Results of Proficiency Test
Benzene & Toluene
April 2011

Organised by: Institute for Interlaboratory Studies (iis)
Spijkenisse Netherlands

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1 INTRODUCTION

Since 1999, the Institute for Interlaboratory Studies organizes proficiency tests for the analysis of Benzene and Toluene. In the annual proficiency testing program of 2010-2011, it was decided to continue the proficiency test for the analysis of Benzene and Toluene. In the interlaboratory study for Benzene 51 laboratories from 24 different countries have participated and for Toluene 40 participants in 20 countries have participated. See appendix 2 for the number of participants per country.
In this report, the results of the proficiency test Benzene and Toluene are presented and discussed.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organizer of this proficiency test. The analyses for fit-for-use and homogeneity determination were subcontracted to an accredited laboratory. The participants received depending on their registration: 1* 1 litre bottle with Benzene (sample #11034) and/or 1* 1 litre bottle with Toluene (sample #11035).
In order to collect sufficient data for a statistical evaluation, the participants were asked to send in rounded and unrounded results. The unrounded were preferred used for statistical evaluation.

2.1 ACCREDITATION

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, is accredited in accordance with ISO guide 43 and ILAC-G13:2007, (R007), since January 2000, by the Dutch Accreditation Council (Raad voor Accreditatie), see www.rva.nl. This ensures 100% confidentiality of participant's data. Also, customer's satisfaction is measured on a regular basis by sending out questionnaires. The analysis did subcontract to an accredited laboratory.

2.2 PROTOCOL

The protocol followed in the organisation of this proficiency test was the one as described for proficiency testing in the report 'iis. Interlaboratory Studies: Protocol for the Organization, Statistics and Evaluation' (iis-protocol, version 3.2) of January 2010.

2.3 CONFIDENTIALITY STATEMENT

All data present 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

BENZENE

The necessary bulk material of Benzene was obtained from a local chemical supplier. The approximately 60 litre was spiked with 534.4 mg 1-Methyl-2-Pyrrolidinone (for the Nitrogen determination) and 403.2 mg o-Chlorotoluene (for the Organic Chlorine determination). The bulk sample was, after homogenisation, divided over 60 amber glass bottles of 1 litre, labelled #11034. The homogeneity of the subsamples #11034 was checked by determination of Organic Chlorine in accordance with ASTM D5808:09a, density @ 20°C in accordance with ASTM D4052:09 and Toluene content according to ASTM D4492:10, on 8 stratified randomly selected samples.

Benzene	Organic Chlorine in mg/kg	Density at 20°C in kg/L	Toluene in mg/kg
sample #11034-1	3.4	0.87882	350
sample #11034-2	3.2	0.87884	350
sample #11034-3	3.3	0.87888	370
sample #11034-4	3.3	0.87891	380
sample #11034-5	3.2	0.87892	370
sample #11034-6	3.1	0.08792	370
sample #11034-7	3.2	0.87886	370
sample #11034-8	3.3	0.87881	350

table 1: homogeneity test results of Benzene sub samples #11034

From the above test results the repeatabilities were calculated and compared with 0.3 times the corresponding reproducibilities of the target methods, in agreement with the procedure of ISO 13528, Annex B2 in the next table;

	Organic Chlorine in mg/kg	Density at 20°C in kg/L	Toluene in mg/kg
r (sample #11034)	0.3	0.000010	40
target	ASTM D5808:09a	ASTM D4052:09	ASTM D4492:10
0.3*R (target)	0.4	0.00015	50

table 2: evaluation of repeatabilities of subsamples #11034

The calculated repeatabilities were in agreement with 0.3 times the corresponding target reproducibility. Therefore, homogeneity of the samples was assumed.

TOLUENE

The necessary bulk material of Toluene was purchased from a local chemical supplier. The approximately 60 litre was, after homogenisation, divided over 60 brown glass bottles of 1 litre, labelled #11035. The homogeneity of the subsamples #11035 was checked by determination of Benzene, according to ASTM D2360:08 and density @ 20°C according to ASTM D4052:09 on 8 stratified randomly selected samples.

Toluene	Benzene in mg/kg	Density at 20°C in kg/L
sample #11035-1	1070	0.86689
sample #11035-2	1110	0.86690
sample #11035-3	1100	0.86689
sample #11035-4	1070	0.86689
sample #11035-5	1120	0.86689
sample #11035-6	1080	0.86689
sample #11035-7	1080	0.86693
sample #11035-8	1070	0.86690

table 3: homogeneity test results of Toluene sub samples #11035

From the above test results the repeatabilities were calculated and compared with 0.3 times the corresponding reproducibilities of the target methods, in agreement with the procedure of ISO 13528, Annex B2 in the next table;

	Benzene in mg/kg	Density at 20°C in kg/L
r (sample #11035)	45	0.00004
target	Horwitz	ASTM D4052:09
0.3*R (target)	51	0.00015

table 4: evaluation of repeatabilities of subsamples #11035

The calculated repeatabilities were in agreement with 0.3 times the corresponding target reproducibility. Therefore, homogeneity of the samples was assumed.

Depending on their registration to each of the participating laboratories one 1 litre bottle of Benzene labelled #11034 and/or one 1 litre bottle of Toluene labelled #11035 were sent on March 30, 2011.

2.5 STABILITY OF THE SAMPLES

The stability of Benzene and Toluene, packed in an amber glass bottles, was checked. The material was found sufficiently stable for the period of the proficiency test.

2.6 ANALYSES

The participants were requested to determine on the Benzene sample #11034: Acid Wash Colour, Acidity, Appearance, Bromine Index, Colour Pt-Co, Density @ 20°C, Distillation, Organic Chlorine, Total Nitrogen, Solidification Point, Methylcyclohexane, Toluene, Nonaromatics and Purity.
On Toluene sample #11035 were requested: Acid Wash Colour, Appearance, Copper Corrosion, Colour Pt-Co, Density @ 20°C, Distillation, Purity, Nonaromatics, Benzene and Styrene.
To get maximum information for the statistical calculations, the participants were requested to report unrounded results and results below the usual lower reporting limits, where possible. To get comparable results a detailed report form, on which the units were

prescribed, was sent together with each set of samples. Also, a letter of instructions and a SDS was added to the package.

3 RESULTS

During four weeks after sample despatch, the results of the individual laboratories were received. The original reported 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 fax was sent to those laboratories that had not yet reported any results at that moment.
Shortly after the deadline, the available results were screened for suspect data. A 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 results. Additional or corrected results are used for data analysis and original results are placed under 'Remarks' in the result tables in appendix 1.

3.1 STATISTICS

Statistical calculations were performed as described in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' (iis-protocol, version 3.2) of January 2010.
For statistical evaluation the *unrounded* (when available) figures were used instead of the rounded results. 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. After removal of outliers this check was repeated. Not all data sets proved to have a normal distribution, in which cases the results of the statistical evaluation should be used with due care.
In accordance to ISO 5725 (1986 and 1994) the original results per determination were subsequently submitted to Dixon and Grubbs outlier tests. Outliers are marked by D(0.01) for the Dixon test and by G(0.01) or DG(0.01) for the Grubbs test. Stragglers are marked by D(0.05) for the Dixon test and by G(0.05) or DG(0.05) for the Grubbs test. Both outliers and stragglers were not included in the calculations of the averages and the standard deviations.
Finally, the reproducibilities were calculated from the standard deviations by multiplying these with a factor of 2.8.

3.2 GRAPHICS

In order to visualise the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for one determination (see appendix 1). On the Y-axis the reported analysis results are plotted. The corresponding laboratory numbers are under 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 standard. 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 method is for producing a smooth density approximation to a set of data that avoids some problems associated with histograms (see appendix 3; nr.14 and 15).

3.3 Z-SCORES

To evaluate the performance of the participating laboratories the z-scores were calculated. As it was decided to evaluate the performance of the participants in this proficiency test (PT) against the literature requirements, e.g. ASTM reproducibilities, the z-scores were calculated using a target standard deviation. This target standard deviation was calculated from the literature reproducibility by division with 2.8.
The z-scores were calculated according to:

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

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, several problems were encountered during the execution. Laboratories in Brazil, India, Iran, Kuwait, Malaysia and Saudi Arabia did receive the samples late due to courier problems and/or custom clearance. Several participants reported their results after the final reporting date. Not all laboratories were able to perform all analysis requested. Finally, for sample #11034 (Benzene) and sample #11035 (Toluene) in total 833 results were submitted. Observed were in total 45 outlying results, which is 5.4%. In proficiency studies, outlier percentages of 3% - 7.5% are normal.

4.1 EVALUATION PER SAMPLE AND TEST

In this section, the results are discussed per sample and test. The methods, which are used by the various laboratories, were taken into account for explaining the observed differences when possible and applicable. These methods are also in the tables together with the original data. The abbreviations, used in these tables, are listed in appendix 3. In case no suitable test method is available, the Horwitz equation was used.
Not all original data sets proved to have a normal distribution. Not normal distributions were found for sample #11034: Acid Wash Colour, Colour Pt-Co, Density, Distillation (50% and DP), Solidification Point and Purity. For sample #11035 not normal distributions were found for: Acid Wash Colour, Density, Distillation, Purity and Styrene. For these determinations the results of the statistical evaluation should be used with due care.

For Benzene sample #11034

Acid Wash Colour: This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in full agreement with the requirements of the ASTM D848:09.

Acidity: This determination was not problematic. The way of reporting varies strongly and should be improved in accordance with ASTM D847:08: report "no free acid" (NFA) or, when positive, "acidity as mg NaOH/100 mL".

Appearance: No analytical problems were observed. All labs agreed about the appearance of the sample #11034, which was bright, clear and free of suspended matter. The uniformity of reporting can be improved. A new standardized method is available for Appearance since 2009, being ASTM E2680. According this method the appearance should be reported as ‘pass’ (or ‘fail’).

Bromine Index: This determination was not problematic. Only one statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in good agreement with the estimated reproducibility requirements of ASTM D5776:07e1.

Colour Pt-Co: This determination was not problematic. Only one statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D1209:05e1.

Density @20°C: This determination was not problematic. Three statistical outliers were observed and one result was excluded, as specific gravity was reported for density. However, the calculated reproducibility after rejection of the statistical outliers is in good agreement with the requirements of ASTM D4052:09.

Distillation: This determination was problematic for a number laboratories. In total ten statistical outliers were observed. The calculated reproducibility for IBP

and 50% recovered, after rejection of statistical outliers, is in agreement with the requirements of ASTM D850:08e1 (manual). The calculated reproducibility for DP does not meet the requirements of ASTM D850:08e1. From the reported results of the 50% recovered, it appears that five participants obviously did not correct the results for barometric pressure and thermometer inaccuracy as described in ASTM D850-08e1 (paragraph 11.4).

Organic Chlorine: This determination was not problematic. Only one statistical outlier and one false negative test result was observed. The calculated reproducibility after rejection of the statistical outlier is almost in agreement with the requirements of ASTM D5808:09a. The average recovery of Organic Chlorine (theoretical increment of 2.30 mg/kg) may be good: “less then 123%”, as the actual blank Organic Chlorine content is unknown.

Total Nitrogen: This determination was problematic. Two statistical outliers were observed. The calculated reproducibility after the rejection of the statistical outliers is not in agreement with the requirements of ASTM D6069:06. However, when the results for ASTM D4629 and ASTM D6069 were evaluated separately, the calculated reproducibility of the ASTM D6069 results is in full agreement with the requirements of the standard. The calculated reproducibility of the ASTM D4629 results does not meet the requirements. The average recovery of Total Nitrogen (theoretical increment of 1.54 mg/kg) may be satisfactory: “less then 164%”, as the actual blank Total Nitrogen content is unknown.

Solidification Point: This determination was problematic. Only one statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D852:08. Important in this solidification point determination is addition of water, the correct benzene container and the correction by 0.09ºC.

Methylcyclohexane; This determination was problematic. Four statistical outliers were observed and the calculated reproducibility after rejection of statistical outliers is not at all in agreement with the requirements of ASTM D5713:05.

Toluene: This determination was not problematic. Only one statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in good agreement with the reproducibility of ASTM D4492:10.

Nonaromatics: This determination was problematic. Four statistical outliers were observed. After rejection of the statistical outliers, the calculated reproducibility is not in agreement with the reproducibility of ASTM D4492:10.

Purity: This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in good agreement with the estimated reproducibility of ASTM D4492:10.

For Toluene sample #11035

Acid Wash Colour: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of the ASTM D848:09.

Appearance: No analytical problems were observed. All labs agreed about the appearance of the sample #11035, which was bright, clear and free of suspended matter. The uniformity of reporting can be improved. A standardized method is available for Appearance since 2009, being ASTM E2680. According this method the appearance should be reported as 'pass' (or 'fail').

Copper Corr: No problems have been observed. All participants agreed on a result of 1 (1A).

Colour Pt-Co: This determination was not problematic. Two statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in good agreement with the requirements of ASTM D1209:05e1.

Density @20°C: This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in good agreement with the requirements of ASTM D4052:09.

Distillation: This determination was problematic for a number laboratories. In total nine statistical outliers were observed. The calculated reproducibilities, after rejection of statistical outliers, are all in good agreement with the requirements of ASTM D850:08e1 (automated and manual mode). From the reported results of the 50% recovered, it appears that three participants obviously did not correct the results for barometric pressure and thermometer inaccuracy as described in ASTM D850-08e1 (paragraph 11.4).

Purity: This determination was problematic. Only one statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is not at all in agreement with the requirements of ASTM D2360:08.

Nonaromatics: This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D2360:08.

Benzene: This determination may be problematic. Only one statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is not at all in agreement with the strict estimated reproducibility limits calculated using the Horwitz equation.

Styrene: This determination was not problematic. Two statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the strict estimated reproducibility limits calculated using the Horwitz equation.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the relevant standard and the reproducibility as found for the group of participating laboratories. The average results per sample, calculated reproducibilities and reproducibilities derived from literature standards (in casu ASTM standards) are compared in the next table.

Parameter	unit	n	average	2.8 *sd_R	R (lit)
Acid Wash Colour		35	0.63	0.71	1.99
Acidity	mgNaOH/100ml	34	No free acid	n.a.	n.a.
Appearance		--	pass	n.a.	n.a.
Bromine Index	mg Br/100g	33	5.10	3.83	4.60
Colour Pt-Co		29	3.7	4.8	7.0
Density @ 20ºC	kg/L	37	0.8789	0.0002	0.0005
Distillation, IBP	°C	31	79.75	0.36	0.42
Distillation, 50%	°C	30	80.09	0.14	0.42
Distillation, DP	°C	30	80.54	0.50	0.42
Organic Chlorine	mg/kg	32	2.82	1.41	1.30
Total Nitrogen	mg/kg	28	2.53	1.38	0.98
Solidification Point	^{o}C	25	5.45	0.06	0.05
Methylcyclohexane	mg/kg	27	90.9	31.7	19.6
Toluene	mg/kg	41	401.5	90.0	186.9
Nonaromatics	mg/kg	38	418.9	138.3	104.6
Purity	%M/M	43	99.905	0.026	0.027

Table 5: reproducibilities of Benzene sample #11034

Parameter	unit	n	average	2.8 *sd_R	R (lit)
Acid Wash Colour		31	0.72	0.64	2.03
Appearance		--	pass	n.a.	n.a.
Copper corrosion		31	1(1A)	n.a.	n.a.
Colour Pt-Co		19	3.1	3.3	7.0
Density @ 20ºC	kg/L	35	0.8669	0.0002	0.0005
Distillation, IBP	°C	30	110.27	0.32	0.58
Distillation, 50% rec.	°C	30	110.60	0.09	0.16
Distillation, DP	°C	29	110.69	0.18	0.46
Purity	%M/M	33	99.845	0.041	0.021
Nonaromatics	mg/kg	31	375.9	131.1	179.8
Benzene	mg/kg	32	1061.4	280.7	166.6
Styrene	mg/kg	24	10.30	2.24	3.25

Table 6: reproducibilities of Toluene sample #11035

Without further statistical calculations, it can be concluded that for most of the tests there is a compliance of the group of participating laboratories with the relevant standards. The tests that are problematic have been discussed in paragraph 4.1.

4.3 COMPARISON OF THE PROFICIENCY TEST OF APRIL 2011 WITH PREVIOUS PTS

	April 2011	April 2010	April 2009	March 2008
Number of reporting labs	45	44	42	36
Number of results reported	833	684	811	607
Statistical outliers	45	28	28	38
Percentage outliers	5.4%	4.1%	3.5%	6.3%

table 7: comparison with previous proficiency tests.

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

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

	April 2011	April 2010	April 2009	March 2008
Acid Wash Colour	++	++	++	++
Acidity	++	n.e.	++	n.e.
Appearance	++	n.e.	++	n.e.
Bromine Index	++	++	+/-	++
Colour Pt-Co	++	++	++	++
Density @ 20ºC	++	++	++	++
Distillation, IBP	++	++	+	++
Distillation, 50%	++	++	++	++
Distillation, DP	--	++	--	--
Organic Chlorine	-	+/-	+/-	++
Total Nitrogen	--	--	--	--
Solidification Point	--	--	--	++
Methylcyclohexane	--	++	--	n.e.
Toluene	++	++	++	++
Nonaromatics	--	+	--	--
Purity	+	++	+	--

table 8: comparison determinations on Benzene against the standards

	April 2011	April 2010	April 2009	March 2008
Acid Wash Colour	++	++	++	++
Appearance	++	+	++	n.e.
Copper Corrosion	++	++	++	+/-
Colour Pt-Co	++	++	++	+
Density @ 20 ºC	++	++	++	++
Distillation, IBP	++	++	++	++
Distillation, 50%	++	++	--	--
Distillation, DP	++	++	++	+
Purity	--	++	++	n.e.
Nonaromatics	++	++	++	n.e.
Benzene	-- *)	- *)	-- *)	n.e.
Styrene	++ *)	+ *)	+/- *)	- *)

table 9: comparison determinations on Toluene against the standard
*) against the strict Horwitz equation

The performance of the determinations against the requirements of the respective standards is listed in the above table. The following performance categories were used:

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

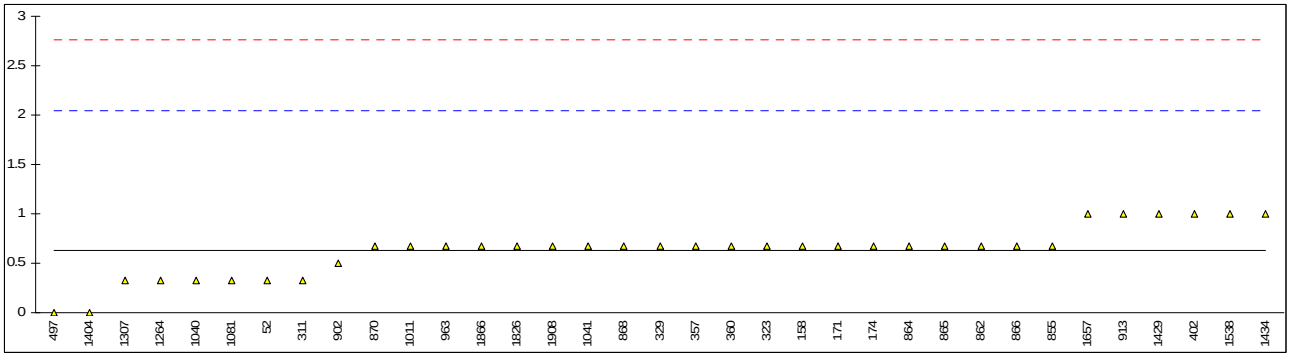
APPENDIX 1

Determination of Acid Wash Colour on Benzene sample #11034

lab	method	value	mark	z(targ)	remarks
52	D848	0+		-0.42	
150		-----		-----	
158	D848	1-		0.06	
171	D848	1-		0.06	
174	D848	1-		0.06	
311	D848	0+		-0.42	
323	D848	1-		0.06	
329	D848	1-		0.06	
333		-----		-----	
334		-----		-----	
357	D848	1-		0.06	
360	D848	1-		0.06	
402	D848	1		0.53	
444		-----		-----	
497	D848	0		-0.88	
555		-----		-----	
855	D848	1-		0.06	
862	D848	1-		0.06	
864	D848	1-		0.06	
865	D848	1-		0.06	
866	D848	1-		0.06	
868	D848	1-		0.06	
870	D848	1-		0.06	
902	D848	0.5		-0.18	
912		-----		-----	
913	D848	1		0.53	
963	D848	1-		0.06	
1011	D848	1-		0.06	
1040	D848	0+		-0.42	
1041	D848	1-		0.06	
1067		-----		-----	
1081	D848	0+		-0.42	
1117		-----		-----	
1263		-----		-----	
1264	D848	0+		-0.42	
1305	D848	<1		-----	
1307	D848	0+		-0.42	
1404	D848	0-		-0.88	
1429	D848	1		0.53	
1434	D848	1		0.53	
1508		-----		-----	
1538	D848	1		0.53	
1653		-----		-----	
1657	D848	1		0.53	
1812		-----		-----	
1823		-----		-----	
1826	D848	1-		0.06	
1866	D848	1-		0.06	
1908	D848	1-		0.06	
7009		-----		-----	
9008		-----		-----	

normality	not OK
n	35
outliers	0
mean (n)	0.63
st.dev. (n)	0.255
R(calc.)	0.71
R(D848:09)	1.99

*) In the calculation of the mean, standard deviation, the reproducibility and in below graphs, a reported value of ‘x-‘ is changed into x-0.33 (for example 1- into 0.67) and ‘x+’ is changed into x+0.33 (for example 0+ into 0.33)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2.5
2
1.5
1
0.5
0
497
1404
1307
1264
1040
1061
52
311
902
870
1011
963
1866
1826
1908
1041
868
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360
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158
171
174
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865
862
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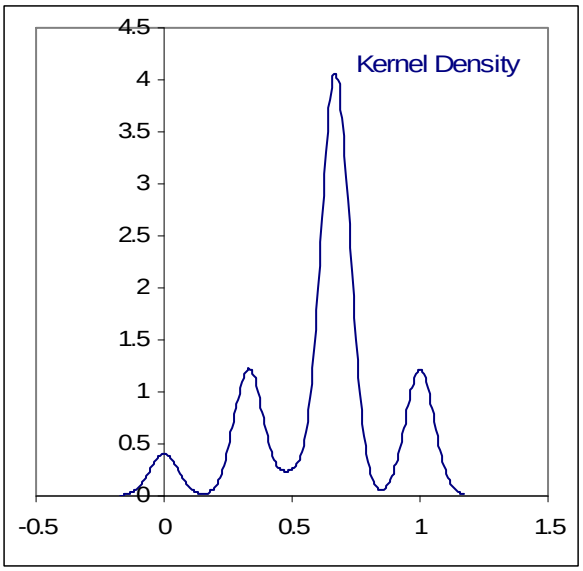
855
1657
913
1429
402
1538
1434


Kernel Density
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4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
0
0.5
1
1.5

Determination of Acidity on Benzene sample #11034; results in mg NaOH per 100mL

lab	method	value	mark	z(targ)	remarks
52	D847	nil		-----	
150	D847	<0.1		-----	
158	D847	NFA		-----	
171	D847	n.d.		-----	
174	D847	NFA		-----	
311	D847	NFA		-----	
323	D847	pass		-----	
329	D847	pass		-----	
333		-----		-----	
334		-----		-----	
357	D847	NFA		-----	
360	D847	NFA		-----	
402	D847	NFA		-----	
444		-----		-----	
497		-----		-----	
555		-----		-----	
855	D847	NFA		-----	
862	D847	NFA		-----	
864	D847	NFA		-----	
865	D847	NFA		-----	
866	D847	NFA		-----	
868	D847	NFA		-----	
870	D847	NFA		-----	
902	D847	NFA		-----	
912		-----		-----	
913	D847	nil		-----	
963	D847	NFA		-----	
1011	D847	nil		-----	
1040		-----		-----	
1041		-----		-----	
1067		-----		-----	
1081	D847	0		-----	
1117	D847	0.37		-----	
1263		-----		-----	
1264	D847	NFA		-----	
1305	D847	NFA		-----	
1307	D847	absent		-----	
1404		-----		-----	
1429	D847	n.d.		-----	
1434	D847	nil		-----	
1508		-----		-----	
1538	D847	NFA		-----	
1653		-----		-----	
1657	D847	n.d.		-----	
1812		-----		-----	
1823		-----		-----	
1826	D847	NFA		-----	
1866	D847	0.360		-----	
1908	D847	NFA		-----	
7009		-----		-----	
9008		-----		-----	

normality	n.a.
n	34
outliers	0
mean (n)	No free acid
st.dev. (n)	n.a.
R(calc.)	n.a.
R(D847:08)	n.a.

NFA: No Free Acid

Determination of Appearance on Benzene sample #11034

lab	method	value	mark	z(targ)	remarks
52	D4176	pass		---	
150	E2680	pass		---	
158	E2680	pass		---	
171	E2680	C&F		---	
174	E2680	pass		---	
311	E2680	pass		---	
323	E2680	pass		---	
329	E2680	pass		---	
333		---		---	
334		---		---	
357	E2680	pass		---	
360	E2680	B&C		---	
402	E2680	B&C		---	
444	E2680	pass		---	
497	E2680	B&C		---	
555		---		---	
855	E2680	pass		---	
862		---		---	
864	E2680	pass		---	
865	E2680	pass		---	
866	E2680	pass		---	
868	E2680	pass		---	
870	E2680	clear		---	
902	E2680	B&C		---	
912		---		---	
913	E2680	CFSM		---	
963	E2680	pass		---	
1011	visual	B&C		---	
1040	D4176	B&C		---	
1041	visual	CFSM		---	
1067	E2680	pass		---	
1081	in house	B&C		---	
1117	D4176	on-spec		---	
1263		---		---	
1264	E2680	B&C		---	
1305	E2680	pass		---	
1307	E2680	B&C		---	
1404		---		---	
1429	visual	B&C		---	
1434	E2680	clear		---	
1508		---		---	
1538	visual	B&C		---	
1653		---		---	
1657		---		---	
1812		---		---	
1823	E2680	CFFSM		---	
1826	visual	pass		---	
1866		---		---	
1908	visual	B&C		---	
7009		---		---	
9008		---		---	

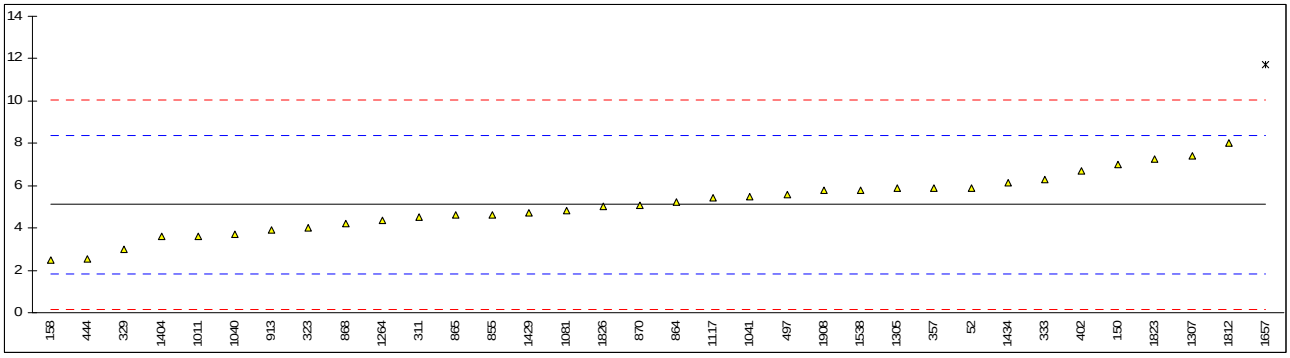
Abbreviations:

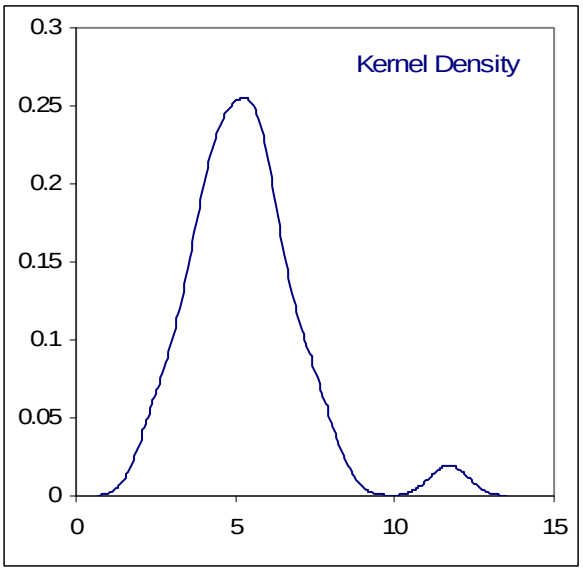
C	= clear
B&C	= bright and clear
C&F	= clear and free
CFSM	= clear and free from suspended matter
CWWFFWEM	= clear water white free from water and extraneous matter
CLFSH	= clear liquid free of sediment and haze
CWWL	= clear water white liquid
CFFMS	= clear free from matter in suspension

Determination of Bromine Index on Benzene sample #11034; results in mg Br/100g

lab	method	value	mark	z(targ)	remarks
52	D1492	5.9		0.48	
150	D1492	7		1.15	
158	D5776	2.5		-1.59	
171	D2710	<5		-----	
174		-----		-----	
311	D5776	4.5		-0.37	
323	D5776	4.0		-0.67	
329	D5776	3		-1.28	
333	D2710	6.3		0.73	
334		-----		-----	
357	D5776	5.9		0.48	
360		-----		-----	
402	D5776	6.72		0.98	
444	D5776	2.52		-1.57	
497	D5776	5.6		0.30	
555		-----		-----	
855	D5776	4.60		-0.31	
862		-----		-----	
864	D5776	5.2		0.06	
865	D5776	4.6		-0.31	
866		-----		-----	
868	D5776	4.2		-0.55	
870	D5776	5.05		-0.03	
902		-----		-----	
912		-----		-----	
913	D2710	3.9		-0.73	
963		-----		-----	
1011	D1159	3.605		-0.91	
1040	DIN 51774	3.7		-0.85	
1041	DIN51774	5.50		0.24	
1067		-----		-----	
1081	D1492	4.8		-0.19	
1117	D1492	5.45		0.21	
1263		-----		-----	
1264	D5776	4.38		-0.44	
1305	D1492	5.87		0.47	
1307	D5776	7.3869		1.39	
1404	D5776	3.6		-0.92	
1429	D2710	4.7		-0.25	
1434	D5776	6.15		0.64	
1508		-----		-----	
1538	D1492	5.8	C	0.42	First reported 0.63
1653		-----		-----	
1657	D5776	11.7	G(0.01)	4.01	
1812	DIN51774	8.00	C	1.76	First reported 0.08
1823	D1492	7.25		1.31	
1826	D5776	5.0		-0.06	
1866		-----		-----	
1908	D5776	5.77		0.41	
7009		-----		-----	
9008		-----		-----	

normality	OK
n	33
outliers	1
mean (n)	5.10
st.dev. (n)	1.367
R(calc.)	3.83
R(D5776:07e1)	4.60

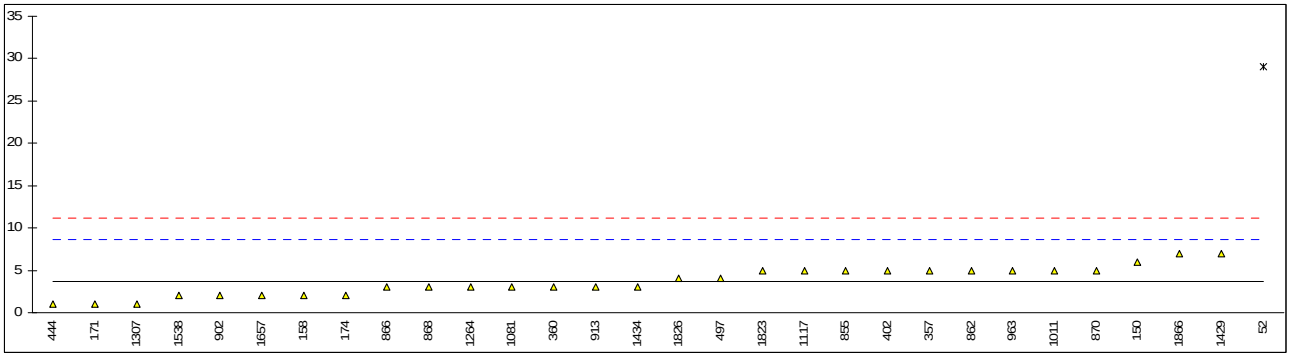

14
12
10
8
6
4
2
0
158
444
329
1404
1011
1040
913
323
868
1264
311
865
855
1429
1061
1826
870
864
1117
1041
497
1908
1538
1305
357
52
1434
333
402
150
1823
1307
1812
1657

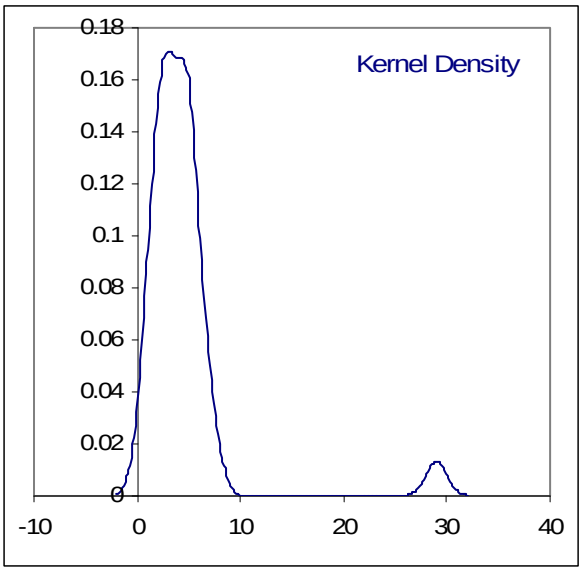

Kernel Density
0.3
0.25
0.2
0.15
0.1
0.05
0
0
5
10
15

Determination of Colour Pt-Co on Benzene sample #11034

lab	method	value	mark	z(targ)	remarks
52	D1209	29	G(0.01)	10.13	
150	D1209	6		0.93	
158	D1209	2		-0.67	
171	D5386	1		-1.07	
174	D1209	2		-0.67	
311	D1209	<5		-----	
323	D1209	<5		-----	
329	D1209	<5		-----	
333		-----		-----	
334		-----		-----	
357	D1209	5		0.53	
360	D1209	3		-0.27	
402	D1209	5		0.53	
444	D5386	1		-1.07	
497	D1209	4		0.13	
555		-----		-----	
855	D1209	5		0.53	
862	D1209	5		0.53	
864	D1209	<5		-----	
865	D1209	<5		-----	
866	D1209	3		-0.27	
868	D1209	3		-0.27	
870	D1209	5		0.53	
902	D5386	2		-0.67	
912		-----		-----	
913	D5386	3.0		-0.27	
963	D1209	5		0.53	
1011	D1209	5		0.53	
1040	ISO6271	<5		-----	
1041	ISO6271	<5		-----	
1067	D1209	<5		-----	
1081	D5386	3		-0.27	
1117	D1209	5		0.53	
1263		-----		-----	
1264	D1209	3		-0.27	
1305	D1209	<5		-----	
1307	D5386	1		-1.07	
1404		-----		-----	
1429	D1209	7		1.33	
1434	D1209	3		-0.27	
1508		-----		-----	
1538	D1209	2		-0.67	
1653		-----		-----	
1657	D1209	2		-0.67	
1812		-----		-----	
1823	D5386	4.9		0.49	
1826	D1209	4		0.13	
1866	D1209	7		1.33	
1908	D1209	<5		-----	
7009		-----		-----	
9008		-----		-----	

normality	not OK
n	29
outliers	1
mean (n)	3.69
st.dev. (n)	1.711
R(calc.)	4.79
R(D1209:05e1)	7.00

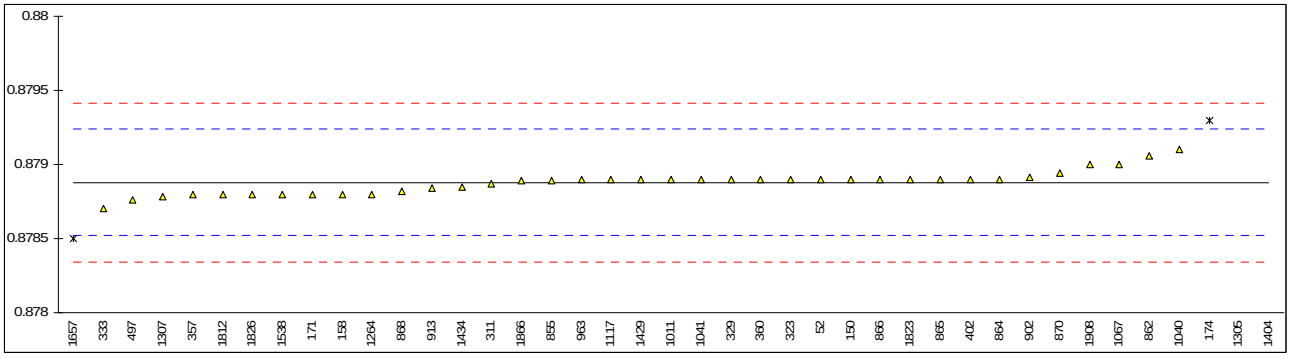

35
30
25
20
15
10
5
0
*
444
171
1307
1538
902
1657
158
174
886
888
1264
1061
360
913
1434
1826
497
1823
1117
855
402
357
862
963
1011
870
150
1866
1429
52

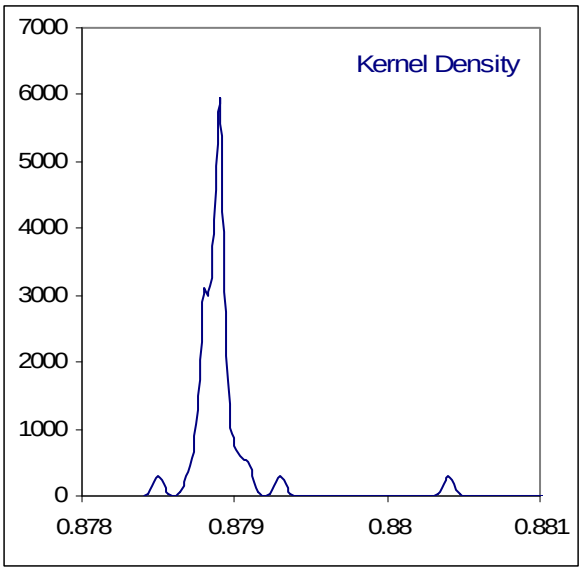

Kernel Density
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-10
0
10
20
30
40

Determination of Density @ 20°C on Benzene sample #11034; results in kg/L

lab	method	value	mark	z(targ)	remarks
52	D4052	0.8789		0.12	
150	D4052	0.8789		0.12	
158	D4052	0.8788		-0.44	
171	D4052	0.8788		-0.44	
174	D4052	0.8793	G(0.01)	2.36	
311	D4052	0.87887		-0.05	
323	D4052	0.8789		0.12	
329	D4052	0.8789		0.12	
333	D4052	0.8787	C	-1.00	First reported 878.7
334		-----		-----	
357	D4052	0.8788		-0.44	
360	D4052	0.8789		0.12	
402	D4052	0.87890		0.12	
444		-----		-----	
497	D4052	0.87876		-0.67	
555		-----		-----	
855	D4052	0.87889		0.06	
862	D4052	0.87906		1.01	
864	D4052	0.8789		0.12	
865	D4052	0.8789		0.12	
866	D4052	0.87890		0.12	
868	D4052	0.87882		-0.33	
870	D4052	0.87894		0.34	
902	D4052	0.87891		0.17	
912		-----		-----	
913	D4052	0.87884		-0.22	
963	D4052	0.8789		0.12	
1011	D4052	0.87890		0.12	
1040	D4052	0.8791		1.24	
1041	D4052	0.87890		0.12	
1067	D4052	0.8790	C	0.68	First reported 0.8842 (measured at 15ºC)
1081		-----		-----	
1117	D4052	0.8789		0.12	
1263		-----		-----	
1264	D4052	0.8788		-0.44	
1305	D4052	0.8804	ex	8.52	Result excluded, result was reported as specific gravity
1307	D4052	0.87878		-0.55	
1404	ISO12185	0.8843	G(0.01)	30.36	
1429	D4052	0.8789		0.12	
1434	D4052	0.87885		-0.16	
1508		-----		-----	
1538	D4052	0.8788		-0.44	
1653		-----		-----	
1657	D4052	0.8785	G(0.05)	-2.12	
1812	ISO12185	0.8788	C	-0.44	First reported 878.8
1823	D4052	0.8789		0.12	
1826	D4052	0.8788		-0.44	
1866	D4052	0.87889		0.06	
1908	D4052	0.87900		0.68	
7009		-----		-----	
9008		-----		-----	

normality	not OK	
n	37	
outliers	3	(1 x excl.)
mean (n)	0.87888	
st.dev. (n)	0.000080	
R(calc.)	0.00022	
R(D4052:09)	0.00050	


0.88
0.8795
0.879
0.8785
0.878
1657 333 497 1307 357 1812 1826 1538 171 158 1264 868 913 1434 311 1866 855 963 1117 1429 1011 1041 329 360 323 52 150 866 1823 865 402 864 902 870 1908 1067 862 1040 174 1305 1404

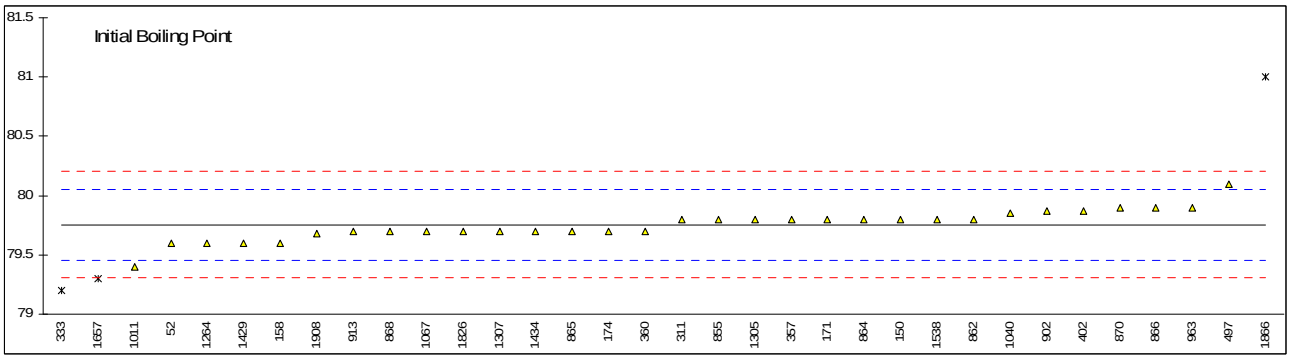

Kernel Density
7000
6000
5000
4000
3000
2000
1000
0
0.878
0.879
0.88
0.881

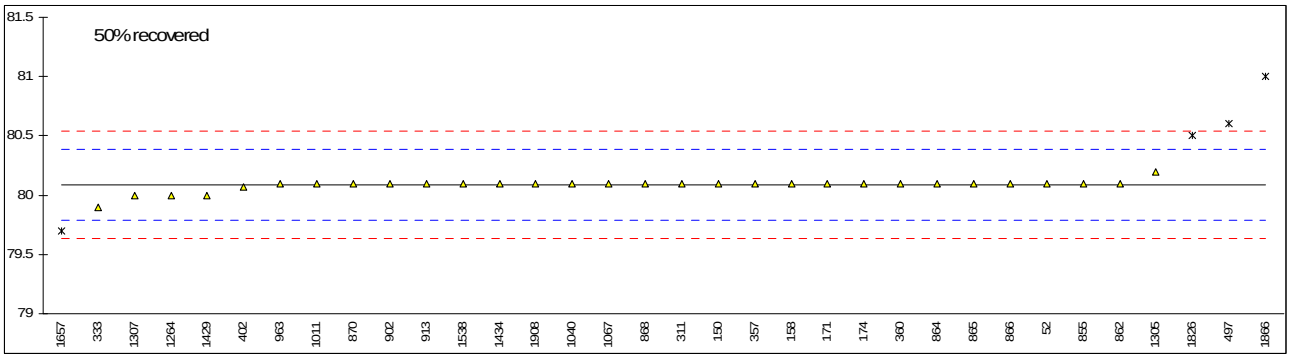
Determination of Distillation (automated + manual) on Benzene sample #11034; results in °C

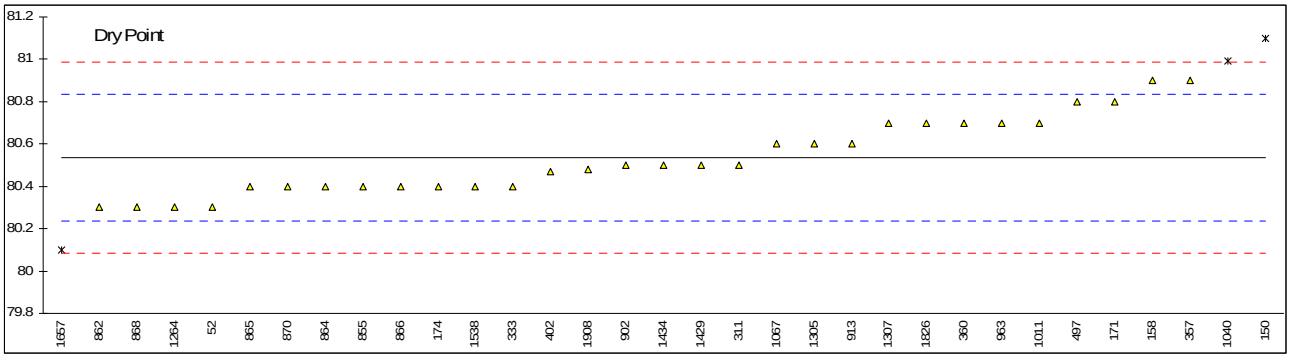
Lab	method	IBP	mark	z(targ)	50%	mark	z(targ)	DP	mark	z(targ)	remarks
52	D850-A	79.6		-1.03	80.1		0.10	80.3		-1.57	
150	D850-A	79.8		0.31	80.1		0.10	81.1	C,G(0.05)	3.77	Fr 80.2
158	D850-A	79.6		-1.03	80.1		0.10	80.9		2.43	
171	D850-A	79.8		0.31	80.1		0.10	80.8		1.77	
174	D850-A	79.7		-0.36	80.1		0.10	80.4	C	-0.90	Fr 81
311	D850-A	79.8		0.31	80.1		0.10	80.5		-0.23	
323		-----		-----	-----		-----	-----		-----	
329		-----		-----	-----		-----	-----		-----	
333	D850-A	79.2	G(0.05)	-3.69	79.9		-1.24	80.4		-0.90	
334		-----		-----	-----		-----	-----		-----	
357	D850-A	79.8		0.31	80.1		0.10	80.9		2.43	
360	D850-A	79.7		-0.36	80.1		0.10	80.7		1.10	
402	D850-M	79.87		0.77	80.07		-0.10	80.47		-0.43	
444		-----		-----	-----		-----	-----		-----	
497	D850-A	80.1		2.31	80.6	G(0.01)	3.43	80.8		1.77	
555		-----		-----	-----		-----	-----		-----	
855	D850-M	79.8		0.31	80.1		0.10	80.4		-0.90	
862	D850-M	79.8		0.31	80.1		0.10	80.3		-1.57	
864	D850-M	79.8		0.31	80.1		0.10	80.4		-0.90	
865	D850-M	79.7		-0.36	80.1		0.10	80.4		-0.90	
866	D850-M	79.9		0.97	80.1		0.10	80.4		-0.90	
868	D850-M	79.7		-0.36	80.1		0.10	80.3		-1.57	
870	D850-M	79.9		0.97	80.1		0.10	80.4		-0.90	
902	D850-M	79.87		0.77	80.1		0.10	80.5		-0.23	
912		-----		-----	-----		-----	-----		-----	
913	D850-M	79.7		-0.36	80.1		0.10	80.6		0.43	
963	D850-M	79.9		0.97	80.1		0.10	80.7		1.10	
1011	D850-A	79.4		-2.36	80.1		0.10	80.7		1.10	
1040	DIN51761-M	79.85		0.64	80.10		0.10	80.99	G(0.05)	3.03	
1041		-----		-----	-----		-----	-----		-----	
1067	D850	79.7		-0.36	80.1		0.10	80.6		0.43	
1081		-----		-----	-----		-----	-----		-----	
1117		-----		-----	-----		-----	-----		-----	
1263		-----		-----	-----		-----	-----		-----	
1264	D850-A	79.6		-1.03	80.0		-0.57	80.3		-1.57	
1305	D850-A	79.8		0.31	80.2		0.76	80.6		0.43	
1307	D850-A	79.7		-0.36	80.0		-0.57	80.7		1.10	
1404		-----		-----	-----		-----	-----		-----	
1429	D850	79.6		-1.03	80.0		-0.57	80.5		-0.23	
1434	D850-A	79.7		-0.36	80.1		0.10	80.5		-0.23	
1508		-----		-----	-----		-----	-----		-----	
1538	D850-A	79.8		0.31	80.1		0.10	80.4		-0.90	
1653		-----		-----	-----		-----	-----		-----	
1657	D850-A	79.3	G(0.05)	-3.03	79.7	G(0.01)	-2.57	80.1	G(0.05)	-2.90	
1812		-----		-----	-----		-----	-----		-----	
1823		-----		-----	-----		-----	-----		-----	
1826	D850-M	79.7		-0.36	80.5	G(0.01)	2.76	80.7	C	1.10	Fr 81.1
1866	D850-M	81.0	G(0.01)	8.31	81.0	G(0.01)	6.10	-----		-----	
1908	D850-M	79.68		-0.49	80.10		0.10	80.48		-0.37	
7009		-----		-----	-----		-----	-----		-----	
9008		-----		-----	-----		-----	-----		-----	
	normality	OK			not OK			not OK			
	n	31			30			30			
	outliers	3			4			3			
	mean (n)	79.75			80.09			80.54			
	st.dev. (n)	0.128			0.051			0.180			
	R(calc.)	0.36			0.14			0.50			
	R(D850:08e1)	0.42			0.42			0.42			

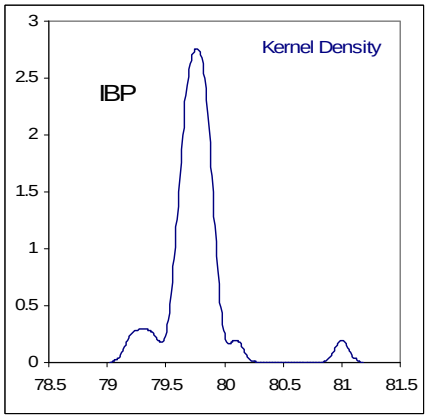
After manual corrections for “50% recovered”

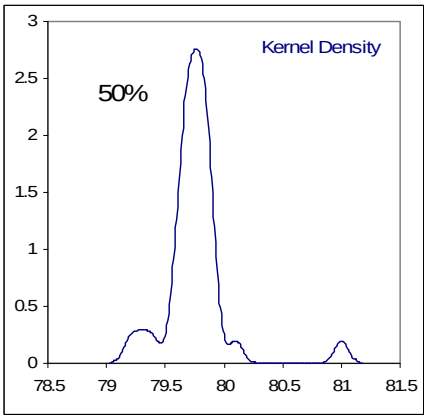
Lab	IBP	mark	z(targ)	50%	mark	z(targ)	DP	mark	z(targ)	remarks
333	79.4		-2.26	80.1		0.05	80.6		0.59	
497	79.6		-0.92	80.1		0.05	80.3		-1.41	
1657	79.7		-0.26	80.1		0.05	80.5		-0.08	
1826	79.3	G(0.01)	-2.92	80.1		0.05	80.3		-1.41	
1866	80.1		2.41	80.1		0.05	‘-----			
normality	OK			not OK			not OK			
n	33			30			31			
outliers	1			4			2			
mean (n)	79.74			80.09			80.51			
st.dev. (n)	0.141			0.034			0.175			
R(calc.)	0.39			0.10			0.49			
R(D850:08e1)	0.42			0.42			0.42			

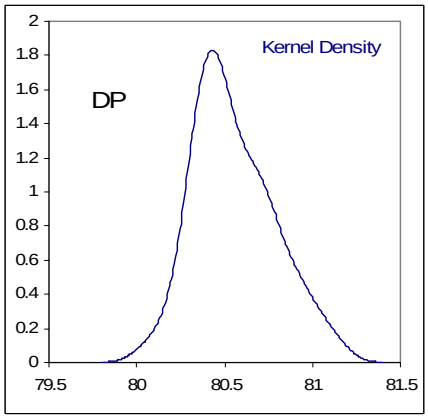






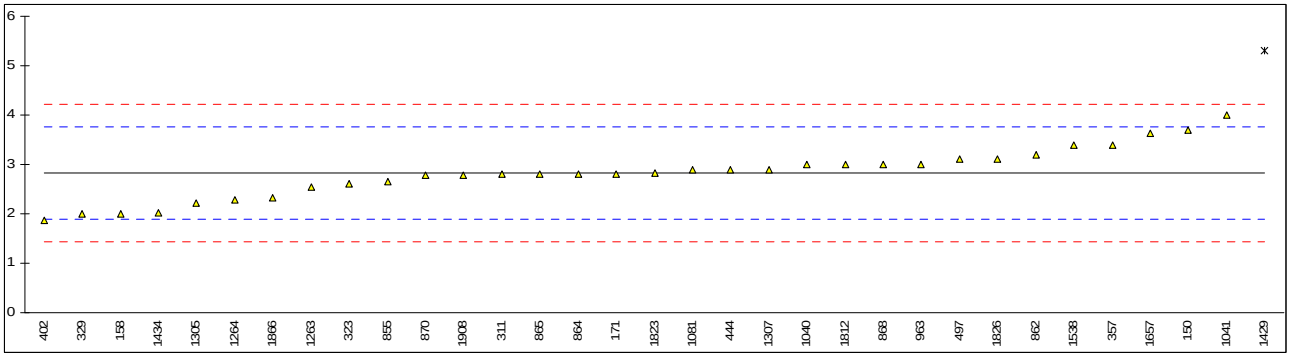


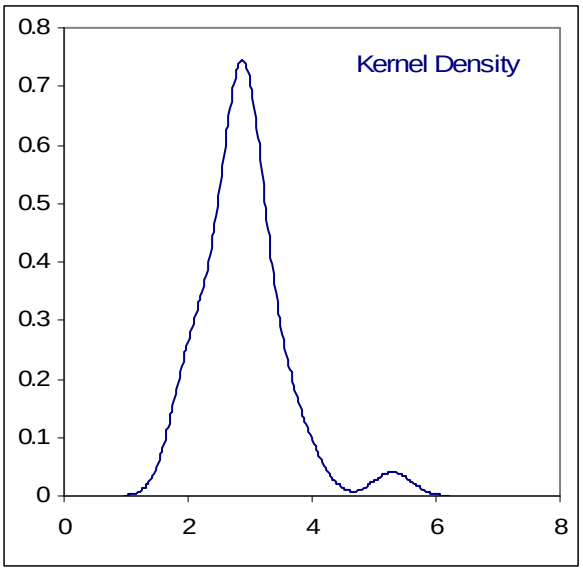




Determination of Organic Chlorine on Benzene sample #11034; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D5124	<1		<-3.93	False negative?
150	D7359	3.7	C	1.89	First reported 4
158	D5808	2		-1.77	
171	D5808	2.81		-0.03	
174		-----		-----	
311	D5808	2.8		-0.05	
323	D5808	2.6		-0.48	
329	D5808	2		-1.77	
333		-----		-----	
334		-----		-----	
357	D5808	3.4		1.24	
360		-----		-----	
402	D5808	1.88		-2.03	
444	IP510	2.9		0.16	
497	D5808	3.1		0.59	
555		-----		-----	
855	D5808	2.66		-0.35	
862	D5808	3.2		0.81	
864	D5808	2.8		-0.05	
865	D5808	2.8		-0.05	
866		-----		-----	
868	D5808	3.0		0.38	
870	D5808	2.78		-0.09	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D5808	3		0.38	
1011		-----		-----	
1040	EN14077	2.99		0.36	
1041	D5808	4.0		2.53	
1067		-----		-----	
1081	D5808	2.9		0.16	
1117		-----		-----	
1263	DIN14077	2.546		-0.60	
1264	D5808	2.29		-1.15	
1305	D5808	2.21		-1.32	
1307	D5808	2.90		0.16	
1404		-----		-----	
1429	D5805	5.3	G(0.01)	5.33	
1434	D7536	2.03		-1.71	
1508		-----		-----	
1538	D5808	3.39		1.22	
1653		-----		-----	
1657	D4929	3.63		1.74	
1812	DIN51408	3.0		0.38	
1823	in house	2.83		0.01	
1826	INH-97	3.1		0.59	
1866	D5808	2.33		-1.06	
1908	D5808	2.79		-0.07	
7009		-----		-----	
9008		-----		-----	
	normality	OK			
	n	32			
	outliers	1	Spike:		
	mean (n)	2.824	2.30		Recovery <123%
	st.dev. (n)	0.5025			
	R(calc.)	1.407			
	R(D5808:09a)	1.300			

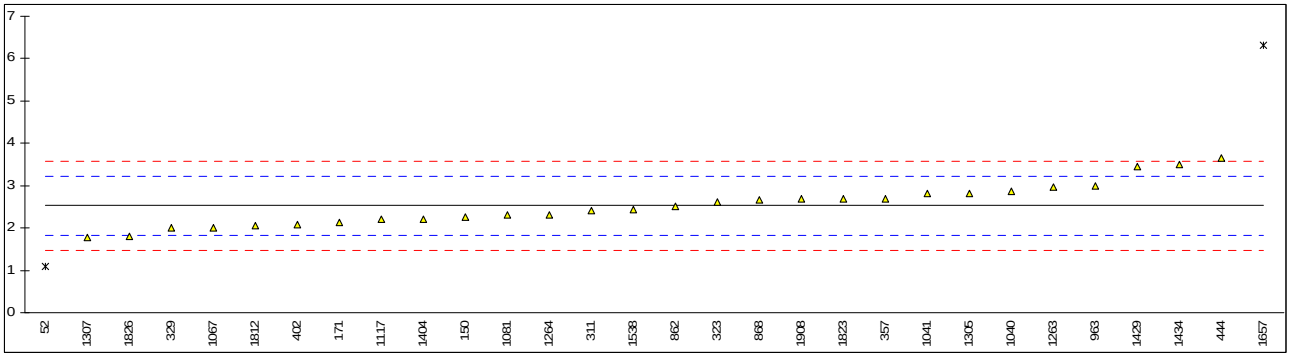

6
5
4
3
2
1
0
402
329
158
1434
1305
1264
1866
1263
323
855
870
1908
311
865
864
171
1823
1081
444
1307
1040
1812
868
963
497
1826
862
1538
357
1657
150
1041
1429

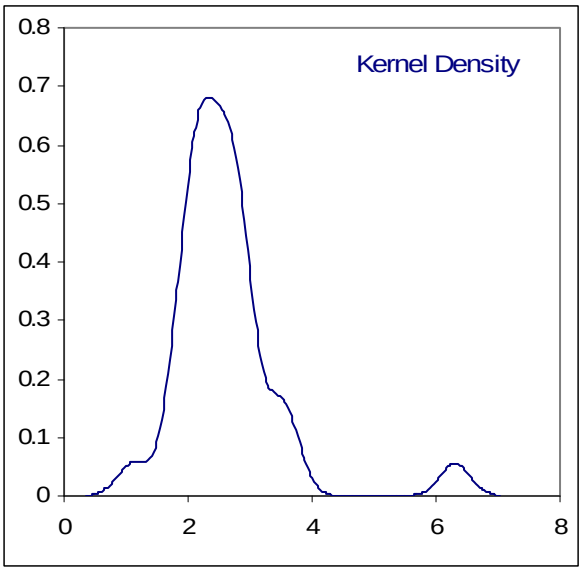

Kernel Density
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8

Determination of Total Nitrogen on Benzene sample #11034; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D6069	1.1	G(0.05)	-4.09	
150	D6069	2.25		-0.80	
158		-----		-----	
171	D4626	2.13		-1.14	
174		-----		-----	
311	D6069	2.4		-0.37	
323	D4629	2.6		0.20	
329	D6069	2		-1.52	
333		-----		-----	
334		-----		-----	
357	D6069	2.7		0.49	
360		-----		-----	
402	D4629	2.08		-1.29	
444	D4629	3.65		3.21	
497		-----		-----	
555		-----		-----	
855		-----		-----	
862	D6069	2.5		-0.08	
864		-----		-----	
865		-----		-----	
866		-----		-----	
868	D6069	2.67	C	0.40	First reported 3.67
870		-----		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D4629	3		1.35	
1011		-----		-----	
1040	D4629	2.87		0.98	
1041	D6069	2.81		0.81	
1067	D6069	2.0		-1.52	
1081	D6069	2.3		-0.66	
1117	D6069	2.2	C	-0.94	First reported 0.92
1263	D4629	2.972		1.27	
1264	D6069	2.3		-0.66	
1305	D6069	2.82		0.83	
1307	D6069	1.77		-2.17	
1404	D6069	2.2		-0.94	
1429	D4629	3.44		2.61	
1434	D7183	3.51		2.81	
1508		-----		-----	
1538	D6069	2.43		-0.28	
1653		-----		-----	
1657	D4629	6.31	G(0.01)	10.83	
1812	D6069	2.05		-1.37	
1823	D6069	2.68		0.43	
1826	D4629	1.8		-2.09	
1866		-----		-----	
1908	D6069	2.68		0.43	
7009		-----		-----	
9008		-----		-----	

					Only ASTM D6069 data:	ASTM D4629 data:
	normality	OK			OK	OK
	n	28			18	9
	outliers	2	Spike:		1	1
	mean (n)	2.529	1.54	<164%	2.376	2.727
	st.dev. (n)	0.4918			0.3093	0.6291
	R(calc.)	1.377			0.866	1.761
	R(D6069:06)	0.977			0.918	1.357

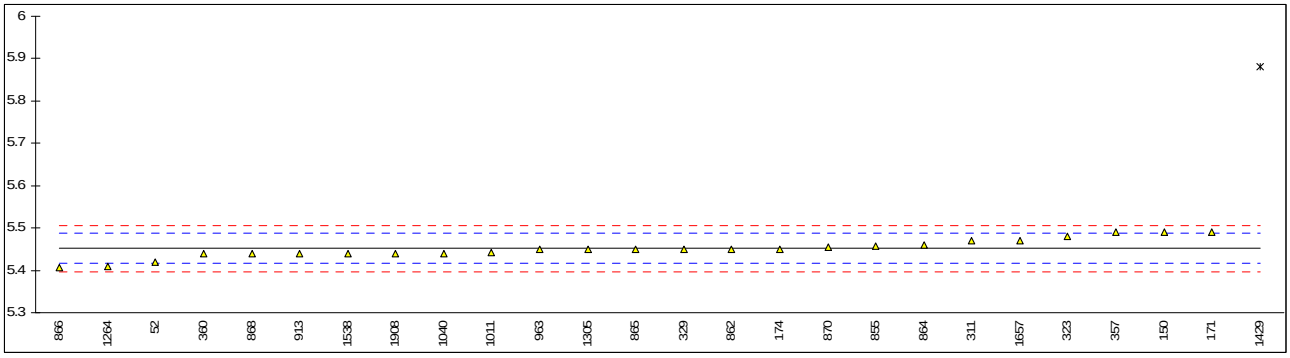

7
6
5
4
3
2
1
0
52
1307
1826
329
1067
1812
402
171
1117
1404
150
1081
1264
311
1538
862
323
868
1908
1823
357
1041
1305
1040
1263
963
1429
1434
444
1657

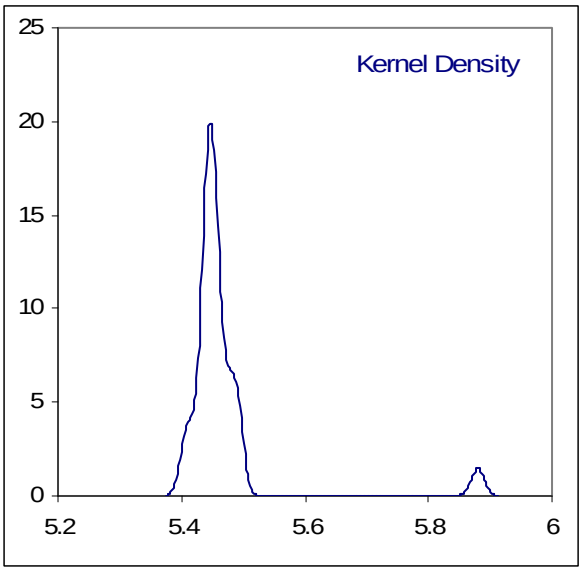

Kernel Density
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8

Determination of Solidification Point (anhydrous) on Benzene sample #11034; results in °C

lab	method	value	mark	z(targ)	remarks
52	D852	5.42		-1.74	
150	D852	5.49		2.18	
158		-----		-----	
171	D852	5.49		2.18	
174	D852	5.45		-0.06	
311	D852	5.47		1.06	
323	D852	5.48		1.62	
329	D852	5.45		-0.06	
333		-----		-----	
334		-----		-----	
357	D852	5.49		2.18	
360	D852	5.44		-0.62	
402		-----		-----	
444		-----		-----	
497		-----		-----	
555		-----		-----	
855	D852	5.456		0.27	
862	D852	5.45		-0.06	
864	D852	5.46		0.50	
865	D852	5.45		-0.06	
866	D852	5.406		-2.53	
868	D852	5.44		-0.62	
870	D852	5.454		0.16	
902		-----		-----	
912		-----		-----	
913	D852	5.44		-0.62	
963	D852	5.45		-0.06	
1011	D852	5.442		-0.51	
1040	DIN51798	5.44		-0.62	
1041		-----		-----	
1067		-----		-----	
1081		-----		-----	
1117		-----		-----	
1263		-----		-----	
1264	D852	5.41		-2.30	
1305	D852	5.45	C	-0.06	First reported 5.35
1307		-----		-----	
1404		-----		-----	
1429	D852	5.88	G(0.01)	24.02	
1434		-----		-----	
1508		-----		-----	
1538	D852	5.44		-0.62	
1653		-----		-----	
1657	D852	5.47		1.06	
1812		-----		-----	
1823		-----		-----	
1826		-----		-----	
1866		-----		-----	
1908	D852	5.44		-0.62	
7009		-----		-----	
9008		-----		-----	

normality	not OK
n	25
outliers	1
mean (n)	5.451
st.dev. (n)	0.0221
R(calc.)	0.062
R(D852:08)	0.050

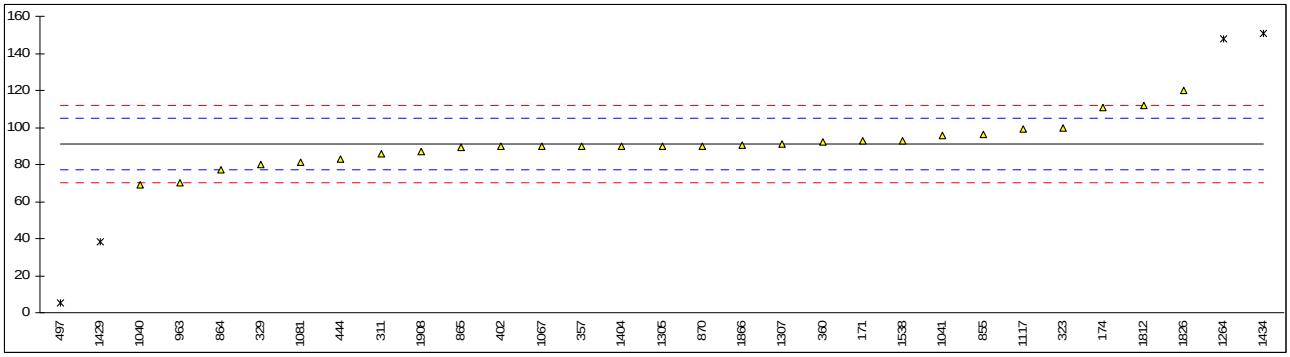

6
5.9
5.8
5.7
5.6
5.5
5.4
5.3
866
1264
52
360
868
913
1538
1908
1040
1011
963
1305
865
329
862
174
870
855
864
311
1657
323
357
150
171
1429

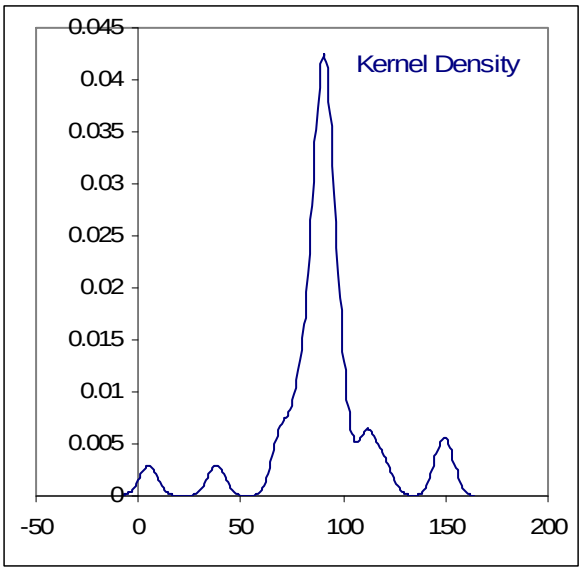

Kernel Density
25
20
15
10
5
0
5.2
5.4
5.6
5.8
6

Determination of Methylcyclohexane on Benzene sample #11034 in mg/kg

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150		-----		-----	
158		-----		-----	
171	D5713	92.5		0.23	
174	D4492	111		2.88	
311	D5713	86		-0.70	
323	D4492	100		1.31	
329	D4492	80		-1.56	
333		-----		-----	
334		-----		-----	
357	D4492Mod	90		-0.13	
360	D4492	92		0.16	
402	D4492	89.7		-0.17	
444	D5713	83		-1.13	
497		5	G(0.01)	-12.30	
555		-----		-----	
855		96.0		0.73	
862		-----		-----	
864	D4492	77		-1.99	
865	D4492	89		-0.27	
866		-----		-----	
868		-----		-----	
870		90		-0.13	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D4492Mod	70		-2.99	
1011		-----		-----	
1040	D4492	69		-3.13	
1041	in house	95.5		0.66	
1067		90		-0.13	
1081	in house	81		-1.41	
1117	D4492	99.0		1.16	
1263		-----		-----	
1264		148	DG(0.01)	8.18	
1305	D6733	90	C	-0.13	First reported 0.009
1307	in house	91		0.02	
1404	D4492	90		-0.13	
1429	in house	38	G(0.01)	-7.57	
1434	D4492	150.5	DG(0.01)	8.54	
1508		-----		-----	
1538	D4492	93		0.30	
1653		-----		-----	
1657		-----		-----	
1812	DIN51437	112		3.02	
1823		-----		-----	
1826	in house	120	C	4.17	First reported 150.5
1866	D4492	90.3		-0.08	
1908	D4492	86.8		-0.58	
7009		-----		-----	
9008		-----		-----	

normality	OK
n	27
outliers	4
mean (n)	90.88
st.dev. (n)	11.332
R(calc.)	31.73
R(D5713:05)	19.56

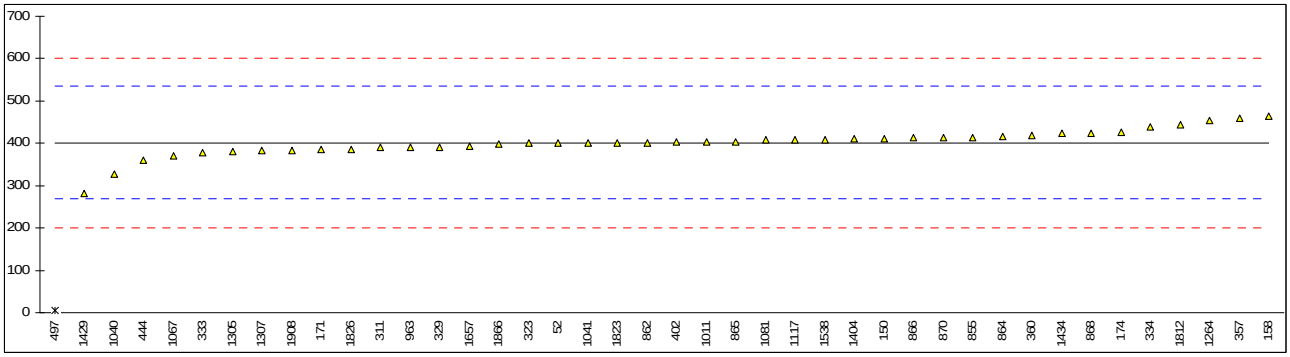

160
140
120
100
80
60
40
20
0
497
1429
1040
963
864
329
1081
444
311
1908
865
402
1067
357
1404
1305
870
1866
1307
360
171
1538
1041
855
1117
323
174
1812
1826
1264
1434

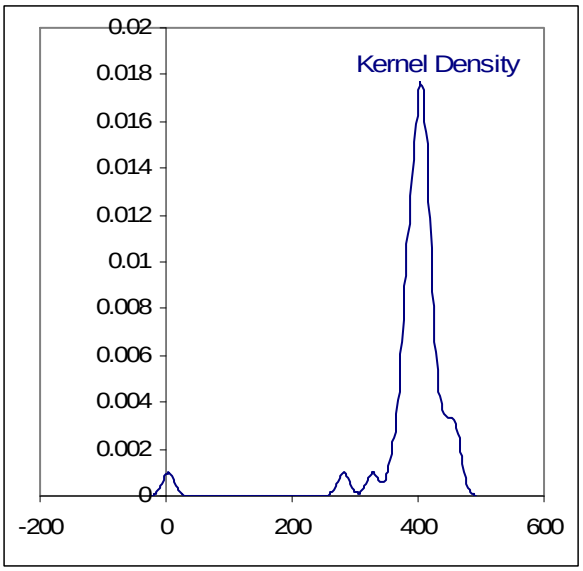

Kernel Density
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
-50
0
50
100
150
200

Determination of Toluene on Benzene sample #11034; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D4492	400		-0.02	
150	D4492	410	C	0.13	First reported 4
158	D4492	463		0.92	
171	D4492	384.5		-0.25	
174	D4492	427		0.38	
311	D4492	390		-0.17	
323	D4492	400		-0.02	
329	D4492	390		-0.17	
333	D4492	377		-0.37	
334	D4492	440		0.58	
357	D4492	460		0.88	
360	D4492	418		0.25	
402	D4492	403.54		0.03	
444	D4492	359		-0.64	
497	D4492	4	G(0.01)	-5.95	
555		-----		-----	
855	D4492	414.5		0.20	
862	D4492	401		-0.01	
864	D4492	416		0.22	
865	D4492	404		0.04	
866	D4492	412.9		0.17	
868	D4492	424		0.34	
870	D4492	414		0.19	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D4492	390		-0.17	
1011	D2360	404.0		0.04	
1040	D4492	328		-1.10	
1041	D4492	400.8		-0.01	
1067	D4492	370		-0.47	
1081	in house	408		0.10	
1117	D4492	408		0.10	
1263		-----		-----	
1264	D4492	453		0.77	
1305	D4492	380	C	-0.32	First reported 0.038
1307	in house	382		-0.29	
1404	D4492	410		0.13	
1429	in house	282		-1.79	
1434	D4492	423.8		0.33	
1508		-----		-----	
1538	D4492	409		0.11	
1653		-----		-----	
1657	D4492	393		-0.13	
1812	DIN51437	443		0.62	
1823	D4492	401		-0.01	
1826	D4492	385		-0.25	
1866	D4492	398.5		-0.04	
1908	D4492	382		-0.29	
7009		-----		-----	
9008		-----		-----	

normality	OK
n	41
outliers	1
mean (n)	401.45
st.dev. (n)	32.134
R(calc.)	89.97
R(D4492:10)	186.88

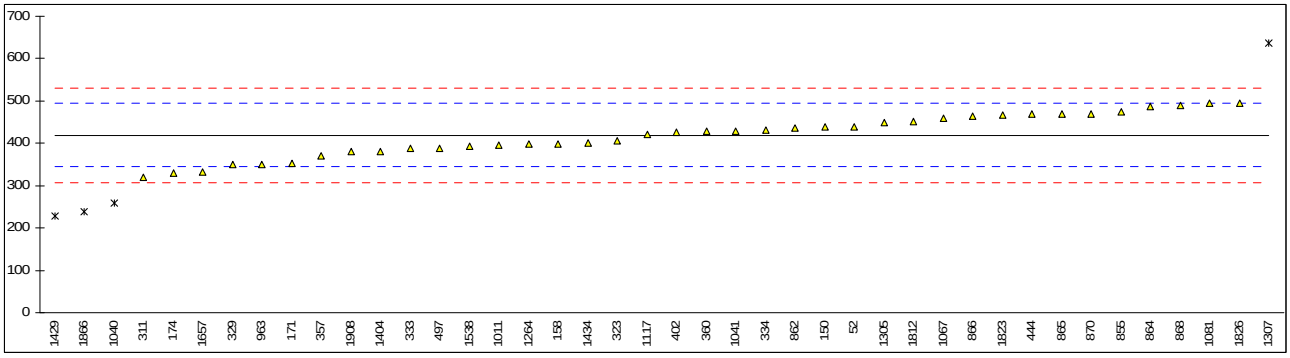

700
600
500
400
300
200
100
0
497
1429
1040
444
1067
333
1305
1307
1908
171
1826
311
963
329
1657
1886
323
52
1041
1823
862
402
1011
865
1081
1117
1538
1404
150
866
870
855
864
360
1434
868
174
334
1812
1264
357
158

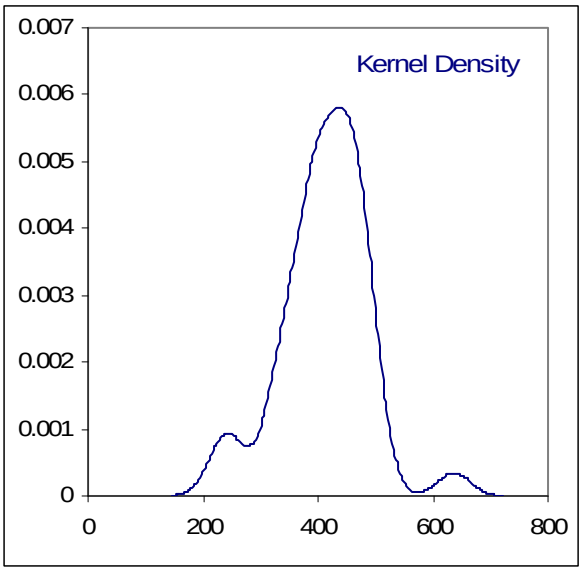

Kernel Density
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-200
0
200
400
600

Determination of Nonaromatics on Benzene sample #11034; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D4492	440		0.56	
150	D4492	440		0.56	
158	D4492	399		-0.53	
171	D4492	351.7		-1.80	
174	D4492	329		-2.41	
311	D4492	320		-2.65	
323	D4492	407		-0.32	
329	D4492	350		-1.85	
333	D4492	388		-0.83	
334	D4492	430		0.30	
357	D4492	370		-1.31	
360	D4492	428		0.24	
402	D4492	426.2		0.20	
444	D4492	468		1.31	
497	D4492	389		-0.80	
555		-----		-----	
855	D4492	473.4		1.46	
862	D4492	437		0.48	
864	D4492	486		1.80	
865	D4492	468		1.31	
866	D4492	465.1		1.24	
868	D4492	490		1.90	
870	D4492	469		1.34	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D4492	350		-1.85	
1011	D2360	396.8		-0.59	
1040	D4492	259	G(0.05)	-4.28	
1041	D4492	428.0		0.24	
1067	D4492	460		1.10	
1081	in house	495		2.04	
1117	D4492	421		0.06	
1263		-----		-----	
1264	D4492	397		-0.59	
1305	D4492	450	C	0.83	First reported 0.045
1307	in house	637	G(0.05)	5.84	
1404	D4492	380		-1.04	
1429	in house	229	DG(0.05)	-5.08	
1434	D4492	399.6		-0.52	
1508		-----		-----	
1538	D4492	393		-0.69	
1653		-----		-----	
1657	D4492	332		-2.33	
1812	DIN51437	451		0.86	
1823	D4492	466		1.26	
1826	D4492	495		2.04	
1866	D4492	239.5	DG(0.05)	-4.80	
1908	D4492	380	C	-1.04	First reported 272
7009		-----		-----	
9008		-----		-----	

normality	OK
n	38
outliers	4
mean (n)	418.92
st.dev. (n)	49.398
R(calc.)	138.31
R(D4492:10)	104.59

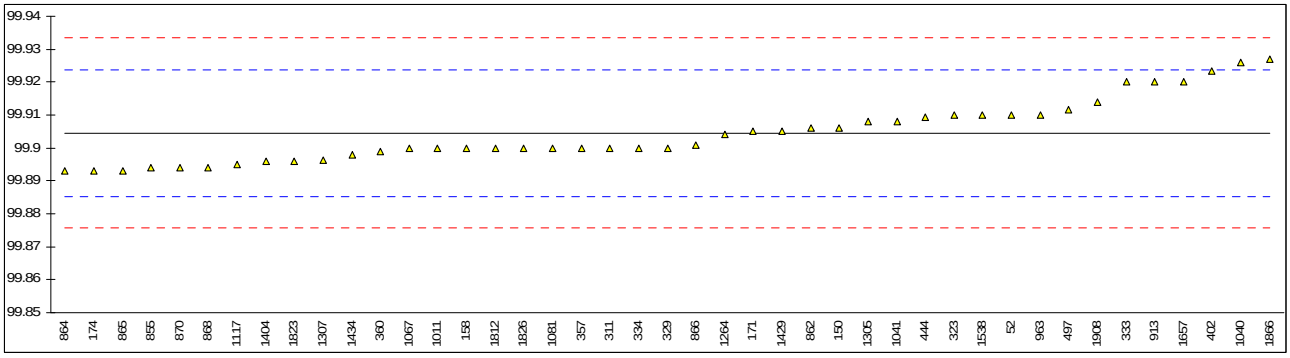

700
600
500
400
300
200
100
0
1429
1866
1040
311
174
1657
329
963
171
357
1908
1404
333
497
1538
1011
1264
158
1434
323
1117
402
360
1041
334
862
150
52
1305
1812
1067
866
1823
444
865
870
855
864
868
1081
1826
1307

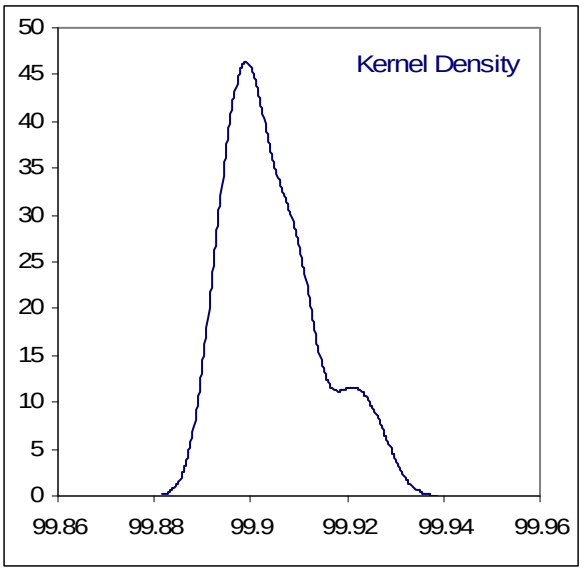

Kernel Density
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
0
200
400
600
800

Determination of Purity on Benzene sample #11034; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D4492	99.91		0.57	
150	D4492	99.906		0.15	
158	D4492	99.90		-0.47	
171	D4492	99.905	C	0.05	First reported 99.926
174	D4492	99.893		-1.20	
311	D4492	99.90		-0.47	
323	D4492	99.91		0.57	
329	D4492	99.90		-0.47	
333	D4492	99.92		1.60	
334	D4492	99.90		-0.47	
357	D4492	99.90		-0.47	
360	D4492	99.899		-0.58	
402	D4492	99.9233		1.94	
444	D4492	99.9095		0.51	
497	D4492	99.9115		0.72	
555		-----		-----	
855	D4492	99.894		-1.09	
862	D4492	99.906		0.15	
864	D4492	99.893		-1.20	
865	D4492	99.893		-1.20	
866	D4492	99.901		-0.37	
868	D4492	99.894		-1.09	
870	D4492	99.894		-1.09	
902		-----		-----	
912		-----		-----	
913	D4492	99.92		1.60	
963	D4492	99.91		0.57	
1011	D2360	99.900		-0.47	
1040	D4492	99.926		2.22	
1041	D4492	99.908		0.36	
1067	D4492	99.90		-0.47	
1081	in house	99.90		-0.47	
1117	D4492	99.895		-0.99	
1263		-----		-----	
1264	D4492	99.904		-0.06	
1305	D4492	99.908		0.36	
1307	in house	99.8964		-0.84	
1404	D4492	99.896		-0.89	
1429	in house	99.905		0.05	
1434	D4492	99.8979		-0.69	
1508		-----		-----	
1538	D4492	99.91		0.57	
1653		-----		-----	
1657	D4492	99.92		1.60	
1812	DIN51437	99.900		-0.47	
1823	D4492	99.896		-0.89	
1826	D4492	99.90		-0.47	
1866	D4492	99.927		2.33	
1908	D4492	99.914	C	0.98	First reported 99.934
7009		-----		-----	
9008		-----		-----	

normality	not OK
n	43
outliers	0
mean (n)	99.9046
st.dev. (n)	0.00935
R(calc.)	0.0262
R(D4492:10)	0.0270


99.94
99.93
99.92
99.91
99.9
99.89
99.88
99.87
99.86
99.85
864 174 865 855 870 868 1117 1404 1823 1307 1434 360 1067 1011 158 1812 1826 1081 357 311 334 329 866 1264 171 1429 862 150 1305 1041 444 323 1538 52 963 497 1908 333 913 1657 402 1040 1866

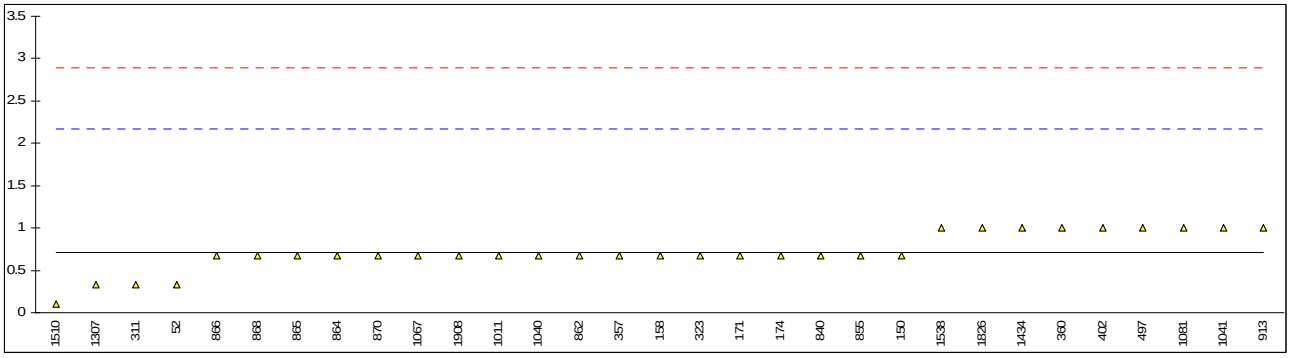

Kernel Density
50
45
40
35
30
25
20
15
10
5
0
99.86
99.88
99.9
99.92
99.94
99.96

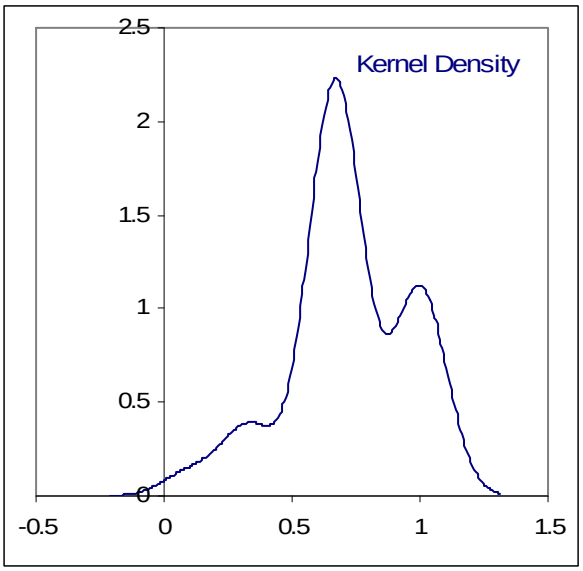
Determination of Acid Wash Colour on Toluene sample #11035

lab	method	value	mark	z(targ)	remarks
52	D848	0+		-0.53	
150	D848	1-		-0.06	
158	D848	1-		-0.06	
171	D848	1-		-0.06	
174	D848	1-		-0.06	
311	D848	0+		-0.53	
323	D848	1-		-0.06	
333	D848	<1		-----	
334		-----		-----	
357	D848	1-		-0.06	
360	D848	1		0.39	
396		-----		-----	
402	D848	1		0.39	
497	D848	1		0.39	
555		-----		-----	
840	D848	1-		-0.06	
855	D848	1-		-0.06	
862	D848	1-		-0.06	
864	D848	1-		-0.06	
865	D848	1-		-0.06	
866	D848	1-		-0.06	
868	D848	1-		-0.06	
870	D848	1-		-0.06	
902	D848	<1		-----	
912		-----		-----	
913	D848	1		0.39	
1011	D848	1-		-0.06	
1040	D848	1-		-0.06	
1041	D848	1		0.39	
1067	D848	1-		-0.06	
1081	D848	1		0.39	
1307	D848	0+		-0.53	
1434	D848	1		0.39	
1510	D848	0.1		-0.85	
1538	D848	1		0.39	
1653		-----		-----	
1812		-----		-----	
1826	D848	1		0.39	
1866	D848	3-X		-----	False positive?
1908	D848	1-		-0.06	

normality	not OK
n	31
outliers	0
mean (n)	0.72
st.dev. (n)	0.230
R(calc.)	0.64
R(D848:09)	2.03

*) In the calculation of the mean, standard deviation, the reproducibility and in below graphs, a reported value of ‘x-‘ is changed into x-0.33 (for example 1- into 0.67) and ‘x+’ is changed into x+0.33 (for example 0+ into 0.33)


3.5
3
2.5
2
1.5
1
0.5
0
1510
1307
311
52
866
868
865
864
870
1067
1908
1011
1040
862
357
158
323
171
174
840
855
150
1538
1826
1434
360
402
497
1061
1041
913


Kernel Density
2.5
2
1.5
1
0.5
0
-0.5
0
0.5
1
1.5

Determination of Appearance on Toluene sample #11035

lab	method	value	mark	z(targ)	remarks
52	D4176	pass		-----	
150	E2680	pass		-----	
158	E2680	pass		-----	
171	E2680	C&F		-----	
174	E2680	pass		-----	
311	E2680	pass		-----	
323	E2680	pass		-----	
333		-----		-----	
334		-----		-----	
357	E2680	pass		-----	
360	E2680	B&C		-----	
396	E2680	pass		-----	
402	E2680	B&C		-----	
497	E2680	B&C		-----	
555		-----		-----	
840	E2680	pass		-----	
855	E2680	pass		-----	
862		-----		-----	
864	E2680	pass		-----	
865	E2680	pass		-----	
866	E2680	pass		-----	
868	E2680	pass		-----	
870	E2680	clear		-----	
902	E2680	B&C		-----	
912		-----		-----	
913	D2680	CFSM		-----	
1011	visual	B&C		-----	
1040	D4176	B&C		-----	
1041	visual	CFSM		-----	
1067	E2680	pass		-----	
1081	in house	B&C		-----	
1307	E2680	clear		-----	
1434	E2680	clear		-----	
1510	visual	B&C		-----	
1538	visual	B&C		-----	
1653		-----		-----	
1812		-----		-----	
1826	E2680	C&F		-----	
1866		-----		-----	
1908	visual	B&C		-----	

Abbreviations:

B&C	= bright and clear
C&F	= clear and free
CFSM	= clear and free from suspended matter
CWWFS	= clear water white free from sediment
CFFMS	= clear free from matter in suspension
CCLFFSH	= clear colourless liquid free from sediment and haze

Determination of Copper Corrosion on Toluene sample #11035

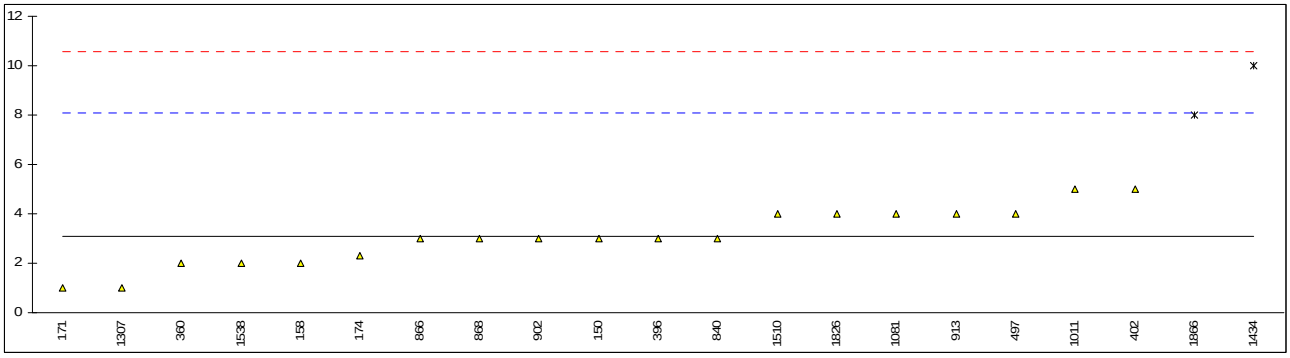
lab	method	value	mark	z(targ)	remarks
52	D849	1A		-----	
150	D849	1A		-----	
158	D849	1A		-----	
171	D849	1A		-----	
174	D849	1A		-----	
311	D849	1A		-----	
323	D849	1A		-----	
333	D849	1B		-----	
334		-----		-----	
357	D849	1A		-----	
360	D849	1A		-----	
396		-----		-----	
402	D130	1		-----	
497	D849	1A		-----	
555		-----		-----	
840	D849	1A		-----	
855	D849	1A		-----	
862	D849	1A		-----	
864	D849	1A		-----	
865	D849	1A		-----	
866	D849	1A		-----	
868	D849	1A		-----	
870	D849	1A		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
1011	D849	1A		-----	
1040	ISO2160	1		-----	
1041	D849	1A		-----	
1067	D849	1A		-----	
1081	D849	1		-----	
1307	D849	1A		-----	
1434	D849	1A		-----	
1510	D849	1A		-----	
1538	D849	1A		-----	
1653		-----		-----	
1812		-----		-----	
1826	D849	1A		-----	
1866		-----		-----	
1908	D849	1A		-----	

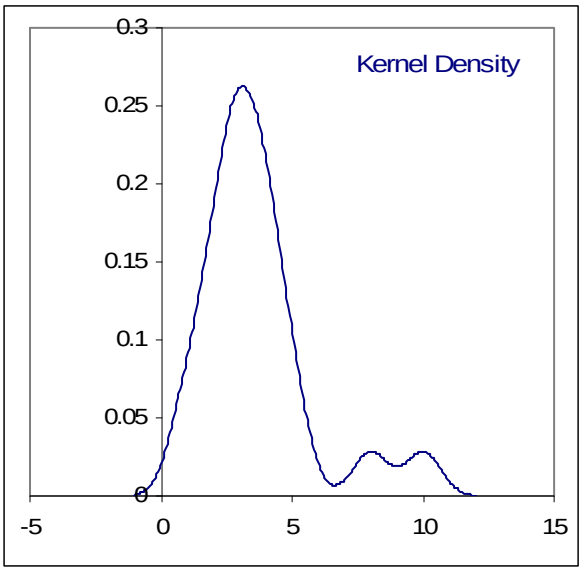
normality	n.a.
n	31
Outliers	0
mean (n)	1
st.dev. (n)	n.a.
R(calc.)	n.a.
R(D849:05)	n.a.

Determination of Colour (Pt-Co scale) on Toluene sample #11035

lab	method	value	mark	z(targ)	remarks
52	D1209	<5		-----	
150	D1209	3		-0.03	
158	D1209	2		-0.43	
171	D5386	1		-0.83	
174	D1209	2.3		-0.31	
311	D1209	<5		-----	
323	D1209	<5		-----	
333		-----		-----	
334		-----		-----	
357	D1209	<5		-----	
360	D1209	2		-0.43	
396	D1209	3		-0.03	
402	D1209	5		0.77	
497	D1209	4		0.37	
555		-----		-----	
840	D1209	3		-0.03	
855	D1209	<5		-----	
862	D1209	<5		-----	
864	D1209	<5		-----	
865	D1209	<5		-----	
866	D1209	3		-0.03	
868	D1209	3		-0.03	
870	D1209	<5		-----	
902	D5386	3		-0.03	
912		-----		-----	
913	D5386	4.0		0.37	
1011	D1209	5		0.77	
1040	ISO6271	<5		-----	
1041	ISO6271	<5		-----	
1067	D1209	<5		-----	
1081	D5386	4		0.37	
1307	D5386	1		-0.83	
1434	D1209	10	G(0.05)	2.77	
1510	D1209	4		0.37	
1538	D1209	2		-0.43	
1653		-----		-----	
1812		-----		-----	
1826	D1209	4		0.37	
1866	D1209	8	G(0.05)	1.97	
1908	D1209	<5		-----	

normality	OK
n	19
outliers	2
mean (n)	3.07
st.dev. (n)	1.164
R(calc.)	3.26
R(D1209:05e1)	7.00

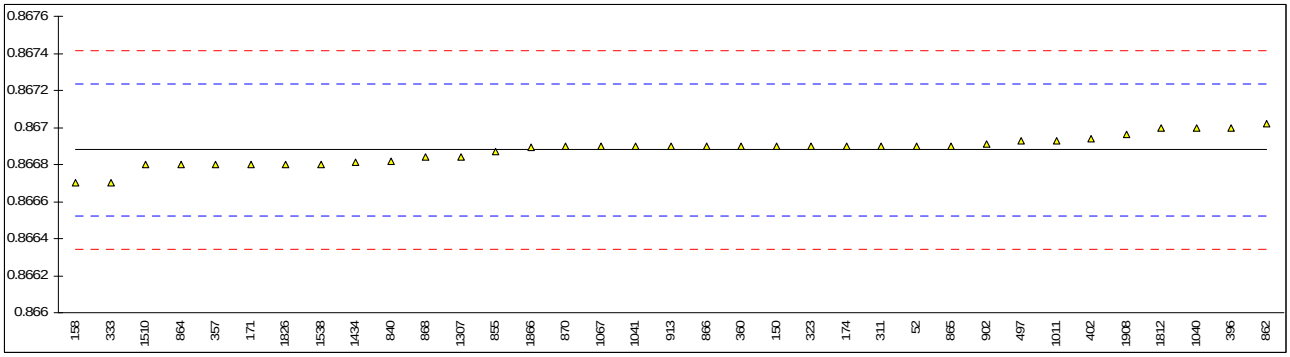

12
10
8
6
4
2
0
171
1307
360
1538
158
174
866
868
902
150
396
840
1510
1826
1061
913
497
1011
402
1866
1434

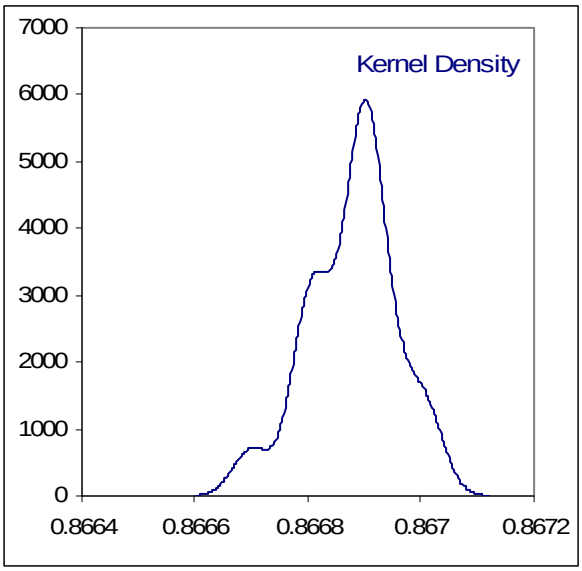

Kernel Density
0.3
0.25
0.2
0.15
0.1
0.05
0
-5
0
5
10
15

Determination of Density @ 20°C on Toluene sample #11035: results in kg/L

lab	method	value	mark	z(targ)	remarks
52	D4052	0.8669		0.12	
150	D4052	0.8669		0.12	
158	D4052	0.8667		-1.00	
171	D4052	0.8668		-0.44	
174	D4052	0.8669		0.12	
311	D4052	0.8669		0.12	
323	D4052	0.8669		0.12	
333	D4052	0.8667	C	-1.00	First reported 866.7
334		-----		-----	
357	D4052	0.8668		-0.44	
360	D4052	0.8669		0.12	
396	D4052	0.8670		0.68	
402	D4052	0.86694		0.34	
497	D4052	0.86693		0.29	
555		-----		-----	
840	D4052	0.86682		-0.33	
855	D4052	0.86687		-0.05	
862	D4052	0.86702		0.79	
864	D4052	0.8668		-0.44	
865	D4052	0.8669		0.12	
866	D4052	0.86690		0.12	
868	D4052	0.86684		-0.22	
870	D4052	0.86690		0.12	
902	D4052	0.86691		0.17	
912		-----		-----	
913	D4052	0.8669		0.12	
1011	D4052	0.86693		0.29	
1040	D4052	0.8670		0.68	
1041	D4052	0.86690		0.12	
1067	D4052	0.8669		0.12	
1081		-----		-----	
1307	D4052	0.86684		-0.22	
1434	D4052	0.86681		-0.39	
1510	IP365	0.8668		-0.44	
1538	D4052	0.8668		-0.44	
1653		-----		-----	
1812	ISO12185	0.8670	C	0.68	First reported 867.0
1826	D4052	0.8668	C	-0.44	First reported 866.8
1866	D4052	0.86689		0.06	
1908	D4052	0.86696		0.45	

normality	not OK
n	35
outliers	0
mean (n)	0.86688
st.dev. (n)	0.000076
R(calc.)	0.00021
R(D4052:09)	0.00050


0.8676
0.8674
0.8672
0.867
0.8668
0.8666
0.8664
0.8662
0.866
158
333
1510
864
357
171
1826
1538
1434
840
868
1307
855
1866
870
1067
1041
913
866
360
150
323
174
311
52
865
902
497
1011
402
1908
1812
1040
396
862

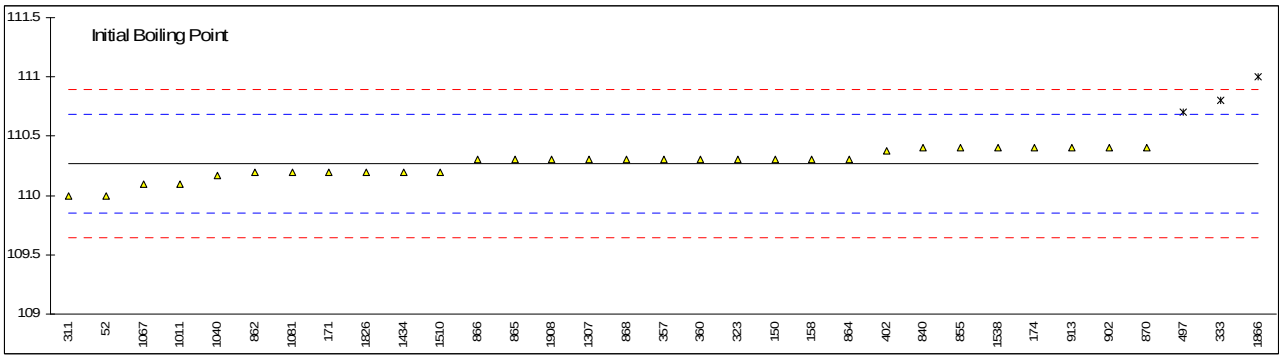

Kernel Density
7000
6000
5000
4000
3000
2000
1000
0
0.8664
0.8666
0.8668
0.867
0.8672

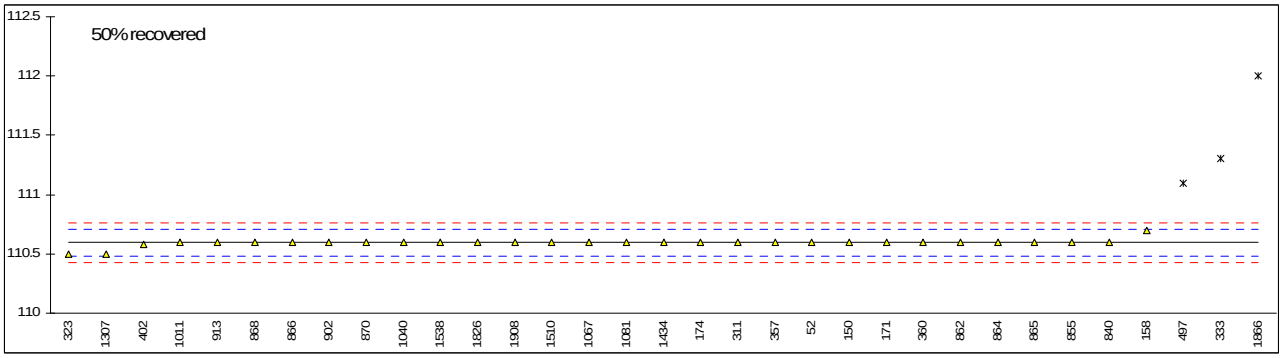
Determination of Distillation (automated and manual) on Toluene sample #11035; results in °C

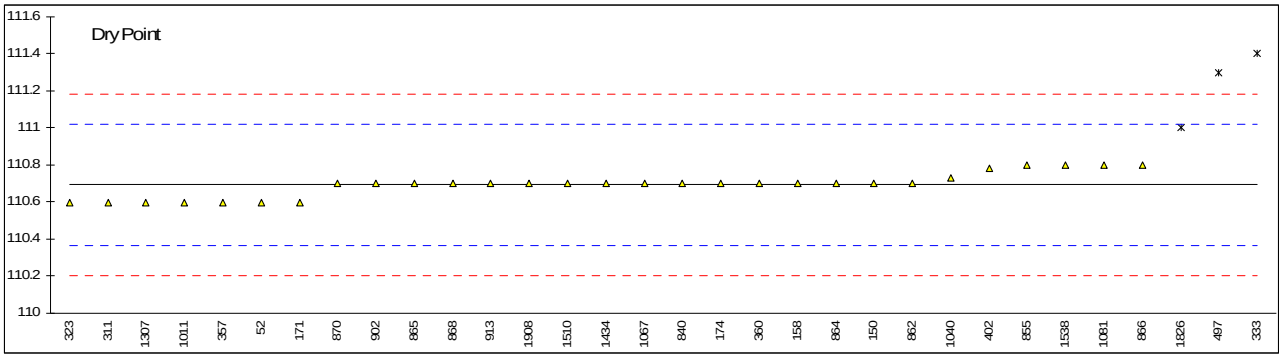
lab	method	IBP	mark	z(targ)	50%	mark	z(targ)	DP	mark	z(targ)	remarks
52	D850-A	110.0		-1.29	110.6		0.07	110.6		-0.57	
150	D850-A	110.3	Fr 107.5	0.15	110.6	Fr 109.2	0.07	110.7	Fr 119.9	0.04	
158	D850-A	110.3		0.15	110.7		1.87	110.7		0.04	
171	D850-A	110.2		-0.33	110.6		0.07	110.6		-0.57	
174	D850-A	110.4		0.63	110.6		0.07	110.7		0.04	
311	D850-A	110.0		-1.29	110.6		0.07	110.6		-0.57	
323	D850-M	110.3		0.15	110.5		-1.72	110.6		-0.57	
333	D850-A	110.8	G(0.05)	2.56	111.3	G(0.01)	12.64	111.4	G(0.01)	4.34	
334		-----		-----	-----		-----	-----		-----	
357	D850-A	110.3		0.15	110.6		0.07	110.6		-0.57	
360	D850-A	110.3		0.15	110.6		0.07	110.7		0.04	
396		-----		-----	-----		-----	-----		-----	
402	D850-M	110.38		0.54	110.58		-0.29	110.78		0.53	
497	D850-A	110.7	G(0.05)	2.08	111.1	G(0.01)	9.05	111.3	G(0.01)	3.72	
555		-----		-----	-----		-----	-----		-----	
840	D850-M	110.4		0.63	110.6		0.07	110.7		0.04	
855	D850-M	110.4		0.63	110.6		0.07	110.8		0.65	
862	D850-M	110.2		-0.33	110.6		0.07	110.7		0.04	
864	D850-M	110.3		0.15	110.6		0.07	110.7		0.04	
865	D850-M	110.3		0.15	110.6		0.07	110.7		0.04	
866	D850-M	110.3		0.15	110.6		0.07	110.8		0.65	
868	D850-M	110.3		0.15	110.6		0.07	110.7		0.04	
870	D850-M	110.4		0.63	110.6		0.07	110.7		0.04	
902	D850-M	110.4		0.63	110.6		0.07	110.7		0.04	
912		-----		-----	-----		-----	-----		-----	
913	D850-M	110.4		0.63	110.6		0.07	110.7		0.04	
1011	D850-A	110.1		-0.81	110.6		0.07	110.6		-0.57	
1040	DIN51761-M	110.17		-0.47	110.60		0.07	110.73		0.22	
1041		-----		-----	-----		-----	-----		-----	
1067	D850-M	110.1		-0.81	110.6		0.07	110.7		0.04	
1081	D850-A	110.2		-0.33	110.6		0.07	110.8		0.65	
1307	D850-A	110.3		0.15	110.5		-1.72	110.6		-0.57	
1434	D850-A	110.2		-0.33	110.6		0.07	110.7		0.04	
1510	D850-A	110.2		-0.33	110.6		0.07	110.7		0.04	
1538	D850-A	110.4		0.63	110.6		0.07	110.8		0.65	
1653		-----		-----	-----		-----	-----		-----	
1812		-----		-----	-----		-----	-----		-----	
1826	D850-M	110.2		-0.33	110.6		0.07	111.0	G(0.01)	1.88	
1866	D850-M	111.0	G(0.01)	3.53	112.0	G(0.01)	25.20	-----		-----	
1908	D850-M	110.30		0.15	110.60		0.07	110.70		0.04	
	normality	not OK			not OK			not OK			
	n	30			30			29			
	outliers	3			3			3			
	mean (n)	110.27			110.60			110.69			
	st.dev. (n)	0.115			0.032			0.064			
	R(calc.)	0.32			0.09			0.18			
	R(D850:08e1)	0.58			0.16			0.46			Automated
	R(D850:08e1)	0.47			0.42			0.42			Manual

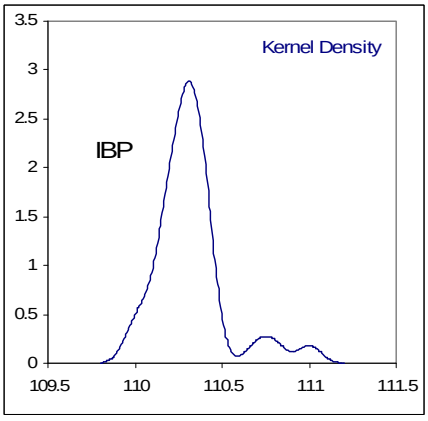
After manual corrections for “50% recovered”

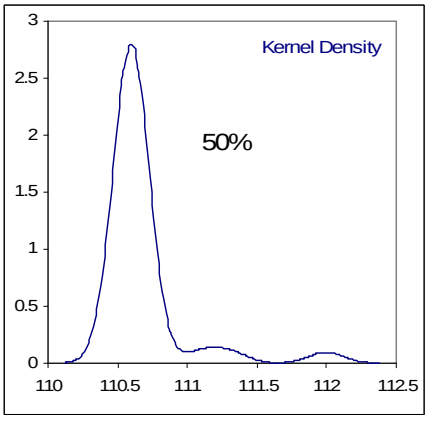
Lab		IBP	mark	z(targ)	50%	mark	z(targ)	DP	mark	z(targ)	remarks
333		110.1		-0.78	110.6		0.07	110.7		0.02	
497		110.2		-0.29	110.6		0.07	110.8		0.63	
1866		109.6	G(0.01)	-3.19	110.6		0.07	-----		-----	
	normality	not OK			not OK			not OK			
	n	32			33			31			
	outliers	1			0			1			
	mean (n)	110.26			110.60			110.70			
	st.dev. (n)	0.116			0.031			0.065			
	R(calc.)	0.32			0.09			0.18			
	R(D850:08e1)	0.58			0.16			0.46			

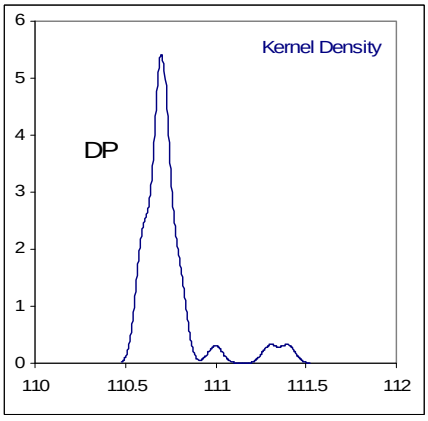

Initial Boiling Point
111.5
111
110.5
110
109.5
109
311 52 1067 1011 1040 862 1081 171 1826 1434 1510 866 865 1908 1307 868 357 360 323 150 158 864 402 840 855 1538 174 913 902 870 497 333 1866


50% recovered
112.5
112
111.5
111
110.5
110
323 1307 402 1011 913 868 866 902 870 1040 1538 1826 1908 1510 1067 1081 1434 174 311 357 52 150 171 360 862 864 865 855 840 158 497 333 1866


Dry Point
111.6
111.4
111.2
111
110.8
110.6
110.4
110.2
110
323 311 1307 1011 357 52 171 870 902 865 868 913 1908 1510 1434 1067 840 174 360 158 864 150 862 1040 402 855 1538 1081 866 1826 497 333


Kernel Density
IBP
3.5
3
2.5
2
1.5
1
0.5
0
109.5 110 110.5 111 111.5

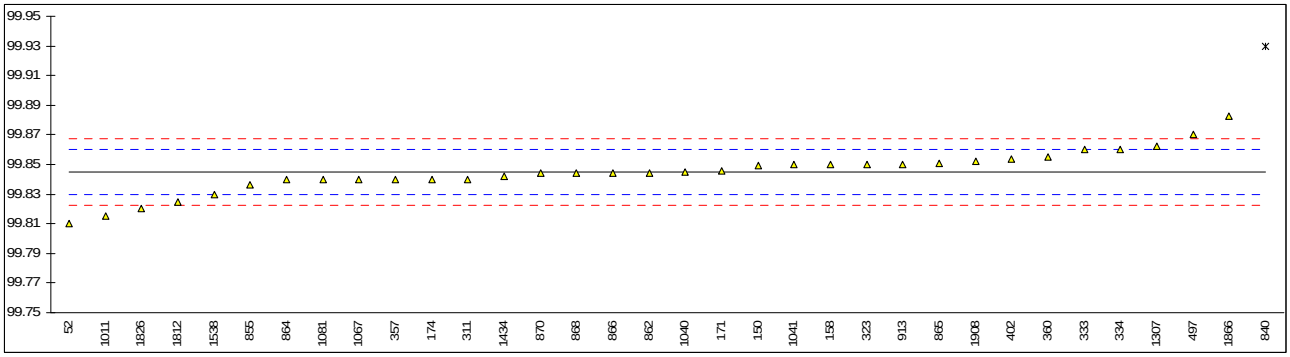

Kernel Density
50%
3
2.5
2
1.5
1
0.5
0
110 110.5 111 111.5 112 112.5

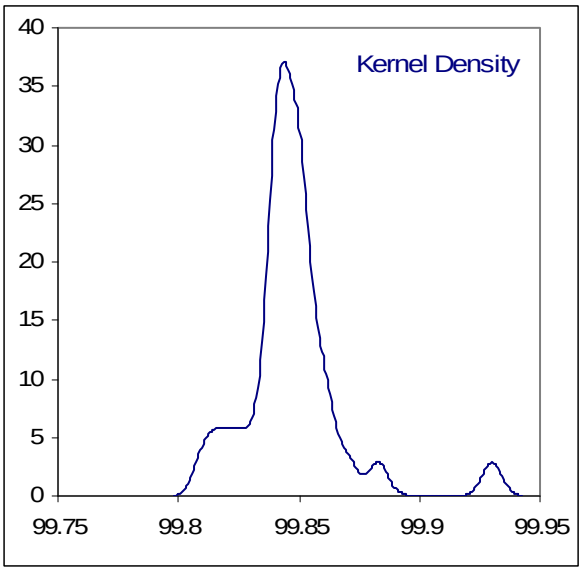

Kernel Density
DP
6
5
4
3
2
1
0
110 110.5 111 111.5 112

Determination of Purity on Toluene sample #11035; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	99.81		-4.65	
150	D2360	99.849		0.55	
158	D2360	99.85		0.68	
171	D6526	99.846		0.15	
174	D2360	99.840	C	-0.65	First reported 99.822
311	D2360	99.84		-0.65	
323	D2360	99.85		0.68	
333	D2360	99.86		2.02	
334	D2360	99.86		2.02	
357	D5917	99.84		-0.65	
360	D2360	99.855		1.35	
396		-----		-----	
402	D2360	99.8533		1.12	
497	D2360	99.8705		3.42	
555		-----		-----	
840	D7504	99.930	C,G(0.01)	11.36	First reported 99.877
855	D2360	99.836		-1.19	
862	D2360	99.844		-0.12	
864	D7504	99.840		-0.65	
865	D2360	99.851		0.82	
866	D2360	99.844		-0.12	
868	D2360	99.844		-0.12	
870	D2360	99.844		-0.12	
902		-----		-----	
912		-----		-----	
913	D2360	99.85		0.68	
1011	D2360	99.815		-3.99	
1040	D2360	99.845		0.02	
1041	D2360	99.850		0.68	
1067	D2360	99.84		-0.65	
1081	in house	99.84		-0.65	
1307	in house	99.8624	C	2.34	First reported 99.8014
1434	D4492	99.8418		-0.41	
1510		-----		-----	
1538	D2360	99.83		-1.99	
1653		-----		-----	
1812	ISO5279	99.825		-2.65	
1826	D2360	99.82		-3.32	
1866	D2360	99.8829		5.07	
1908	D2360	99.852		0.95	

normality	not OK
n	33
outliers	1
mean (n)	99.8449
st.dev. (n)	0.01461
R(calc.)	0.0409
R(D2360:08)	0.0210

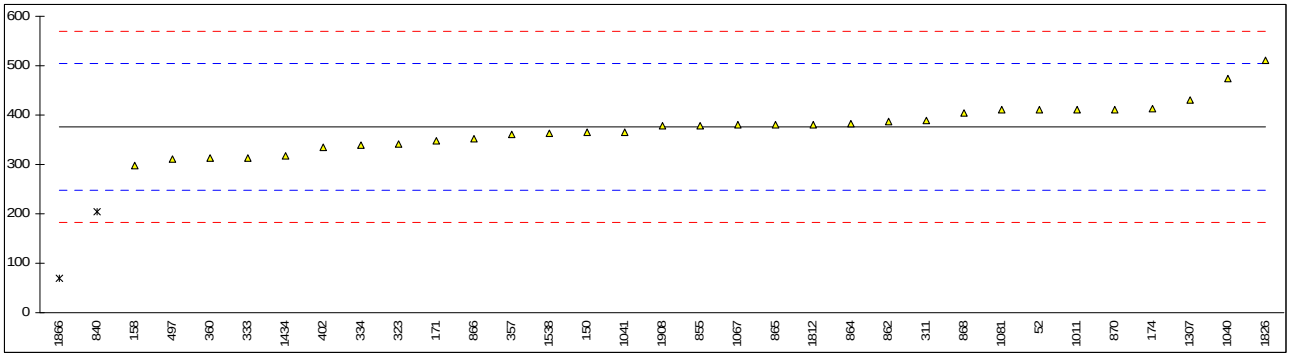

99.95
99.93
99.91
99.89
99.87
99.85
99.83
99.81
99.79
99.77
99.75
52
1011
1826
1812
1538
855
864
1061
1067
357
174
311
1434
870
868
866
862
1040
171
150
1041
158
323
913
865
1908
402
360
333
334
1307
497
1866
840

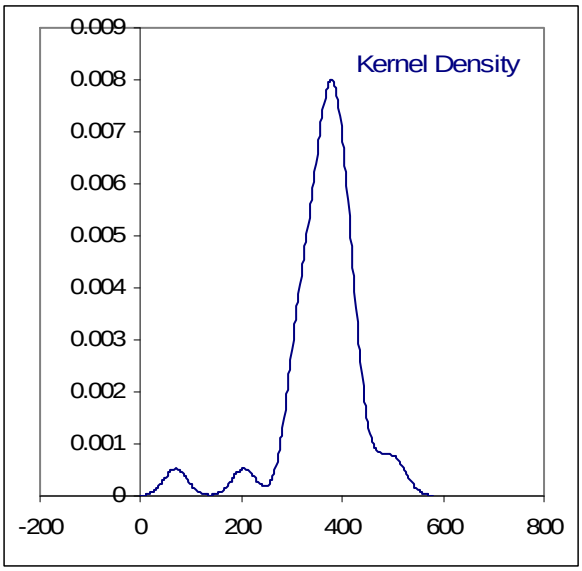

Kernel Density
40
35
30
25
20
15
10
5
0
99.75
99.8
99.85
99.9
99.95

Determination of Nonaromatics on Toluene sample #11035; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D7504	410		0.53	
150	D2360	365		-0.17	
158	D2360	297		-1.23	
171	D6526	347.9		-0.44	
174	D2360	414		0.59	
311	D2360	390		0.22	
323	D2360	342		-0.53	
333	D2360	314		-0.96	
334	D2360	340		-0.56	
357	D5917	360		-0.25	
360	D2360	313		-0.98	
396		-----		-----	
402	D2360	334.94		-0.64	
497	D2360	311		-1.01	
555		-----		-----	
840	D7504	205	C,G(0.05)	-2.66	First reported 323.7
855	D2360	378.3		0.04	
862	D2360	387		0.17	
864	D7504	383		0.11	
865	D2360	380		0.06	
866	D2360	353.1		-0.36	
868	D2360	404		0.44	
870	D2360	410		0.53	
902		-----		-----	
912		-----		-----	
913		-----		-----	
1011	D2360	410		0.53	
1040	D2360	475		1.54	
1041	D2360	366.3		-0.15	
1067	D2360	380		0.06	
1081	in house	410		0.53	
1307	in house	430		0.84	
1434	D4492	316.9		-0.92	
1510		-----		-----	
1538	D2360	363		-0.20	
1653		-----		-----	
1812	ISO5279	380		0.06	
1826	D2360	510		2.09	
1866	D2360	69.33	G(0.01)	-4.77	
1908	D2360	378		0.03	

normality	OK
n	31
outliers	2
mean (n)	375.92
st.dev. (n)	46.837
R(calc.)	131.14
R(D2360:08)	179.79

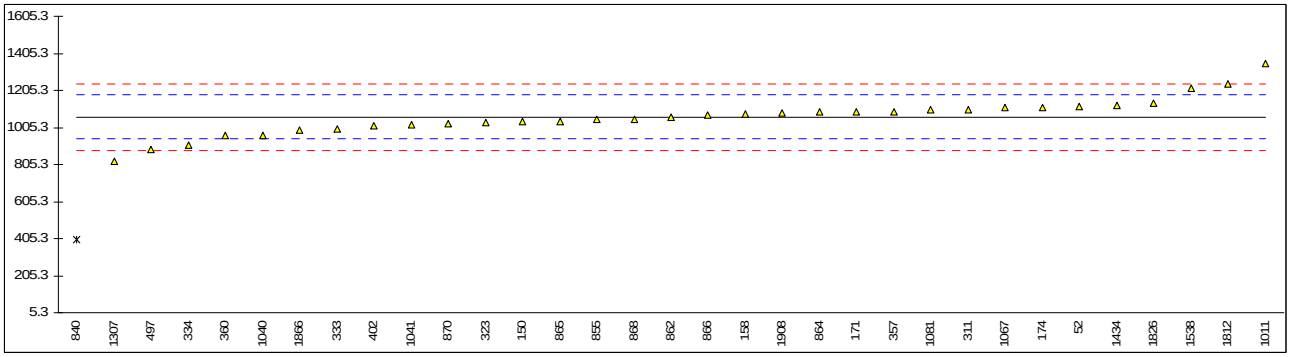

600
500
400
300
200
100
0
1866
840
158
497
360
333
1434
402
334
323
171
866
357
1538
150
1041
1908
855
1067
865
1812
864
862
311
868
1061
52
1011
870
174
1307
1040
1826

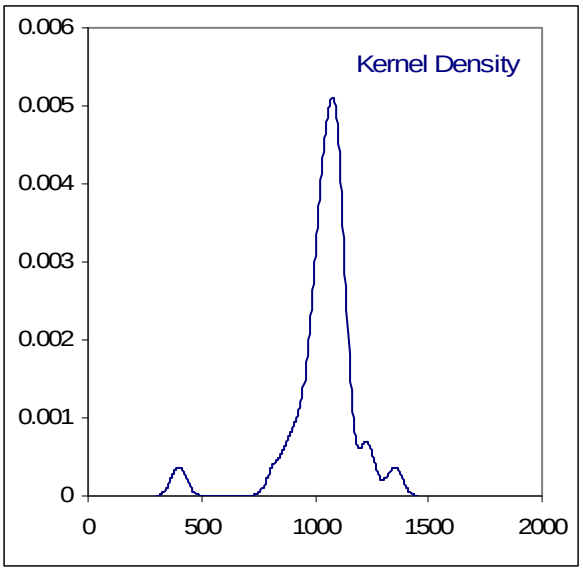

Kernel Density
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
-200
0
200
400
600
800

Determination of Benzene on Toluene sample #11035; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D7504	1120		0.98	
150	D2360	1035		-0.44	
158	D2360	1079		0.30	
171	D6526	1089.7		0.48	
174	D2360	1111	C	0.83	First reported 1293
311	D2360	1100		0.65	
323	D2360	1031		-0.51	
333	D2360	995		-1.12	
334	D2360	910		-2.54	
357	D5917	1090		0.48	
360	D2360	962		-1.67	
396		-----		-----	
402	D2360	1014.82		-0.78	
497	D2360	887		-2.93	
555		-----		-----	
840	D7504	402	C,G(0.01)	-11.08	First reported 737.8
855	D2360	1047.4		-0.24	
862	D2360	1058		-0.06	
864	D7504	1088		0.45	
865	D2360	1039		-0.38	
866	D2360	1074.8		0.23	
868	D2360	1051		-0.17	
870	D2360	1028		-0.56	
902		-----		-----	
912		-----		-----	
913		-----		-----	
1011	D2360	1352		4.88	
1040	D2360	964		-1.64	
1041	D2360	1021.0		-0.68	
1067	D2360	1110		0.82	
1081	in house	1100		0.65	
1307	in house	822	C	-4.02	First reported 1431
1434	D4492	1122		1.02	
1510		-----		-----	
1538	D2360	1216		2.60	
1653		-----		-----	
1812	ISO5279	1242		3.03	
1826	D2360	1133		1.20	
1866	D2360	988.3		-1.23	
1908	D2360	1084		0.38	

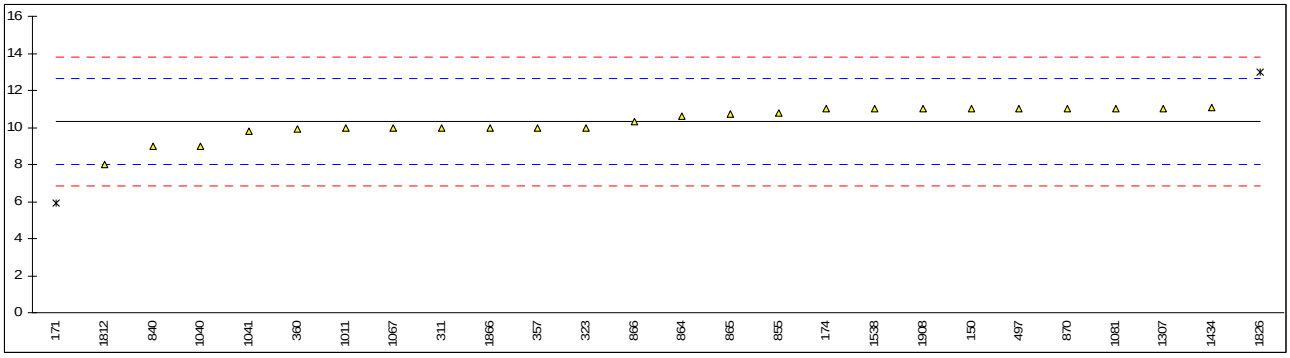
normality	OK
n	32
outliers	1
mean (n)	1061.41
st.dev. (n)	100.234
R(calc.)	280.66
R(Horwitz)	166.62

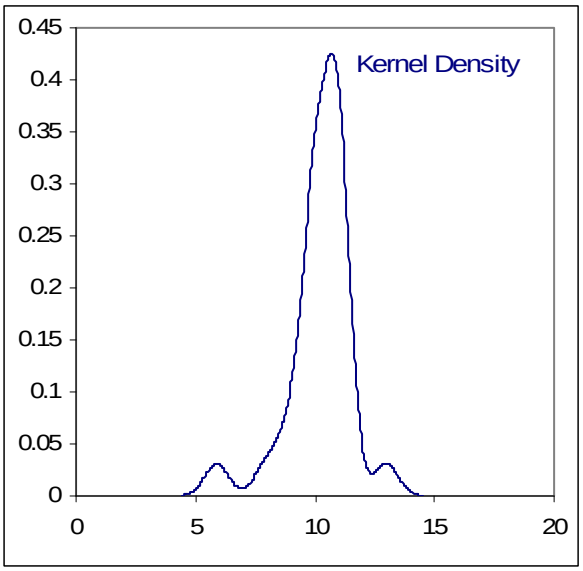

1605.3
1405.3
1205.3
1005.3
805.3
605.3
405.3
205.3
5.3
840
1307
497
334
360
1040
1866
333
402
1041
870
323
150
865
855
868
862
866
158
1908
864
171
357
1081
311
1067
174
52
1434
1826
1538
1812
1011


Kernel Density
0.006
0.005
0.004
0.003
0.002
0.001
0
0
500
1000
1500
2000

Determination of Styrene on Toluene sample #11035; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D2360	11		0.60	
158		-----		-----	
171	D6526	5.9	G(0.01)	-3.79	
174	D2360	11		0.60	
311		10		-0.26	
323	D2360	10		-0.26	
333		-----		-----	
334		-----		-----	
357	D5917	10		-0.26	
360	D2360	9.9		-0.35	
396		-----		-----	
402		-----		-----	
497		11		0.60	
555		-----		-----	
840	D7504	9	C	-1.12	First reported 15.9
855	D2360	10.8		0.43	
862		-----		-----	
864	D7504	10.6		0.26	
865	D2360	10.7		0.34	
866	D2360	10.3		0.00	
868		-----		-----	
870	D2360	11		0.60	
902		-----		-----	
912		-----		-----	
913		-----		-----	
1011	D2360	10		-0.26	
1040	D2360	9		-1.12	
1041	in house	9.82		-0.41	
1067		10		-0.26	
1081	in house	11		0.60	
1307	in house	11		0.60	
1434	D4492	11.1		0.69	
1510		-----		-----	
1538	D2360	11		0.60	
1653		-----		-----	
1812	ISO5279	8		-1.98	
1826		13	D(0.05)	2.33	
1866		10.00		-0.26	
1908	D2360	11		0.60	
	normality	not OK			
	n	24			
	outliers	2			
	mean (n)	10.30			
	st.dev. (n)	0.798			
	R(calc.)	2.24			
	R(Horwitz)	3.25			


16
14
12
10
8
6
4
2
0
171
1812
840
1040
1041
360
1011
1067
311
1866
357
323
866
864
865
855
174
1538
1908
150
497
870
1081
1307
1434
1826


Kernel Density
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
5
10
15
20

APPENDIX 2

Number of participants in the Benzene PT

1 laboratory in AUSTRIA
3 laboratories in BELGIUM
2 laboratories in BRAZIL
1 laboratory in BULGARIA
1 laboratory in CANADA
1 laboratory in FINLAND
3 laboratories in FRANCE
4 laboratories in GERMANY
2 laboratories in INDIA
1 laboratory in IRAN
1 laboratory in ISRAEL
1 laboratory in KUWAIT
1 laboratory in MALAYSIA
8 laboratories in P.R. of CHINA
1 laboratory in POLAND
1 laboratory in PORTUGAL
1 laboratory in ROMANIA
4 laboratories in SAUDI ARABIA
5 laboratories in THE NETHERLANDS
1 laboratory in TURKEY
1 laboratory in U.A.E.
4 laboratories in U.S.A.
2 laboratories in UNITED KINGDOM

Number of participants in the Toluene PT

2 laboratories in BELGIUM
2 laboratories in BRAZIL
1 laboratory in BULGARIA
1 laboratory in CANADA
1 laboratory in FINLAND
2 laboratories in FRANCE
4 laboratories in GERMANY
2 laboratories in INDIA
1 laboratory in ISRAEL
1 laboratory in ITALY
8 laboratories in P.R. of CHINA
1 laboratory in POLAND
1 laboratory in PORTUGAL
1 laboratory in ROMANIA
1 laboratory in SAUDI ARABIA
4 laboratories in THE NETHERLANDS
1 laboratory in TURKEY
4 laboratories in U.S.A.
1 laboratory in UNITED KINGDOM
1 laboratory in VIETNAM

APPENDIX 3

Abbreviations:

C	= final result after checking of first reported suspect result
D(0.01)	= outlier in Dixon's outlier test
D(0.05)	= straggler in Dixon's outlier test
G(0.01)	= outlier in Grubbs' outlier test
G(0.05)	= straggler in Grubbs' outlier test
DG(0.01)	= outlier in Double Grubbs' outlier test
DG(0.05)	= straggler in Double Grubbs' outlier test
E	= error in calculations
ex	= excluded from calculations
n.a.	= not applicable
fr	= first reported
U	= reported in different unit
SDS	= Safety Data Sheet

Literature:

1 iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, January 2010

2 W. Horwitz and R. Albert, J. AOAC Int., Vol. 79, 3, p. 589, (1996)

3 ASTM E178-02

4 ASTM E1301-03

5 ISO13528-05

6 ISO 5725-86

7 ISO 5725, parts 1-6, 1994

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

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

10 IP 367/84

11 DIN 38402 T41/42

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

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

14 Analytical Methods Committee Technical brief, No4 January 2001.

15 The Royal Society of Chemistry 2002, Analyst 2002, 127 page 1359-1364, P.J. Lowthian and M. Thompson (see http://www.rsc.org/suppdata/an/b2/b205600n/).