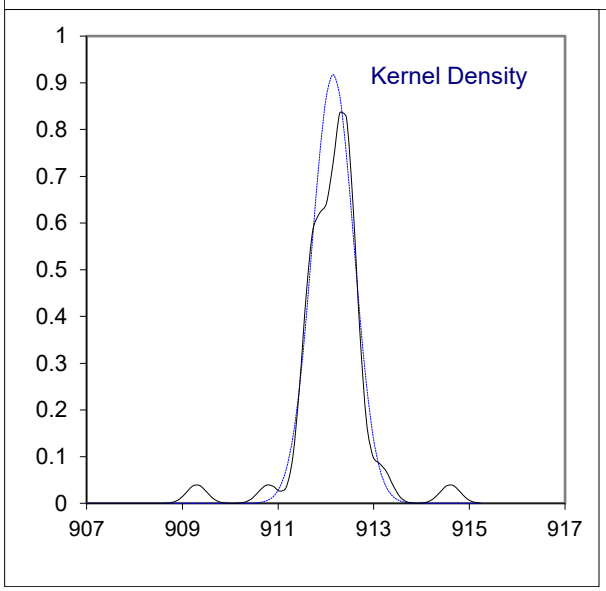

Kernel Density
18
16
14
12
10
8
6
4
2
0
0
0.1
0.2
0.3
0.4
0.5

Determination of Density at 15 °C on sample #23250; results in kg/m$^3$

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | D4052 | 911.7 | | -0.84 | |
| 62 | D4052 | 911.8 | | -0.66 | |
| 120 | D4052 | 912.6 | | 0.84 | |
| 140 | D4052 | 912.0 | | -0.28 | |
| 150 | D4052 | 912.4 | | 0.46 | |
| 154 | D4052 | 912.4 | | 0.46 | |
| 158 | D4052 | 912.4 | | 0.46 | |
| 159 | | ----- | | ----- | |
| 171 | ISO12185 | 912.4 | | 0.46 | |
| 225 | D4052 | 911.8 | | -0.66 | |
| 311 | ISO12185 | 911.7 | | -0.84 | |
| 313 | ISO12185 | 912.0 | | -0.28 | |
| 323 | ISO12185 | 911.6 | | -1.03 | |
| 333 | ISO12185 | 912.4 | | 0.46 | |
| 356 | ISO12185 | 911.7 | | -0.84 | |
| 381 | D4052 | 909.3 | R(0.01) | -5.32 | |
| 445 | ISO12185 | 912.5 | | 0.65 | |
| 494 | ISO12185 | 913.1 | | 1.77 | |
| 608 | D4052 | 911.8 | | -0.66 | |
| 657 | D4052 | 911.9 | | -0.47 | |
| 710 | ISO12185 | 912.3 | | 0.28 | |
| 736 | D1298 | 911.7 | | -0.84 | |
| 750 | | ----- | | ----- | |
| 752 | ISO3675 | 912.4 | | 0.46 | |
| 753 | ISO12185 | 912.4 | | 0.46 | |
| 778 | ISO12185 | 912.5 | | 0.65 | |
| 781 | ISO12185 | 912.5 | | 0.65 | |
| 785 | ISO12185 | 911.9 | | -0.47 | |
| 798 | | ----- | | ----- | |
| 823 | | ----- | | ----- | |
| 872 | ISO12185 | 912.2 | | 0.09 | |
| 873 | ISO12185 | 912.2 | | 0.09 | |
| 874 | ISO12185 | 912.2 | | 0.09 | |
| 875 | D1298 | 912.0 | | -0.28 | |
| 994 | ISO12185 | 911.7 | | -0.84 | |
| 995 | ISO12185 | 912.2 | | 0.09 | |
| 1026 | D4052 | 880.2 | R(0.01) | -59.64 | |
| 1065 | D4052 | 913.2 | | 1.96 | |
| 1081 | D4052 | 911.6 | | -1.03 | |
| 1140 | IP365 | 912.6 | | 0.84 | |
| 1191 | ISO12185 | 912.5 | | 0.65 | |
| 1205 | | ----- | | ----- | |
| 1357 | | ----- | | ----- | |
| 1372 | | ----- | | ----- | |
| 1556 | ISO12185 | 911.7 | | -0.84 | |
| 1677 | D4052 | 911.6 | | -1.03 | |
| 1862 | ISO12185 | 912.4 | | 0.46 | |
| 1950 | ISO12185 | 912.2 | | 0.09 | |
| 1967 | D1298 | 912.1 | | -0.10 | |
| 6024 | D1298 | 912.5 | | 0.65 | |
| 6025 | ISO12185 | 912.3 | C | 0.28 | Reported 0.9123 kg/m3 |
| 6026 | ISO12185 | 912.6 | | 0.84 | |
| 6112 | ISO12185 | 912.3 | | 0.28 | |
| 6195 | D4052 | 910.8 | | -2.52 | |
| 6203 | D4052 | 914.6 | R(0.01) | 4.57 | |
| 6447 | | ----- | | ----- | |

| | |
|---|---|
| normality | suspect |
| n | 45 |
| outliers | 3 |
| mean (n) | 912.15 |
| st.dev. (n) | 0.435 |
| R(calc.) | 1.22 |
| st.dev.(ISO12185:96) | 0.536 |
| R(ISO12185:96) | 1.5 |

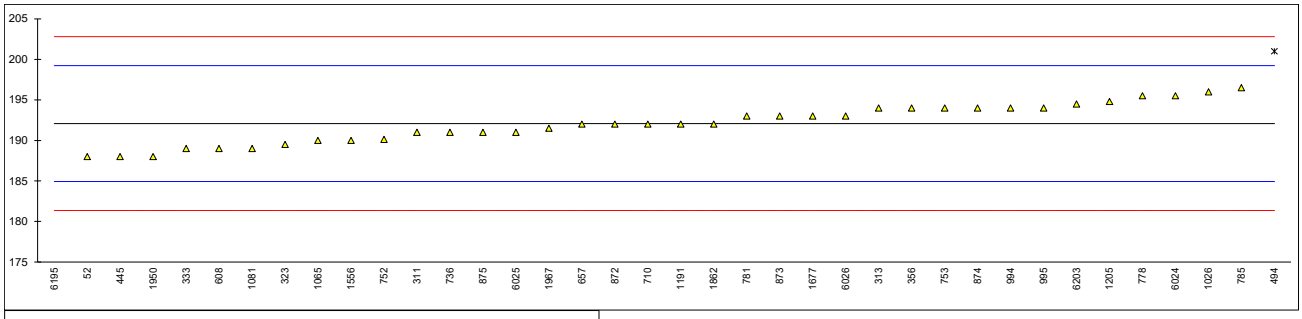

915
914
913
912
911
910
909
908
1026 381 6195 323 1081 1677 52 356 311 736 994 1556 62 608 225 657 785 313 140 875 1967 872 873 874 995 1950 710 6025 6112 333 150 752 753 154 158 171 1862 778 445 781 1191 6024 120 1140 6026 494 1065 6203

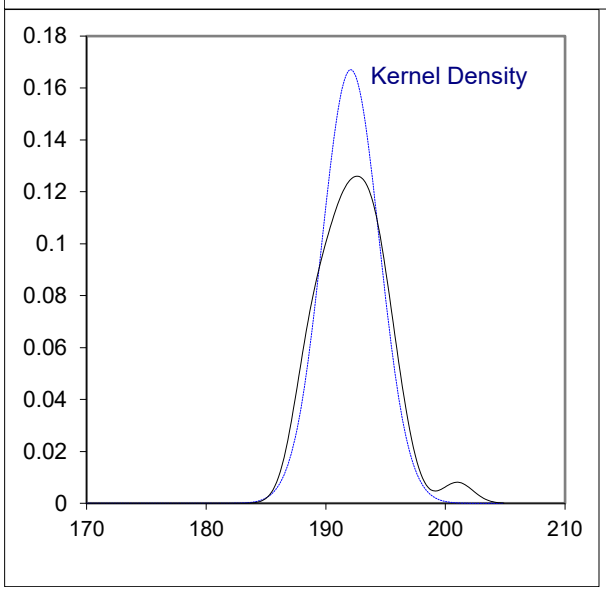

Kernel Density
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
907 909 911 913 915 917

## Determination of Flash Point PMcc on sample #23250; results in °C

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | D93-A | 188.0 | | -1.14 | |
| 62 | D93-B | >150 | | ----- | |
| 120 | | ----- | | ----- | |
| 140 | D93-B | >110.0 | | ----- | |
| 150 | | ----- | | ----- | |
| 154 | D93-B | >110 | | ----- | |
| 158 | D93-B | >110 | | ----- | |
| 159 | | ----- | | ----- | |
| 171 | D93-B | >110 | | ----- | |
| 225 | | ----- | | ----- | |
| 311 | D93-B | 191.0 | | -0.30 | |
| 313 | D93-B | 194.0 | | 0.54 | |
| 323 | D93-B | 189.5 | | -0.72 | |
| 333 | D93-B | 189.0 | | -0.86 | |
| 356 | D93-B | 194.0 | | 0.54 | |
| 381 | | ----- | | ----- | |
| 445 | D93-B | 188.0 | | -1.14 | |
| 494 | D93-B | 201.0 | R(0.05) | 2.50 | |
| 608 | D93-B | 189 | | -0.86 | |
| 657 | D93-B | 192 | | -0.02 | |
| 710 | D93-B | 192.0 | | -0.02 | |
| 736 | D93-B | 191.0 | | -0.30 | |
| 750 | | ----- | | ----- | |
| 752 | D93-B | 190.13 | | -0.55 | |
| 753 | D93-B | 194.0 | | 0.54 | |
| 778 | D93-B | 195.5 | | 0.96 | |
| 781 | D93-A | 193.0 | | 0.26 | |
| 785 | D93-B | 196.5 | | 1.24 | |
| 798 | | ----- | | ----- | |
| 823 | | ----- | | ----- | |
| 872 | D93-B | 192.0 | | -0.02 | |
| 873 | D93-B | 193.0 | | 0.26 | |
| 874 | D93-B | 194.0 | | 0.54 | |
| 875 | D93-B | 191.0 | | -0.30 | |
| 994 | D93-B | 194.0 | | 0.54 | |
| 995 | D93-B | 194.0 | | 0.54 | |
| 1026 | D93-A | 196.0 | | 1.10 | |
| 1065 | D93-A | 190 | | -0.58 | |
| 1081 | | 189.0 | | -0.86 | |
| 1140 | D93-B | >100.0 | | ----- | |
| 1191 | ISO2719 | 192.0 | | -0.02 | |
| 1205 | D93-B | 194.8 | | 0.76 | |
| 1357 | | ----- | | ----- | |
| 1372 | | ----- | | ----- | |
| 1556 | ISO2719 | 190.0 | | -0.58 | |
| 1677 | D93-B | 193.0 | | 0.26 | |
| 1862 | D93-B | 192.0 | | -0.02 | |
| 1950 | D93-B | 188.0 | | -1.14 | |
| 1967 | D93-B | 191.5 | | -0.16 | |
| 6024 | D93-B | 195.5 | | 0.96 | |
| 6025 | D93-B | 191.0 | | -0.30 | |
| 6026 | D93-B | 193.0 | | 0.26 | |
| 6112 | | ----- | | ----- | |
| 6195 | D93-B | 130.0 | R(0.01) | -17.38 | |
| 6203 | D93-B | 194.5 | | 0.68 | |
| 6447 | | ----- | | ----- | |

| | |
|---|---|
| normality | OK |
| n | 36 |
| outliers | 2 |
| mean (n) | 192.081 |
| st.dev. (n) | 2.3881 |
| R(calc.) | 6.687 |
| st.dev.(D93-B:20) | 3.5714 |
| R(D93-B:20) | 10 |

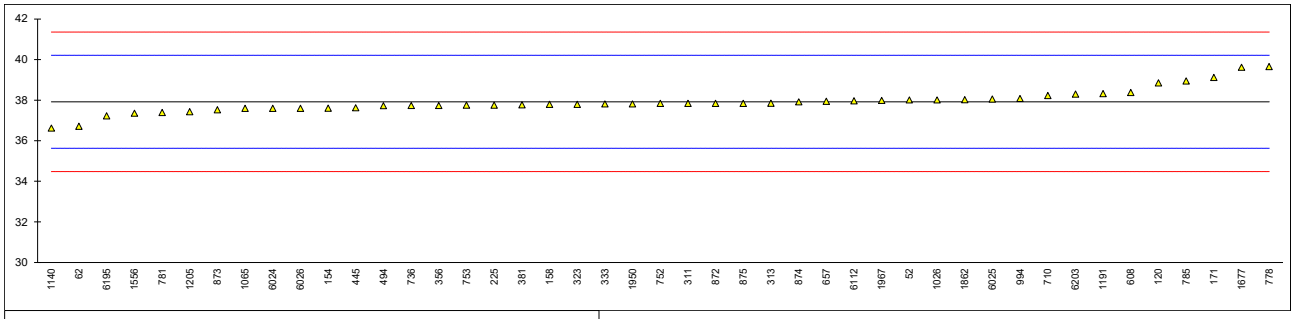

205
200
195
190
185
180
175
6195
52
445
1950
333
608
1081
323
1065
1556
752
311
736
875
6025
1967
657
872
710
1191
1862
781
873
1677
6026
313
356
753
874
994
995
6203
1205
778
6024
1026
785
494

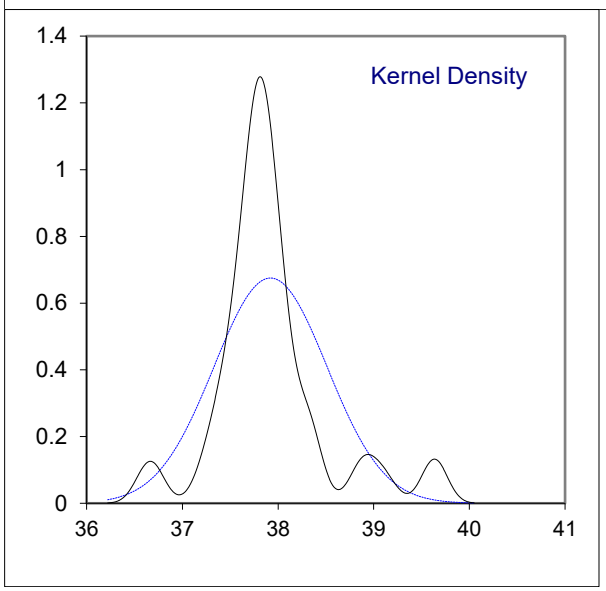

Kernel Density
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
170
180
190
200
210

Determination of Kinematic Viscosity at 50 °C on sample #23250; results in $mm^2/s$

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | D445 | 38.01 | | 0.08 | |
| 62 | D445 | 36.71 | | -1.06 | |
| 120 | D445 | 38.85 | | 0.81 | |
| 140 | | ----- | | ----- | |
| 150 | | ----- | | ----- | |
| 154 | D445 | 37.60 | | -0.28 | |
| 158 | D445 | 37.79 | | -0.11 | |
| 159 | | ----- | | ----- | |
| 171 | D445 | 39.12 | | 1.05 | |
| 225 | D445 | 37.75 | | -0.15 | |
| 311 | D445 | 37.84 | | -0.07 | |
| 313 | D445 | 37.85 | | -0.06 | |
| 323 | D445 | 37.79 | | -0.11 | |
| 333 | D445 | 37.81 | | -0.10 | |
| 356 | D445 | 37.73 | | -0.17 | |
| 381 | D445 | 37.77 | | -0.13 | |
| 445 | D445 | 37.62 | | -0.26 | |
| 494 | D445 | 37.726 | | -0.17 | |
| 608 | D445 | 38.38 | | 0.40 | |
| 657 | D445 | 37.94 | | 0.02 | |
| 710 | D445 | 38.223 | | 0.26 | |
| 736 | D445 | 37.73 | | -0.17 | |
| 750 | | ----- | | ----- | |
| 752 | D445 | 37.84 | | -0.07 | |
| 753 | D445 | 37.75 | | -0.15 | |
| 778 | D445 | 39.65 | | 1.51 | |
| 781 | D445 | 37.39 | | -0.46 | |
| 785 | D445 | 38.94 | | 0.89 | |
| 798 | | ----- | | ----- | |
| 823 | | ----- | | ----- | |
| 872 | D445 | 37.84 | | -0.07 | |
| 873 | D445 | 37.52 | | -0.35 | |
| 874 | D445 | 37.91 | | -0.01 | |
| 875 | D445 | 37.84 | | -0.07 | |
| 994 | D445 | 38.08 | | 0.14 | |
| 995 | | ----- | | ----- | |
| 1026 | ISO3104 | 38.01 | | 0.08 | |
| 1065 | D445 | 37.59 | | -0.29 | |
| 1081 | | ----- | | ----- | |
| 1140 | D445 | 36.62 | | -1.14 | |
| 1191 | ISO3104 | 38.32 | | 0.35 | |
| 1205 | ISO3104 | 37.42575 | | -0.43 | |
| 1357 | | ----- | | ----- | |
| 1372 | | ----- | | ----- | |
| 1556 | ISO3104 | 37.352 | | -0.50 | |
| 1677 | D445 | 39.62 | | 1.48 | |
| 1862 | D445 | 38.02 | | 0.09 | |
| 1950 | D445 | 37.81 | | -0.10 | |
| 1967 | D445 | 37.986 | | 0.06 | |
| 6024 | D445 | 37.59 | C | -0.29 | Test results Kinematic Viscosity 50°C and 100°C were mixed-up |
| 6025 | D445 | 38.05 | | 0.11 | |
| 6026 | ISO3104 | 37.59 | | -0.29 | |
| 6112 | D445 | 37.96 | | 0.03 | |
| 6195 | D445 | 37.22 | | -0.61 | |
| 6203 | D7042 | 38.294 | | 0.33 | |
| 6447 | | ----- | | ----- | |

| | |
|---|---|
| normality | not OK |
| n | 45 |
| outliers | 0 |
| mean (n) | 37.9212 |
| st.dev. (n) | 0.59077 |
| R(calc.) | 1.6541 |
| st.dev.(D445:23) | 1.14590 |
| R(D445:23) | 3.2085 |

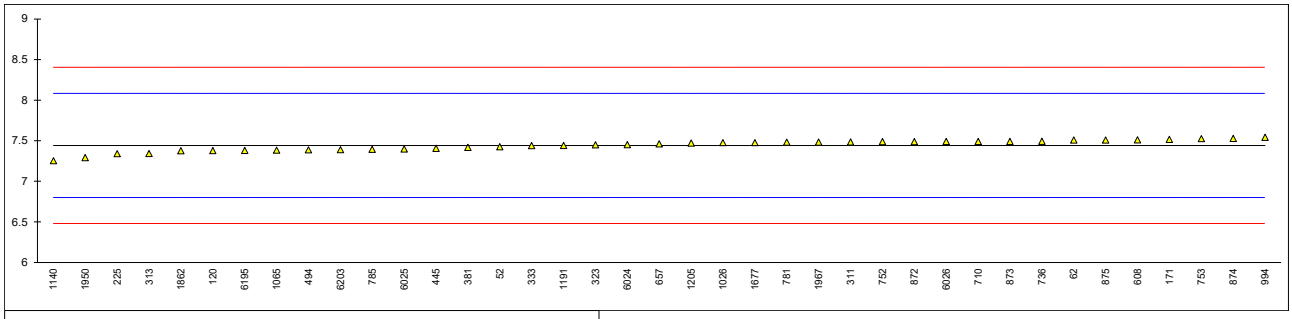

42
40
38
36
34
32
30
1140 62 6195 1556 781 1205 873 1065 6024 6026 154 445 494 736 356 753 225 381 158 323 333 1950 752 311 872 875 313 874 657 6112 1967 52 1026 1862 6025 994 710 6203 1191 608 120 785 171 1677 778

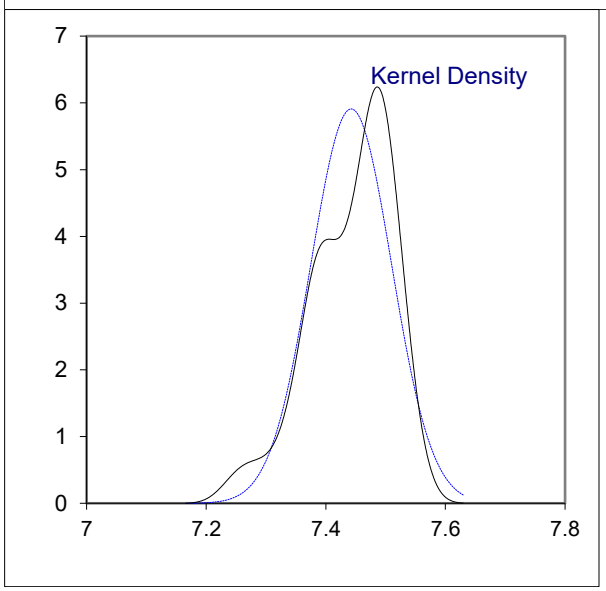

Kernel Density
1.4
1.2
1
0.8
0.6
0.4
0.2
0
36 37 38 39 40 41

Determination of Kinematic Viscosity at 100 °C on sample #23250; results in $mm^2/s$

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | D445 | 7.425 | | -0.05 | |
| 62 | D445 | 7.508 | | 0.21 | |
| 120 | D7042 | 7.378 | | -0.20 | |
| 140 | | ----- | | ----- | |
| 150 | | ----- | | ----- | |
| 154 | | ----- | | ----- | |
| 158 | | ----- | | ----- | |
| 159 | | ----- | | ----- | |
| 171 | D445 | 7.515 | | 0.23 | |
| 225 | D445 | 7.339 | | -0.32 | |
| 311 | D445 | 7.485 | | 0.13 | |
| 313 | D445 | 7.342 | | -0.31 | |
| 323 | D445 | 7.449 | | 0.02 | |
| 333 | D445 | 7.440 | | -0.01 | |
| 356 | | ----- | | ----- | |
| 381 | D445 | 7.417 | | -0.08 | |
| 445 | D445 | 7.406 | | -0.11 | |
| 494 | D445 | 7.387 | | -0.17 | |
| 608 | D445 | 7.51 | | 0.21 | |
| 657 | D445 | 7.461 | | 0.06 | |
| 710 | D445 | 7.4903 | | 0.15 | |
| 736 | D445 | 7.493 | | 0.16 | |
| 750 | | ----- | | ----- | |
| 752 | D445 | 7.489 | | 0.15 | |
| 753 | D445 | 7.525 | | 0.26 | |
| 778 | | ----- | | ----- | |
| 781 | D445 | 7.482 | | 0.12 | |
| 785 | D445 | 7.395 | | -0.15 | |
| 798 | | ----- | | ----- | |
| 823 | | ----- | | ----- | |
| 872 | D445 | 7.489 | | 0.15 | |
| 873 | D445 | 7.491 | | 0.15 | |
| 874 | D445 | 7.528 | | 0.27 | |
| 875 | D445 | 7.509 | | 0.21 | |
| 994 | D445 | 7.542 | | 0.31 | |
| 995 | | ----- | | ----- | |
| 1026 | D445 | 7.475 | | 0.10 | |
| 1065 | D445 | 7.3826 | | -0.19 | |
| 1081 | | ----- | | ----- | |
| 1140 | D445 | 7.253 | | -0.59 | |
| 1191 | ISO3104 | 7.4412 | | 0.00 | |
| 1205 | ISO3104 | 7.469745 | | 0.09 | |
| 1357 | | ----- | | ----- | |
| 1372 | | ----- | | ----- | |
| 1556 | | ----- | | ----- | |
| 1677 | D445 | 7.475 | | 0.10 | |
| 1862 | D445 | 7.376 | | -0.21 | |
| 1950 | D445 | 7.290 | | -0.48 | |
| 1967 | D445 | 7.4839 | | 0.13 | |
| 6024 | D445 | 7.450 | C | 0.02 | Test results Kinematic Viscosity 50°C and 100°C were mixed-up |
| 6025 | D445 | 7.398 | | -0.14 | |
| 6026 | ISO3104 | 7.490 | | 0.15 | |
| 6112 | | ----- | | ----- | |
| 6195 | D445 | 7.380 | | -0.19 | |
| 6203 | D7042 | 7.389 | | -0.17 | |
| 6447 | | ----- | | ----- | |

| | |
|---|---|
| normality | OK |
| n | 39 |
| outliers | 0 |
| mean (n) | 7.4423 |
| st.dev. (n) | 0.06752 |
| R(calc.) | 0.1890 |
| st.dev.(D445:23) | 0.32055 |
| R(D445:23) | 0.8975 |

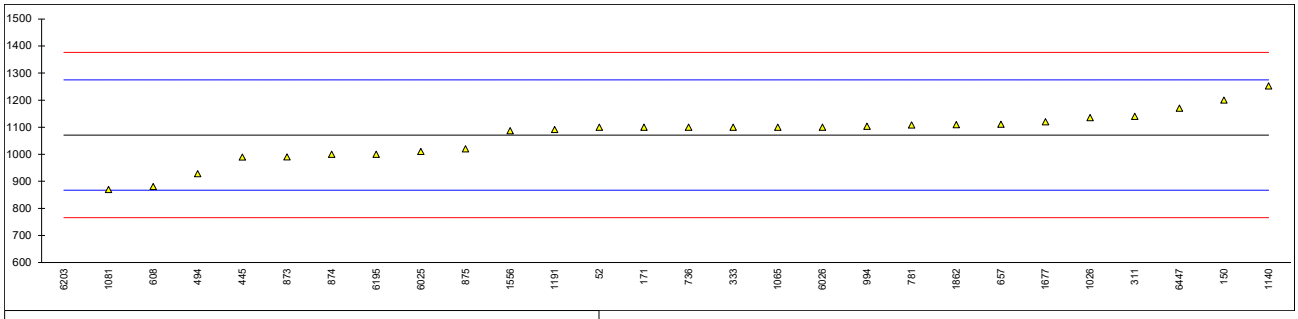

9
8.5
8
7.5
7
6.5
6
1140
1950
225
313
1862
120
6195
1065
494
6203
785
6025
445
381
52
333
1191
323
6024
657
1205
1026
1677
781
1967
311
752
872
6026
710
873
736
62
875
608
171
753
874
994

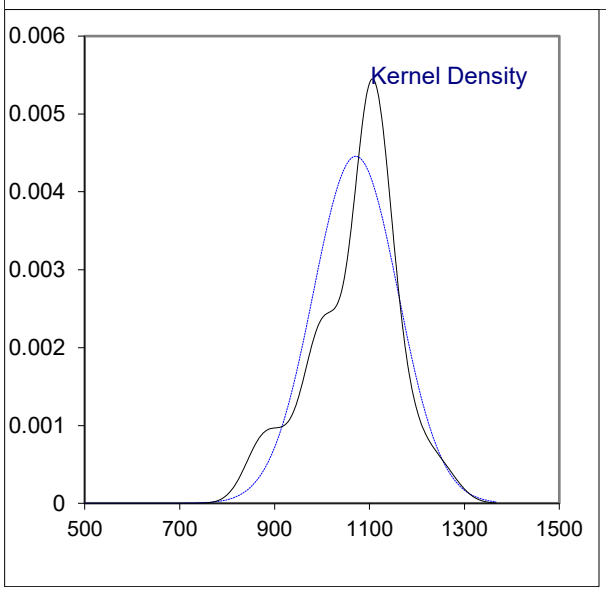

Kernel Density
7
6
5
4
3
2
1
0
7
7.2
7.4
7.6
7.8

## Determination of Nitrogen on sample #23250; results in mg/kg

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | D4629 | 1100 | | 0.29 | |
| 62 | | ----- | | ----- | |
| 120 | | ----- | | ----- | |
| 140 | | ----- | | ----- | |
| 150 | D5762 Gravimetric | 1200 | | 1.27 | |
| 154 | | ----- | | ----- | |
| 158 | | ----- | | ----- | |
| 159 | | ----- | | ----- | |
| 171 | D5762 Gravimetric | 1100 | | 0.29 | |
| 225 | | ----- | | ----- | |
| 311 | D5762 Volumetric | 1140 | | 0.68 | |
| 313 | | ----- | | ----- | |
| 323 | | ----- | | ----- | |
| 333 | D5762 Gravimetric | 1100 | | 0.29 | |
| 356 | | ----- | | ----- | |
| 381 | | ----- | | ----- | |
| 445 | D5762 Gravimetric | 989.3 | | -0.80 | |
| 494 | D5762 Gravimetric | 928 | | -1.40 | |
| 608 | D5762 Gravimetric | 880.54 | | -1.87 | |
| 657 | D5762 Gravimetric | 1110.6 | | 0.39 | |
| 710 | | ----- | | ----- | |
| 736 | D5762 Volumetric | 1100 | | 0.29 | |
| 750 | | ----- | | ----- | |
| 752 | | ----- | | ----- | |
| 753 | | ----- | | ----- | |
| 778 | | ----- | | ----- | |
| 781 | D5762 Gravimetric | 1108 | | 0.36 | |
| 785 | | ----- | | ----- | |
| 798 | | ----- | | ----- | |
| 823 | | ----- | | ----- | |
| 872 | | ----- | | ----- | |
| 873 | D4629 | 990 | | -0.80 | |
| 874 | D5762 | 1000 | | -0.70 | |
| 875 | D5762 Volumetric | 1020 | | -0.50 | |
| 994 | D5762 Volumetric | 1103 | | 0.32 | |
| 995 | | ----- | | ----- | |
| 1026 | D4629 | 1135 | | 0.63 | |
| 1065 | D4629 | 1100 | | 0.29 | |
| 1081 | D4629 | 870 | | -1.97 | |
| 1140 | D4629 | 1252.2 | | 1.78 | |
| 1191 | D5762 Gravimetric | 1091.1 | | 0.20 | |
| 1205 | | ----- | | ----- | |
| 1357 | | ----- | | ----- | |
| 1372 | | ----- | | ----- | |
| 1556 | D5762 Gravimetric | 1087 | | 0.16 | |
| 1677 | D5762 Gravimetric | 1120 | | 0.48 | |
| 1862 | D5762 Gravimetric | 1109 | | 0.37 | |
| 1950 | | ----- | | ----- | |
| 1967 | | ----- | | ----- | |
| 6024 | | ----- | | ----- | |
| 6025 | D5762 Volumetric | 1010 | | -0.60 | |
| 6026 | D5762 Gravimetric | 1100 | | 0.29 | |
| 6112 | | ----- | | ----- | |
| 6195 | D4629 | 1000 | | -0.70 | |
| 6203 | D5762 Gravimetric | 0.25 | R(0.01) | -10.52 | |
| 6447 | D5762 Volumetric | 1170 | | 0.97 | |

| | |
|---|---|
| normality | OK |
| n | 27 |
| outliers | 1 |
| mean (n) | 1070.88 |
| st.dev. (n) | 89.531 |
| R(calc.) | 250.69 |
| st.dev.(D5762:18a) | 101.734 |
| R(D5762:18a) | 284.85 |

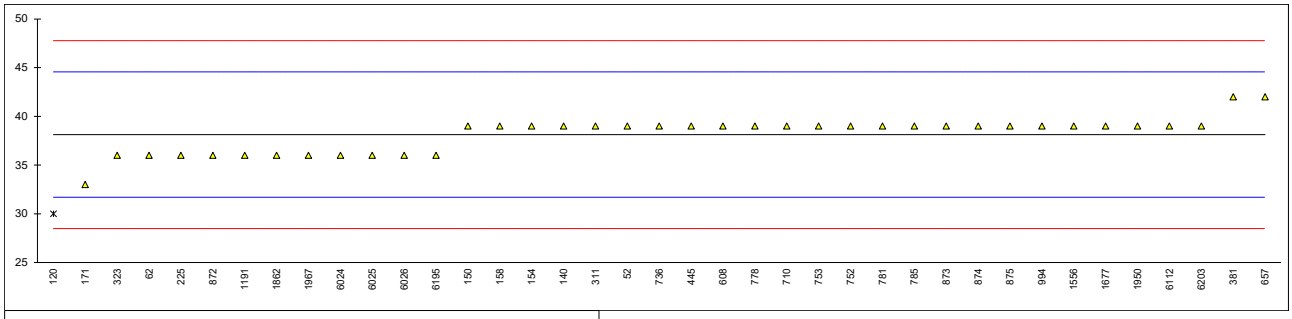

1500
1400
1300
1200
1100
1000
900
800
700
600
6203
1081
608
494
445
873
874
6195
6025
875
1556
1191
52
171
736
333
1065
6026
994
781
1862
657
1677
1026
311
6447
150
1140

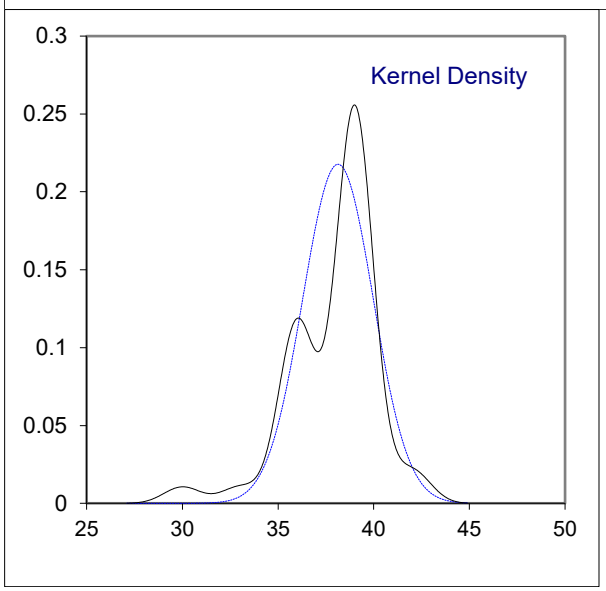

Kernel Density
0.006
0.005
0.004
0.003
0.002
0.001
0
500
700
900
1100
1300
1500

Determination of Pour Point Manual on sample #23250; results in °C

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | D97 | 39 | | 0.27 | |
| 62 | D97 | 36 | | -0.66 | |
| 120 | D97 | 30 | R(0.01) | -2.53 | |
| 140 | D97 | 39 | | 0.27 | |
| 150 | D97 | 39 | | 0.27 | |
| 154 | D97 | 39 | | 0.27 | |
| 158 | D97 | 39 | | 0.27 | |
| 159 | | ----- | | ----- | |
| 171 | D97 | 33 | | -1.60 | |
| 225 | D97 | 36 | | -0.66 | |
| 311 | D97 | 39 | | 0.27 | |
| 313 | | ----- | | ----- | |
| 323 | D97 | 36 | | -0.66 | |
| 333 | | ----- | | ----- | |
| 356 | | ----- | | ----- | |
| 381 | ISO3016 | 42 | | 1.20 | |
| 445 | D97 | 39 | | 0.27 | |
| 494 | | ----- | | ----- | |
| 608 | D97 | 39 | | 0.27 | |
| 657 | D97 | 42 | | 1.20 | |
| 710 | D97 | 39 | | 0.27 | |
| 736 | D97 | 39 | | 0.27 | |
| 750 | | ----- | | ----- | |
| 752 | D97 | 39 | | 0.27 | |
| 753 | D97 | 39 | | 0.27 | |
| 778 | D97 | 39 | | 0.27 | |
| 781 | D97 | 39 | | 0.27 | |
| 785 | D97 | 39.0 | | 0.27 | |
| 798 | | ----- | | ----- | |
| 823 | | ----- | | ----- | |
| 872 | D97 | 36 | | -0.66 | |
| 873 | D97 | 39 | | 0.27 | |
| 874 | D97 | 39 | | 0.27 | |
| 875 | D97 | 39 | | 0.27 | |
| 994 | D97 | 39 | | 0.27 | |
| 995 | | ----- | | ----- | |
| 1026 | | ----- | | ----- | |
| 1065 | | ----- | | ----- | |
| 1081 | | ----- | | ----- | |
| 1140 | | ----- | | ----- | |
| 1191 | ISO3016 | 36 | | -0.66 | |
| 1205 | | ----- | | ----- | |
| 1357 | | ----- | | ----- | |
| 1372 | | ----- | | ----- | |
| 1556 | ISO3016 | 39 | | 0.27 | |
| 1677 | D97 | 39 | | 0.27 | |
| 1862 | D97 | 36 | | -0.66 | |
| 1950 | D97 | 39 | | 0.27 | |
| 1967 | D97 | 36 | | -0.66 | |
| 6024 | D97 | 36 | | -0.66 | |
| 6025 | D97 | 36 | | -0.66 | |
| 6026 | D97 | 36 | | -0.66 | |
| 6112 | D97 | 39 | | 0.27 | |
| 6195 | D97 | 36 | | -0.66 | |
| 6203 | D97 | 39 | | 0.27 | |
| 6447 | | ----- | | ----- | |

| | |
|---|---|
| normality | OK |
| n | 38 |
| outliers | 1 |
| mean (n) | 38.13 |
| st.dev. (n) | 1.833 |
| R(calc.) | 5.13 |
| st.dev.(D97:17bR22) | 3.214 |
| R(D97:17bR22) | 9 |

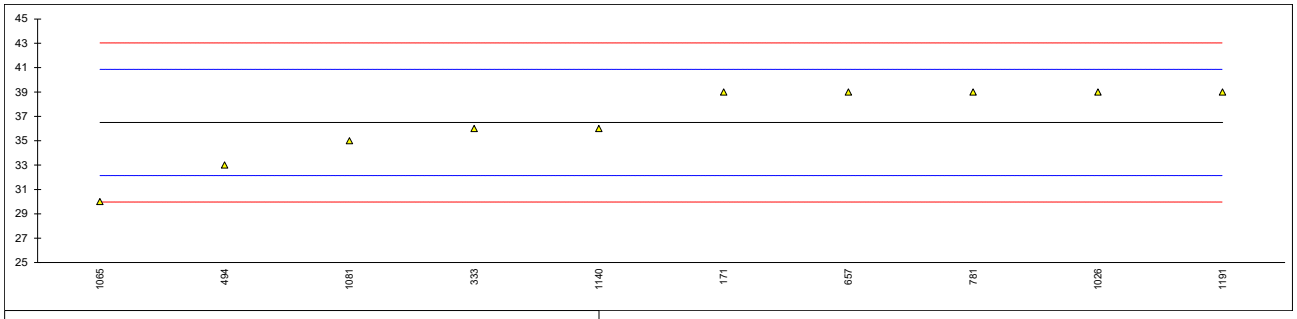

50
45
40
35
30
25
120
171
323
62
225
872
1191
1862
1967
6024
6025
6026
6195
150
158
154
140
311
52
736
445
608
778
710
753
752
781
785
873
874
875
994
1556
1677
1950
6112
6203
381
657

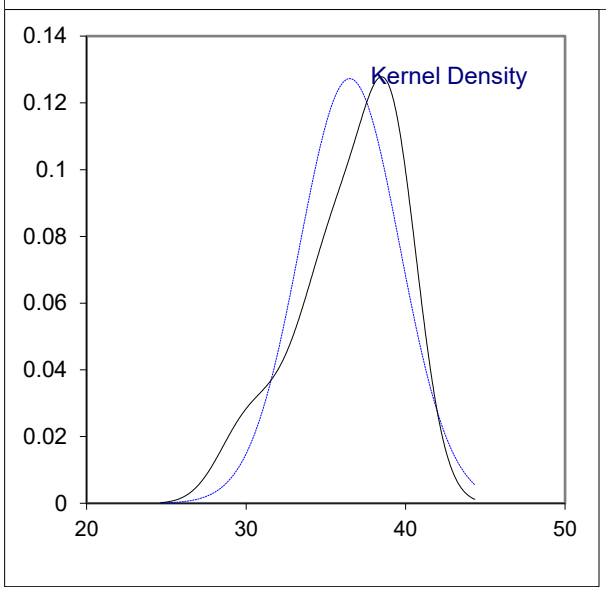

Kernel Density
0.3
0.25
0.2
0.15
0.1
0.05
0
25
30
35
40
45
50

Determination of Pour Point Automated 3 °C interval on sample #23250; results in °C

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | | ----- | | ----- | |
| 62 | | ----- | | ----- | |
| 120 | | ----- | | ----- | |
| 140 | | ----- | | ----- | |
| 150 | | ----- | | ----- | |
| 154 | | ----- | | ----- | |
| 158 | | ----- | | ----- | |
| 159 | | ----- | | ----- | |
| 171 | D5950 | 39 | | 1.15 | |
| 225 | | ----- | | ----- | |
| 311 | | ----- | | ----- | |
| 313 | | ----- | | ----- | |
| 323 | | ----- | | ----- | |
| 333 | D5950 | 36 | | -0.23 | |
| 356 | | ----- | | ----- | |
| 381 | | ----- | | ----- | |
| 445 | | ----- | | ----- | |
| 494 | D5950 | 33 | | -1.61 | |
| 608 | | ----- | | ----- | |
| 657 | D5950 | 39 | | 1.15 | |
| 710 | | ----- | | ----- | |
| 736 | | ----- | | ----- | |
| 750 | | ----- | | ----- | |
| 752 | | ----- | | ----- | |
| 753 | | ----- | | ----- | |
| 778 | | ----- | | ----- | |
| 781 | D5950 | 39 | | 1.15 | |
| 785 | | ----- | | ----- | |
| 798 | | ----- | | ----- | |
| 823 | | ----- | | ----- | |
| 872 | | ----- | | ----- | |
| 873 | | ----- | | ----- | |
| 874 | | ----- | | ----- | |
| 875 | | ----- | | ----- | |
| 994 | | ----- | | ----- | |
| 995 | | ----- | | ----- | |
| 1026 | D5950 | 39 | | 1.15 | |
| 1065 | D5950 | 30 | | -2.98 | |
| 1081 | D5950 | 35 | | -0.69 | |
| 1140 | D5950 | 36 | | -0.23 | |
| 1191 | D5950 | 39 | | 1.15 | |
| 1205 | | ----- | | ----- | |
| 1357 | | ----- | | ----- | |
| 1372 | | ----- | | ----- | |
| 1556 | | ----- | | ----- | |
| 1677 | | ----- | | ----- | |
| 1862 | | ----- | | ----- | |
| 1950 | | ----- | | ----- | |
| 1967 | | ----- | | ----- | |
| 6024 | | ----- | | ----- | |
| 6025 | | ----- | | ----- | |
| 6026 | | ----- | | ----- | |
| 6112 | | ----- | | ----- | |
| 6195 | | ----- | | ----- | |
| 6203 | | ----- | | ----- | |
| 6447 | | ----- | | ----- | |

| | |
|---|---|
| normality | OK |
| n | 10 |
| outliers | 0 |
| mean (n) | 36.50 |
| st.dev. (n) | 3.136 |
| R(calc.) | 8.78 |
| st.dev.(D5950:14R20) | 2.179 |
| R(D5950:14R20) | 6.1 |

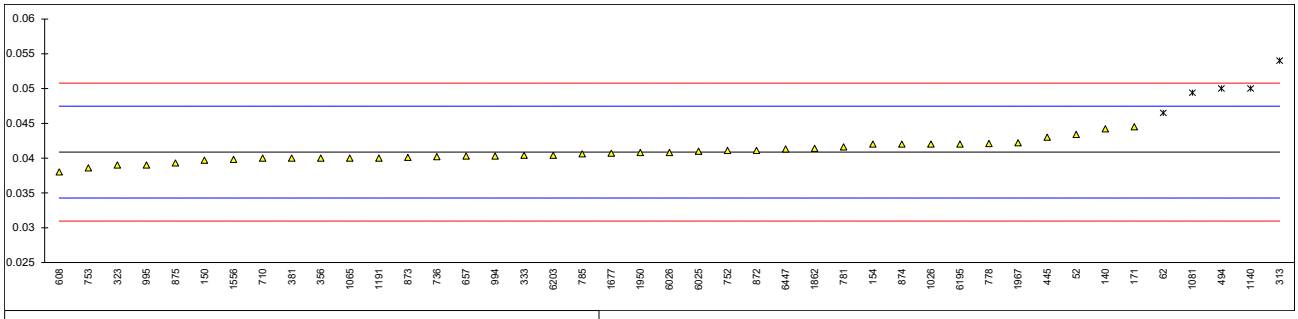

45
43
41
39
37
35
33
31
29
27
25
1065
494
1081
333
1140
171
657
781
1026
1191

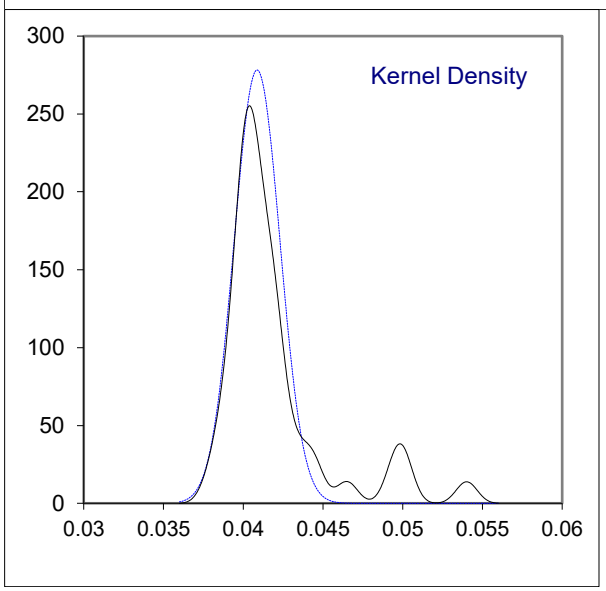

Kernel Density
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
20
30
40
50

## Determination of Total Sulfur on sample #23250; results in %M/M

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | D4294 | 0.0434 | | 0.77 | |
| 62 | D4294 | 0.0465 | R(0.05) | 1.71 | |
| 120 | | ----- | | ----- | |
| 140 | D4294 | 0.0442 | | 1.01 | |
| 150 | D4294 | 0.0397 | | -0.35 | |
| 154 | D4294 | 0.0420 | | 0.34 | |
| 158 | | ----- | | ----- | |
| 159 | | ----- | | ----- | |
| 171 | D4294 | 0.0445 | | 1.10 | |
| 225 | | ----- | | ----- | |
| 311 | | ----- | | ----- | |
| 313 | D4294 | 0.054 | R(0.01) | 3.98 | |
| 323 | D4294 | 0.039 | | -0.56 | |
| 333 | D4294 | 0.0404 | | -0.14 | |
| 356 | D4294 | 0.040 | | -0.26 | |
| 381 | ISO8754 | 0.04 | | -0.26 | |
| 445 | D4294 | 0.0430 | | 0.65 | |
| 494 | ISO8754 | 0.05 | R(0.01) | 2.76 | |
| 608 | D4294 | 0.038 | | -0.87 | |
| 657 | D4294 | 0.0403 | | -0.17 | |
| 710 | D4294 | 0.040 | | -0.26 | |
| 736 | D4294 | 0.0402 | | -0.20 | |
| 750 | | ----- | | ----- | |
| 752 | D4294 | 0.0411 | | 0.07 | |
| 753 | D4294 | 0.0386 | | -0.69 | |
| 778 | D4294 | 0.0421 | | 0.37 | |
| 781 | D4294 | 0.0416 | | 0.22 | |
| 785 | D4294 | 0.0406 | | -0.08 | |
| 798 | | ----- | | ----- | |
| 823 | | ----- | | ----- | |
| 872 | D4294 | 0.0411 | | 0.07 | |
| 873 | D4294 | 0.0401 | | -0.23 | |
| 874 | D4294 | 0.0420 | | 0.34 | |
| 875 | D4294 | 0.0393 | | -0.47 | |
| 994 | D4294 | 0.0403 | | -0.17 | |
| 995 | D4294 | 0.039 | | -0.56 | |
| 1026 | D2622 | 0.042 | | 0.34 | |
| 1065 | D4294 | 0.0400 | | -0.26 | |
| 1081 | D4294 | 0.0494 | C,R(0.01) | 2.58 | First reported 0.494 |
| 1140 | IP336 | 0.05 | R(0.01) | 2.76 | |
| 1191 | ISO8754 | 0.04 | | -0.26 | |
| 1205 | | ----- | | ----- | |
| 1357 | | ----- | | ----- | |
| 1372 | | ----- | | ----- | |
| 1556 | ISO8754 | 0.0398 | | -0.32 | |
| 1677 | D4294 | 0.0407 | C | -0.05 | First reported 0.407 |
| 1862 | D4294 | 0.0414 | | 0.16 | |
| 1950 | D4294 | 0.0408 | | -0.02 | |
| 1967 | D4294 | 0.0422 | | 0.40 | |
| 6024 | | ----- | | ----- | |
| 6025 | D4294 | 0.041 | | 0.04 | |
| 6026 | D4294 | 0.0408 | | -0.02 | |
| 6112 | | ----- | | ----- | |
| 6195 | D4294 | 0.042 | | 0.34 | |
| 6203 | D4294 | 0.0404 | | -0.14 | |
| 6447 | D2622 | 0.0413 | | 0.13 | |

| | |
|---|---|
| normality | OK |
| n | 38 |
| outliers | 5 |
| mean (n) | 0.04087 |
| st.dev. (n) | 0.001434 |
| R(calc.) | 0.00402 |
| st.dev.(D4294:21) | 0.003304 |
| R(D4294:21) | 0.00925 |


0.06
0.055
0.05
0.045
0.04
0.035
0.03
0.025
608 753 323 995 875 150 1556 710 381 356 1065 1191 873 736 657 994 333 6203 785 1677 1950 6026 6025 752 872 6447 1862 781 154 874 1026 6195 778 1967 445 52 140 171 62 1081 494 1140 313


Kernel Density
300
250
200
150
100
50
0
0.03 0.035 0.04 0.045 0.05 0.055 0.06

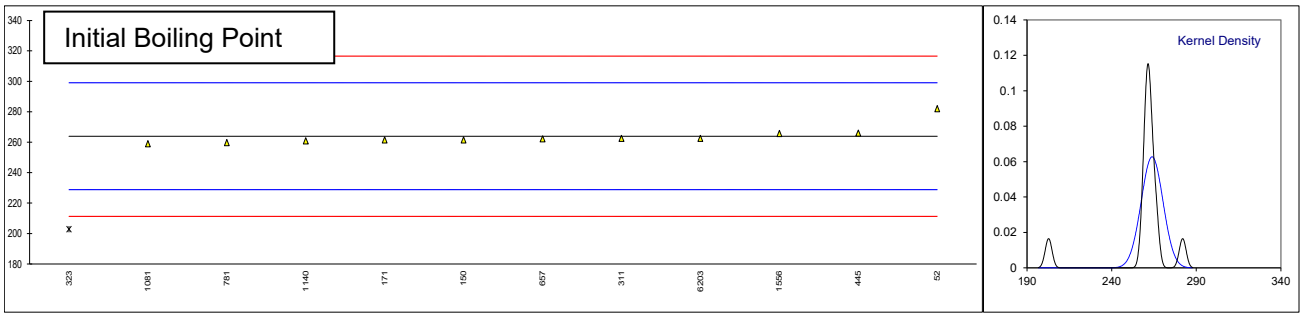
## Determination of Simulated Distillation on sample #23250; result in °C

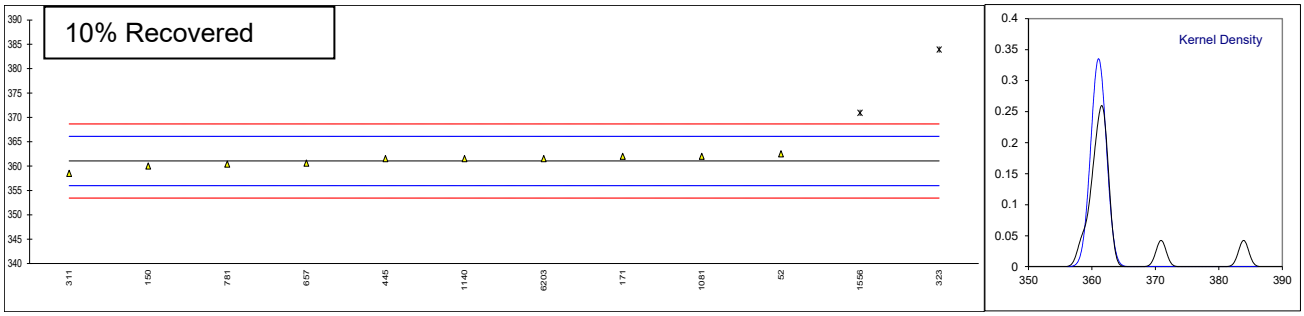
| lab | method | IBP | 10% | 30% | 50% | 70% | 90% | FBP |
|---|---|---|---|---|---|---|---|---|
| 52 | D6352 | 282.0 | 362.5 | 407.0 | 436.5 | 470.5 | 522.5 | 603.5 |
| 62 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 120 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 140 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 150 | D6352 | 261.5 | 360.0 | 407.0 | 438.0 | 473.5 | 525.5 | 607.5 |
| 154 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 158 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 159 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 171 | D6352 | 261.5 | 362.0 | 408.5 | 439.5 | 474.5 | 527.5 | 619.5 |
| 225 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 311 | D6352 | 262.5 | 358.5 | 405.0 | 435.5 | 471.0 | 522.0 | 596.5 |
| 313 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 323 | D6352 | 202.8 G(1) | 383.9 G(1) | 433.3 G(1) | 463.9 G(1) | 494.2 G(1) | 538.7 G(1) | 603.8 ex |
| 333 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 356 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 381 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 445 | D7169 | 266.0 | 361.5 | 407.5 | 438.5 | 474.5 | 525.5 | 603.0 |
| 494 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 608 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 657 | D6352 | 262.2 | 360.6 | 407.2 | 438.2 | 473.5 | 523.9 | 604.2 |
| 710 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 736 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 750 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 752 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 753 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 778 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 781 | D6352 | 259.7 | 360.4 | 407.2 | 437.4 | 473.7 | 524.2 | 597.8 |
| 785 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 798 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 823 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 872 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 873 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 874 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 875 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 994 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 995 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1026 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1065 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1081 | IP480 | 259 | 362 | 409 | 440 | 476 | 529 C | 609 |
| 1140 | D7169 | 260.8 | 361.5 | 409.4 | 441.1 | 476.0 | 526.3 | 612.3 |
| 1191 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1205 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1357 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1372 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1556 | ISO3924 | 265.7 | 370.9 G(1) | 416.0 G(1) | 445.9 G(5) | 478.7 | 527.9 | 592.3 |
| 1677 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1862 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1950 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1967 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6024 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6025 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6026 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6112 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6195 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6203 | D6352 | 262.5 | 361.5 | 407.0 | 438.0 | 473.5 | 526.5 | 602.5 |
| 6447 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| | normality | not OK | suspect | OK | OK | OK | OK | OK |
| | n | 11 | 10 | 10 | 10 | 11 | 11 | 11 |
| | outliers | 1 | 2 | 2 | 2 | 1 | 1 | 0 + 1ex |
| | mean (n) | 263.95 | 361.05 | 407.48 | 438.27 | 474.13 | 525.53 | 604.37 |
| | st.dev. (n) | 6.363 | 1.190 | 1.249 | 1.643 | 2.291 | 2.217 | 7.616 |
| | R(calc.) | 17.82 | 3.33 | 3.50 | 4.60 | 6.42 | 6.21 | 21.32 |
| | st.dev.(D6352:19e1) | 17.536 | 2.536 | 2.107 | 2.286 | 2.571 | 3.75 | 13.607 |
| | R(D6352:19e1) | 49.1 | 7.1 | 5.9 | 6.4 | 7.2 | 10.5 | 38.1 |

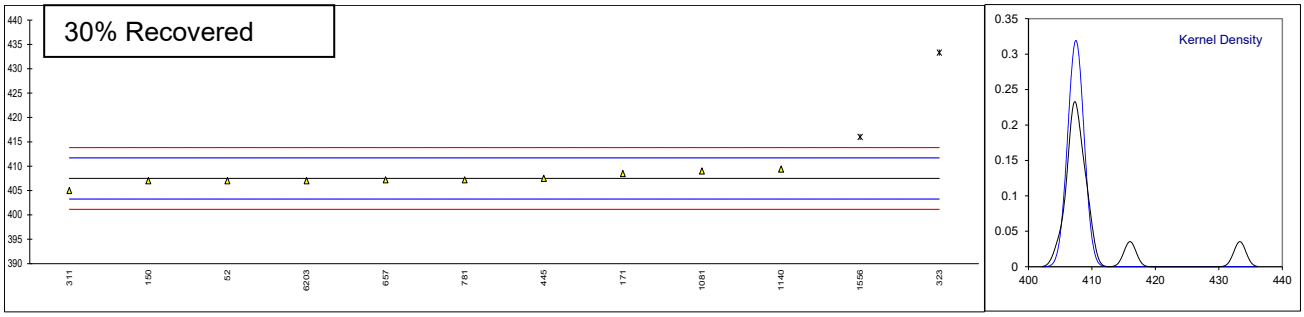
Lab 1081 first reported 553
Lab 323: ex = test result excluded as 4 or more test results are statistical outliers.

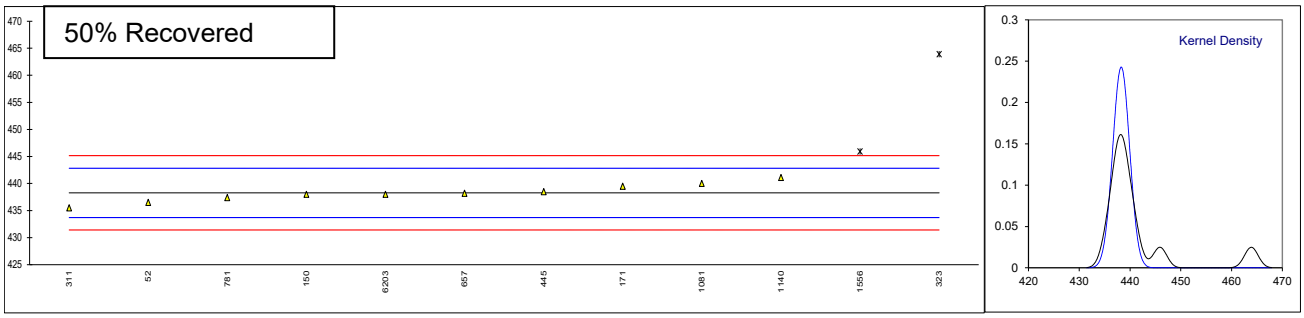
## z-scores for Simulated Distillation

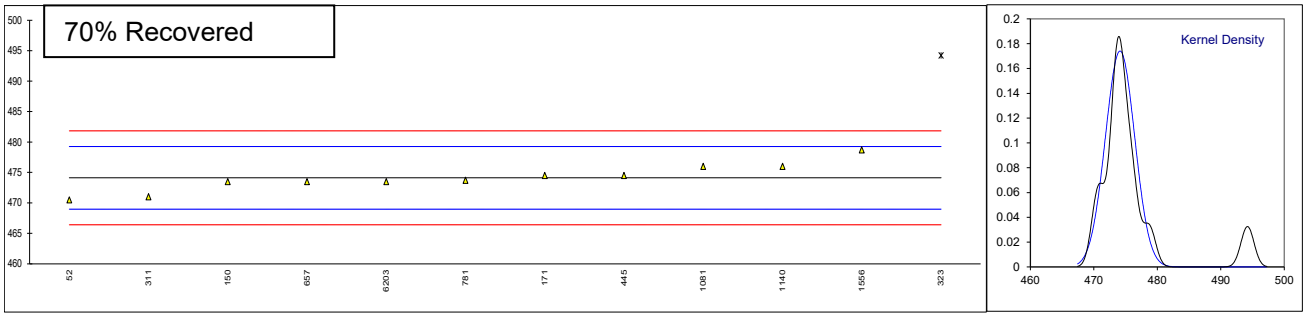
| lab | IBP | 10% | 30% | 50% | 70% | 90% | FBP |
|---|---|---|---|---|---|---|---|
| 52 | 1.03 | 0.57 | -0.23 | -0.77 | -1.41 | -0.81 | -0.06 |
| 62 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 120 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 140 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 150 | -0.14 | -0.41 | -0.23 | -0.12 | -0.24 | -0.01 | 0.23 |
| 154 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 158 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 159 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 171 | -0.14 | 0.37 | 0.48 | 0.54 | 0.14 | 0.53 | 1.11 |
| 225 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 311 | -0.08 | -1.01 | -1.18 | -1.21 | -1.22 | -0.94 | -0.58 |
| 313 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 323 | -3.49 | 9.01 | 12.25 | 11.21 | 7.81 | 3.51 | -0.04 |
| 333 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 356 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 381 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 445 | 0.12 | 0.18 | 0.01 | 0.10 | 0.14 | -0.01 | -0.10 |
| 494 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 608 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 657 | -0.10 | -0.18 | -0.13 | -0.03 | -0.24 | -0.43 | -0.01 |
| 710 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 736 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 750 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 752 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 753 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 778 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 781 | -0.24 | -0.26 | -0.13 | -0.38 | -0.17 | -0.35 | -0.48 |
| 785 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 798 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 823 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 872 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 873 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 874 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 875 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 994 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 995 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1026 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1065 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1081 | -0.28 | 0.37 | 0.72 | 0.76 | 0.73 | 0.93 | 0.34 |
| 1140 | -0.18 | 0.18 | 0.91 | 1.24 | 0.73 | 0.21 | 0.58 |
| 1191 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1205 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1357 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1372 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1556 | 0.10 | 3.88 | 4.04 | 3.34 | 1.78 | 0.63 | -0.89 |
| 1677 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1862 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1950 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1967 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6024 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6025 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6026 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6112 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6195 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6203 | -0.08 | 0.18 | -0.23 | -0.12 | -0.24 | 0.26 | -0.14 |
| 6447 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |

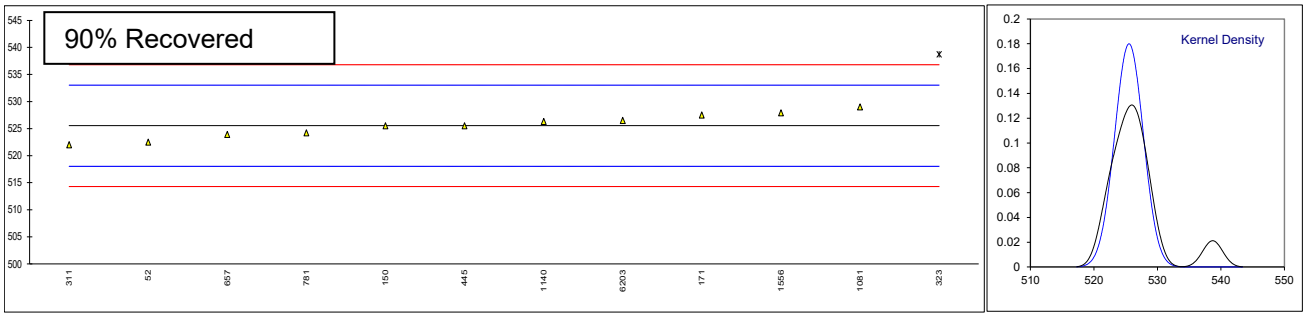


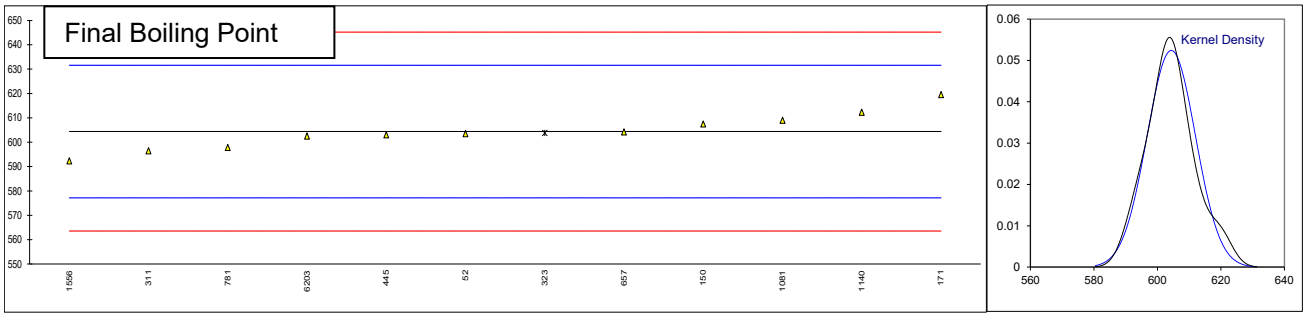

10% Recovered
Kernel Density


30% Recovered
Kernel Density


50% Recovered
Kernel Density


70% Recovered
Kernel Density


90% Recovered
Kernel Density

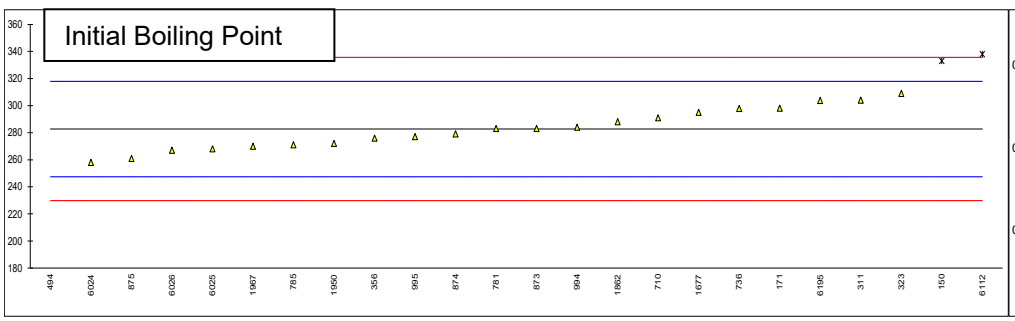

Final Boiling Point
Kernel Density

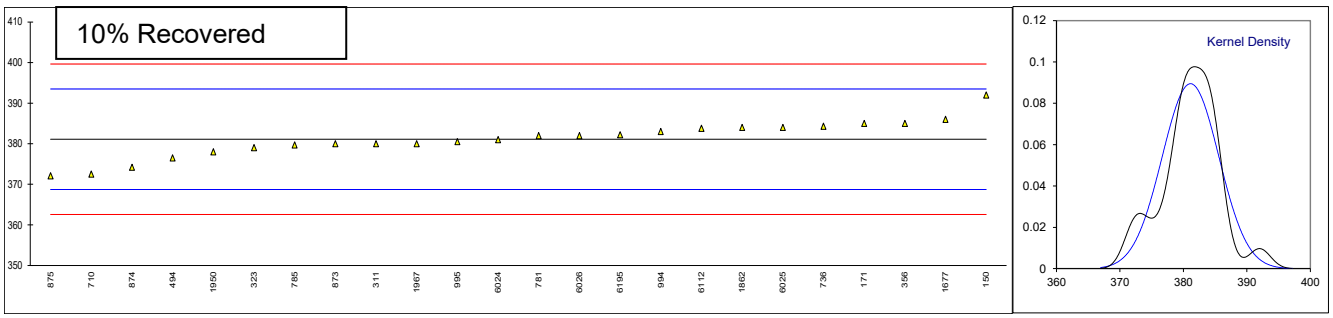
## Determination of Distillation at 10 mmHg as AET on sample #23250; result in °C

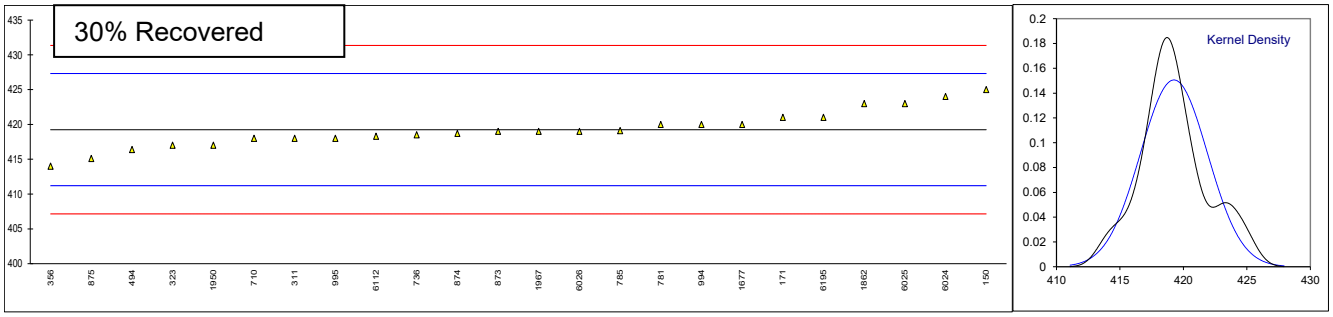
| lab | method | IBP | 10% | 30% | 50% | 70% | 90% | FBP |
|---|---|---|---|---|---|---|---|---|
| 52 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 62 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 120 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 140 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 150 | D1160 | 333 DG(5) | 392 | 425 | 452 | 483 | 536 | 596 G(1) |
| 154 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 158 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 159 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 171 | D1160 | 298 | 385 | 421 | 443 | 473 | 517 | 540 |
| 225 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 311 | D1160 | 304 | 380 | 418 | 445 | 478 | 527 | 555 |
| 313 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 323 | D1160 | 309 | 379 | 417 | 447 | 480 | 534 | 558 |
| 333 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 356 | D1160 | 276 | 385 | 414 | 448 | 476 | 524 | 553 |
| 381 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 445 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 494 | D1160 | 95.6 G(1) | 376.5 | 416.4 | 444.4 | 476.9 | 531.8 | 554.8 |
| 608 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 657 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 710 | D1160 | 291.0 | 372.5 | 418.0 | 442.5 | 474.0 | 522.0 | 555.0 |
| 736 | D1160 | 297.8 | 384.3 | 418.5 | 445.5 | 474.5 | 524.4 | 550.4 |
| 750 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 752 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 753 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 778 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 781 | D1160 | 283 | 382 | 420 | 443 | 478 | 524 | 539 |
| 785 | D1160 | 271.1 | 379.7 | 419.1 | 447.0 | 481.1 | 532.4 | ----- |
| 798 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 823 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 872 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 873 | D1160 | 283 | 380 | 419 | 445 | 475 | 526 | 543 |
| 874 | D1160 | 279.1 | 374.2 | 418.7 | 442.0 | 475.0 | 526.0 | 543.0 |
| 875 | D1160 | 260.9 | 372.1 | 415.1 | 445.2 | 477.0 | 528.8 | 539.0 |
| 994 | D1160 | 284.0 | 383.0 | 420.0 | 445.0 | 472.0 | 515.0 | 546.0 |
| 995 | D1160 | 277.0 | 380.5 | 418.0 | 442.0 | 468.0 | 510.5 | 539.0 |
| 1026 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1065 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1081 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1140 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1191 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1205 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1357 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1372 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1556 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1677 | D1160 | 295 | 386 | 420 | 446 | 478 | 527 | 555 |
| 1862 | D1160 | 288 | 384 | 423 | 449 | 481 | 533 | 550 |
| 1950 | D1160 | 272 | 378 | 417 | 442 | 472 | 520 | 548 |
| 1967 | D1160 | 270 | 380 | 419 | 443 | 477 | 530 | 549 |
| 6024 | D1160 | 258 | 381 | 424 | 450 | 480 | 532 | 550 |
| 6025 | D1160 | 268.0 | 384.0 | 423.0 | 443.0 | 478.0 | 530.0 | 549.0 |
| 6026 | D1160 | 267 | 382 | 419 | 442 | 477 | 530 | 549 |
| 6112 | D1160 | 338.0 DG(5) | 383.8 | 418.3 | 445.4 | 476.3 | 525.5 | 554.2 |
| 6195 | D1160 | 303.8 | 382.2 | 421.0 | 449.7 | 481.8 | 533.5 | ----- |
| 6203 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6447 | | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| | normality | OK | OK | OK | OK | OK | OK | OK |
| | n | 21 | 24 | 24 | 24 | 24 | 24 | 21 |
| | outliers | 3 | 0 | 0 | 0 | 0 | 0 | 1 |
| | mean (n) | 282.65 | 381.12 | 419.25 | 445.28 | 476.77 | 526.66 | 548.54 |
| | st.dev. (n) | 14.750 | 4.461 | 2.648 | 2.854 | 3.516 | 6.366 | 6.034 |
| | R(calc.) | 41.30 | 12.49 | 7.41 | 7.99 | 9.85 | 17.83 | 16.90 |
| | st.dev.(D1160:18) | 17.660 | 6.179 | 4.033 | 3.856 | 3.438 | 3.674 | 9.605 |
| | R(D1160:18) | 49.45 | 17.30 | 11.29 | 10.80 | 9.63 | 10.29 | 26.89 |

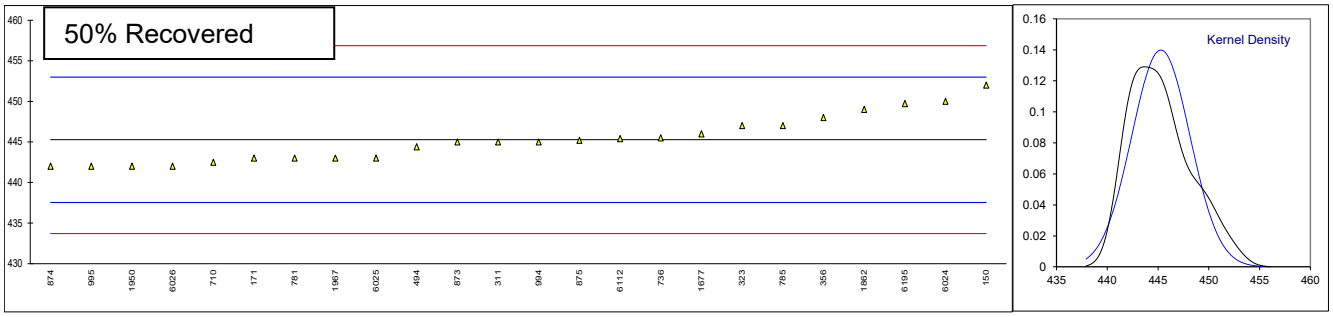
## z-scores Distillation at 10 mmHg as AET

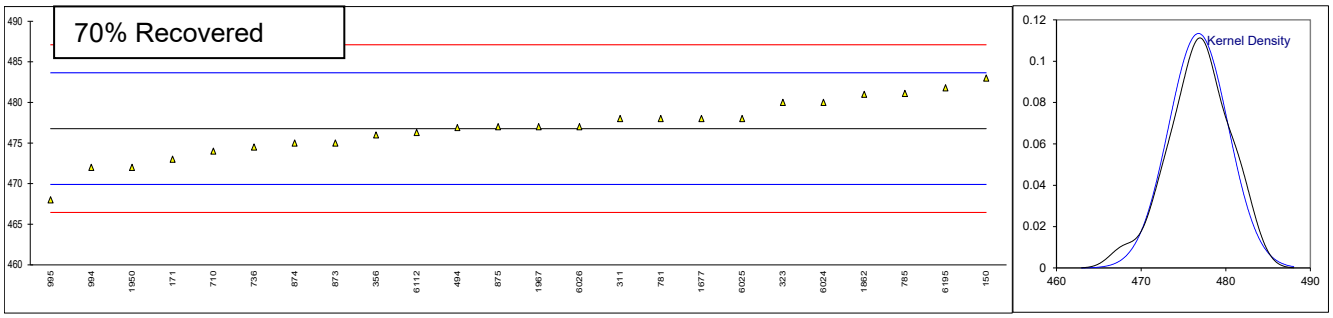
| lab | IBP | 10% | 30% | 50% | 70% | 90% | FBP |
|---|---|---|---|---|---|---|---|
| 52 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 62 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 120 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 140 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 150 | 2.85 | 1.76 | 1.42 | 1.74 | 1.81 | 2.54 | 4.94 |
| 154 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 158 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 159 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 171 | 0.87 | 0.63 | 0.43 | -0.59 | -1.10 | -2.63 | -0.89 |
| 225 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 311 | 1.21 | -0.18 | -0.31 | -0.07 | 0.36 | 0.09 | 0.67 |
| 313 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 323 | 1.49 | -0.34 | -0.56 | 0.45 | 0.94 | 2.00 | 0.98 |
| 333 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 356 | -0.38 | 0.63 | -1.30 | 0.71 | -0.23 | -0.72 | 0.46 |
| 381 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 445 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 494 | -10.59 | -0.75 | -0.71 | -0.23 | 0.04 | 1.40 | 0.65 |
| 608 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 657 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 710 | 0.47 | -1.39 | -0.31 | -0.72 | -0.81 | -1.27 | 0.67 |
| 736 | 0.86 | 0.52 | -0.19 | 0.06 | -0.66 | -0.62 | 0.19 |
| 750 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 752 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 753 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 778 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 781 | 0.02 | 0.14 | 0.18 | -0.59 | 0.36 | -0.72 | -0.99 |
| 785 | -0.65 | -0.23 | -0.04 | 0.45 | 1.26 | 1.56 | ----- |
| 798 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 823 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 872 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 873 | 0.02 | -0.18 | -0.06 | -0.07 | -0.52 | -0.18 | -0.58 |
| 874 | -0.20 | -1.12 | -0.14 | -0.85 | -0.52 | -0.18 | -0.58 |
| 875 | -1.23 | -1.46 | -1.03 | -0.02 | 0.07 | 0.58 | -0.99 |
| 994 | 0.08 | 0.30 | 0.18 | -0.07 | -1.39 | -3.17 | -0.26 |
| 995 | -0.32 | -0.10 | -0.31 | -0.85 | -2.55 | -4.40 | -0.99 |
| 1026 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1065 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1081 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1140 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1191 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1205 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1357 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1372 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1556 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1677 | 0.70 | 0.79 | 0.18 | 0.19 | 0.36 | 0.09 | 0.67 |
| 1862 | 0.30 | 0.47 | 0.93 | 0.96 | 1.23 | 1.73 | 0.15 |
| 1950 | -0.60 | -0.50 | -0.56 | -0.85 | -1.39 | -1.81 | -0.06 |
| 1967 | -0.72 | -0.18 | -0.06 | -0.59 | 0.07 | 0.91 | 0.05 |
| 6024 | -1.40 | -0.02 | 1.18 | 1.22 | 0.94 | 1.45 | 0.15 |
| 6025 | -0.83 | 0.47 | 0.93 | -0.59 | 0.36 | 0.91 | 0.05 |
| 6026 | -0.89 | 0.14 | -0.06 | -0.85 | 0.07 | 0.91 | 0.05 |
| 6112 | 3.13 | 0.43 | -0.24 | 0.03 | -0.14 | -0.32 | 0.59 |
| 6195 | 1.20 | 0.18 | 0.43 | 1.15 | 1.46 | 1.86 | ----- |
| 6203 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6447 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |

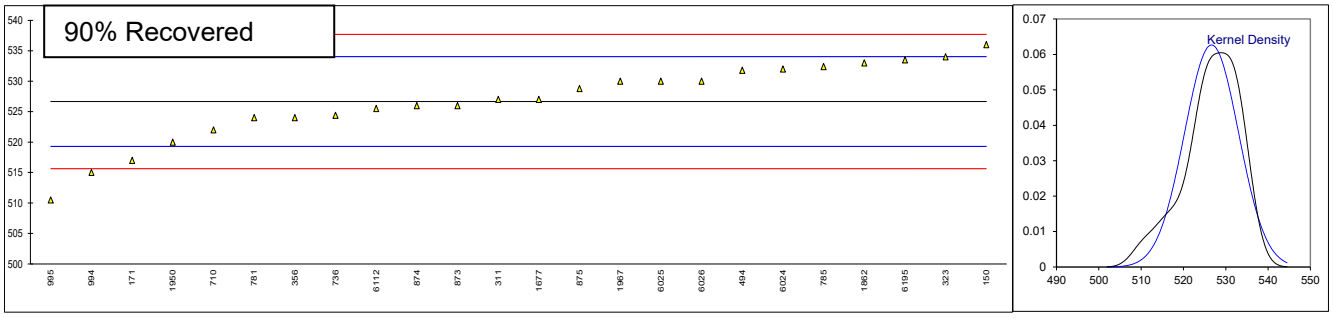


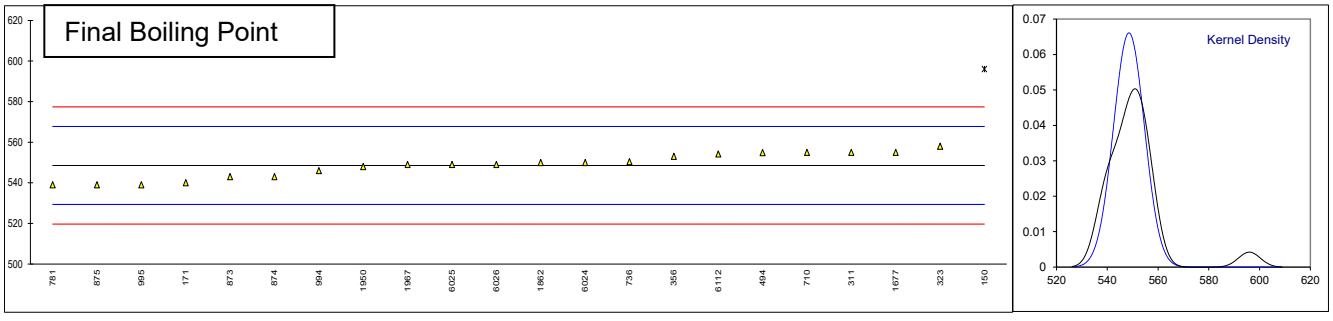

10% Recovered
Kernel Density


30% Recovered
Kernel Density


50% Recovered
Kernel Density


70% Recovered
Kernel Density

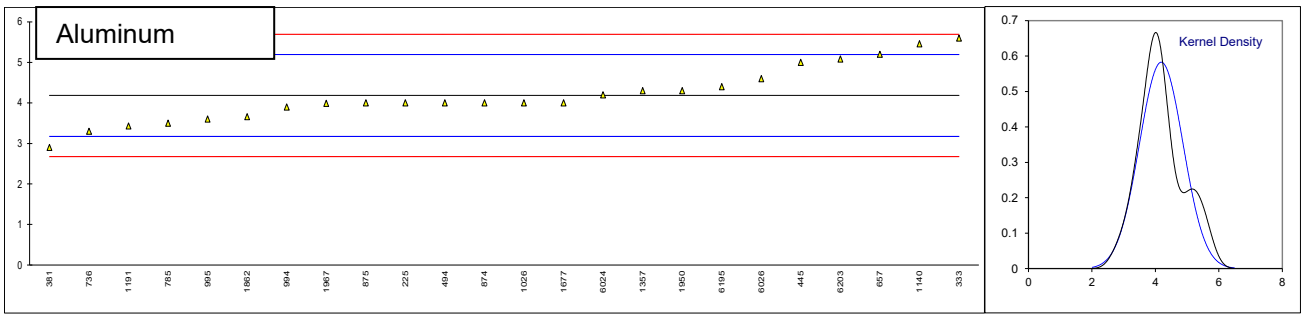

90% Recovered
Kernel Density

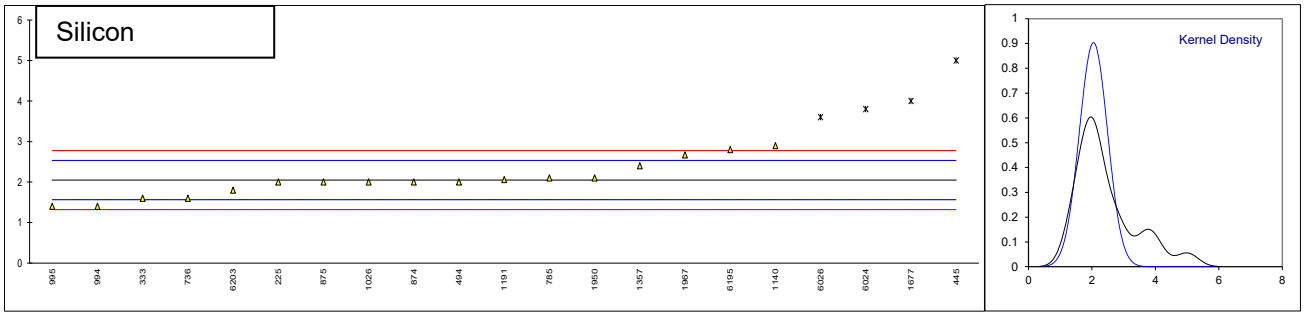

Final Boiling Point
Kernel Density

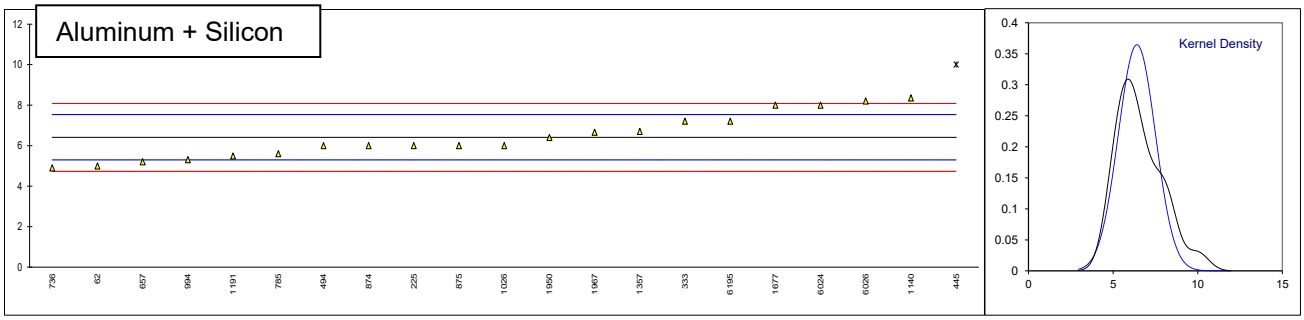
Determination of Aluminum as Al, Silicon as Si and sum Al and Si on sample #23251; results in mg/kg

| lab | method | Al | mark | z(targ) | Si | mark | z(targ) | Sum Al+Si | mark | z(targ) |
|---|---|---|---|---|---|---|---|---|---|---|
| 52 | IP501 | <5 | | ----- | <10 | | ----- | <15 | | ----- |
| 62 | IP501 | <5 | | ----- | <10 | | ----- | 5 | | ----- |
| 120 | | ----- | | ----- | ----- | | ----- | ----- | | ----- |
| 150 | IP501 | <5 | | ----- | <10 | | ----- | <15 | | ----- |
| 154 | IP501 | <5 | | ----- | <10 | C | ----- | <15 | C | ----- |
| 158 | IP501 | <5 | | ----- | <10 | | ----- | ----- | | ----- |
| 171 | | ----- | | ----- | ----- | | ----- | ----- | | ----- |
| 225 | IP501 | 4 | | ----- | 2 | | ----- | 6 | | ----- |
| 311 | | ----- | | ----- | ----- | | ----- | ----- | | ----- |
| 323 | IP501 | < 5 | | ----- | < 10 | | ----- | < 15 | | ----- |
| 333 | IP501 | 5.6 | | ----- | 1.6 | | ----- | 7.2 | | ----- |
| 381 | D5184 | 2.9 | | ----- | ----- | | ----- | ----- | | ----- |
| 445 | IP501 | 5.0 | | ----- | 5.0 | DG(5) | ----- | 10.0 | G(5) | ----- |
| 494 | IP501 | 4 | | ----- | 2 | | ----- | 6 | | ----- |
| 608 | | ----- | | ----- | ----- | | ----- | ----- | | ----- |
| 657 | IP501 | 5.2 | | ----- | <10 | | ----- | 5.2 | | ----- |
| 736 | IP501 | 3.3 | | ----- | 1.6 | | ----- | 4.9 | | ----- |
| 752 | | ----- | | ----- | ----- | | ----- | ----- | | ----- |
| 781 | IP501 | <5 | | ----- | <10 | | ----- | <15 | | ----- |
| 785 | IP470 | 3.5 | | ----- | 2.1 | | ----- | 5.6 | | ----- |
| 823 | | ----- | | ----- | ----- | | ----- | ----- | | ----- |
| 873 | | ----- | | ----- | ----- | | ----- | ----- | | ----- |
| 874 | IP501 | 4 | | ----- | 2 | | ----- | 6 | | ----- |
| 875 | IP501 | 4 | | ----- | 2 | | ----- | 6 | | ----- |
| 994 | IP501 | 3.9 | | ----- | 1.4 | | ----- | 5.3 | | ----- |
| 995 | IP470 | 3.6 | | ----- | 1.4 | | ----- | ----- | | ----- |
| 1026 | IP501 | 4 | | ----- | 2 | | ----- | 6 | | ----- |
| 1065 | | ----- | | ----- | ----- | | ----- | ----- | | ----- |
| 1140 | IP501 | 5.457 | | ----- | 2.898 | | ----- | 8.355 | | ----- |
| 1191 | IP501 | 3.43 | | ----- | 2.06 | | ----- | 5.49 | | ----- |
| 1357 | IP501 | 4.3 | | ----- | 2.4 | | ----- | 6.7 | | ----- |
| 1556 | | ----- | | ----- | ----- | | ----- | ----- | | ----- |
| 1677 | IP501 | 4 | | ----- | 4 | DG(5) | ----- | 8 | | ----- |
| 1862 | IP501 | 3.66 | | ----- | <10 | | ----- | <15 | | ----- |
| 1950 | IP470 | 4.3 | | ----- | 2.1 | | ----- | 6.4 | | ----- |
| 1967 | IP470 | 3.99 | | ----- | 2.67 | | ----- | 6.66 | | ----- |
| 6024 | IP470 | 4.2 | | ----- | 3.8 | DG(5) | ----- | 8.0 | | ----- |
| 6026 | IP470 | 4.6 | | ----- | 3.6 | DG(5) | ----- | 8.2 | | ----- |
| 6195 | IP501 | 4.4 | | ----- | 2.8 | | ----- | 7.2 | | ----- |
| 6203 | IP501 | 5.085 | | ----- | 1.8 | | ----- | ----- | | ----- |
| | normality | OK | | | OK | | | OK | | |
| | n | 24 | | | 17 | | | 20 | | |
| | outliers | 0 | | | 4 | | | 1 | | |
| | mean (n) | 4.18 | | | 2.05 | | | 6.41 | | |
| | st.dev. (n) | 0.685 | | | 0.441 | | | 1.094 | | |
| | R(calc.) | 1.92 | | | 1.24 | | | 3.06 | | |
| | st.dev.(IP501:05R19) | (0.504) | | | (0.243) | | | (0.559) | | |
| | R(IP501:05R19) | (1.41) | | | (0.68) | | | (1.57) | | |
| Application range | | 5 – 150 mg/kg | | | 10 – 250 mg/kg | | | | | |

Lab 154: First reported 12 and 15


Aluminum
Kernel Density


Silicon
Kernel Density


Aluminum + Silicon
Kernel Density

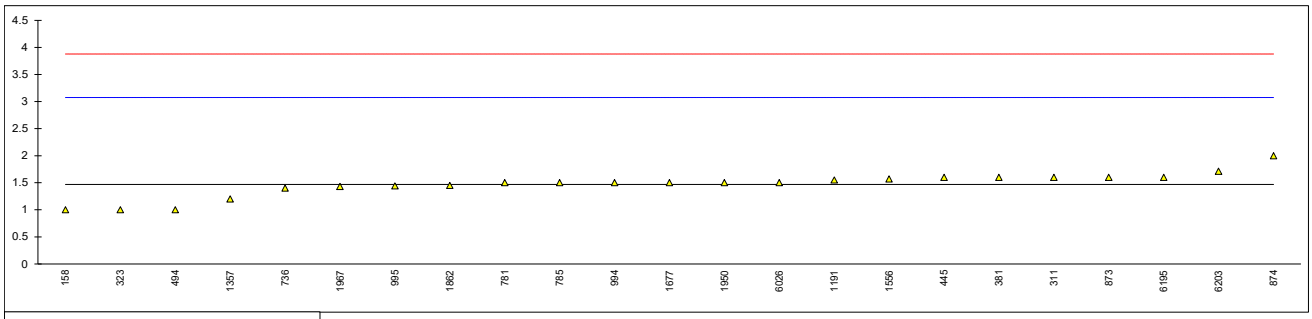
Determination of Arsenic as As on sample #23251; results in mg/kg

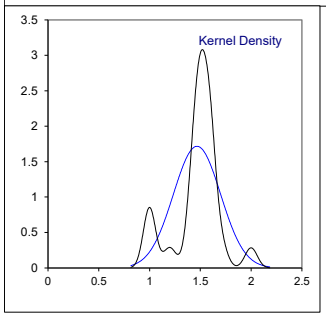
| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | | ----- | | ----- | |
| 62 | | ----- | | ----- | |
| 120 | | ----- | | ----- | |
| 150 | | ----- | | ----- | |
| 154 | | ----- | | ----- | |
| 158 | | ----- | | ----- | |
| 171 | | ----- | | ----- | |
| 225 | | ----- | | ----- | |
| 311 | | ----- | | ----- | |
| 323 | | ----- | | ----- | |
| 333 | | ----- | | ----- | |
| 381 | INH-118 | 5.1 | | ----- | |
| 445 | | ----- | | ----- | |
| 494 | | ----- | | ----- | |
| 608 | | ----- | | ----- | |
| 657 | | ----- | | ----- | |
| 736 | | ----- | | ----- | |
| 752 | | ----- | | ----- | |
| 781 | | ----- | | ----- | |
| 785 | | ----- | | ----- | |
| 823 | | ----- | | ----- | |
| 873 | | ----- | | ----- | |
| 874 | | ----- | | ----- | |
| 875 | | ----- | | ----- | |
| 994 | | ----- | | ----- | |
| 995 | | ----- | | ----- | |
| 1026 | | ----- | | ----- | |
| 1065 | | ----- | | ----- | |
| 1140 | | ----- | | ----- | |
| 1191 | | ----- | | ----- | |
| 1357 | | ----- | | ----- | |
| 1556 | | ----- | | ----- | |
| 1677 | IP621 | 3.8 | | ----- | |
| 1862 | | ----- | | ----- | |
| 1950 | | ----- | | ----- | |
| 1967 | | ----- | | ----- | |
| 6024 | | ----- | | ----- | |
| 6026 | | ----- | | ----- | |
| 6195 | | ----- | | ----- | |
| 6203 | In house | 4.52 | | ----- | |
| | n | 3 | | | |
| | mean (n) | <10 | | | |

## Determination of Copper as Cu on sample #23251; results in mg/kg

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | | ----- | | ----- | |
| 62 | | ----- | | ----- | |
| 120 | | ----- | | ----- | |
| 150 | | ----- | | ----- | |
| 154 | | ----- | | ----- | |
| 158 | IP501 | 1 | | -0.58 | |
| 171 | | ----- | | ----- | |
| 225 | | ----- | | ----- | |
| 311 | IP621 | 1.6 | | 0.17 | |
| 323 | IP501 | 1 | | -0.58 | |
| 333 | | ----- | | ----- | |
| 381 | INH-118 | 1.6 | | 0.17 | |
| 445 | IP621 | 1.6 | | 0.17 | |
| 494 | IP501 | 1 | | -0.58 | |
| 608 | | ----- | | ----- | |
| 657 | IP501 | <1 | | ----- | |
| 736 | IP501 | 1.4 | | -0.08 | |
| 752 | | ----- | | ----- | |
| 781 | IP621 | 1.5 | | 0.04 | |
| 785 | IP470 | 1.5 | | 0.04 | |
| 823 | | ----- | | ----- | |
| 873 | IP621 | 1.6 | | 0.17 | |
| 874 | IP621 | 2.0 | | 0.66 | |
| 875 | | ----- | | ----- | |
| 994 | IP501 | 1.5 | | 0.04 | |
| 995 | IP621 | 1.44 | | -0.03 | |
| 1026 | | ----- | | ----- | |
| 1065 | | ----- | | ----- | |
| 1140 | | ----- | | ----- | |
| 1191 | In house | 1.55 | | 0.10 | |
| 1357 | IP501 | 1.2 | | -0.33 | |
| 1556 | IP621 | 1.57 | | 0.13 | |
| 1677 | IP621 | 1.5 | | 0.04 | |
| 1862 | IP621 | 1.45 | | -0.02 | |
| 1950 | IP621 | 1.5 | | 0.04 | |
| 1967 | IP470 | 1.43 | | -0.05 | |
| 6024 | | ----- | | ----- | |
| 6026 | IP470 | 1.5 | | 0.04 | |
| 6195 | IP501 | 1.6 | | 0.17 | |
| 6203 | IP501 | 1.71 | | 0.30 | |

| | |
|---|---|
| normality | suspect |
| n | 23 |
| outliers | 0 |
| mean (n) | 1.467 |
| st.dev. (n) | 0.2324 |
| R(calc.) | 0.651 |
| st.dev.(IP621:16) | 0.8033 |
| R(IP621:16) | 2.249 |

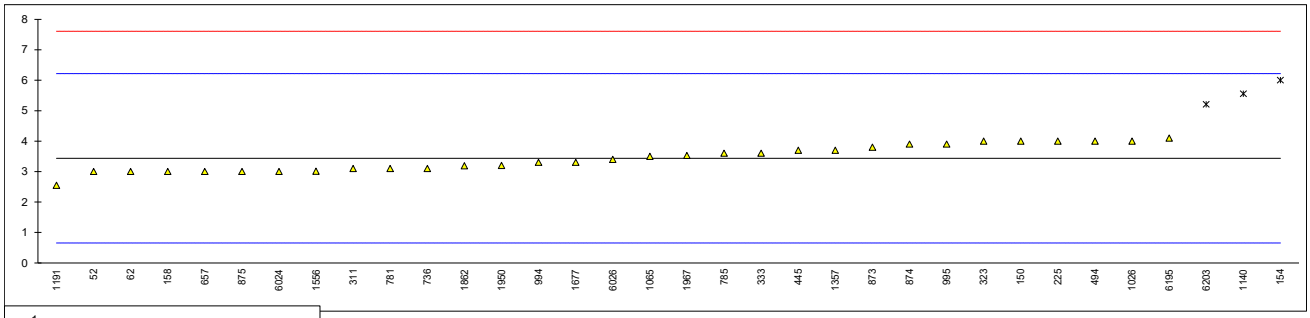


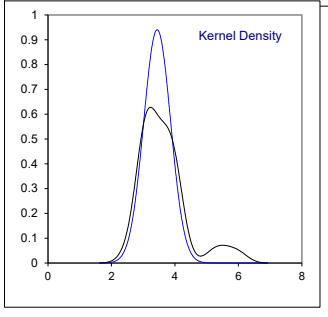



## Determination of Iron as Fe on sample #23251; results in mg/kg

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | IP501 | 3 | | -0.32 | |
| 62 | IP501 | 3 | | -0.32 | |
| 120 | | ----- | | ----- | |
| 150 | IP501 | 4 | | 0.40 | |
| 154 | IP501 | 6 | G(0.05) | 1.84 | |
| 158 | IP501 | 3 | | -0.32 | |
| 171 | | ----- | | ----- | |
| 225 | IP501 | 4 | | 0.40 | |
| 311 | IP621 | 3.1 | | -0.24 | |
| 323 | IP501 | 4 | | 0.40 | |
| 333 | IP501 | 3.6 | | 0.12 | |
| 381 | | ----- | | ----- | |
| 445 | IP621 | 3.7 | | 0.19 | |
| 494 | IP501 | 4 | | 0.40 | |
| 608 | | ----- | | ----- | |
| 657 | IP501 | 3.0 | | -0.32 | |
| 736 | IP501 | 3.1 | | -0.24 | |
| 752 | | ----- | | ----- | |
| 781 | IP621 | 3.1 | | -0.24 | |
| 785 | IP470 | 3.6 | | 0.12 | |
| 823 | | ----- | | ----- | |
| 873 | IP621 | 3.8 | | 0.26 | |
| 874 | IP621 | 3.9 | | 0.33 | |
| 875 | IP501 | 3 | | -0.32 | |
| 994 | IP501 | 3.3 | | -0.10 | |
| 995 | IP621 | 3.9 | | 0.33 | |
| 1026 | IP501 | 4 | | 0.40 | |
| 1065 | IP470 | 3.5 | | 0.04 | |
| 1140 | IP501 | 5.554 | G(0.05) | 1.52 | |
| 1191 | ISO10478 | 2.55 | | -0.64 | |
| 1357 | IP501 | 3.7 | | 0.19 | |
| 1556 | IP621 | 3.01 | | -0.31 | |
| 1677 | IP621 | 3.3 | | -0.10 | |
| 1862 | IP501 | 3.19 | | -0.18 | |
| 1950 | IP621 | 3.2 | | -0.17 | |
| 1967 | IP470 | 3.53 | | 0.07 | |
| 6024 | IP470 | 3 | | -0.32 | |
| 6026 | IP470 | 3.4 | | -0.03 | |
| 6195 | IP501 | 4.1 | | 0.48 | |
| 6203 | IP501 | 5.205 | G(0.01) | 1.27 | |

| | |
|---|---|
| normality | OK |
| n | 31 |
| outliers | 3 |
| mean (n) | 3.438 |
| st.dev. (n) | 0.4243 |
| R(calc.) | 1.188 |
| st.dev.(IP621:16) | 1.3904 |
| R(IP621:16) | 3.893 |

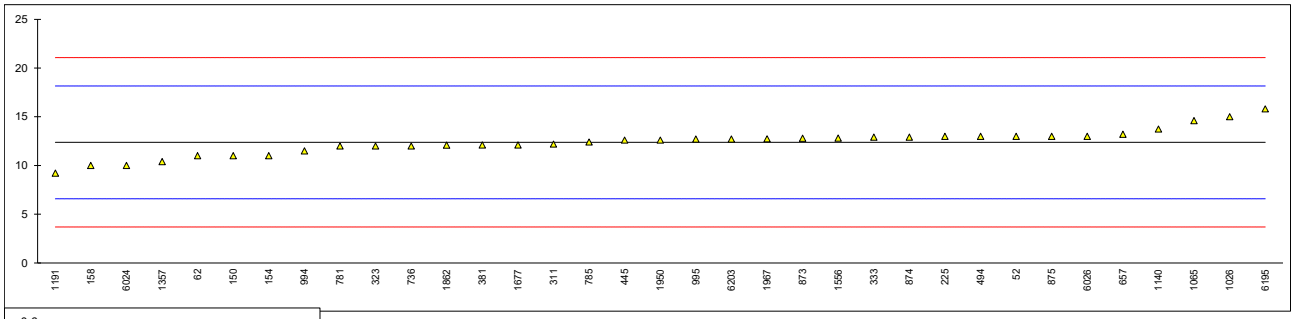


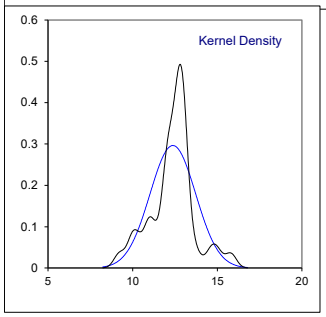



## Determination of Nickel as Ni on sample #23251; results in mg/kg

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | IP501 | 13 | | 0.22 | |
| 62 | IP501 | 11 | | -0.47 | |
| 120 | | ----- | | ----- | |
| 150 | IP501 | 11 | | -0.47 | |
| 154 | IP501 | 11 | | -0.47 | |
| 158 | IP501 | 10 | | -0.82 | |
| 171 | | ----- | | ----- | |
| 225 | IP501 | 13 | | 0.22 | |
| 311 | IP621 | 12.2 | | -0.06 | |
| 323 | IP501 | 12 | | -0.13 | |
| 333 | IP501 | 12.9 | | 0.18 | |
| 381 | D7111 | 12.1 | | -0.09 | |
| 445 | IP621 | 12.6 | | 0.08 | |
| 494 | IP501 | 13 | | 0.22 | |
| 608 | | ----- | | ----- | |
| 657 | IP501 | 13.2 | | 0.29 | |
| 736 | IP501 | 12.0 | | -0.13 | |
| 752 | | ----- | | ----- | |
| 781 | IP621 | 12.0 | | -0.13 | |
| 785 | IP470 | 12.4 | | 0.01 | |
| 823 | | ----- | | ----- | |
| 873 | IP621 | 12.8 | | 0.15 | |
| 874 | IP621 | 12.9 | | 0.18 | |
| 875 | IP501 | 13 | | 0.22 | |
| 994 | IP501 | 11.5 | | -0.30 | |
| 995 | IP621 | 12.7 | | 0.11 | |
| 1026 | IP501 | 15 | | 0.91 | |
| 1065 | IP470 | 14.6 | | 0.77 | |
| 1140 | IP501 | 13.74 | | 0.47 | |
| 1191 | ISO10478 | 9.22 | | -1.09 | |
| 1357 | IP501 | 10.4 | | -0.68 | |
| 1556 | IP621 | 12.81 | | 0.15 | |
| 1677 | IP621 | 12.1 | | -0.09 | |
| 1862 | IP501 | 12.08 | | -0.10 | |
| 1950 | IP621 | 12.6 | | 0.08 | |
| 1967 | IP470 | 12.74 | | 0.13 | |
| 6024 | IP470 | 10 | | -0.82 | |
| 6026 | IP470 | 13 | | 0.22 | |
| 6195 | IP501 | 15.8 | | 1.18 | |
| 6203 | IP501 | 12.705 | | 0.11 | |

| | |
|---|---|
| normality | suspect |
| n | 35 |
| outliers | 0 |
| mean (n) | 12.374 |
| st.dev. (n) | 1.3472 |
| R(calc.) | 3.772 |
| st.dev.(IP621:16) | 2.8973 |
| R(IP621:16) | 8.112 |

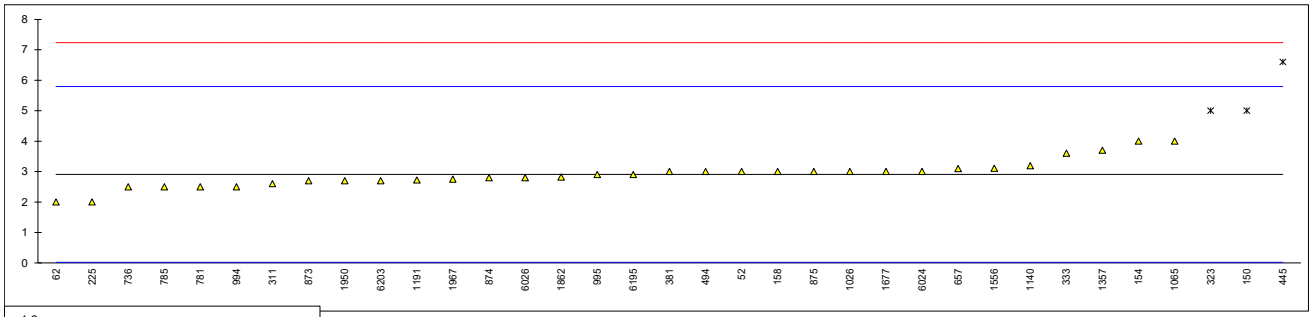


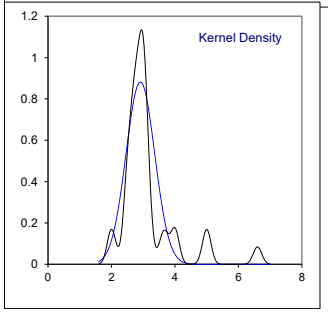



## Determination of Sodium as Na on sample #23251; results in mg/kg

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | IP501 | 3 | | 0.06 | |
| 62 | IP501 | 2 | | -0.63 | |
| 120 | | ----- | | ----- | |
| 150 | IP501 | 5 | R(0.01) | 1.45 | |
| 154 | IP501 | 4 | | 0.76 | |
| 158 | IP501 | 3 | | 0.06 | |
| 171 | | ----- | | ----- | |
| 225 | IP501 | 2 | | -0.63 | |
| 311 | IP621 | 2.6 | | -0.21 | |
| 323 | IP501 | 5 | R(0.01) | 1.45 | |
| 333 | IP501 | 3.6 | | 0.48 | |
| 381 | D7111 | 3.0 | | 0.06 | |
| 445 | IP621 | 6.6 | R(0.01) | 2.56 | |
| 494 | IP501 | 3 | | 0.06 | |
| 608 | | ----- | | ----- | |
| 657 | IP501 | 3.1 | | 0.13 | |
| 736 | IP501 | 2.5 | | -0.28 | |
| 752 | | ----- | | ----- | |
| 781 | IP621 | 2.5 | | -0.28 | |
| 785 | IP470 | 2.5 | | -0.28 | |
| 823 | | ----- | | ----- | |
| 873 | IP621 | 2.7 | | -0.15 | |
| 874 | IP621 | 2.8 | | -0.08 | |
| 875 | IP501 | 3 | | 0.06 | |
| 994 | IP501 | 2.5 | | -0.28 | |
| 995 | IP621 | 2.9 | | -0.01 | |
| 1026 | IP501 | 3 | | 0.06 | |
| 1065 | IP470 | 4.0 | | 0.76 | |
| 1140 | IP501 | 3.191 | | 0.20 | |
| 1191 | ISO10478 | 2.72 | | -0.13 | |
| 1357 | IP501 | 3.7 | | 0.55 | |
| 1556 | IP621 | 3.11 | | 0.14 | |
| 1677 | IP621 | 3.0 | | 0.06 | |
| 1862 | IP501 | 2.82 | | -0.06 | |
| 1950 | IP621 | 2.7 | | -0.15 | |
| 1967 | IP470 | 2.75 | | -0.11 | |
| 6024 | IP470 | 3 | | 0.06 | |
| 6026 | IP470 | 2.8 | | -0.08 | |
| 6195 | IP501 | 2.9 | | -0.01 | |
| 6203 | IP501 | 2.7 | | -0.15 | |

| | |
|---|---|
| normality | suspect |
| n | 32 |
| outliers | 3 |
| mean (n) | 2.909 |
| st.dev. (n) | 0.4525 |
| R(calc.) | 1.267 |
| st.dev.(IP621:16) | 1.4417 |
| R(IP621:16) | 4.037 |

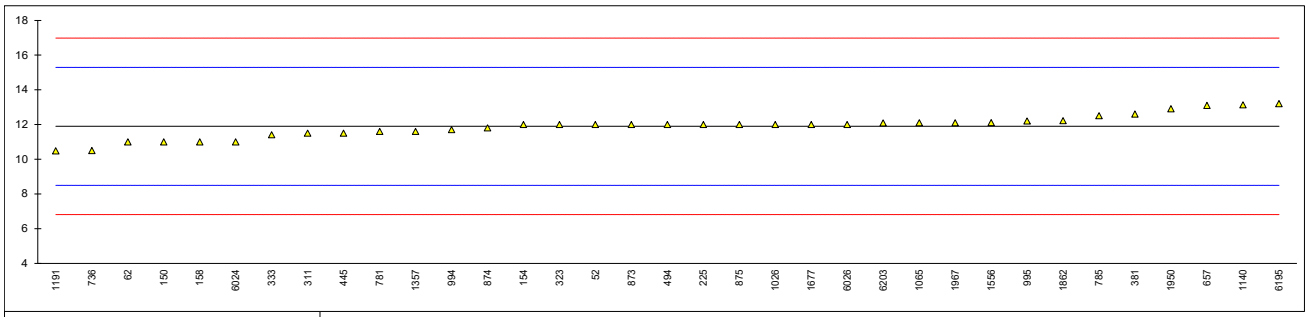


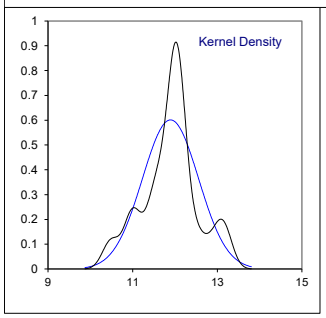



## Determination of Vanadium as V on sample #23251; results in mg/kg

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | IP501 | 12 | | 0.06 | |
| 62 | IP501 | 11 | | -0.53 | |
| 120 | | ----- | | ----- | |
| 150 | IP501 | 11 | | -0.53 | |
| 154 | IP501 | 12 | | 0.06 | |
| 158 | IP501 | 11 | | -0.53 | |
| 171 | | ----- | | ----- | |
| 225 | IP501 | 12 | | 0.06 | |
| 311 | IP621 | 11.5 | | -0.23 | |
| 323 | IP501 | 12 | | 0.06 | |
| 333 | IP501 | 11.4 | | -0.29 | |
| 381 | D7111 | 12.6 | | 0.42 | |
| 445 | IP621 | 11.5 | | -0.23 | |
| 494 | IP501 | 12 | | 0.06 | |
| 608 | | ----- | | ----- | |
| 657 | IP501 | 13.1 | | 0.71 | |
| 736 | IP501 | 10.5 | | -0.82 | |
| 752 | | ----- | | ----- | |
| 781 | IP621 | 11.6 | | -0.17 | |
| 785 | IP470 | 12.5 | | 0.36 | |
| 823 | | ----- | | ----- | |
| 873 | IP621 | 12.0 | | 0.06 | |
| 874 | IP621 | 11.8 | | -0.06 | |
| 875 | IP501 | 12 | | 0.06 | |
| 994 | IP501 | 11.7 | | -0.11 | |
| 995 | IP621 | 12.2 | | 0.18 | |
| 1026 | IP501 | 12 | | 0.06 | |
| 1065 | IP470 | 12.1 | | 0.12 | |
| 1140 | IP501 | 13.13 | | 0.73 | |
| 1191 | ISO10478 | 10.48 | | -0.83 | |
| 1357 | IP501 | 11.6 | | -0.17 | |
| 1556 | IP621 | 12.11 | | 0.13 | |
| 1677 | IP621 | 12.0 | | 0.06 | |
| 1862 | IP501 | 12.22 | | 0.19 | |
| 1950 | IP621 | 12.9 | | 0.59 | |
| 1967 | IP470 | 12.10 | | 0.12 | |
| 6024 | IP470 | 11 | | -0.53 | |
| 6026 | IP470 | 12.0 | | 0.06 | |
| 6195 | IP501 | 13.2 | | 0.77 | |
| 6203 | IP501 | 12.085 | | 0.11 | |

| | |
|---|---|
| normality | OK |
| n | 35 |
| outliers | 0 |
| mean (n) | 11.895 |
| st.dev. (n) | 0.6633 |
| R(calc.) | 1.857 |
| st.dev.(IP621:16) | 1.6961 |
| R(IP621:16) | 4.749 |

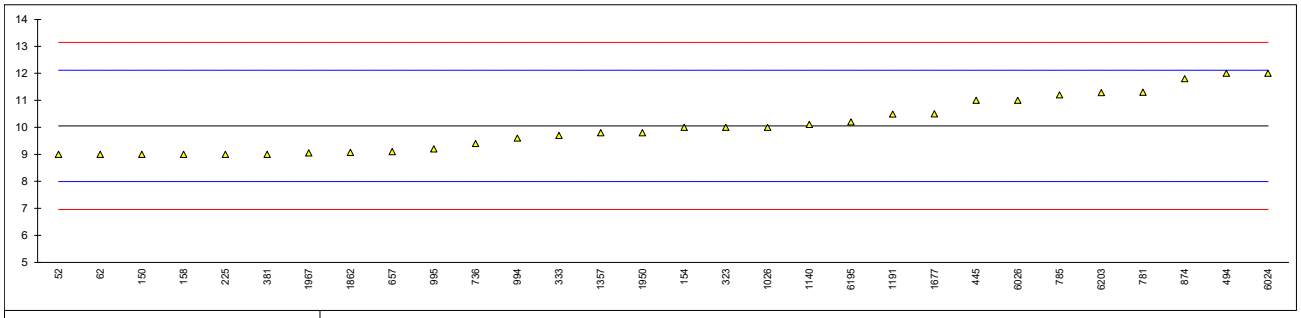


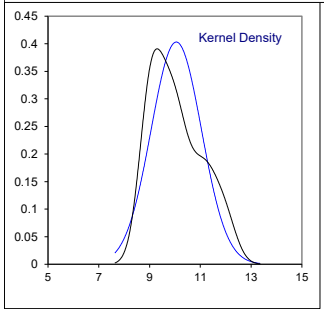



## Determination of Calcium as Ca on sample #23251; results in mg/kg

| lab | method | value | mark | z(targ) | remarks |
|---|---|---|---|---|---|
| 52 | IP501 | 9 | | -1.02 | |
| 62 | IP501 | 9 | | -1.02 | |
| 120 | | ----- | | ----- | |
| 150 | IP501 | 9 | | -1.02 | |
| 154 | IP501 | 10 | | -0.05 | |
| 158 | IP501 | 9 | | -1.02 | |
| 171 | | ----- | | ----- | |
| 225 | IP501 | 9 | | -1.02 | |
| 311 | | ----- | | ----- | |
| 323 | IP501 | 10 | | -0.05 | |
| 333 | IP501 | 9.7 | | -0.34 | |
| 381 | D7111 | 9.0 | | -1.02 | |
| 445 | IP621 | 11.0 | | 0.92 | |
| 494 | IP501 | 12 | | 1.89 | |
| 608 | | ----- | | ----- | |
| 657 | IP501 | 9.1 | | -0.92 | |
| 736 | IP501 | 9.4 | | -0.63 | |
| 752 | | ----- | | ----- | |
| 781 | IP501 | 11.3 | | 1.21 | |
| 785 | IP470 | 11.2 | | 1.11 | |
| 823 | | ----- | | ----- | |
| 873 | | ----- | | ----- | |
| 874 | IP621 | 11.8 | | 1.69 | |
| 875 | | ----- | | ----- | |
| 994 | IP501 | 9.6 | | -0.44 | |
| 995 | IP621 | 9.2 | | -0.83 | |
| 1026 | IP501 | 10 | | -0.05 | |
| 1065 | | ----- | | ----- | |
| 1140 | IP501 | 10.11 | | 0.05 | |
| 1191 | In house | 10.49 | | 0.42 | |
| 1357 | IP5 | 9.8 | | -0.25 | |
| 1556 | | ----- | | ----- | |
| 1677 | IP621 | 10.5 | | 0.43 | |
| 1862 | IP501 | 9.07 | | -0.95 | |
| 1950 | IP470 | 9.8 | | -0.25 | |
| 1967 | IP470 | 9.05 | | -0.97 | |
| 6024 | IP470 | 12 | | 1.89 | |
| 6026 | IP470 | 11.0 | | 0.92 | |
| 6195 | IP501 | 10.2 | | 0.14 | |
| 6203 | IP501 | 11.285 | | 1.19 | |

| | |
|---|---|
| normality | OK |
| n | 30 |
| outliers | 0 |
| mean (n) | 10.053 |
| st.dev. (n) | 0.9893 |
| R(calc.) | 2.770 |
| st.dev.(IP501:05R19) | 1.0309 |
| R(IP501:05R19) | 2.887 |



## APPENDIX 2

### Number of participants per country

| | |
|---|---|
| 1 lab in | AZERBAIJAN |
| 2 labs in | BELGIUM |
| 2 labs in | CANADA |
| 1 lab in | COTE D'IVOIRE |
| 1 lab in | EGYPT |
| 1 lab in | ESTONIA |
| 1 lab in | FINLAND |
| 1 lab in | FRANCE |
| 1 lab in | GEORGIA |
| 1 lab in | GERMANY |
| 1 lab in | GREECE |
| 1 lab in | ISRAEL |
| 2 labs in | KAZAKHSTAN |
| 1 lab in | KOREA, Republic of |
| 1 lab in | MALAYSIA |
| 1 lab in | MALTA |
| 5 labs in | NETHERLANDS |
| 1 lab in | OMAN |
| 1 lab in | ROMANIA |
| 17 labs in | RUSSIAN FEDERATION |
| 1 lab in | SERBIA |
| 1 lab in | SINGAPORE |
| 1 lab in | SWEDEN |
| 1 lab in | UNITED ARAB EMIRATES |
| 2 labs in | UNITED KINGDOM |
| 7 labs in | UNITED STATES OF AMERICA |

**APPENDIX 3**

**Abbreviations**

| | |
|---|---|
| C | = final test result after checking of first reported suspect test result |
| D(0.01) / D(1) | = outlier in Dixon's outlier test |
| D(0.05) / D(5) | = straggler in Dixon's outlier test |
| G(0.01) / G(1) | = outlier in Grubbs' outlier test |
| G(0.05) / G(5) | = straggler in Grubbs' outlier test |
| DG(0.01) / DG(1) | = outlier in Double Grubbs' outlier test |
| DG(0.05) / DG(5) | = straggler in Double Grubbs' outlier test |
| R(0.01) / R(1) | = outlier in Rosner's outlier test |
| R(0.05) / R(5) | = 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**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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)

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