Results of Proficiency Test
Benzene & Toluene
February 2014

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 2013/2014, it was decided to continue the proficiency test for the analysis of Benzene and Toluene. In the interlaboratory study for Benzene 53 laboratories from 24 different countries have participated and for Toluene 38 participants in 19 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. This report is also electronically available through the iis internet site www.iisnl.com.

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. It was decided to send one sample of Benzene (1 litre bottle, labelled # 14011) and/or one sample of Toluene (1 litre bottle, labelled # 14012) to the participants.

2.1 ACCREDITATION

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, is accredited in agreement with ISO/IEC 17043:2010 (R007), since January 2000, by the Dutch Accreditation Council (Raad voor Accreditatie). This ensures strict adherence to protocols for sample preparation and statistical evaluation and 100% confidentially of participant's data. Feedback from the participants on the reported data is encouraged and customer's satisfaction is measured on regular basis by sending out questionnaires.

2.2 PROTOCOL

The protocol followed in the organisation was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of January 2010 (iis-protocol, version 3.2). This protocol can be downloaded via the FAQ page of the iis website http://www.iisnl.com.

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

BENZENE

The necessary bulk material of Benzene was obtained from a local chemical supplier. The approximately 75 litre was spiked with 467.2mg 1-Methyl-2-Pyrrolidinone (for the Nitrogen determination) and 235.3mg o-Chlorotoluene (for the Organic Chlorine determination). The bulk sample was, after homogenisation, divided over 75 amber glass bottles of 1 litre, labelled #14011. The homogeneity of the subsamples #14011 was checked by determination of Total Nitrogen in accordance with ASTM D6069 and Toluene content according to ASTM D4492, on 8 stratified randomly selected samples.

Benzene	Total Nitrogen in mg/kg	Toluene in mg/kg
sample #14011-1	1.1	5730
sample #14011-2	1.1	5990
sample #14011-3	1.1	5700
sample #14011-4	1.1	5720
sample #14011-5	1.1	5770
sample #14011-6	1.1	5960
sample #14011-7	1.1	5730
sample #14011-8	1.1	5810

table 1: homogeneity test results of Benzene sub samples #14011

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;

	Total Nitrogen in mg/kg	Toluene in mg/kg
r (sample #14011)	0.0	316
target	ASTM D6069:01(2006)	ASTM D4492:10
0.3*R (target)	0.1	827

table 2: evaluation of repeatabilities of subsamples #14011

The calculated repeatabilities for sample #14011 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 80 litre was spiked with approx. 40 mg/kg Pygas and after homogenisation, divided over 80 brown glass bottles of 1 litre, labelled #14012. The Pygas was added to the Toluene to give a positive test result on Acid Wash Colour. The homogeneity of the subsamples #14012 was checked by determination of Density @20ºC, according to ASTM D4052 on 8 stratified randomly selected samples.

Toluene	Density at 20°C in kg/L
sample #14012-1	0.86691
sample #14012-2	0.86692
sample #14012-3	0.86692
sample #14012-4	0.86691
sample #14012-5	0.86691
sample #14012-6	0.86691
sample #14012-7	0.86690
sample #14012-8	0.86691

table 3: homogeneity test results of Toluene sub samples #14012

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

	Density at 20°C in kg/L
r (sample #14012)	0.00002
target	ASTM D4052:02e1
0.3*R (target)	0.00015

table 4: evaluation of repeatabilities of subsamples #14012

The calculated repeatability on Density for sample #14012 was in agreement with 0.3 times the corresponding target reproducibility. Therefore, homogeneity of the sub samples was assumed.

Depending on their registration to each of the participating laboratories one 1 litre bottle of Benzene labelled #14011 and/or one 1 litre bottle of Toluene labelled #14012 were sent on February 12, 2014.

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 #14011: Acid Wash Color, Acidity, Appearance, Bromine Index, Color Pt-Co, Density @ 20°C, Distillation, Organic Chlorides, Total Chlorides, Total Nitrogen, Solidification Point, Methylcyclohexane, Toluene, Nonaromatics and Purity.
On Toluene sample #14012 were requested: Acid Wash Color, Appearance, Copper Corrosion, Color Pt-Co, Density @ 20°C, Distillation, Purity, Nonaromatics and Benzene.

To get comparable results a detailed report form, on which the units were prescribed as well as some of the required standards and a letter of instructions were prepared and made available for download on the iis website (www.iisnl.com).
A SDS and a form to confirm receipt of the samples were added to the sample 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, a variant of the Kolmogorov-Smirnov test and by the calculation of skewness and kurtosis. Evaluation of the three normality indicators in combination with the visual evaluation of the graphic Kernel density plot, lead to judgement of the normality being either 'unknown', 'OK', 'suspect' or 'not OK'. After removal of outliers this check was repeated.
Not all data sets proved to have a normal distribution, in which cases the 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, by G(0.01) or DG(0.01) for the Grubbs test and R(0.01) for Rosner General ESD test. Stragglers are marked by D(0.05) for the Dixon test, by G(0.05) or DG(0.05) for the Grubbs test and by R(0.05) for the Rosner General ESD test (ref. 16).
Both outliers and stragglers were not included in the calculations of the averages and the standard deviations.

For each assigned value the uncertainty was determined in accordance with ISO13528. Subsequently the calculated uncertainty was evaluated against the respective requirement based on the target reproducibility in accordance with ISO13528. When the uncertainty passed the evaluation no remarks are made in the report. However, when the uncertainty failed the evaluation it is mentioned in the report and it will have consequences for the evaluation of the test results.
Finally, the reproducibilities were calculated from the standard deviations by multiplying 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. The Kernel Density Graph is a method for producing a smooth density approximation to a set of data that avoids some problems associated with histograms. Also a normal Gauss curve was projected over the Kernel Density Graph for reference (see appendix 3; nos.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.

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 the fit-for-useness of the reported test result.

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:

|z| < 1	good
1 < |z| < 2	satisfactory
2 < |z| < 3	questionable
3 < |z|	unsatisfactory

4 EVALUATION

In this proficiency test, problems were encountered during the execution. Laboratories in Brazil, India, Spain and the U.S.A. did receive the samples late or not at all due to several reasons. For sample #14011 (Benzene) and #14012 (Toluene), respectively five and three participants did not report any test results and respectively eight and six laboratories reported the test results after the final reporting date.
Finally, for sample #14011 (Benzene) and sample #14012 (Toluene) in total 800 results were submitted. Observed were in total 36 outlying results, which is 4.5%. 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. When no suitable test method is available, the Horwitz equation was used.
Not all original data sets proved to have a normal distribution. Not normal (or suspect) distributions were found for sample #14011: Distillation (IBP and 50%), Organic Chloride, Solidification Point, Purity and Toluene. For sample #14012 not normal (or suspect) distributions were found for: Distillation (50%), Purity and Nonaromatics. For these determinations the results of the statistical evaluation should be used with due care.

For Benzene sample #14011

Acid Wash Color: No analytical problems were observed. Twenty-one laboratories reported the Acid Wash Color as 1-. Other laboratories reported the Acid Wash Color as 0, 0+, -1 or 1. Two laboratories reported a “less than” test result, which is not in accordance with ASTM D848:09.

Acidity: This determination was not problematic. The way of reporting varies 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 #14011, which was bright, clear and free of suspended matter (pass).

Bromine Index: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is agreement with the requirements of ASTM D5776:14.

Color Pt-Co: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ASTM D1209:05e1(2011).

Density @20°C: 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 D4052:02e1. The current version of this method ASTM D4052:11 is being valid for gasolines, distillates, basestocks and lubricating oils. Therefore the reproducibility of this 2011 version may not be applicable for Benzene and Toluene.

Distillation: This determination was problematic. In total nine statistical outliers were observed. As four statistical outliers are from two laboratories (1340 and 9008) and the results not independent from each other, it was decided to reject the other test result for distillation these two laboratories for the statistical evaluation. The calculated reproducibilities for IBP and 50% recovered, after rejection of statistical outliers, are in agreement with the requirements of ASTM D850:11. However, the calculated reproducibility for DP did not meet at all the requirements

From the reported results of the 50% recovered, it appears that seven participants probably did not correct the results for barometric pressure and thermometer inaccuracy as described in ASTM D850:11 (paragraph 11).

Organic Chloride: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D5808:09a(2014).

The average recovery of Organic Chloride (theoretical increment of 0.93 mg/kg) may be good: “less then 106%” (the actual blank is unknown).

Total Chloride: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of statistical outlier is in good agreement with the requirements of ASTM D5194:13.

Total Nitrogen: This determination was problematic. Only one statistical outlier was observed. Two test results were excluded from the statistical evaluation as the reported test method was not equivalent to ASTM D6069:06. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of ASTM D6069:06.

The average recovery of Total Nitrogen (theoretical increment of 0.93 mg/kg) may be good: “less than 113%” (the actual blank is unknown).

Solidification Point: This determination was very problematic. Five statistical outliers were observed. The calculated reproducibility after rejection of statistical outliers is not at all in agreement with the requirements of ASTM D852:13.

Purity: This determination was very problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not at all in agreement with the estimated reproducibility of ASTM D4492:10.

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

Nonaromatics: This determination was not problematic. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in full agreement with the requirements of ASTM D4492:10.

Methylcyclohexane: This determination was not problematic. All participants agreed on level of below 10 mg/kg, which is near or below the detection limit.
It is remarkable that thirteen of the thirty laboratories used ASTM D4492, a method which may be not applicable for the determination of methyl cyclohexane, while only five laboratories used ASTM D5713 a method that is suitable for the determination of methyl Cyclohexane in benzene.

General: The benzene sample was contaminated with a significant amount of toluene (5700 ppmwt). This toluene contamination was detected by all laboratories that reported toluene test results on the benzene sample #14011. This group of 41 laboratories consequently reported a low purity of the benzene (99.4 %M/M). Remarkable, a number of these laboratories did not report a low solidification point that is expected for such low purity benzene. Also, a number of these laboratories did not report a high dry point (large boiling range) that is expected for such low purity benzene.

For Toluene sample #14012

Acid Wash Color: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is full agreement with the estimated reproducibility limits of ASTM D848:14.
One laboratory reported a less than test result, which is not in accordance with ASTM D848:09.

Appearance: No analytical problems were observed. All labs agreed about the appearance of the sample #14012, which was bright, clear and free of suspended matter (pass).

Copper Corr: No problems have been observed. All participants agreed on a result of 1 or 1A. One laboratory reported according to ISO2160, a method that is not equivalent to ASTM D849:11.

Color 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(2011).

Density @20°C: This determination was not problematic. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in good agreement with the requirements of ASTM D4052:02e1. The current version of this method ASTM D4052:11 is being valid for gasolines, distillates, base stocks and lubricating oils. Therefore the reproducibility of this 2011 version may not be applicable for Benzene and Toluene.

Distillation: This determination was problematic. In total four statistical outliers were observed. The calculated reproducibilities for IBP and 50% recovered, after rejection of statistical outliers, are in agreement with the requirements of ASTM D850:11. However, the calculated reproducibility for DP did not meet at all the requirements.
From the reported test 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 D850:11 (paragraph 11).

Purity: 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 D6526:12. The reproducibility of ASTM D2360:11 is a fixed value at a purity of 99.94%. Therefore the reproducibility of ASTM D6526:12 was used. In ASTM D6526:12 reproducibilities at three different concentrations are given.

Nonaromatics: 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 D2360:11.

Benzene: This determination may not be problematic at the concentration of 55.0 mg/kg. No statistical outliers were observed. The calculated reproducibility is in full agreement with the 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 Color		34	1-	n.a.	n.a.
Acidity	mg NaOH/100ml	34	No free acid	n.a.	n.a.
Appearance		37	Pass	n.a.	n.a.
Bromine Index	mg Br/100g	24	1.78	3.48	4.60
Color Pt-Co		31	3.4	4.2	7.0
Density @ 20ºC	kg/l	42	0.8789	0.0002	0.0005
Distillation, IBP	°C	30	79.78	0.40	0.42
Distillation, 50%	°C	30	80.12	0.25	0.42
Distillation, DP	°C	25	82.10	1.30	0.42
Organic Chloride	mg/kg	25	1.00	0.31	1.30
Total Chloride	mg/kg	6	1.05	0.34	0.90
Total Nitrogen	mg/kg	27	1.05	0.52	0.41
Solidification Point	°C	20	5.18	0.11	0.05
Purity	%M/M	39	99.42	0.09	0.03
Toluene	mg/kg	39	5718	845	2662
Nonaromatics	mg/kg	34	41.0	24.9	26.7
Methylcyclohexane	mg/kg	30	<10	n.a.	n.a.

Table 5: reproducibilities of Benzene sample #14011

Parameter	unit	n	average	2.8 *sd_R	R (lit)
Acid Wash Color		31	2+	2.8	2.7
Appearance		29	pass	n.a.	n.a.
Copper corrosion		28	1(1A)	n.a.	n.a.
Color Pt-Co		24	3.1	2.9	7.0
Density @ 20ºC	kg/L	32	0.8669	0.0002	0.0005
Distillation, IBP	°C	29	110.27	0.40	0.58
Distillation, 50% rec.	°C	27	110.60	0.12	0.16
Distillation, DP	°C	29	111.47	1.29	0.46
Purity	%M/M	31	99.72	0.05	0.05
Nonaromatics	mg/kg	29	398	157	191
Benzene	mg/kg	30	55.0	13.1	13.5

Table 6: reproducibilities of Toluene sample #14012

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 FEBRUARY 2014 WITH PREVIOUS PTS

	February 2014	April 2013	April 2012	April 2011
Number of reporting labs	58	41	46	45
Number of results reported	800	686	718	833
Statistical outliers	36	27	27	45
Percentage outliers	4.5%	3.9%	3.8%	5.4%

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:

	February 2014	April 2013	April 2012	April 2011
Acid Wash Color	n.e.	n.e.	n.e.	++
Acidity	n.e.	n.e.	n.e.	++
Appearance	n.e.	n.e.	n.e.	++
Bromine Index	+	+	++	++
Color Pt-Co	++	++	++	++
Density @ 20ºC	++	++	++	++
Distillation, IBP	+/-	++	++	++
Distillation, 50%	+	++	++	++
Distillation, DP	--	+	+	--
Organic Chloride	++	+	++	-
Total Chloride	++	--	-	n.e.
Total Nitrogen	-	+/-	-	--
Solidification Point	--	+/-	-	--
Purity	--	+	++	+
Toluene	++	++	++	++
Nonaromatics	+	--	--	--
Methylcyclohexane	n.e.	-- *)	n.e.	--

table 8: comparison determinations on Benzene against the standards

	February 2014	April 2013	April 2012	April 2011
Acid Wash Color	+/-	n.e	n.e	++
Appearance	n.e.	n.e	n.e	++
Copper Corrosion	n.e.	n.e	n.e	++
Color Pt-Co	++	++	++	++
Density @ 20 ºC	++	++	++	++
Distillation, IBP	++	-	++	++
Distillation, 50%	+	-	++	++
Distillation, DP	--	++	++	++
Purity	-	+/-	++	--
Nonaromatics	++	++	++	++
Benzene	+/- *)	- *)	-- *)	-- *)

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 Color on Benzene sample #14011

lab	method	value	mark	z(targ)	remarks
52	D848	0		-----	
131		-----		-----	
150	D848	1-		-----	
171	D848	1-		-----	
174	D848	1-		-----	
311	D848	0+		-----	
322	D848	-1		-----	
323	D848	-1		-----	
333	D848	1		-----	
334		-----		-----	
337		-----		-----	
347		-----		-----	
360	D848	1		-----	
444		-----		-----	
551		-----		-----	
555		-----		-----	
663	D848	1		-----	
823	D848	1-		-----	
855	D848	1-		-----	
862	D848	1-		-----	
864	D848	1-		-----	
865	D848	1-		-----	
866	D848	1-		-----	
868	D848	1-		-----	
870	D848	1-		-----	
902	D848	1-		-----	
912		-----		-----	
913	D848	<1		-----	
963	D848	1-		-----	
1011	D848	1-		-----	
1040	D848	0+		-----	
1041	D848	1-		-----	
1067	D848	1-		-----	
1081	D848	0+		-----	
1117		-----		-----	
1201	D848	0		-----	
1264	D848	-1		-----	
1307	D848	0+		-----	
1340		-----		-----	
1429	D848	1-		-----	
1434	D848	1		-----	
1480		-----		-----	
1538	D848	1-		-----	
1592		-----		-----	
1603		-----		-----	
1657	D848	1-		-----	
1781		-----		-----	
1790		-----		-----	
1823		-----		-----	
1846		-----		-----	
1866	D848	1-		-----	
1908	D848	1-		-----	
9008	D848	<1		-----	
	normality	n.a.			
	n	34			
	outliers	0			
	mean (n)	1-			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	R(D848:14)	n.a.			

Determination of Acidity on Benzene sample #14011; results in mg NaOH per 100mL

lab	method	value	mark	z(targ)	remarks
52	D847	Nil		-----	
131		-----		-----	
150	D847	NFA		-----	
171	D847	0.0		-----	
174	D847	n.d.		-----	
311	D847	NFA		-----	
322	D847	Pass		-----	
323	D847	NFA		-----	
333	D847	0		-----	
334		-----		-----	
337		-----		-----	
347	D847	NFA		-----	
360	D847	NFA		-----	
444		-----		-----	
551		-----		-----	
555		-----		-----	
663	D847	NFA		-----	
823	D847	NFA		-----	
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	D847	NFA		-----	
1081	D847	0		-----	
1117	D847	0.46		-----	
1201	D847	NFA		-----	
1264	D847	NFA		-----	
1307	D847	n.d.		-----	
1340		-----		-----	
1429	D847	NFA		-----	
1434	D847	Nil		-----	
1480		-----		-----	
1538	D847	NFC		-----	
1592		-----		-----	
1603		-----		-----	
1657	D847	NFA		-----	
1781		-----		-----	
1790		-----		-----	
1823		-----		-----	
1846		-----		-----	
1866	D847	NFA		-----	
1908	D847	NFA		-----	
9008		-----		-----	
	normality	n.a.			
	n	34			
	outliers	0			
	mean (n)	NFA			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	R(D847:08)	n.a.			

Abbreviation

NFA = No Free Acid

Determination of Appearance on Benzene sample #14011

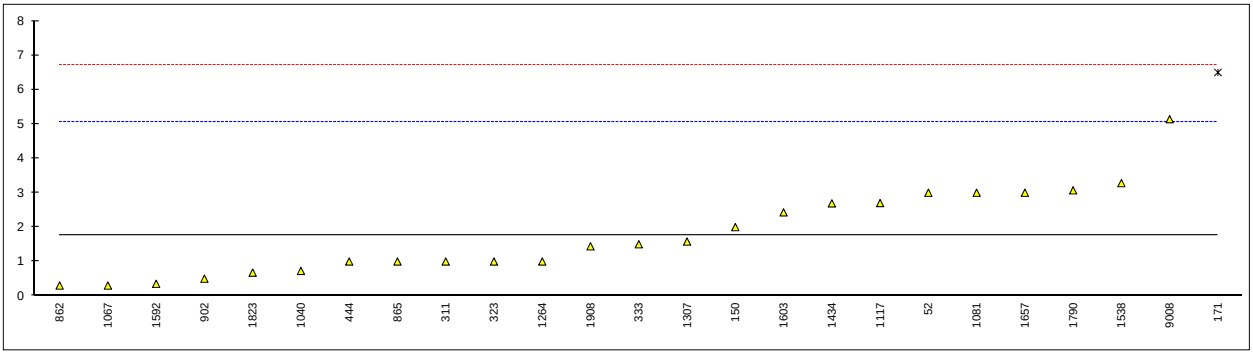
lab	method	value	mark	z(targ)	remarks
52	D4176	Pass		-----	
131		-----		-----	
150		C&B		-----	
171		C&F		-----	
174	E2680	Pass		-----	
311	INH-402	B&C		-----	
322		CLFSH		-----	
323	E2680	Pass		-----	
333		-----		-----	
334		-----		-----	
337		C&C		-----	
347	E2680	Pass		-----	
360	E2680	B&C		-----	
444	E2680	Pass		-----	
551		-----		-----	
555		-----		-----	
663	E2680	Pass		-----	
823	E2680	Pass		-----	
855	E2680	Pass		-----	
862		-----		-----	
864	E2680	Pass		-----	
865	E2680	Pass		-----	
866	E2680	Pass		-----	
868	E2680	Pass		-----	
870	E2680	Pass		-----	
902		Pass		-----	
912		-----		-----	
913	Visual	Pass		-----	
963	E2680	Pass		-----	
1011	Visual	B&C		-----	
1040		CLFSM		-----	
1041		-----		-----	
1067	E2680	Pass		-----	
1081	in house	B&C		-----	
1117	D4176	On spec		-----	
1201		B&C		-----	
1264		Clear		-----	
1307		B&C		-----	
1340	Visual	B&C		-----	
1429	E2680	B&C		-----	
1434		Clear		-----	
1480		-----		-----	
1538		B&C		-----	
1592		-----		-----	
1603	in house	CFSM		-----	
1657		-----		-----	
1781		-----		-----	
1790		-----		-----	
1823		-----		-----	
1846		-----		-----	
1866	Visual	Pass		-----	
1908	E2680	B&C		-----	
9008		Clear		-----	
	normality	n.a.			
	n	37			
	outliers	0			
	mean (n)	Pass (B&C)			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	R(E2680:09e1)	unknown			

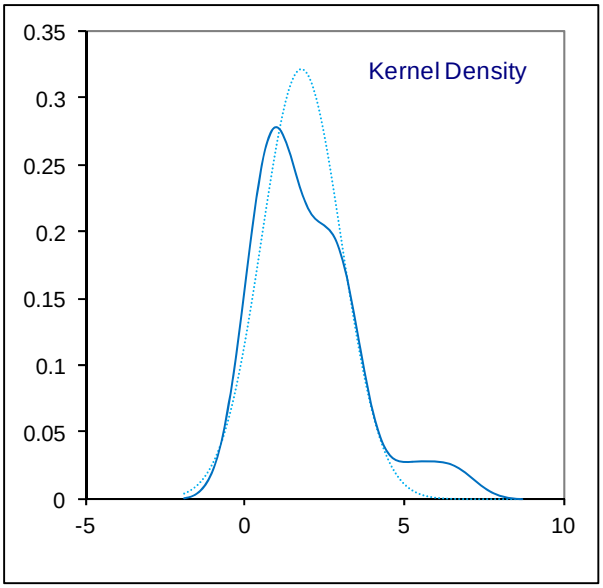
Abbreviations:

B&C	= bright and clear
C&F	= clear and free
CFSM	= clear free of suspended matter
CLFSH	= clear liquid free of sediment and haze

Determination of Bromine Index on Benzene sample #14011; results in mg Br/100g

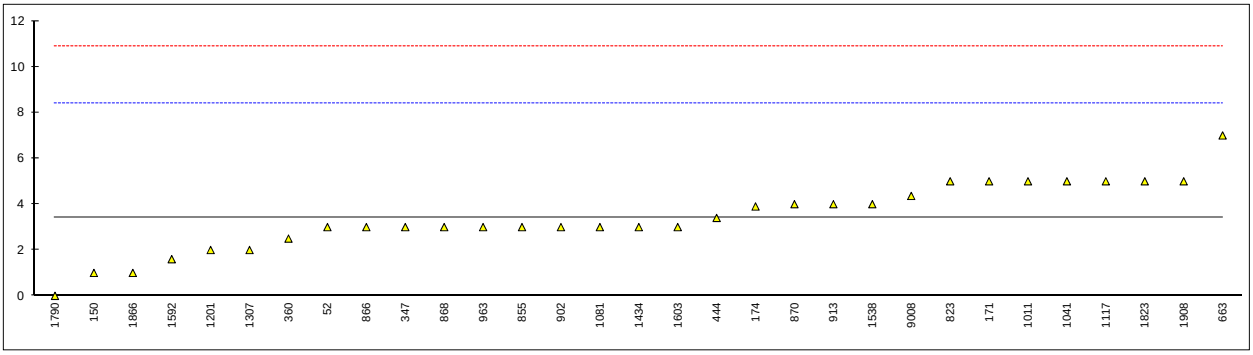
lab	method	value	mark	z(targ)	remarks
52	D1492	3		0.74	
131		-----		-----	
150	D1492	2.0		0.13	
171	D2710	6.5	R(0.05)	2.87	
174		-----		-----	
311	D5776	1.0		-0.47	
322	D5776	<1		-----	
323	D5776	1.0		-0.47	
333	D5776	1.5		-0.17	
334		-----		-----	
337		-----		-----	
347		-----		-----	
360		-----		-----	
444	D5776	1.0		-0.47	
551		-----		-----	
555		-----		-----	
663	D5776	<0.5		-----	
823		-----		-----	
855	D5776	<0.5		-----	
862	D5776	0.3		-0.90	
864	D5776	<0.5		-----	
865	D5776	1.0		-0.47	
866	D5776	<10		-----	
868	D5776	<10		-----	
870	D5776	<0.5		-----	
902	D5776	0.5		-0.78	
912		-----		-----	
913		-----		-----	
963		-----		-----	
1011		-----		-----	
1040	DIN51774	0.725		-0.64	
1041	DIN51774	<1		-----	
1067	D5776	0.3		-0.90	
1081	D1492	3	C	0.74	First reported 8
1117	D1492	2.7		0.56	
1201	D5776	<10		-----	
1264	D1492	1.0		-0.47	
1307	D5776	1.58		-0.12	
1340		-----		-----	
1429	D2710	<1		-----	
1434	D5776	2.69		0.55	
1480		-----		-----	
1538	D1492	3.28		0.91	
1592	D5776	0.35		-0.87	
1603	in house	2.43		0.40	
1657	D5776	3.0		0.74	
1781		-----		-----	
1790	D5776	3.07		0.79	
1823	D1492	0.6754		-0.67	
1846		-----		-----	
1866		-----		-----	
1908	D5776	1.44		-0.21	
9008	D1492	5.14		2.05	
	normality	OK			
	n	24			
	outliers	1			
	mean (n)	1.78			
	st.dev. (n)	1.242			
	R(calc.)	3.48			
	R(D5776:14)	4.60			Compare R(D1492:13) = to be determined Compare R(D1492:02) = 4.1

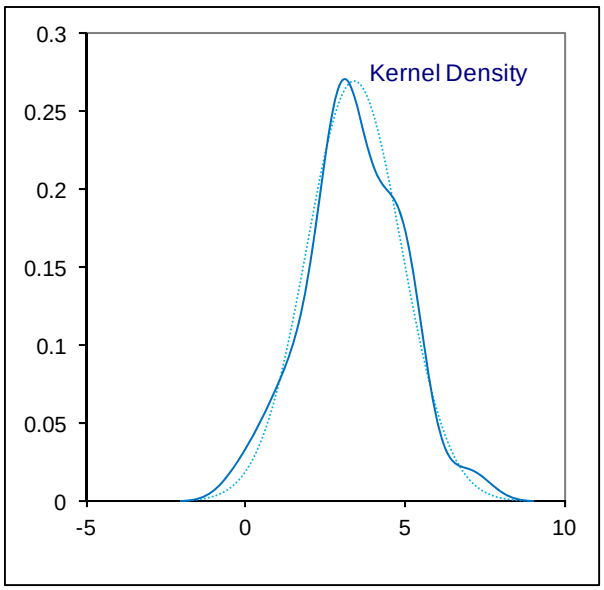

8
7
6
5
4
3
2
1
0
862
1067
1592
902
1823
1040
444
865
311
323
1264
1908
333
1307
150
1603
1434
1117
52
1081
1657
1790
1538
9008
171


Kernel Density
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-5
0
5
10

Determination of Colour (Pt-Co scale) on Benzene sample #14011

lab	method	value	mark	z(targ)	remarks
52	D5386	3		-0.16	
131		-----		-----	
150	D1209	1		-0.96	
171	D1209	5		0.64	
174	D1209	3.9		0.20	
311	D1209	<5		-----	
322	D1209	<5		-----	
323	D1209	<5		-----	
333		-----		-----	
334		-----		-----	
337		-----		-----	
347	D5386	3		-0.16	
360	D1209	2.5		-0.36	
444	D5386	3.4		0.00	
551		-----		-----	
555		-----		-----	
663	D1209	7		1.44	
823	D5386	5		0.64	
855	D5386	3		-0.16	
862	D1209	<5		-----	
864	D1209	<5		-----	
865	D1209	<5		-----	
866	D1209	3		-0.16	
868	D1209	3		-0.16	
870	D1209	4		0.24	
902	D1209	3		-0.16	
912		-----		-----	
913	D5386	4		0.24	
963	D1209	3		-0.16	
1011	D1209	5		0.64	
1040	ISO6271	<5		-----	
1041	ISO6271	5		0.64	
1067	D1209	<5		-----	
1081	D5386	3		-0.16	
1117	D1209	5		0.64	
1201	D1209	2		-0.56	
1264	D1209	<5		-----	
1307	D5386	2		-0.56	
1340		-----		-----	
1429	D1209	<5		-----	
1434	D1209	3		-0.16	
1480		-----		-----	
1538	D1209	4		0.24	
1592	D5386	1.6		-0.72	
1603	in house	3		-0.16	
1657	D1209	<8		-----	
1781		-----		-----	
1790	D1209	0		-1.36	
1823	D5386	5.0		0.64	
1846		-----		-----	
1866	D1209	1		-0.96	
1908	D1209	5		0.64	
9008	D5386	4.36		0.38	
	normality	OK			
	n	31			
	outliers	0			
	mean (n)	3.41			
	st.dev. (n)	1.481			
	R(calc.)	4.15			
	R(D1209:11)	7.00			

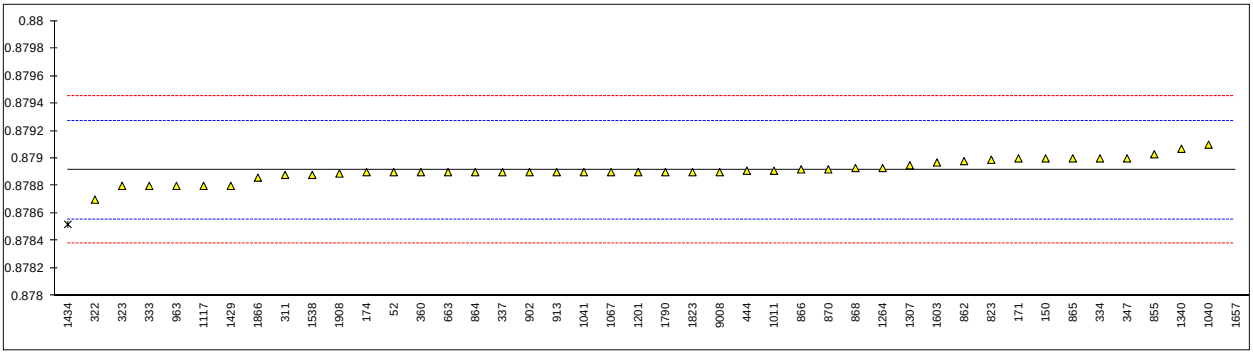

12
10
8
6
4
2
0
1790
150
1866
1592
1201
1307
360
52
866
347
868
963
855
902
1081
1434
1603
444
174
870
913
1538
9008
823
171
1011
1041
1117
1823
1908
663

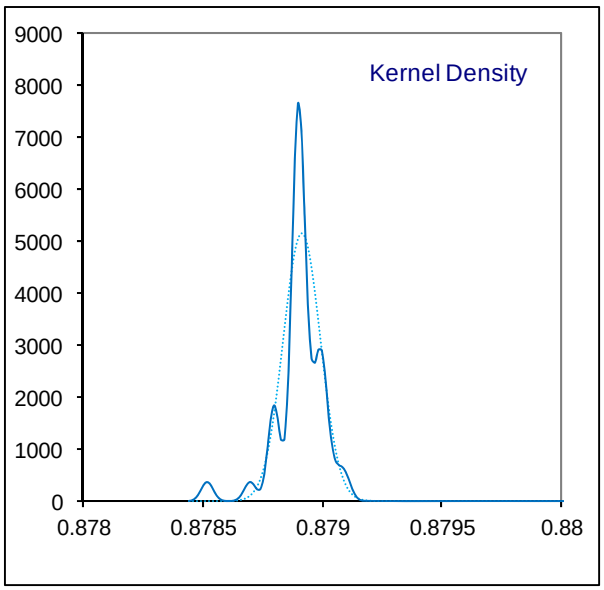

Kernel Density
0.3
0.25
0.2
0.15
0.1
0.05
0
-5
0
5
10

Determination of Density @ 20°C on Benzene sample #14011; results in kg/L

lab	method	value	mark	z(targ)	remarks
52	D4052	0.8789		-0.08	
131		-----		-----	
150	D4052	0.8790		0.48	
171	D4052	0.8790		0.48	
174	D4052	0.8789	C	-0.08	First reported 0.8785
311	D4052	0.87888		-0.19	
322	D4052	0.8787		-1.20	
323	D4052	0.8788		-0.64	
333	D4052	0.8788		-0.64	
334	D4052	0.8790		0.48	
337	D4052	0.8789		-0.08	
347	D4052	0.8790		0.48	
360	D4052	0.8789		-0.08	
444	D4052	0.87891		-0.03	
551		-----		-----	
555		-----		-----	
663	D4052	0.8789		-0.08	
823	D4052	0.87899		0.42	
855	D4052	0.87903		0.65	
862	D4052	0.87898		0.37	
864	D4052	0.8789		-0.08	
865	D4052	0.8790		0.48	
866	D4052	0.87892	C	0.03	First reported 0.89892
868	D4052	0.87893	C	0.09	First reported 0.89893
870	D4052	0.87892		0.03	
902	D4052	0.8789		-0.08	
912		-----		-----	
913	D4052	0.8789		-0.08	
963	D4052	0.8788		-0.64	
1011	D4052	0.87891		-0.03	
1040	ISO12185	0.8791		1.04	
1041	D4052	0.87890		-0.08	
1067	D4052	0.8789		-0.08	
1081		-----		-----	
1117	D4052	0.8788		-0.64	
1201	D4052	0.8789		-0.08	
1264	D4052	0.87893		0.09	
1307	D4052	0.87895		0.20	
1340	ISO12185	0.87907		0.87	
1429	D4052	0.8788		-0.64	
1434	D4052	0.87852	C,R(0.01)	-2.21	First reported 0.8842
1480		-----		-----	
1538	D4052	0.87888		-0.19	
1592		-----		-----	
1603	in house	0.87897		0.31	
1657	D4052	0.8820	R(0.01)	17.28	
1781		-----		-----	
1790	D4052	0.8789		-0.08	
1823	D4052	0.8789		-0.08	
1846		-----		-----	
1866	D4052	0.87886		-0.31	
1908	D4052	0.87889		-0.14	
9008	D4052	0.8789		-0.08	

normality	OK
n	42
outliers	2
mean (n)	0.87891
st.dev. (n)	0.000077
R(calc.)	0.00022
R(D4052:02e1)	0.00050


0.88
0.8798
0.8796
0.8794
0.8792
0.879
0.8788
0.8786
0.8784
0.8782
0.878
1434 322 323 333 963 1117 1429 1866 311 1538 1908 174 52 360 663 864 337 902 913 1041 1067 1201 1790 1823 9008 444 1011 866 870 868 1264 1307 1603 862 823 171 150 865 334 347 855 1340 1040 1657


Kernel Density
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
0.878
0.8785
0.879
0.8795
0.88

Determination of Distillation (automated) on Benzene sample #14011; results in °C

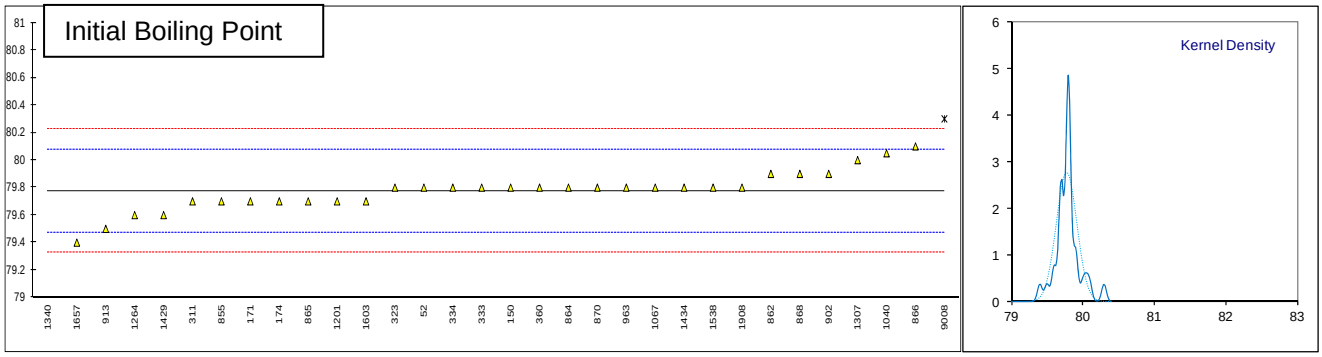
Lab	method	IBP	mark	z(targ)	50%	mark	z(targ)	DP	mark	z(targ)	remarks
52	D850-A	79.8		0.17	80.1		-0.15	81.1	R(0.05)	-6.67	
131		-----		-----	-----		-----	-----		-----	
150	D850	79.8		0.17	80.1		-0.15	82.6		3.33	
171	D850-A	79.7		-0.50	80.1		-0.15	80.2	R(0.05)	-12.67	
174	D850-A	79.7		-0.50	80.1		-0.15	82.9		5.33	
311	D850-A	79.7		-0.50	80.1		-0.15	82.3		1.33	
322		-----		-----	-----		-----	-----		-----	
323	D850-M	79.8		0.17	80.1		-0.15	82.1		0.00	
333	D850-A	79.8		0.17	80.1		-0.15	81.6		-3.33	
334	D850-A	79.8		0.17	80.1		-0.15	81.6		-3.33	
337		-----		-----	-----		-----	-----		-----	
347		-----		-----	-----		-----	-----		-----	
360	D850-A	79.8	C	0.17	80.3		1.18	81.9		-1.33	
444		-----		-----	-----		-----	-----		-----	
551		-----		-----	-----		-----	-----		-----	
555		-----		-----	-----		-----	-----		-----	
663		-----		-----	-----		-----	-----		-----	
823		-----		-----	-----		-----	-----		-----	
855	D850-M	79.7		-0.50	80.1		-0.15	82.6		3.33	
862	D850-M	79.9		0.83	80.1		-0.15	82.0		-0.67	
864	D850-M	79.8		0.17	80.1		-0.15	82.8		4.67	
865	D850-M	79.7		-0.50	80.1		-0.15	82.2		0.67	
866	D850-M	80.1	C	2.17	80.3	C	1.18	82.4		2.00	
868	D850-M	79.9		0.83	80.3		1.18	82.4		2.00	
870	D850-M	79.8		0.17	80.1		-0.15	82.6		3.33	
902	D850-M	79.9		0.83	80.1		-0.15	80.5	R(0.05)	-10.67	
912		-----		-----	-----		-----	-----		-----	
913	D850-M	79.5		-1.83	80.0		-0.82	81.8		-2.00	
963	D850-M	79.8		0.17	80.1		-0.15	80.4	R(0.05)	-11.33	
1011		-----		-----	-----		-----	-----		-----	
1040	DIN51761-M	80.05		1.83	80.29		1.11	82.60		3.33	
1041		-----		-----	-----		-----	-----		-----	
1067	D850-M	79.8		0.17	80.1		-0.15	81.5		-4.00	
1081		-----		-----	-----		-----	-----		-----	
1117		-----		-----	-----		-----	-----		-----	
1201	D850-A	79.7		-0.50	80.0		-0.82	82.1		0.00	
1264	D850-A	79.6		-1.17	80.2		0.51	82.3		1.33	
1307	D850-A	80.0		1.50	80.2		0.51	82.5		2.67	
1340	D850-A	75.0	C,G(0.01)	-31.83	79.0	C,G(0.01)	-7.49	82.0	C,ex	-0.67	See §4.1
1429	D850-A	79.6		-1.17	80.1		-0.15	81.6		-3.33	
1434	D850-A	79.8		0.17	80.2		0.51	81.5		-4.00	
1480		-----		-----	-----		-----	-----		-----	
1538	D850-A	79.8		0.17	80.1		-0.15	81.5		-4.00	
1592		-----		-----	-----		-----	-----		-----	
1603	in house-A	79.7		-0.50	80.1		-0.15	80.8	R(0.05)	-8.67	
1657	D850-A	79.4		-2.50	79.9		-1.49	81.4		-4.67	
1781		-----		-----	-----		-----	-----		-----	
1790		-----		-----	-----		-----	-----		-----	
1823		-----		-----	-----		-----	-----		-----	
1846		-----		-----	-----		-----	-----		-----	
1866		-----		-----	-----		-----	-----		-----	
1908	D850-A	79.8		0.17	80.1		-0.15	81.7		-2.67	
9008	D850-A	80.3	G(0.01)	3.50	80.7	G(0.01)	3.85	82.2	ex	0.67	See §4.1
	normality	suspect			suspect			OK			
	n	30			30			25			
	outliers	2			2			5 + 2 excl.			
	mean (n)	79.78			80.12			82.10			
	st.dev. (n)	0.144			0.089			0.465			
	R(calc.)	0.40			0.25			1.30			
	R(D850:11)	0.42			0.42			0.42			

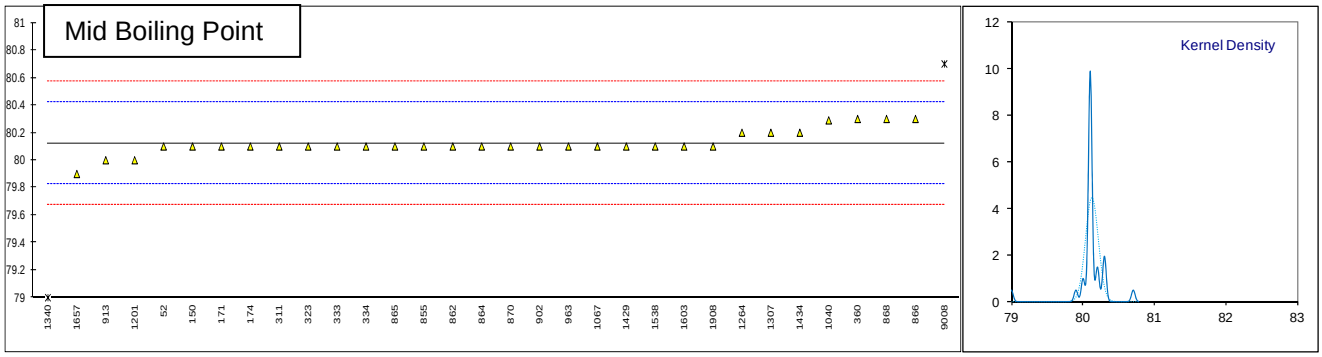
Lab 360 : first reported 79.3
Lab 866: first reported 79.9, 80.1, 81.7
Lab 1340: first reported 78.6, 79.4, 79.6

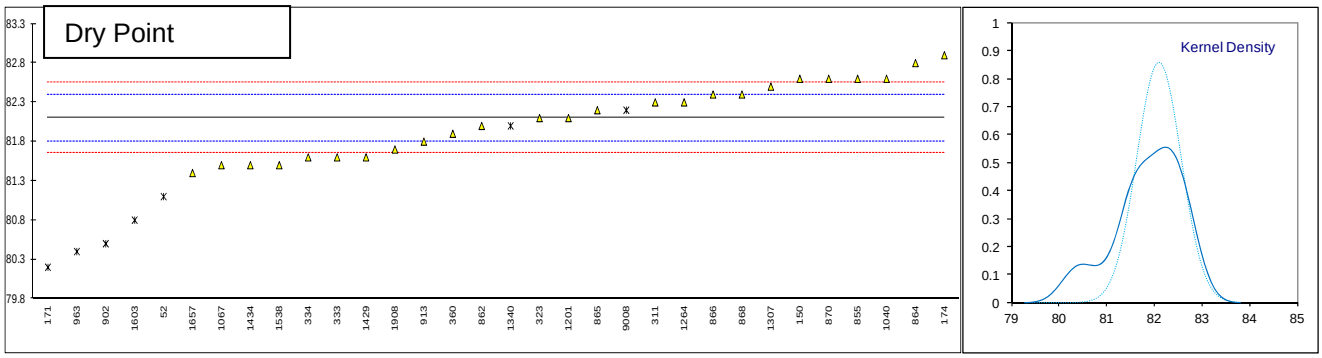
Theoretical boiling mid point = 80.1ºC

After manual correction:

360	D850-A	79.6		-1.02	80.1	-0.02	81.7	-2.64
866	D850-M	79.9		0.98	80.1	-0.02	82.2	0.69
868	D850-M	79.7		-0.36	80.1	-0.02	82.2	0.69
1040	DIN51761-M	79.86		0.71	80.10	-0.02	82.41	2.09
1340	D850-A	76.1	G(0.01)	-24.36	80.1	-0.02	83.1	6.69
1657	D850-A	79.6		-1.02	80.1	-0.02	81.6	-3.31
9008	D850-A	79.7		-0.36	80.1	-0.02	81.6	-3.31
	normality	OK			not OK		OK	
	n	31			32		27	
	outliers	1			0		5	
	mean (n)	79.75			80.10		82.10	
	st.dev. (n)	0.108			0.040		0.480	
	R(calc.)	0.30			0.11		1.34	
	R(D850:11)	0.42			0.42		0.42	

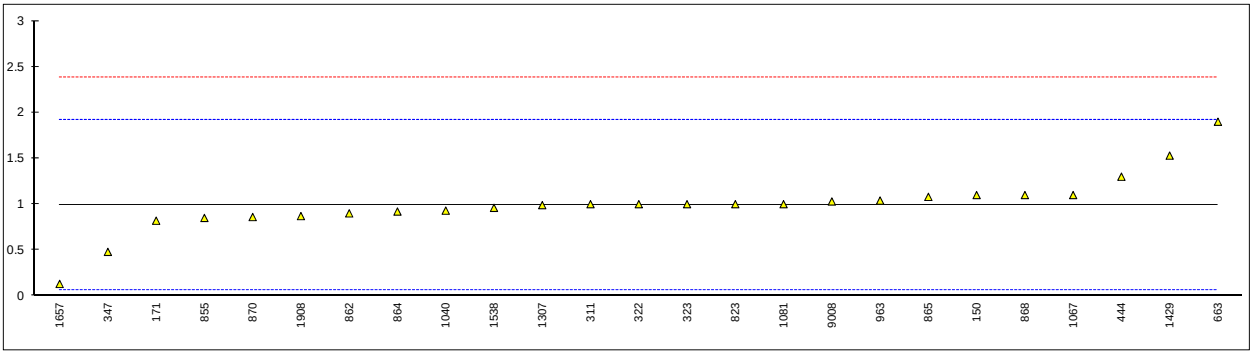


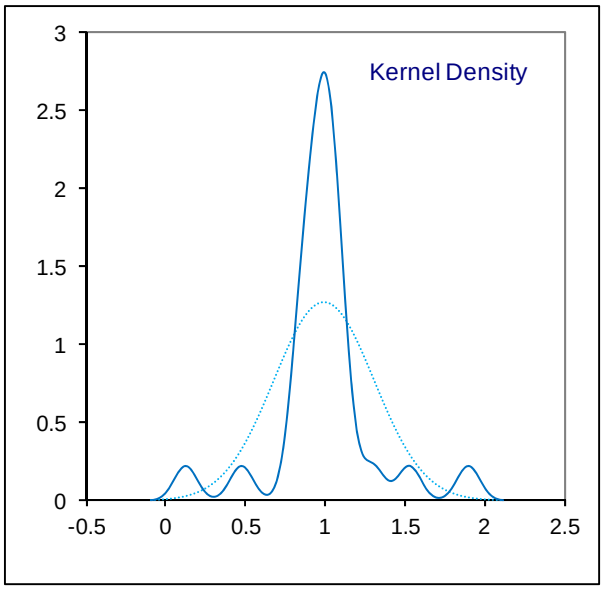




Determination of Organic Chloride on Benzene sample #14011; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
131		-----		-----	
150	D5808	1.1		0.22	
171	D5808	0.82		-0.38	
174		-----		-----	
311	D5808	1		0.01	
322	D5808	1		0.01	
323	D5808	1	C	0.01	First reported 1.5
333		-----		-----	
334		-----		-----	
337		-----		-----	
347	INH-1095	0.48		-1.11	
360		-----		-----	
444	IP510	1.3	C	0.66	Result was reported as Total Chloride
551		-----		-----	
555		-----		-----	
663	D5808	1.9		1.95	
823	D5808	1		0.01	
855	D5808	0.85		-0.31	
862	D5808	0.9		-0.21	
864	D5808	0.92		-0.16	
865	D5808	1.08		0.18	
866		-----		-----	
868	D5808	1.1		0.22	
870	D5808	0.86		-0.29	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D5808	1.04		0.10	
1011	D5808	<1		-----	
1040	EN14077	0.93	C	-0.14	Result was reported as Total Chloride
1041		-----		-----	
1067	UOP779	1.1		0.22	
1081	D5808	1	C	0.01	Result was reported as Total Chloride
1117		-----		-----	
1201	D5808	<1		-----	
1264		-----		-----	
1307	D5808	0.99		-0.01	
1340		-----		-----	
1429	D5808	1.53		1.15	
1434		-----		-----	
1480		-----		-----	
1538	D5808	0.96		-0.08	
1592		-----		-----	
1603		-----		-----	
1657	D5808	0.13	C	-1.86	Result was reported as Total Chloride
1781		-----		-----	
1790		-----		-----	
1823		-----		-----	
1846		-----		-----	
1866		-----		-----	
1908	D5808	0.87		-0.27	
9008	D5808	1.03		0.07	
	normality	not OK			
	n	25			
	outliers	0			
	mean (n)	0.996			Recovery: <107%
	st.dev. (n)	0.3136			
	R(calc.)	0.878			
	R(D5808:14)	1.300			

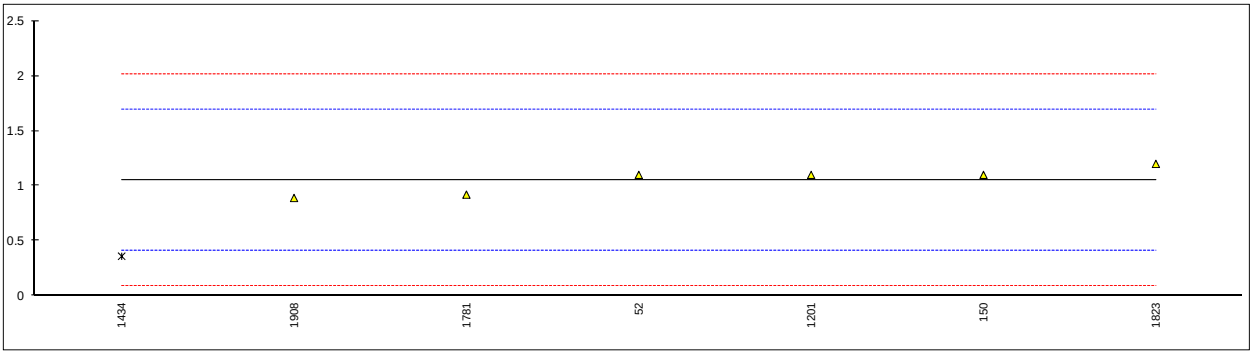

3
2.5
2
1.5
1
0.5
0
1657
347
171
855
870
1908
862
864
1040
1538
1307
311
322
323
823
1081
9008
963
865
150
868
1067
444
1429
663


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

Determination of Total Chloride on Benzene sample #14011; results in mg/kg

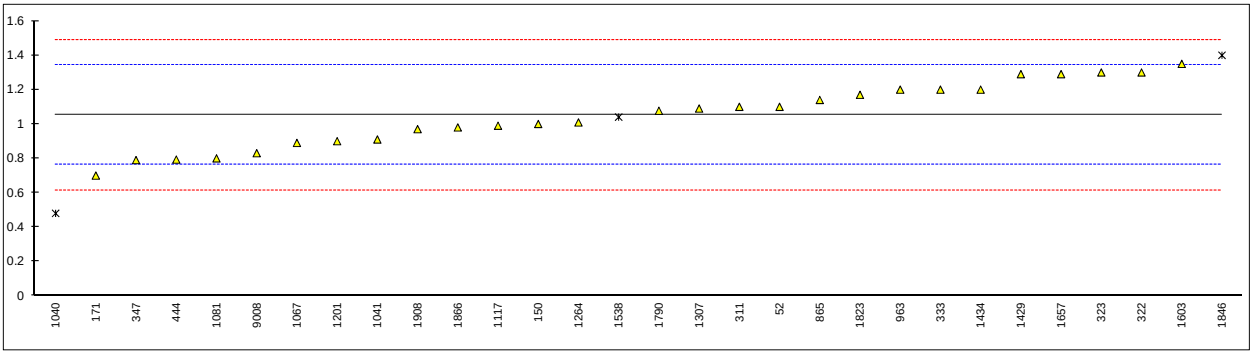
lab	method	value	mark	z(targ)	remarks
52	D5194	1.1		0.15	
131		-----		-----	
150	D7359	1.1		0.15	
171	D5194	<1		-----	
174		-----		-----	
311		-----		-----	
322		-----		-----	
323		-----		-----	
333		-----		-----	
334		-----		-----	
337		-----		-----	
347		-----		-----	
360		-----		-----	
444		-----		-----	See “organic chloride”
551		-----		-----	
555		-----		-----	
663		-----		-----	
823		-----		-----	
855		-----		-----	
862		-----		-----	
864		-----		-----	
865		-----		-----	
866		-----		-----	
868		-----		-----	
870		-----		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963		-----		-----	
1011		-----		-----	
1040		-----		-----	See “organic chloride”
1041		-----		-----	
1067		-----		-----	
1081		-----		-----	See “organic chloride”
1117		-----		-----	
1201	D5194	1.1		0.15	
1264		-----		-----	
1307		-----		-----	
1340		-----		-----	
1429		-----		-----	
1434	D5194	0.36	G(0.01)	-2.15	
1480		-----		-----	
1538		-----		-----	
1592		-----		-----	
1603		-----		-----	
1657		-----		-----	See “organic chloride”
1781	INH-708	0.92		-0.41	
1790		-----		-----	
1823	INH-2296	1.2		0.46	
1846		-----		-----	
1866		-----		-----	
1908	D5194	0.89		-0.50	
9008		-----		-----	

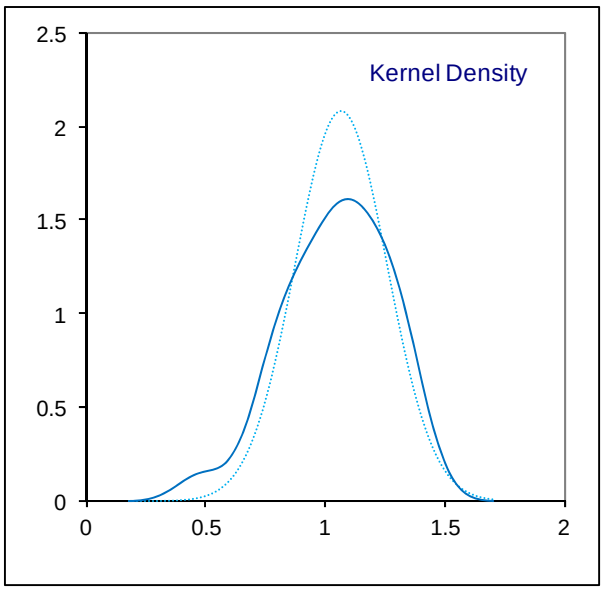
normality	unknown
n	6
outliers	1
mean (n)	1.052
st.dev. (n)	0.1204
R(calc.)	0.337
R(D5194:13)	0.900


2.5
2
1.5
1
0.5
0
1434
1908
1781
52
1201
150
1823

Determination of Total Nitrogen on Benzene sample #14011; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D6069	1.1		0.34	
131		-----		-----	
150	D6069	1.0		-0.35	
171	D6069	0.7		-2.42	
174		-----		-----	
311	D6069	1.1		0.34	
322	D6069	1.3		1.72	
323	D6069	1.3	C	1.72	First reported 1.6
333	D4629	1.2		1.03	
334		-----		-----	
337		-----		-----	
347	D4629	0.79		-1.80	
360		-----		-----	
444	D4629	0.793		-1.78	
551		-----		-----	
555		-----		-----	
663		-----		-----	
823		-----		-----	
855		-----		-----	
862		-----		-----	
864		-----		-----	
865	D6069	1.14		0.62	
866		-----		-----	
868		-----		-----	
870		-----		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D6069	1.20		1.03	
1011		-----		-----	
1040	D6069	0.48	G(0.05)	-3.94	
1041	D6069	0.91		-0.97	
1067	D6069	0.89		-1.11	
1081	D6069	0.8		-1.73	
1117	D6069	0.99		-0.42	
1201	D6069	0.9		-1.04	
1264	D6069	1.009		-0.29	
1307	D6069	1.09		0.27	
1340		-----		-----	
1429	D4629	1.29		1.65	
1434	D6069	1.2		1.03	
1480		-----		-----	
1538	D7184	1.04	ex	-0.07	Result excluded, see §4.1
1592		-----		-----	
1603	in house	1.35		2.06	
1657	D6069	1.29		1.65	
1781		-----		-----	
1790	D6069	1.077		0.18	
1823	D6069	1.17		0.82	
1846	D7184	1.40	ex	2.41	Result excluded, see §4.1
1866	D6069	0.98		-0.49	
1908	D6069	0.97		-0.56	
9008	D6069	0.83		-1.52	
	normality	OK			
	n	27			
	outliers	1 + 2 excl.		Spike	
	mean (n)	1.051		0.93	Recovery: <113%
	st.dev. (n)	0.1841			
	R(calc.)	0.516			
	R(D6069:06)	0.406			Application range D6069:06 = 0.2 – 2 mg/kg
Comp.	R(D4629:12)	0.830			Application range D4629:12 = 0.3 – 100 mg/kg

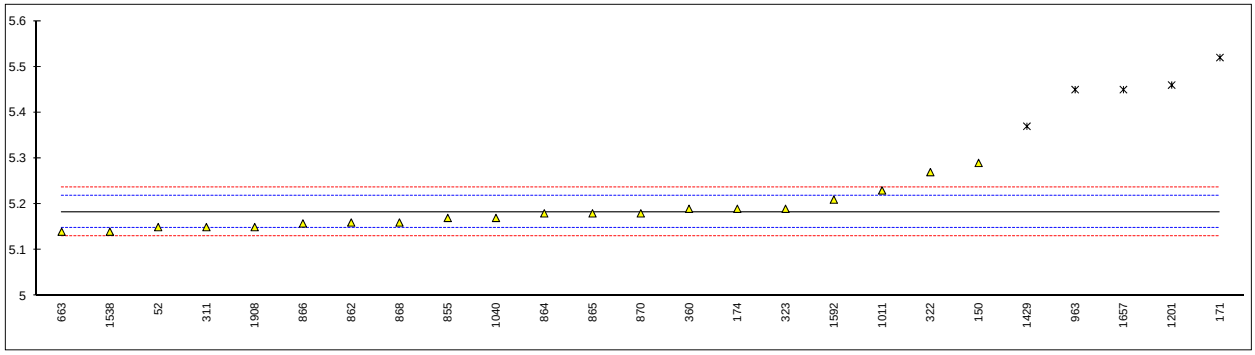

1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1040
171
347
444
1081
9008
1067
1201
1041
1908
1866
1117
150
1264
1538
1790
1307
311
52
865
1823
963
333
1434
1429
1657
323
322
1603
1846

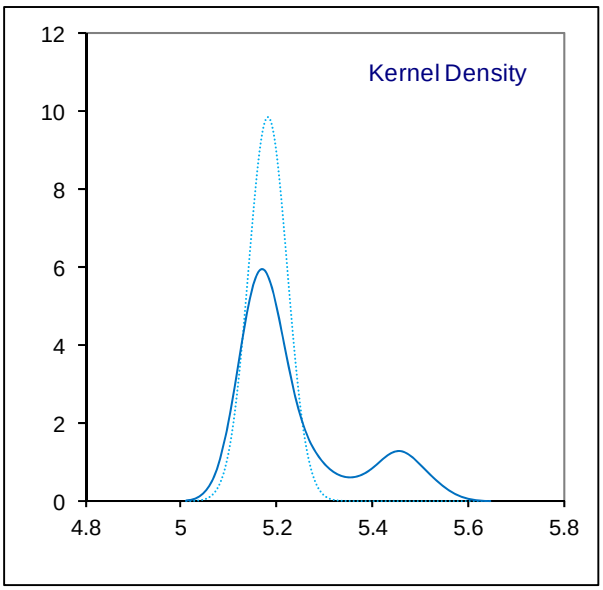

Kernel Density
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2

Determination of Solidification Point (anhydrous) on Benzene sample #14011; results in °C

lab	method	value	mark	z(targ)	remarks
52	D852	5.15		-1.84	
131		-----		-----	
150	D852	5.29		6.00	
171	D852	5.52	G(0.05)	18.88	
174	D852	5.19	C	0.40	First reported 5.5
311	D852	5.15		-1.84	
322	D852	5.27		4.88	
323	D852	5.19		0.40	
333		-----		-----	
334		-----		-----	
337		-----		-----	
347		-----		-----	
360	D852	5.19		0.40	
444		-----		-----	
551		-----		-----	
555		-----		-----	
663	D852	5.14		-2.40	
823		-----		-----	
855	D852	5.17		-0.72	
862	D852	5.16		-1.28	
864	D852	5.18		-0.16	
865	D852	5.18		-0.16	
866	D852	5.158		-1.39	
868	D852	5.16		-1.28	
870	D852	5.18		-0.16	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D852	5.45	DG(0.01)	14.96	
1011	D852	5.23		2.64	
1040	DIN51798	5.17		-0.72	
1041		-----		-----	
1067		-----		-----	
1081		-----		-----	
1117		-----		-----	
1201	D852	5.46	G(0.05)	15.52	
1264		-----		-----	
1307		-----		-----	
1340		-----		-----	
1429	D852	5.37	G(0.01)	10.48	
1434		-----		-----	
1480		-----		-----	
1538	D852	5.14		-2.40	
1592	D852	5.21		1.52	
1603		-----		-----	
1657	D852	5.45	DG(0.01)	14.96	
1781		-----		-----	
1790		-----		-----	
1823		-----		-----	
1846		-----		-----	
1866		-----		-----	
1908	D852	5.15		-1.84	
9008		-----		-----	

normality	not OK
n	20
outliers	5
mean (n)	5.183
st.dev. (n)	0.0405
R(calc.)	0.113
R(D852:13)	0.050

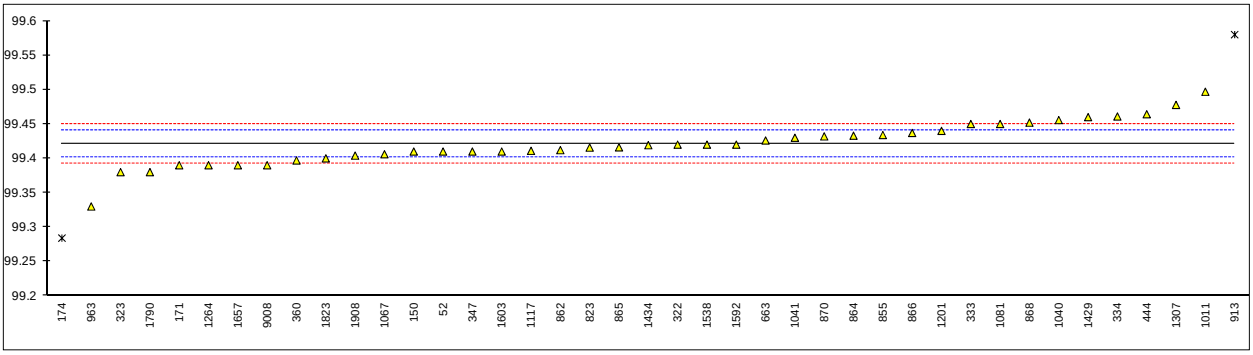

5.6
5.5
5.4
5.3
5.2
5.1
5
663
1538
52
311
1908
866
862
868
855
1040
864
865
870
360
174
323
1592
1011
322
150
1429
963
1657
1201
171

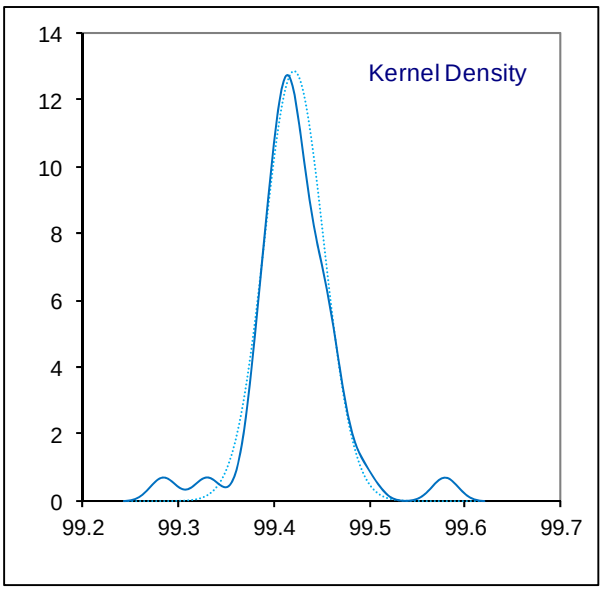

Kernel Density
12
10
8
6
4
2
0
4.8
5
5.2
5.4
5.6
5.8

Determination of Purity on Benzene sample #14011; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D4492	99.41		-1.18	
131		-----		-----	
150	D4492	99.41		-1.18	
171	D4492	99.39		-3.26	
174	D4492	99.284	C,R(0.01)	-14.30	First reported 99.359
311	D4492	<99.8		-----	
322	D4492	99.42		-0.13	
323	D4492	99.38		-4.30	
333	D4492	99.45		2.99	
334	D4492	99.461		4.14	
337		-----		-----	
347	D4492	99.41		-1.18	
360	D4492	99.397		-2.53	
444	D4492	99.4642		4.47	
551		-----		-----	
555		-----		-----	
663	D4492	99.426		0.49	
823	D4492	99.4157		-0.58	
855	D4492	99.434		1.33	
862	D4492	99.412		-0.97	
864	D4492	99.433		1.22	
865	D4492	99.416		-0.55	
866	D4492	99.437		1.64	
868	D4492	99.452		3.20	
870	D4492	99.432		1.12	
902		-----		-----	
912		-----		-----	
913	D4492	99.58	R(0.01)	16.53	
963	D4492	99.33		-9.51	
1011	D2360	99.4969		7.88	
1040	D4492	99.4557		3.59	
1041	D4492	99.430		0.91	
1067	in house	99.406		-1.59	
1081	D4492	99.45		2.99	
1117	D4492	99.411		-1.07	
1201	D4492	99.44		1.95	
1264	D4492	99.39		-3.26	
1307	in house	99.4778		5.89	
1340		-----		-----	
1429	D4492	99.46		4.03	
1434	D4492	99.4192		-0.22	
1480		-----		-----	
1538	D4492	99.42		-0.13	
1592	D4492	99.42		-0.13	
1603	in house	99.41		-1.18	
1657	D4492	99.39		-3.26	
1781		-----		-----	
1790	in house	99.38		-4.30	
1823	D4492	99.40		-2.22	
1846		-----		-----	
1866		-----		-----	
1908	D4492	99.404		-1.80	
9008	D4492	99.39		-3.26	

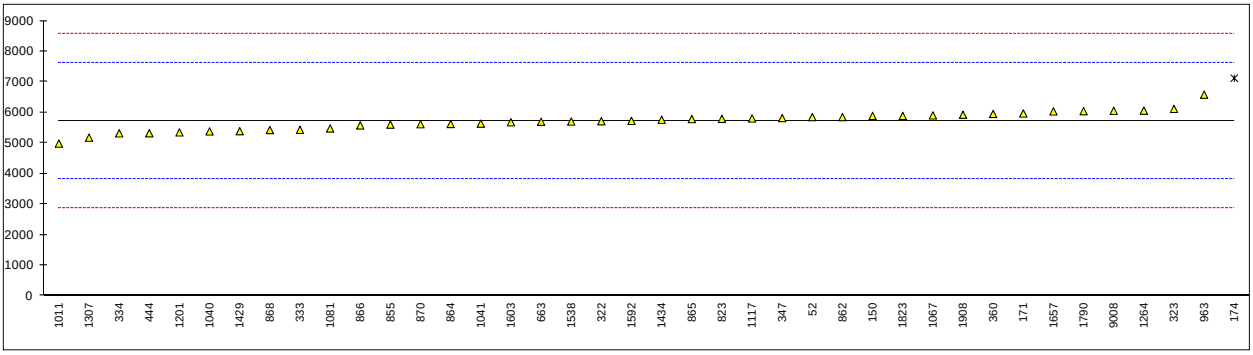
normality	suspect
n	39
outliers	2
mean (n)	99.421
st.dev. (n)	0.0311
R(calc.)	0.087
R(D4492:10)	0.027

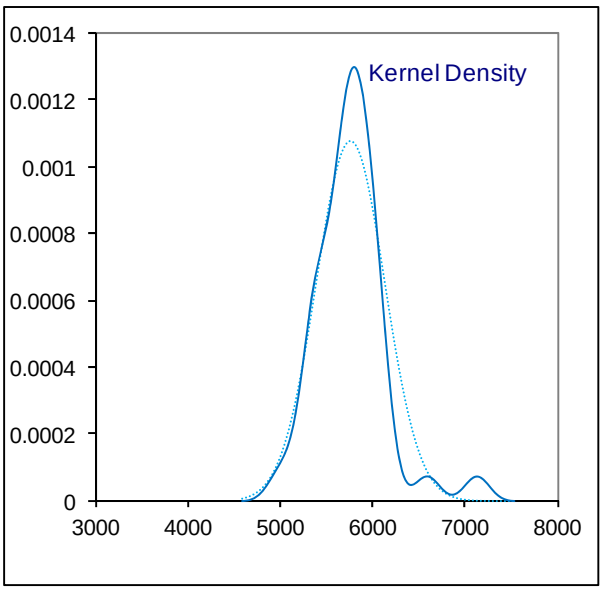

99.6
99.55
99.5
99.45
99.4
99.35
99.3
99.25
99.2
174 963 323 1790 171 1264 1657 9008 360 1823 1908 1067 150 52 347 1603 1117 862 823 865 1434 322 1538 1592 663 1041 870 864 855 866 1201 333 1081 868 1040 1429 334 444 1307 1011 913


Kernel Density
14
12
10
8
6
4
2
0
99.2
99.3
99.4
99.5
99.6
99.7

Determination of Toluene on Benzene sample #14011; results in mg/kg

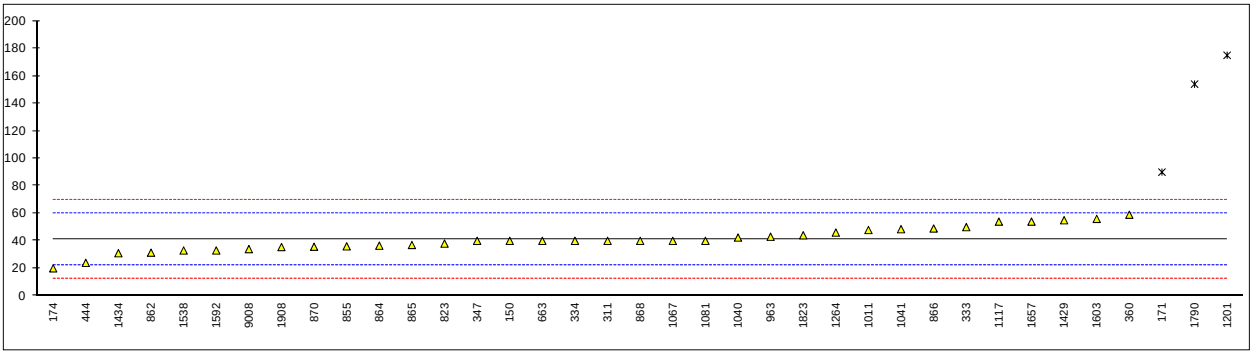
lab	method	value	mark	z(targ)	remarks
52	D4492	5850		0.14	
131		-----		-----	
150	D4492	5890		0.18	
171	D4492	5970	C	0.27	Reported 0.5970, probably an unit error
174	D4492	7124	C,R(0.01)	1.48	First reported 6371
311	D4492	>2000		-----	
322	D4492	5716		0.00	
323	D4492	6120		0.42	
333	D4492	5434	C	-0.30	First reported 0.5453 (%M/M)
334	D4492	5320	C	-0.42	First reported 0.532 (%M/M)
337		-----		-----	
347	D4492	5820		0.11	
360	D4492	5955		0.25	
444	D4492	5323		-0.42	
551		-----		-----	
555		-----		-----	
663	D4492	5700		-0.02	
823	D4492	5793		0.08	
855	D4492	5606		-0.12	
862	D4492	5852		0.14	
864	D4492	5626		-0.10	
865	D4492	5785		0.07	
866	D4492	5580		-0.14	
868	D4492	5426		-0.31	
870	D4492	5617		-0.11	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D4492	6584		0.91	
1011	D2360	4983		-0.77	
1040	D4492	5383		-0.35	
1041	D4492	5637.2		-0.08	
1067	in house	5906		0.20	
1081	D4492	5480		-0.25	
1117	D4492	5808		0.10	
1201	D4492	5350		-0.39	
1264	D4492	6062		0.36	
1307	in house	5177.5		-0.57	
1340		-----		-----	
1429	D4492	5390		-0.34	
1434	D4492	5765		0.05	
1480		-----		-----	
1538	D4492	5706		-0.01	
1592	D4492	5729		0.01	
1603	in house	5682		-0.04	
1657	D4492	6038		0.34	
1781		-----		-----	
1790	in house	6046		0.35	
1823	D4492	5890		0.18	
1846		-----		-----	
1866		-----		-----	
1908	D4492	5930		0.22	
9008	D4492	6057		0.36	
	normality	OK			
	n	39			
	outliers	1			
	mean (n)	5717.6			
	st.dev. (n)	301.90			
	R(calc.)	845.3			
	R(D4492:10)	2661.6			Compare R(Horwitz) = 696.6

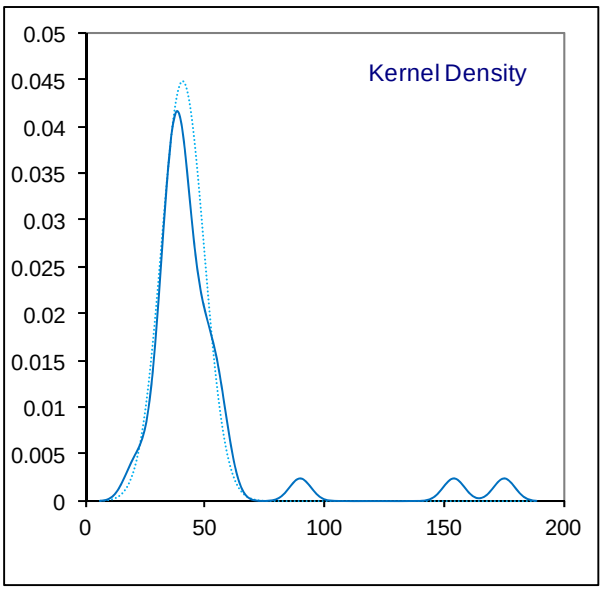

9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1011
1307
334
444
1201
1040
1429
868
333
1081
866
855
870
864
1041
1603
663
1538
322
1592
1434
865
823
1117
347
52
862
150
1823
1067
1908
360
171
1657
1790
9008
1264
323
963
174


0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Kernel Density
3000
4000
5000
6000
7000
8000

Determination of Nonaromatics on Benzene sample #14011; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D4492	<100		-----	
131		-----		-----	
150	D4492	40		-0.10	
171	D4492	90	C,R(0.01)	5.13	Reported 0.009, probably an unit error
174	D4492	20		-2.20	
311	D4492	40		-0.10	
322	D4492	<50		-----	
323	D4492	<50		-----	
333	D4492	50	C	0.94	First reported 0.005 (%M/M)
334	D4492	40	C	-0.10	First reported <0.005 (%M/M)
337		-----		-----	
347	D4492	40		-0.10	
360	D4492	59		1.88	
444	D4492	24		-1.78	
551		-----		-----	
555		-----		-----	
663	D4492	40		-0.10	
823	D4492	38		-0.31	
855	D4492	36		-0.52	
862	D4492	31.4		-1.00	
864	D4492	36.5		-0.47	
865	D4492	37		-0.42	
866	D4492	49		0.84	
868	D4492	40		-0.10	
870	D4492	35.7		-0.55	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D4492	43		0.21	
1011	D2360	47.9		0.72	
1040	D4492	42.4		0.15	
1041	D4492	48.5		0.79	
1067	in house	40		-0.10	
1081	D4492	40		-0.10	
1117	D4492	54		1.36	
1201	D4492	175	R(0.01)	14.03	
1264	D4492	46		0.52	
1307	in house	<100		-----	
1340		-----		-----	
1429	D4492	55		1.47	
1434	D4492	31		-1.05	
1480		-----		-----	
1538	D4492	33		-0.84	
1592	D4492	33		-0.84	
1603	in house	56		1.57	
1657	D4492	54		1.36	
1781		-----		-----	
1790	in house	154	R(0.01)	11.83	
1823	D4492	44.05		0.32	
1846		-----		-----	
1866		-----		-----	
1908	D4492	35.5		-0.58	
9008	D4492	34		-0.73	
	normality	OK			
	n	34			
	outliers	3			
	mean (n)	41.00			
	st.dev. (n)	8.890			
	R(calc.)	24.89			
	R(D4492:10)	26.74			


200
180
160
140
120
100
80
60
40
20
0
174 444 1434 862 1538 1592 9008 1908 870 855 864 865 823 347 150 663 334 311 868 1067 1081 1040 963 1823 1264 1011 1041 866 333 1117 1657 1429 1603 360 171 1790 1201


Kernel Density
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0
50
100
150
200

Determination of Methylcyclohexane on Benzene sample #14011 in mg/kg

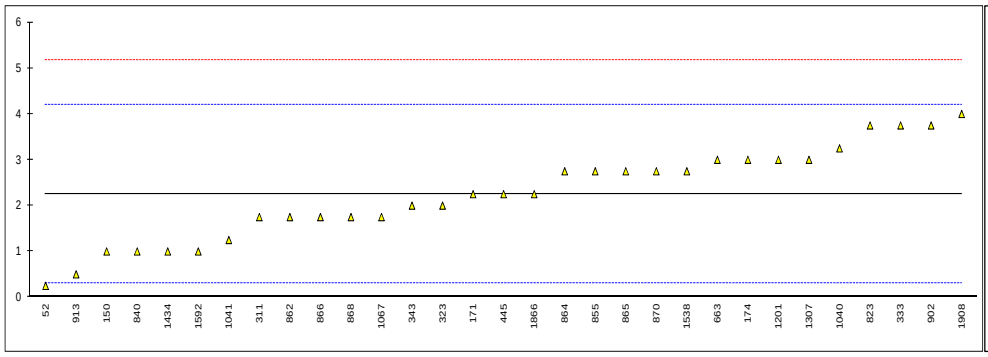
lab	method	value	mark	z(targ)	remarks
52	D5713	<2		-----	
131		-----		-----	
150		-----		-----	
171	D4492	<0.001		-----	
174	D4492	<10		-----	
311	D5713	<2		-----	
322		<10		-----	
323	D5713	<2		-----	
333		-----		-----	
334		-----		-----	
337		-----		-----	
347	D4492	<10		-----	
360	D4492	<10		-----	
444	D5713	<1		-----	
551		-----		-----	
555		-----		-----	
663		-----		-----	
823	D5713	0.4		-----	
855		<10.0		-----	
862		-----		-----	
864		<10		-----	
865	D4492	<10		-----	
866	D4492	<10		-----	
868	D4492	<10		-----	
870		<10		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D4492	<10		-----	
1011		-----		-----	
1040		<1		-----	
1041	in house	<5		-----	
1067	in house	<1		-----	
1081	D4492	<1		-----	
1117	D4492	<10		-----	
1201		0.3		-----	
1264		-----		-----	
1307	in house	<2		-----	
1340		-----		-----	
1429	D4492	10.6		-----	
1434		0		-----	
1480		-----		-----	
1538	D4492	<10		-----	
1592		-----		-----	
1603	in house	<1		-----	
1657		-----		-----	
1781		-----		-----	
1790	in house	<2		-----	
1823		-----		-----	
1846		-----		-----	
1866		-----		-----	
1908	D4492	n.d.		-----	
9008		-----		-----	
	normality	n.a.			
	n	30			
	outliers	0			
	mean (n)	<10			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	R(lit)	n.a.			

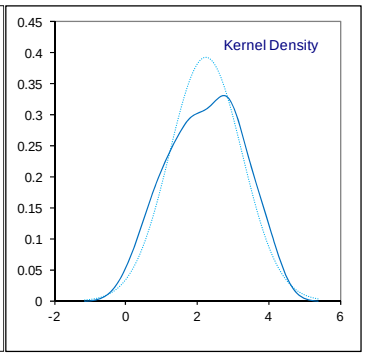
Determination of Acid Wash Color on Toluene sample #14012

lab	method	value	mark	z(targ)	remarks
52	D848	0+		-2.05	
131		-----		-----	
150	D848	1		-1.28	
171	D848	2+		0.00	
174	D848	3		0.77	
311	D848	2-		-0.51	
323	D848	2		-0.26	
333	D848	4-		1.54	
334		-----		-----	
343	D848	2		-0.26	
445	D848	2+		0.00	
551		-----		-----	
555		-----		-----	
663	D848	3		0.77	
823	D848	4-		1.54	
840	D848	1		-1.28	
855	D848	3-		0.51	
862	D848	2-		-0.51	
864	D848	3-		0.51	
865	D848	3-		0.51	
866	D848	2-		-0.51	
868	D848	2-		-0.51	
870	D848	3-		0.51	
902	D848	4-x		1.54	Reported “off hue”
913	D848	<1		-1.80	
1040	D848	3+		1.03	
1041	D848	1+		-1.03	
1067	D848	2-		-0.51	
1161		-----		-----	
1201	D848	3		0.77	
1307	D848	3		0.77	
1419		-----		-----	
1434	D848	1		-1.28	
1538	D848	3-		0.51	
1592	D848	1		-1.28	
1603		-----		-----	
1866	D848	2+		0.00	
1908	D848	4		1.80	

normality	OK
n	31
outliers	0
mean (n)	2.25 (2+)
st.dev. (n)	1.000
R(calc.)	2.80
R(D848:14)	2.73

*) In the calculation of the mean, standard deviation, the reproducibility and in below graphs, a reported value of ‘y-‘ is changed into y-0.25 (for example 1- into 0.75)





Determination of Appearance on Toluene sample #14012

lab	method	value	mark	z(targ)	remarks
52	D4176	Pass		-----	
131		-----		-----	
150	E2680	Pass		-----	
171	E2680	Pass		-----	
174	E2680	Pass		-----	
311	E2680	Pass		-----	
323	E2680	Pass		-----	
333	E2680	B&C		-----	
334		-----		-----	
343	E2680	Pass		-----	
445	E2680	Pass		-----	
551		-----		-----	
555		-----		-----	
663	E2680	Pass		-----	
823	E2680	Pass		-----	
840	E2680	Pass		-----	
855	E2680	Pass		-----	
862		-----		-----	
864	E2680	Pass		-----	
865	E2680	Pass		-----	
866	E2680	Pass		-----	
868	E2680	Pass		-----	
870	E2680	Pass		-----	
902	E2680	Pass		-----	
913	E2680	Pass		-----	
1040	E2680	CFSM		-----	
1041		-----		-----	
1067	E2680	Pass		-----	
1161	E2680	Clear		-----	
1201	E2680	B&C		-----	
1307	E2680	Clear		-----	
1419		-----		-----	
1434	E2680	Clear		-----	
1538	E2680	B&C		-----	
1592		-----		-----	
1603	in house	CFSM		-----	
1866	Visual	Pass		-----	
1908	E2680	B&C		-----	

normality	n.a.
n	29
outliers	n.a.
mean (n)	Pass
st.dev. (n)	n.a.
R(calc.)	n.a.
R(E2680:09e1)	unknown

Abbreviations:

B&C = bright and clear

CFSM = clear and free from suspended matter

Determination of Copper Corrosion on Toluene sample #14012

lab	method	value	mark	z(targ)	remarks
52	D849	1A		-----	
131		-----		-----	
150	D849	1A		-----	
171	D849	1B		-----	
174	D849	1A		-----	
311	D849	1A		-----	
323	D849	1A		-----	
333	D849	Pass		-----	
334		-----		-----	
343	D849	1A		-----	
445	D849	1A		-----	
551		-----		-----	
555		-----		-----	
663	D849	1A		-----	
823	D849	1A		-----	
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		-----		-----	
913	D849	1A		-----	
1040	ISO2160	1A		-----	
1041		-----		-----	
1067	D849	1A		-----	
1161		-----		-----	
1201	D849	1A		-----	
1307	D849	1A		-----	
1419		-----		-----	
1434	D849	1A		-----	
1538	D849	1A		-----	
1592	D849	1A		-----	
1603		-----		-----	
1866		-----		-----	
1908	D849	1A		-----	

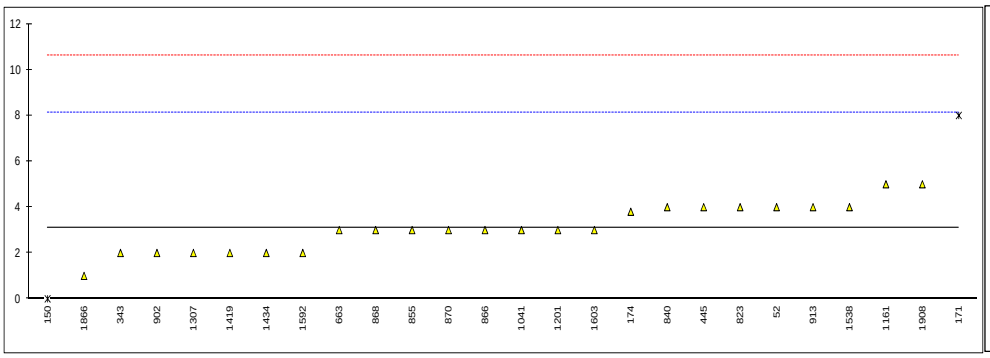
normality	n.a.
n	28
outliers	n.a.
mean (n)	1(1A)
st.dev. (n)	n.a.
R(calc.)	n.a.
R(D849:11)	n.a.

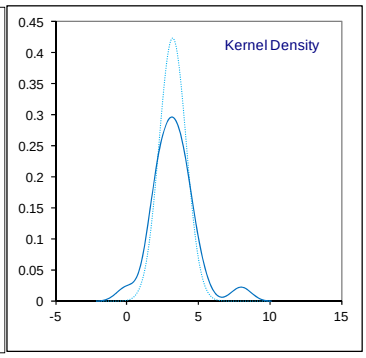
Determination of Colour (Pt-Co scale) on Toluene sample #14012

lab	method	value	mark	z(targ)	remarks
52	D5386	4		0.35	
131		-----		-----	
150	D1209	0	D(0.05)	-1.25	
171	D1209	8	R(0.01)	1.95	
174	D1209	3.8		0.27	
311	D1209	<5		-----	
323	D1209	<5		-----	
333		-----		-----	
334		-----		-----	
343	D5386	2		-0.45	
445	D1209	4		0.35	
551		-----		-----	
555		-----		-----	
663	D1209	3		-0.05	
823	D5386	4		0.35	
840	D1209	4		0.35	
855	D1209	3		-0.05	
862	D1209	<5		-----	
864	D1209	<5		-----	
865	D1209	<5		-----	
866	D1209	3		-0.05	
868	D1209	3		-0.05	
870	D5386	3		-0.05	
902	D1209	2		-0.45	
913	D5386	4		0.35	
1040	ISO6271	<5		-----	
1041	ISO6271	3		-0.05	
1067	D1209	<5		-----	
1161	D1209	5		0.75	
1201	D1209	3		-0.05	
1307	D5386	2		-0.45	
1419	D1209	2		-0.45	
1434	D1209	2		-0.45	
1538	D1209	4		0.35	
1592	D1209	2		-0.45	
1603	in house	3		-0.05	
1866	D1209	1		-0.85	
1908	D1209	5		0.75	

	normality	OK
	n	24
	outliers	2
	mean (n)	3.12
	st.dev. (n)	1.028
	R(calc.)	2.88
	R(D1209:11)	7.00

Compare R(D5386:10) = 5.08

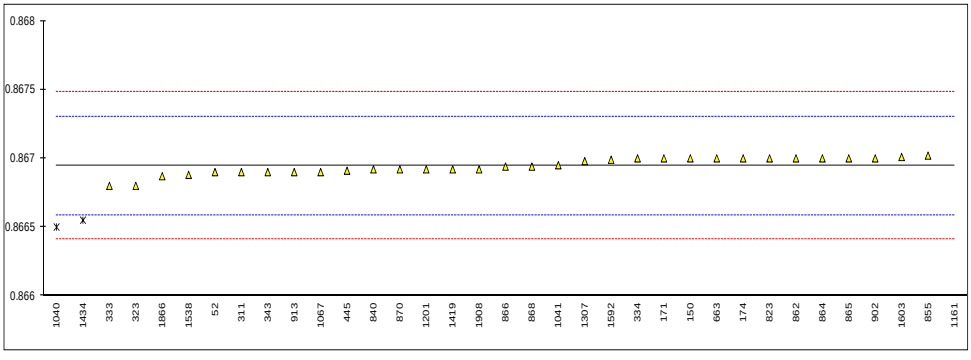


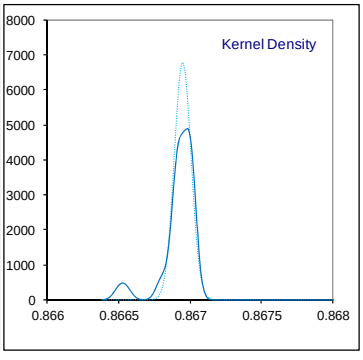


Determination of Density @ 20°C on Toluene sample #14012: results in kg/L

lab	method	value	mark	z(targ)	remarks
52	D4052	0.8669		-0.24	
131		-----		-----	
150	D4052	0.867		0.32	
171	D4052	0.8670		0.32	
174	D4052	0.8670	C	0.32	First reported 0.8665
311	D4052	0.8669		-0.24	
323	D4052	0.8668		-0.80	
333	D4052	0.8668		-0.80	
334	D4052	0.8670		0.32	
343	D4052	0.8669		-0.24	
445	D4052	0.86691		-0.19	
551		-----		-----	
555		-----		-----	
663	D4052	0.8670		0.32	
823	D4052	0.86700		0.32	
840	D4052	0.86692		-0.13	
855	D4052	0.86702		0.43	
862	D4052	0.86700		0.32	
864	D4052	0.8670		0.32	
865	D4052	0.8670		0.32	
866	D4052	0.86694		-0.02	
868	D4052	0.86694		-0.02	
870	D4052	0.86692		-0.13	
902	D4052	0.8670		0.32	
913	D4052	0.8669		-0.24	
1040	ISO12185	0.8665	R(0.01)	-2.48	
1041	D4052	0.86695		0.04	
1067	D4052	0.8669		-0.24	
1161	ISO12185	0.8714	R(0.01)	24.96	Probably measured at a deviating temperature (15 instead of 20ºC)
1201	D4052	0.86692		-0.13	
1307	D4052	0.86698		0.20	
1419	ISO12185	0.86692		-0.13	
1434	D4052	0.86655	C,R(0.01)	-2.20	First reported 0.8715
1538	D4052	0.86688		-0.36	
1592	D4052	0.86699		0.26	
1603	in house	0.86701		0.37	
1866	D4052	0.86687		-0.41	
1908	D4052	0.86692		-0.13	

normality	OK
n	32
outliers	3
mean (n)	0.86694
st.dev. (n)	0.000059
R(calc.)	0.00017
R(D4052:02e1)	0.00050





Determination of Distillation (automated+manual) on Toluene sample #14012; results in °C

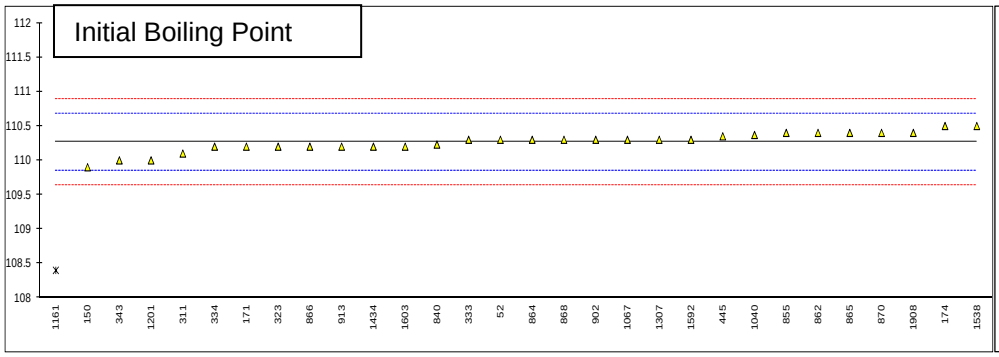
lab		IBP	mark	z(targ)	50%	mark	z(targ)	DP	mark	z(targ)	remarks
52	D850-A	110.3		0.16	110.6		0.09	111.1		-2.28	
131		-----		-----	-----		-----	-----		-----	
150	D850-A	109.9		-1.77	110.4	R(0.01)	-3.50	111.5		0.18	
171	D850-A	110.2		-0.32	110.6		0.09	111.8		2.02	
174	D850-A	110.5		1.12	110.6		0.09	112.5		6.32	
311	D850-A	110.1		-0.81	110.6		0.09	111.3		-1.05	
323	D850-M	110.2		-0.32	110.5		-1.71	111.8	C	2.02	
333	D850-A	110.3		0.16	110.6		0.09	111.3		-1.05	
334	D850-A	110.2		-0.32	110.5		-1.71	111.3	C	-1.05	
343	D850-A	110.0		-1.29	110.6		0.09	110.7		-4.74	
445	D850-M	110.35		0.40	110.60		0.09	111.78		1.90	
551		-----		-----	-----		-----	-----		-----	
555		-----		-----	-----		-----	-----		-----	
663		-----		-----	-----		-----	-----		-----	
823		-----		-----	-----		-----	-----		-----	
840	D850-A	110.23		-0.18	110.60		0.09	111.72		1.53	
855	D850-M	110.4		0.64	110.6		0.09	111.7		1.40	
862	D850-M	110.4		0.64	110.6		0.09	110.9		-3.51	
864	D850-M	110.3		0.16	110.6		0.09	111.7		1.40	
865	D850-A	110.4		0.64	110.6		0.09	111.4		-0.44	
866	D850-M	110.2		-0.32	110.6		0.09	111.1		-2.28	
868	D850-M	110.3		0.16	110.6		0.09	111.2		-1.67	
870	D850-M	110.4		0.64	110.6		0.09	111.6		0.79	
902	D850-M	110.3	C	0.16	110.6		0.09	110.7	C	-4.74	
913	D850-M	110.2		-0.32	110.8	R(0.01)	3.68	111.0		-2.89	
1040	D850-M	110.37		0.50	110.67		1.34	112.17		4.29	
1041		-----		-----	-----		-----	-----		-----	
1067	D850-M	110.3		0.16	110.6		0.09	111.9		2.63	
1161	D850-A	108.4	R(0.01)	-9.00	109.4	R(0.01)	-21.45	-----		-----	
1201	D850-A	110.0		-1.29	110.6		0.09	111.5		0.18	
1307	D850-A	110.3		0.16	110.6		0.09	111.8		2.02	
1419		-----		-----	-----		-----	-----		-----	
1434	D850-A	110.2		-0.32	110.7		1.88	112.2		4.47	
1538	D850-A	110.5		1.12	110.6		0.09	110.8		-4.12	
1592	D850-M	110.3		0.16	110.6		0.09	111.8		2.02	
1603	in house-A	110.2		-0.32	110.5		-1.71	110.9		-3.51	
1866		-----		-----	-----		-----	-----		-----	
1908	D850-A	110.4		0.64	110.6		0.09	111.5		0.18	
	normality	OK			not OK			OK			
	n	29			27			29			
	outliers	1			3			0			
	mean (n)	110.27			110.60			111.47			
	st.dev. (n)	0.142			0.041			0.460			
	R(calc.)	0.40			0.12			1.29			
	R(D850:11)	0.58			0.16			0.46			

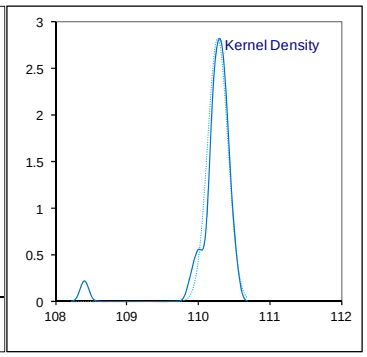
Lab 323: first reported 110.8
Lab 334: first reported 113.3
Lab 902: first reported 109.9, 110.9

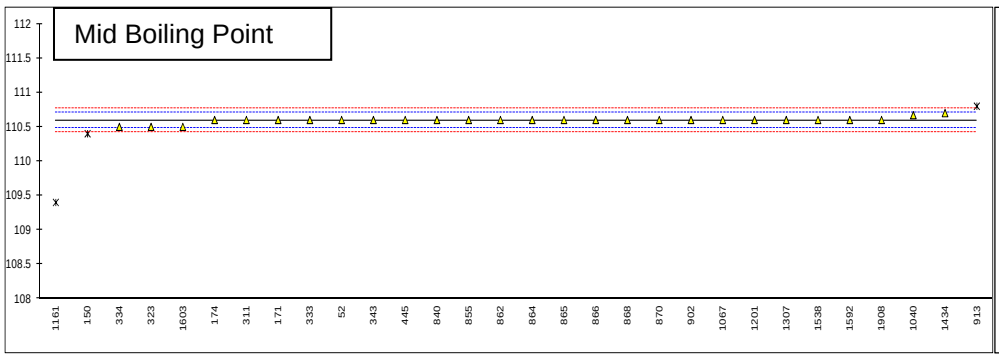
Theoretical boiling mid point = 110.6ºC

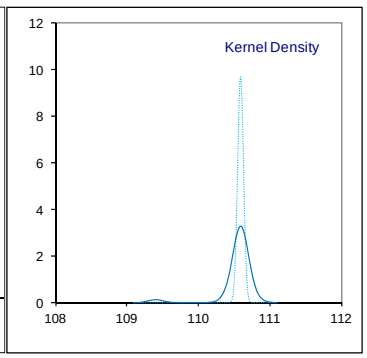
After manual correction:

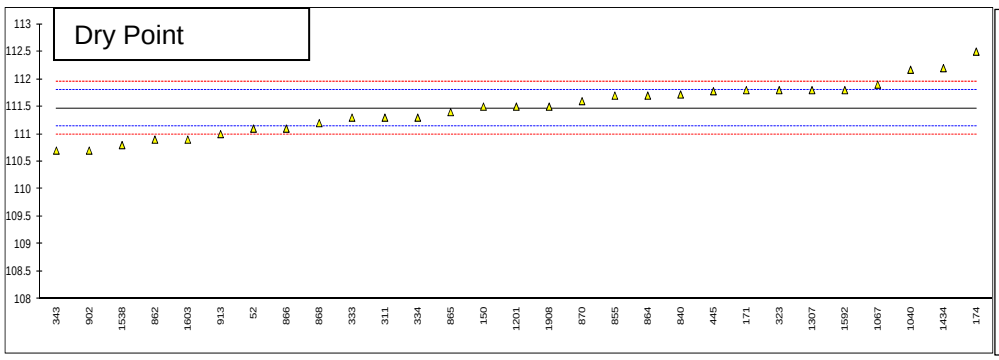
150	D850-A	110.1		-0.81	110.6		0.08	111.7		1.40	
913	D850-M	110.0		-1.29	110.6		0.08	110.8		-4.12	
1161	D850-A	109.6	R(0.05)	-3.22	110.6		0.08	-----		-----	
	normality	OK			not OK			OK			
	n	29			30			29			
	outliers	1			0			0			
	mean (n)	110.27			110.60			111.47			
	st.dev. (n)	0.136			0.039			0.471			
	R(calc.)	0.38			0.11			1.32			
	R(D850:11)	0.58			0.16			0.46			

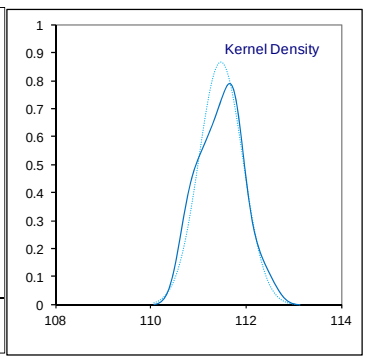

Initial Boiling Point
112
111.5
111
110.5
110
109.5
109
108.5
108
1161 150 343 1201 311 334 171 323 866 913 1434 1603 840 333 52 864 868 902 1067 1307 1592 445 1040 855 862 865 870 1908 174 1538


Kernel Density
3
2.5
2
1.5
1
0.5
0
108 109 110 111 112


Mid Boiling Point
112
111.5
111
110.5
110
109.5
109
108.5
108
1161 150 334 323 1603 174 311 171 333 52 343 445 840 855 862 864 865 866 868 870 902 1067 1201 1307 1538 1592 1908 1040 1434 913

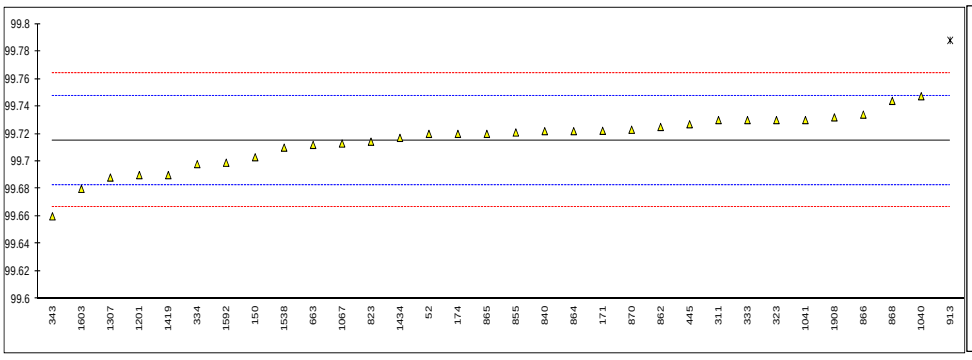

Kernel Density
12
10
8
6
4
2
0
108 109 110 111 112

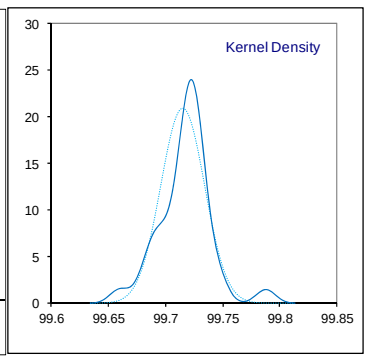

Dry Point
113
112.5
112
111.5
111
110.5
110
109.5
109
108.5
108
343 902 1538 862 1603 913 52 866 868 333 311 334 865 150 1201 1908 870 855 864 840 445 171 323 1307 1592 1067 1040 1434 174


Kernel Density
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
108 110 112 114

Determination of Purity on Toluene sample #14012; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	99.72		0.29	
131		-----		-----	
150	D2360	99.703	C	-0.76	First reported 99.921
171	D2360	99.722		0.43	
174	D2360	99.72		0.29	
311	D2360	99.73		0.90	
323	D2360	99.73		0.90	
333	D2360	99.73		0.90	
334	D2360	99.698		-1.06	
343	D2360	99.66		-3.40	
445	D6826	99.7270		0.72	
551		-----		-----	
555		-----		-----	
663	D2360	99.712		-0.20	
823	D2360	99.7143		-0.06	
840	D2360	99.722		0.41	
855	D7504	99.721		0.35	
862	D2360	99.725		0.60	
864	D7504	99.722		0.41	
865	D7504	99.720		0.29	
866	D2360	99.734		1.15	
868	D2360	99.744		1.77	
870	D7504	99.723		0.47	
902		-----		-----	
913	D2360	99.788	R(0.05)	4.47	
1040	D2360	99.7474		1.97	
1041	D2360	99.730		0.90	
1067	in house	99.713		-0.14	
1161		-----		-----	
1201	D2360	99.69		-1.55	
1307	in house	99.6882	C	-1.67	First reported 99.4674
1419	D6526	99.69		-1.55	
1434	D2360	99.7171		0.11	
1538	D2360	99.71		-0.33	
1592	D2360	99.699		-1.00	
1603	in house	99.68		-2.17	
1866		-----		-----	
1908	D2360	99.732		1.03	
	normality	suspect			
	n	31			
	outliers	1			
	mean (n)	99.7153			
	st.dev. (n)	0.01911			
	R(calc.)	0.0535			
	R(D6526:12)	0.0455			Compare R(D2360:11) = 0.0210 (see §4.1)

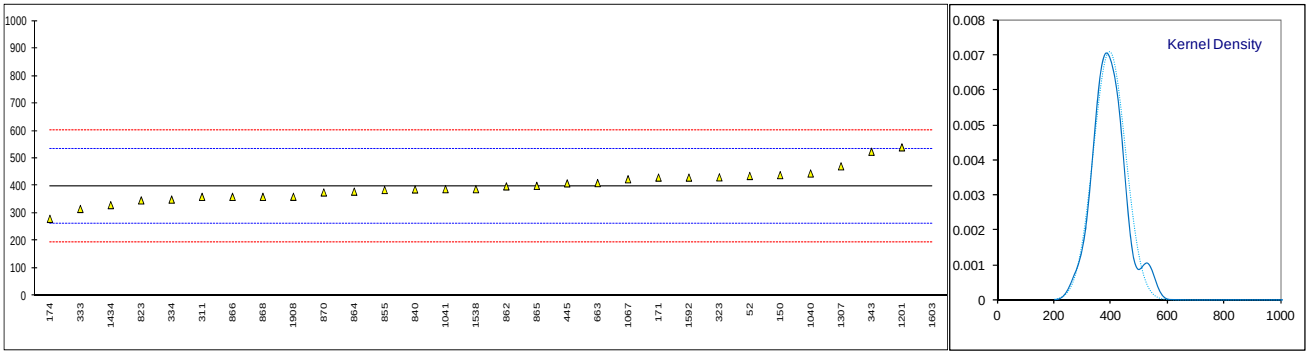




Determination of Nonaromatics on Toluene sample #14012; results in mg/kg

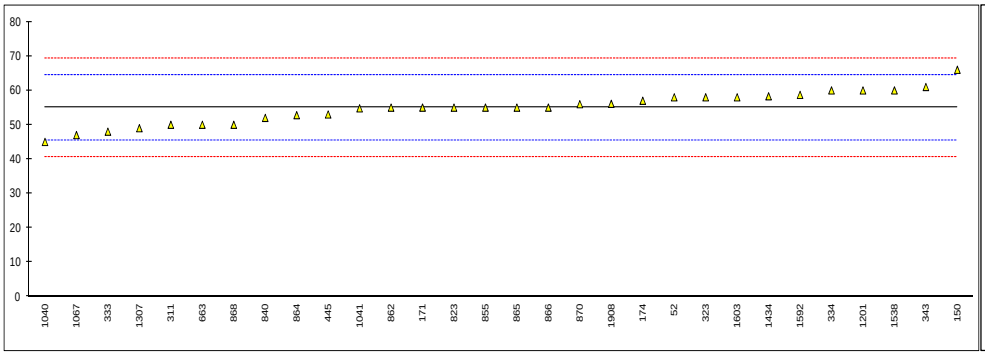
lab	method	value	mark	z(targ)	remarks
52	D7504	436		0.55	
131		-----		-----	
150	D2360	439		0.60	
171	D2360	430	C	0.46	Reported probably in a deviating unit (%M/M instead of mg/kg)
174	D2360	280		-1.74	
311	D2360	360		-0.56	
323	D2360	431		0.48	
333	D2360	316		-1.21	
334	D2360	350	C	-0.71	Reported probably in a deviating unit (%M/M instead of mg/kg)
343	D2360	524		1.85	
445	D6826	409		0.16	
551		-----		-----	
555		-----		-----	
663	D2360	410		0.17	
823	D2360	347		-0.76	
840	D2360	387		-0.17	
855	D7504	385		-0.20	
862	D2360	398		-0.01	
864	D7504	379		-0.28	
865	D7504	400		0.02	
866	D2360	360		-0.56	
868	D2360	360		-0.56	
870	D7504	376		-0.33	
902		-----		-----	
913		-----		-----	
1040	D2360	445		0.69	
1041	D2360	387.9		-0.15	
1067	in house	424		0.38	
1161		-----		-----	
1201	D2360	540		2.08	
1307	in house	471	C	1.07	First reported 5131
1419		-----		-----	
1434	D2360	330		-1.00	
1538	D2360	388		-0.15	
1592	D2360	430		0.46	
1603	in house	2805	R(0.01)	35.37	
1866		-----		-----	
1908	D2360	360.2		-0.56	

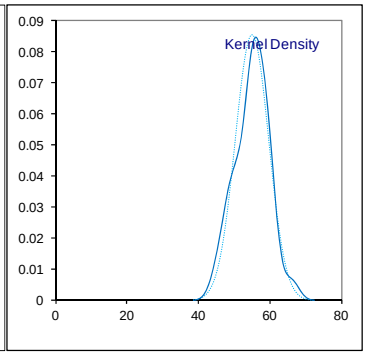
normality	suspect
n	29
outliers	1
mean (n)	398.38
st.dev. (n)	56.079
R(calc.)	157.02
R(D2360:11)	190.53



Determination of Benzene on Toluene sample #14012; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D7504	58		0.63	
131		-----		-----	
150	D2360	66		2.30	
171	D2360	55		0.01	
174	D2360	57		0.42	
311	D2360	50		-1.03	
323	D2360	58		0.63	
333	D2360	48		-1.45	
334	D2360	60	C	1.05	Reported probably in a deviating unit (%M/M instead of mg/kg)
343	D2360	61		1.26	
445	D6826	53		-0.41	
551		-----		-----	
555		-----		-----	
663	D2360	50		-1.03	
823	D2360	55		0.01	
840	D2360	52		-0.61	
855	D7504	55		0.01	
862	D2360	55		0.01	
864	D7504	52.8		-0.45	
865	D7504	55		0.01	
866	D2360	55		0.01	
868	D2360	50		-1.03	
870	D7504	56		0.22	
902		-----		-----	
913		-----		-----	
1040	D2360	45		-2.07	
1041	D2360	54.78		-0.04	
1067	in house	47		-1.65	
1161		-----		-----	
1201	D2360	60		1.05	
1307	in house	49		-1.24	
1419		-----		-----	
1434	D2360	58.3		0.70	
1538	D6526	60		1.05	
1592	D2360	58.7		0.78	
1603	in house	58		0.63	
1866		-----		-----	
1908	D2360	56.1		0.24	
	normality	OK			
	n	30			
	outliers	0			
	mean (n)	54.96			
	st.dev. (n)	4.667			
	R(calc.)	13.07			
	R(Horwitz)	13.47			





APPENDIX 2

Number of participants in the Benzene PT

3 labs in	BELGIUM
1 lab in	BOSNIA and HERZEGOVINA
2 labs in	BRAZIL
1 lab in	BULGARIA
1 lab in	CANADA
3 labs in	FRANCE
3 labs in	GERMANY
2 labs in	INDIA
1 lab in	ISRAEL
1 lab in	KOREA
1 lab in	KUWAIT
1 lab in	MALAYSIA
10 labs in	P.R. of CHINA
1 lab in	POLAND
1 lab in	PORTUGAL
2 labs in	SAUDI ARABIA
2 labs in	SPAIN
1 lab in	TAIWAN ROC
1 lab in	THAILAND
7 labs in	THE NETHERLANDS
1 lab in	TURKEY
1 lab in	U.A.E.
4 labs in	U.S.A.
2 labs in	UNITED KINGDOM

Number of participants in the Toluene PT

2 labs in	BELGIUM
2 labs in	BRAZIL
1 lab in	CANADA
2 labs in	FRANCE
3 labs in	GERMANY
1 lab in	INDIA
1 lab in	ISRAEL
1 lab in	KOREA
9 labs in	P.R. of CHINA
1 lab in	POLAND
1 lab in	SAUDI ARABIA
1 lab in	SLOVAKIA
1 lab in	SPAIN
1 lab in	THAILAND
3 labs in	THE NETHERLANDS
2 labs in	TURKEY
4 labs in	U.S.A.
1 lab in	UNITED KINGDOM
1 lab 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
R(0.01)	= outlier in Rosner's outlier test
R(0.05)	= straggler in Rosner's outlier test
fr	= first reported
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/).
16	Bernard Rosner, Percentage Points for a Generalized ESD Many-Outlier Procedure, *Technometrics*, 25(2), pp. 165-172, (1983)