Results of Proficiency Test
Benzene & Toluene
March 2016

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

Authors: ing. R.J. Starink
Correctors: dr. R.G. Visser & ing. A.S. Noordman-de Neef
Report: iis16C02 & iis16C03

May 2016

-- Empty page --

CONTENTS

1 INTRODUCTION 4

2 SET UP 4

2.1 ACCREDITATION 4

2.2 PROTOCOL 4

2.3 CONFIDENTIALITY STATEMENT 5

2.4 SAMPLES 5

2.5 STABILITY OF THE SAMPLES 6

2.6 ANALYSES 7

3 RESULTS 7

3.1 STATISTICS 7

3.2 GRAPHICS 8

3.3 Z-SCORES 8

4 EVALUATION 9

4.1 EVALUATION PER TEST 9

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES 13

4.3 COMPARISON OF THE PROFICIENCY TEST OF MARCH 2016 WITH PREVIOUS PTs 14

Appendices:

1. Data and statistical results 16
2. Number of participants per country 56
3. Abbreviations and literature 57

1 INTRODUCTION

Since 1999, the Institute for Interlaboratory Studies (iis) organizes proficiency tests for the analysis of Benzene and Toluene every year. In the annual proficiency testing program of 2015/2016, it was decided to continue the proficiency test for the analysis of Benzene in accordance with the latest applicable specification for Benzene: ASTM D2359 and Toluene in accordance with the latest applicable specification for Toluene: ASTM D841. In the interlaboratory study for Benzene 52 laboratories from 20 different countries and for Toluene 41 participants in 20 countries registered for participation. 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 website 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 of the samples for fit-for-use and homogeneity determination were subcontracted to an accredited laboratory. It was decided, depending on the registration, to send one sample of Benzene (1 litre bottle, labelled #16020) and/or one sample of Toluene (1 litre bottle, labelled #16021) to the participants. Participants were requested to report rounded and unrounded test results. The unrounded test results were preferably used for statistical evaluation

2.1 ACCREDITATION

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

2.2 PROTOCOL

The protocol followed in the organisation of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of April 2014 (iis-protocol, version 3.3). This protocol can be downloaded from the iis website www.iisnl.com, from the FAQ page.

2.3 CONFIDENTIALITY STATEMENT

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

2.4 SAMPLES

BENZENE

The necessary bulk material of Benzene was obtained from a local chemical supplier. The approximately 75 kg was spiked with 635.8 mg 1-Methyl-2-Pyrrolidinone (for the Nitrogen determination), 346.2 mg o-Chlorotoluene (for the Organic Chlorides determination) and 1753.4 mg Methylcyclohexane. The bulk sample was, after homogenisation, divided over 84 amber glass bottles of 1 litre, labelled #16020. The homogeneity of the subsamples #16020 was checked by determination of Density at 20°C in accordance with ASTM D4052, Toluene in accordance with ASTM D4492 and Total Nitrogen in accordance with ASTM D6069 on 8 stratified randomly selected samples.

	Density at 20°C in kg/L	Toluene in mg/kg	Total Nitrogen in mg/kg
sample #16020-1	0.87893	251	1.39
sample #16020-2	0.87894	251	1.37
sample #16020-3	0.87894	249	1.37
sample #16020-4	0.87895	248	1.37
sample #16020-5	0.87894	252	1.36
sample #16020-6	0.87894	248	1.37
sample #16020-7	0.87893	248	1.37
sample #16020-8	0.87893	248	1.37

Table 1: homogeneity test results of Benzene sub samples #16020

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

	Density at 20°C in kg/L	Toluene in mg/kg	Total Nitrogen in mg/kg
r (observed)	0.00002	5	0.02
Reference test method	ISO12185:96	ASTM 4492:10	ASTM D6069:01
0.3*R (reference test method)	0.00015	35	0.20

Table 2: evaluation of repeatabilities of subsamples #16020

The calculated repeatabilities for sample #16020 were in agreement with 0.3 times the corresponding reproducibilities of the reference test methods. 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, after homogenisation, was divided over 56 brown glass bottles of 1 litre and labelled #16021. The homogeneity of the subsamples #16021 was checked by determination of Density at 20ºC, according to ASTM D4052 on 8 stratified randomly selected samples.

Toluene	Density at 20°C in kg/L
sample #16021-1	0.86677
sample #16021-2	0.86677
sample #16021-3	0.86676
sample #16021-4	0.86677
sample #16021-5	0.86677
sample #16021-6	0.86677
sample #16021-7	0.86677
sample #16021-8	0.86677

Table 3: homogeneity test results of Toluene subsamples #16021

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

	Density at 20°C in kg/L
r (observed)	0.00001
Reference test method	ISO12185:96
0.3*R (reference test method)	0.00015

Table 4: evaluation of repeatability of subsamples #16021

The calculated repeatability on Density for sample #16021 was in agreement with 0.3 times the corresponding reproducibility of the reference test method. 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 #16020 and/or one 1 litre bottle of Toluene labelled #16021 were sent on February 17, 2016.

2.5 STABILITY OF THE SAMPLES

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

2.6 ANALYSES

The participants were requested to determine on the Benzene sample #16020: Acid Wash Color, Acidity, Appearance, Bromine Index, Total Chlorides, Organic Chlorides, Color Pt-Co, Density at 20°C, Distillation, Total Nitrogen, Purity, Methylcyclohexane, Toluene, Nonaromatics and Solidification Point.
On Toluene sample #16021 was requested: Acid Wash Color, Appearance, Color Pt-Co, Copper Corrosion, Density at 20°C, Distillation, Purity, Benzene, Nonaromatics and Refractive index.

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

3 RESULTS

During five weeks after sample dispatch, the test results of the individual laboratories were gathered via the data entry portal www.kpmd.co.uk/sgs-iis/. The reported test results are tabulated per determination in appendix 1 of this report. The laboratories are presented by their code numbers.
Directly after the deadline, a reminder was sent to those laboratories that had not reported test results at that moment. Shortly after the deadline, the available test results were screened for suspect data. A test result was called suspect in case the Huber Elimination Rule (a robust outlier test) found it to be an outlier. The laboratories that produced these suspect data were asked to check the raw data of these tests (no reanalysis). Additional or corrected test results are used for data analysis and the original test results are placed under the test result tables in appendix 1. Test results that came in after the deadline were not taken into account in this screening for suspect data and thus these participants were not requested for checks.

3.1 STATISTICS

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report ‘iis Interlaboratory Studies: Protocol for the Organization, Statistics and Evaluation’ of April 2014 (iis-protocol, version 3.3). For the statistical evaluation the *unrounded* (when available) test results were used instead of the rounded test results. Test results reported as ‘<…’ or ‘>…’ were not used in the statistical evaluation.

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

In accordance with ISO 5725 the original test results per determination were submitted to Dixon's, Grubbs' and/or Rosner's outlier tests. Outliers are marked by D(0.01) for the Dixon test, by G(0.01) or DG(0.01) for the Grubbs test and by R(0.01) for the Rosner's test. Stragglers are marked by D(0.05) for the Dixon test, by G(0.05) or DG(0.05) for the Grubbs test and by R(0.05) for the Rosner test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.

For each assigned value, the uncertainty was determined in accordance with ISO13528. Subsequently the calculated uncertainty was evaluated against the respective requirement based on the target reproducibility in accordance with ISO13528. When the uncertainty passed the evaluation, no remarks are made in the report. However, when the uncertainty failed the evaluation it is mentioned in the report and it will have consequences for the evaluation of the test results.

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

3.2 GRAPHICS

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

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 results in an evaluation independent of the variation of this interlaboratory study. The target standard deviation was calculated from the literature reproducibility by division with 2.8. In case no literature reproducibility was available, other target values were used. In some cases, a reproducibility based on former iis proficiency tests could be used.

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

The z-scores were calculated in accordance with:

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

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

Absolute values for z<2 are very common and absolute values for z>3 are very rare.
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, Portugal and United Kingdom did receive the samples late or not at all due to several reasons. For samples #16020 (Benzene) and #16021 (Toluene), respectively five and four participants did not report any test results and four (two for Benzene and two for Toluene) other laboratories reported the test results after the final reporting date.
Finally, for sample #16020 (Benzene) and sample #16021 (Toluene) in total 793 results were submitted. Observed were in total 19 outlying results, which is 2.4%. In proficiency studies, outlier percentages of 3% - 7.5% are normal.

4.1 EVALUATION PER SAMPLE AND TEST

In this section, the test 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.

In the iis PT reports, ASTM methods are referred to with a number (e.g. D5808) and an added designation for the year that the method was adopted or revised (e.g. D5808:09a). If applicable, a designation in parentheses is added to designate the year of reapproval (e.g. D5808:09a(2014)). In the results tables of Appendix 1 only the method number and year of adoption or revision e.g. D5808:09a will be used.

Not all original data sets proved to have a normal Gaussian distribution. These are referred to as “not OK” or “suspect”. The statistical evaluation of these data sets should be used with due care, see also paragraph 3.1.

For Benzene sample #16020

Acid Wash Color: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ASTM D848:14.

For the statistical analysis, the result expressed as y- or x+ was changed into a numerical value as follows: y- changed into y-0.25 and x+ into x+0.25.

Acidity: This determination was not problematic. The majority of laboratories report “no free acid” (NFA) or 0 mg NaOH/100 ml in accordance with ASTM D847:15.

Appearance: No analytical problems were observed. All labs agreed about the appearance of the sample #16020, which was bright, clear and free of suspended matter (Pass).

Bromine Index: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D5776:14a.

Total Chlorides: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D5194:13. The average recovery of Organic Chloride (theoretical increment of 1.30 mg/kg) may be good: “less than <102%” (the actual blank is unknown).

Organic Chlorides: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ASTM D5808:09a(2014). The average recovery of Organic Chloride (theoretical increment of 1.30 mg/kg) may be satisfactory: “less than 86%” (the actual blank is unknown).

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) and of ASTM D5386:10.

Density at 20°C: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ISO12185:96.

Distillation: This determination was not problematic. In total five statistical outliers were observed. However, all calculated reproducibilities after rejection of the statistical outliers are in good agreement with the requirements of ASTM D850:11 (Manual mode).
From the reported results of the 50% recovered, it appears that one participant probably did not correct the results for barometric pressure and thermometer inaccuracy as described in ASTM D850 (paragraph 11).

Total Nitrogen: This determination was problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D6069:01(2006). However,

the calculated reproducibility is in agreement with the less strict requirements of ASTM D4629:12.
The average recovery of Total Nitrogen (theoretical increment of 1.20 mg/kg) may be good: “less than 104%” (the actual blank is unknown).

Purity: This determination was problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the estimated reproducibility of ASTM D4492:10.

Methylcyclohexane: This determination may not be problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the estimated reproducibility calculated using the Horwitz equation. The average recovery of Methylcyclohexane (theoretical increment of 23.5 mg/kg) may be good: “less than 100%” (the actual blank is unknown).
It is remarkable that twenty-seven of the thirty-three laboratories used ASTM D4492, a method which may be not applicable for the determination of Methylcyclohexane, while only four laboratories used ASTM D5713 a method that is suitable for the determination of methyl Cyclohexane in benzene.

Toluene: This determination was not problematic. One statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D4492:10.

Nonaromatics: This determination was problematic for a number of participants. Two 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.

Solidification Point: This determination is not problematic. No statistical outliers were observed. The calculated reproducibility is in full agreement with the requirements of ASTM D852:13.

For Toluene sample #16021

Acid Wash Color: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D848:14.
For the statistical analysis, the result expressed as y- or x+ was changed into numerical values as follows: y- changed into y-0.25 and x+ into x+0.25.

Appearance: No analytical problems were observed. All labs agreed about the appearance of the sample #16021, which was bright, clear and free of suspended matter (Pass).

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). One participant reported a result according ASTM D156, which is Saybolt Color.

Copper Corrosion: No problems have been observed. All participants agreed on a result of 1 or 1A.

Density at 20°C: This determination was not problematic. One statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ISO12185:96.

Distillation: This determination was not problematic. In total only one statistical outlier was observed. All calculated reproducibilities after rejection of the statistical outlier, are in agreement with the requirements of ASTM D850:11 (automated mode).
From the reported test results of the 50% recovered, it appears that one participant obviously did not correct the results for barometric pressure and thermometer inaccuracy as described in ASTM D850 (paragraph 11).

Purity: This determination was not problematic. One statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D2360:11.

Benzene: This determination may not be problematic. One statistical outlier was observed. However the calculated reproducibility after rejection of the statistical outlier is in full agreement with the estimated reproducibility limit calculated using the Horwitz equation.

Nonaromatics: 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 D2360:11.

Refractive Index: This determination was problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D1218:12.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the relevant reference test method and the reproducibility as found for the group of participating laboratories. The 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		42	0.8 (1-)	0.6	2.2
Acidity	mg NaOH/100ml	38	NFA	n.a.	n.a.
Appearance		40	Pass	n.a.	n.a.
Bromine Index	mg Br/100g	35	2.4	2.8	4.6
Total Chlorides	mg/kg	5	1.33	0.79	0.90
Organic Chlorides	mg/kg	26	1.11	0.49	1.30
Color Pt-Co		31	4.9	3.1	7.0
Density at 20ºC	kg/L	42	0.8790	0.0002	0.0005
Distillation, IBP	°C	29	79.8	0.1	0.4
Distillation, 50% rec.	°C	30	80.1	0.1	0.4
Distillation, DP	°C	29	80.2	0.2	0.4
Total Nitrogen	mg/kg	29	1.24	0.66	0.48
Purity	%M/M	43	99.968	0.006	0.005
Methylcyclohexane	mg/kg	33	23.6	6.5	6.6
Toluene	mg/kg	43	242	61	104
Nonaromatics	mg/kg	41	73	36	34
Solidification Point	°C	27	5.48	0.05	0.05

Table 5: reproducibilities on Benzene sample #16020

Parameter	unit	n	average	2.8 *sd_R	R (lit)
Acid Wash Color		33	0.7 (1-)	0.5	2.0
Appearance		31	Pass	n.a.	n.a.
Color Pt-Co		22	3.0	3.6	7.0
Copper corrosion		25	1 (1A)	n.a.	n.a.
Density at 20ºC	kg/L	34	0.8668	0.0001	0.0005
Distillation, IBP	°C	29	110.2	0.5	0.6
Distillation, 50% rec.	°C	28	110.6	0.1	0.2
Distillation, DP	°C	29	110.8	0.3	0.5
Purity	%M/M	33	99.933	0.019	0.021
Benzene	mg/kg	33	72	17	17
Nonaromatics	mg/kg	29	541	111	259
Refractive Index at 25°C		17	1.4939	0.0006	0.0005

Table 6: reproducibilities on Toluene sample #16021

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 MARCH 2016 WITH PREVIOUS PTS

	March 2016	February 2015	February 2014	April 2013
Total Number of reporting labs	59	51	58	41
Number of results reported	793	729	800	686
Statistical outliers	19	15	36	27
Percentage outliers	2.4%	2.1%	4.5%	3.9%

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:

	March 2016	February 2015	February 2014	April 2013
Acid Wash Color	++	++	n.e.	n.e.
Acidity	n.e.	n.e.	n.e.	n.e.
Appearance	n.e.	n.e.	n.e.	n.e.
Bromine Index	++	+	+	+
Total Chloride	+	+	++	--
Organic Chloride	++	++	++	+
Color Pt-Co	++	++	++	++
Density at 20ºC	++	++	++	++
Distillation, IBP	++	+	+/-	++
Distillation, 50%	++	++	+	++
Distillation, DP	+	+	--	+
Total Nitrogen	--	-	-	+/-
Purity	-	+/-	--	+
Methylcyclohexane	+/- *)	n.e.	n.e.	-- *)
Toluene	++	+	++	++
Nonaromatics	+/-	-	+	--
Solidification Point	+/-	+/-	--	+/-

Table 8: comparison determinations on Benzene against the standards
*) against the strict Horwitz equation

	March 2016	February 2015	February 2014	April 2013
Acid Wash Color	++	++	+/-	n.e.
Appearance	n.e.	n.e.	n.e.	n.e.
Color Pt-Co	++	+	++	++
Copper Corrosion	n.e.	n.e.	n.e.	n.e
Density at 20 ºC	++	++	++	++
Distillation, IBP	+	++	++	-
Distillation, 50%	+	+	+	-
Distillation, DP	+	-	--	++
Purity	+	+	-	+/-
Benzene	+/- *)	+ *)	+/- *)	- *)
Nonaromatics	++	+	++	++
Refractive Index at 25°C	-	n.e.	n.e.	n.e.

Table 9: comparison determinations on Toluene against the standards
*) 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

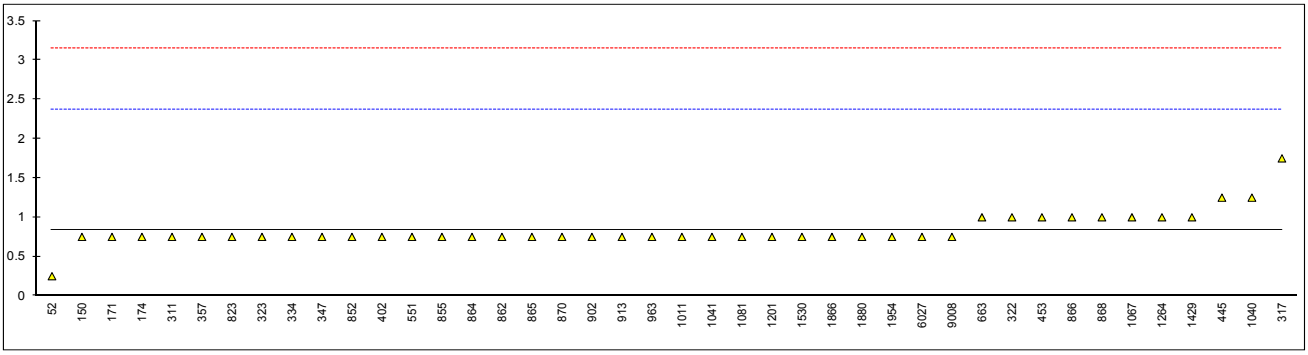
APPENDIX 1

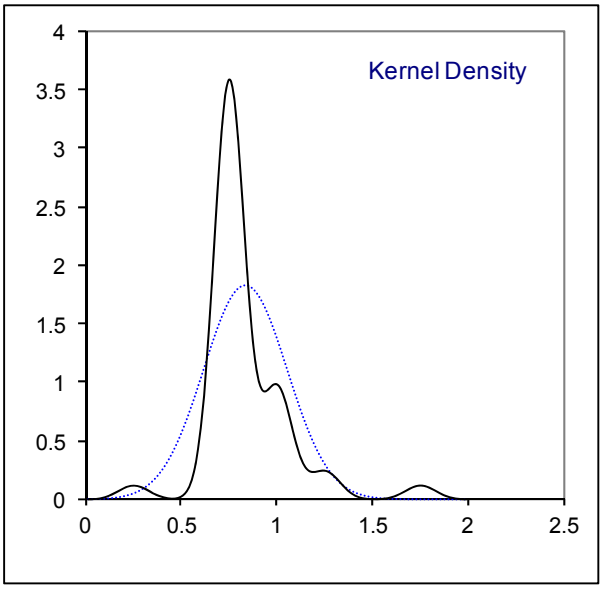
Determination of Acid Wash Color (acid layer) on Benzene sample #16020

lab	method	value	mark	z(targ)	remarks
52	D848	0+		-0.76	
150	D848	1-		-0.11	
171	D848	1-		-0.11	
174	D848	1-		-0.11	
311	D848	1-		-0.11	
317	D848	2-		1.19	
322	D848	1		0.22	
323	D848	1-		-0.11	
333		-----		-----	
334	D848	1-		-0.11	
336		-----		-----	
347	D848	1-		-0.11	
357	D848	1-		-0.11	
402	D848	1-		-0.11	
444		-----		-----	
445	D848	1+		0.54	
453	D848	1		0.22	
551	D848	1-		-0.11	
555		-----		-----	
663	D848	1		0.22	
823	D848	1-		-0.11	
852	D848	1-		-0.11	
855	D848	1-		-0.11	
862	D848	1-		-0.11	
864	D848	1-		-0.11	
865	D848	1-		-0.11	
866	D848	1		0.22	
868	D848	1		0.22	
870	D848	1-		-0.11	
902	D848	1-		-0.11	
912		-----		-----	
913	D848	<1.0		-0.11	
963	D848	1-		-0.11	
1011	D848	1-		-0.11	
1040	D848	1+		0.54	
1041	D848	1-		-0.11	
1067	D848	1		0.22	
1081	D848	1-		-0.11	
1117		-----		-----	
1151		-----		-----	
1201	D848	1-		-0.11	
1264	D848	1		0.22	
1429	D848	1		0.22	
1467		-----		-----	
1530	D848	< 1		-0.11	
1823		-----		-----	
1846		-----		-----	
1866	D848	1-		-0.11	
1880	D848	<1		-0.11	
1954	D848	<1		-0.11	
6027	D848	1-		-0.11	
9008	D848	-1		-0.11	

normality	not OK
n	42
outliers	0
mean (n)	0.83 (1-)
st.dev. (n)	0.219
R(calc.)	0.61
R(D848:14)	2.16

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


3.5
3
2.5
2
1.5
1
0.5
0
52
150
171
174
311
357
823
323
334
347
852
402
551
855
864
862
865
870
902
913
963
1011
1041
1081
1201
1530
1866
1880
1954
6027
9008
663
322
453
866
868
1067
1284
1429
445
1040
317


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

Determination of Acidity on Benzene sample #16020; results in mg NaOH per 100mL

lab	method	value	mark	z(targ)	remarks
52	D847	Nil		-----	
150	D847	NFA		-----	
171	D847	NFA		-----	
174	D847	NFA		-----	
311	D847	pass		-----	
317		-----		-----	
322		-----		-----	
323	D847	NFANEOA		-----	
333		-----		-----	
334		-----		-----	
336		-----		-----	
347	D847	No free acid		-----	
357	D847	No free acid		-----	
402	D847	lipsa		-----	
444		-----		-----	
445	D847	No free acid		-----	
453	D847	nil		-----	
551		-----		-----	
555		-----		-----	
663	D847	No free acid		-----	
823	D847	no free acid		-----	
852	D847	No free acid		-----	
855	D847	No free acid		-----	
862	D847	No free acid		-----	
864	D847	No Free Acid		-----	
865	D847	No free acid		-----	
866	D847	Pass		**-----**	
868	D847	No Free Acid		-----	
870	D847	No Free Acid		-----	
902	D847	NFA		-----	
912		-----		-----	
913	D847	NIL		-----	
963	D847	No Free Acid		-----	
1011	D847	Nill		-----	
1040		-----		-----	
1041		-----		-----	
1067		-----		-----	
1081	D847	0		-----	
1117	D847	0.08		-----	
1151		-----		-----	
1201	D847	Pass		-----	
1264	D847	Nil		-----	
1429	D847	NFA		-----	
1467		-----		-----	
1530		-----		-----	
1823	D847	No Free acid		-----	
1846		-----		-----	
1866	D847	NFA		-----	
1880	D847	NFA		-----	
1954	D847	Not detectable		-----	
6027	D847	No free Acid		-----	
9008	D847	nfa		-----	
	normality	n.a.			
	n	38			
	outliers	n.a.			
	mean (n)	No acid present			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	R(D847:15)	n.a.			

Abbreviation
NFA = No free acid
NFANEOA = No free acid, no evidence of acidity

Determination of Appearance on Benzene sample #16020

lab	method	value	mark	z(targ)	remarks
52	D4176	Pass		-----	
150	E2680	Pass		-----	
171	D4176	Pass		-----	
174	E2680	PASS		-----	
311	INH-402	bright & clear		-----	
317	E2680	pass		-----	
322	D4176	pass		-----	
323	E2680	clear and bright		-----	
333		-----		-----	
334		-----		-----	
336		-----		-----	
347	E2680	Pass		-----	
357	E2680	Pass		-----	
402		-----		-----	
444	E2680	Pass		-----	
445	E2680	C & B		-----	
453	D4176	c&b		-----	
551	E2680	Pass		-----	
555		-----		-----	
663	Visual	CLFSH		-----	
823	E2680	Pass		-----	
852	E2680	Pass		-----	
855	E2680	Pass		-----	
862	E2680	PASS		-----	
864	E2680	Pass		-----	
865	E2680	clear and bright		-----	
866	E2680	Pass		-----	
868	E2680	Pass		-----	
870	E2680	Pass		-----	
902	E2680	PASS		-----	
912		-----		-----	
913	E2680	CLEAR		-----	
963	E2680	Pass		-----	
1011	Visual	Clear		-----	
1040	Visual	C&B		-----	
1041		-----		-----	
1067	E2680	Pass		-----	
1081		-----		-----	
1117	D4176	pass		-----	
1151		-----		-----	
1201	D4176	Bright & Clear		-----	
1264	Visual	Clear & Bright		-----	
1429	E2680	C&B		-----	
1467		-----		-----	
1530		-----		-----	
1823	D4176	CFFSM		-----	
1846		-----		-----	
1866	Visual	Clear		-----	
1880	Visual	Clear		-----	
1954	Visual	CCL		-----	
6027	Visual	clear		-----	
9008	Visual	Clear		-----	
	normality	n.a.			
	n	40			
	outliers	n.a.			
	mean (n)	Pass (C&B)			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	R(E2680:09e1)	n.a.			

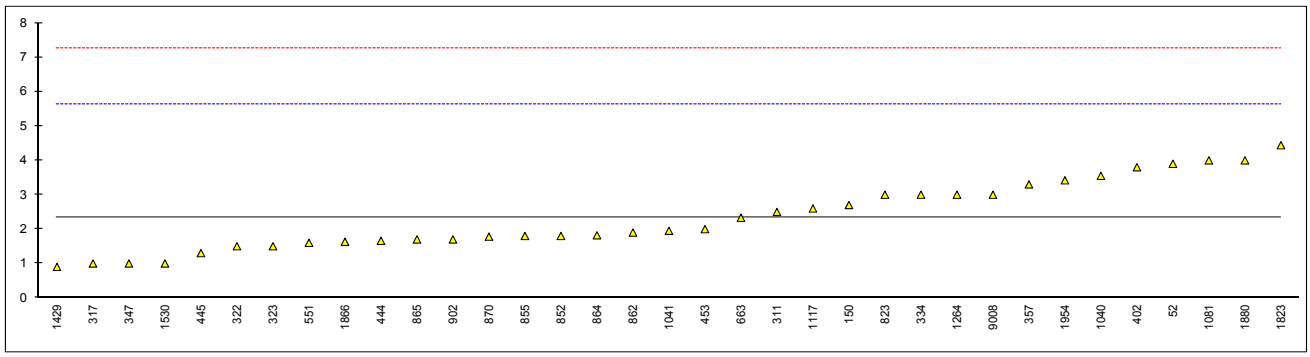
Abbreviations:

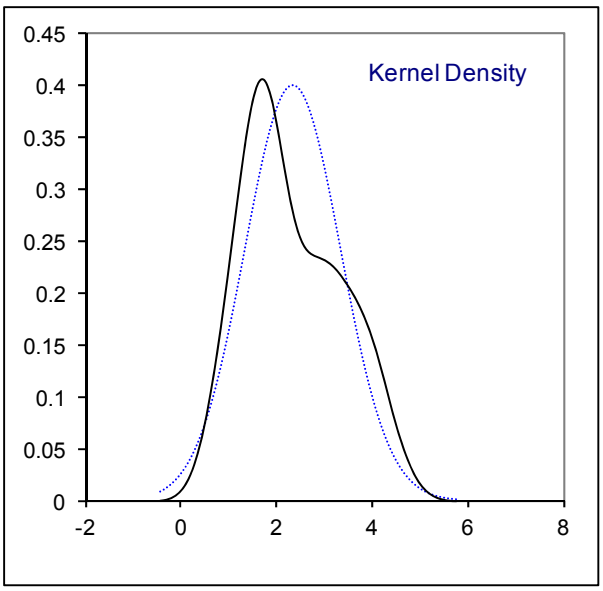
C&B	= clear and bright
C&F	= clear and free
CFFSM	= clear and free from suspended matter/water
CLFSH	= clear liquid free from sediment and haze

Determination of Bromine Index on Benzene sample #16020; results in mg Br/100g

lab	method	value	mark	z(targ)	remarks
52	D1492	3.9		0.95	
150	D1492	2.7		0.22	
171		-----		-----	
174		-----		-----	
311	D5776	2.5		0.09	
317	D5776	1.0	C	-0.82	First reported <0.5
322	D5776	1.5	C	-0.51	First reported <0.5
323	D5776	1.5		-0.51	
333		-----		-----	
334	D5776	3		0.40	
336		-----		-----	
347	D5776	1.0		-0.82	
357	D5776	3.3		0.58	
402	D5776	3.8		0.89	
444	D5776	1.66		-0.42	
445		1.3		-0.64	
453	D1492	2		-0.21	
551	D5776	1.6		-0.45	
555		-----		-----	
663	D5776	2.33		-0.01	
823	D1492	3		0.40	
852	D5776	1.8		-0.33	
855	D5776	1.8		-0.33	
862	D5776	1.9		-0.27	
864	D5776	1.82		-0.32	
865	D5776	1.7		-0.39	
866	D5776	<10		-----	
868	D5776	<10		-----	
870	D5776	1.78		-0.34	
902	D5776	1.7		-0.39	
912		-----		-----	
913		-----		-----	
963		-----		-----	
1011		-----		-----	
1040	DIN51774	3.55		0.73	
1041	DIN51774	1.95		-0.24	
1067		-----		-----	
1081	D1492	4.0		1.01	
1117	D1492	2.6		0.16	
1151		-----		-----	
1201		-----		-----	
1264	D1492	3		0.40	
1429	D2710	0.9		-0.88	
1467		-----		-----	
1530	DIN51774	1		-0.82	
1823	D1492	4.44		1.28	
1846		-----		-----	
1866	D5776	1.63		-0.44	
1880	D1492	4.0		1.01	
1954	D2710	3.42		0.65	
6027		-----		-----	
9008	D1492	3		0.40	

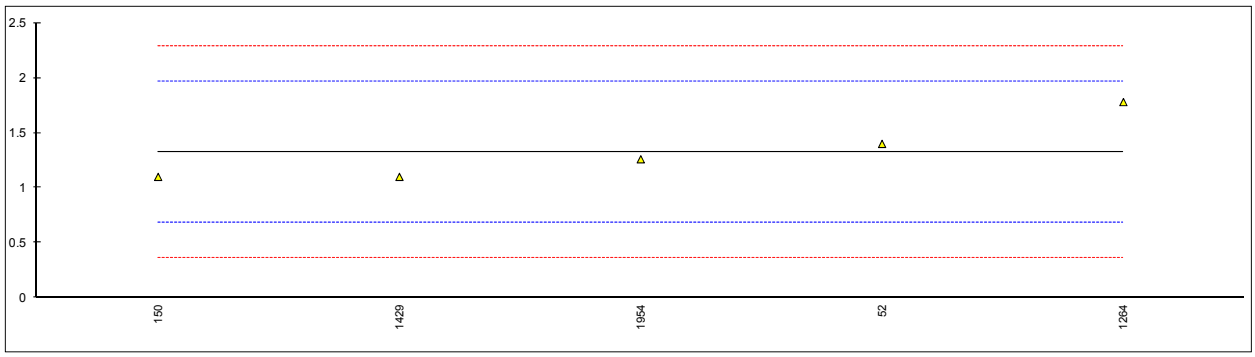
normality	OK
n	35
outliers	0
mean (n)	2.35
st.dev. (n)	0.999
R(calc.)	2.80
R(D5776:14a)	4.60


8
7
6
5
4
3
2
1
0
1429
317
347
1530
445
322
323
551
1866
444
865
902
870
855
852
864
862
1041
453
663
311
1117
150
823
334
1264
9008
357
1954
1040
402
52
1081
1880
1823


Kernel Density
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-2
0
2
4
6
8

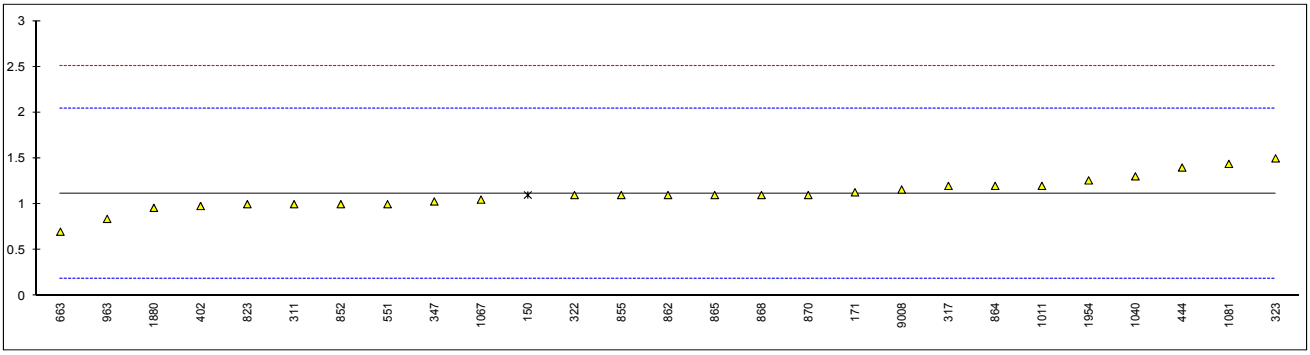
Determination of Chlorides, Total on Benzene sample #16020; results in mg/kg

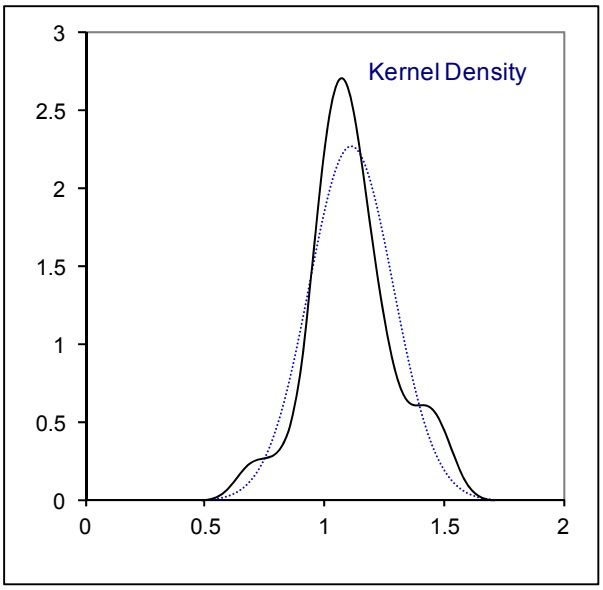
lab	method	value	mark	z(targ)	remarks
52	D5194	1.4		0.22	
150	D7359	1.1		-0.71	
171		-----		-----	
174		-----		-----	
311		-----		-----	
317		-----		-----	
322		-----		-----	
323		-----		-----	
333		-----		-----	
334		-----		-----	
336		-----		-----	
347		-----		-----	
357		-----		-----	
402		-----		-----	
444		-----		-----	
445		-----		-----	
453		-----		-----	
551		-----		-----	
555		-----		-----	
663		-----		-----	
823		-----		-----	
852		-----		-----	
855		-----		-----	
862		-----		-----	
864		-----		-----	
865		-----		-----	
866		-----		-----	
868		-----		-----	
870		-----		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963		-----		-----	
1011		-----		-----	
1040		-----		-----	
1041		-----		-----	
1067		-----		-----	
1081		-----		-----	
1117		-----		-----	
1151		-----		-----	
1201		-----		-----	
1264	D5194	1.78		1.41	
1429	D7359	1.1		-0.71	
1467		-----		-----	
1530		-----		-----	
1823		-----		-----	
1846		-----		-----	
1866		-----		-----	
1880		-----		-----	
1954	D5194	1.26		-0.21	
6027		-----		-----	
9008		-----		-----	
	normality	unknown			
	n	5			
	outliers	0	Spike		
	mean (n)	1.328	1.30		Recovery <102%
	st.dev. (n)	0.2820			
	R(calc.)	0.790			
	R(D5194:13)	0.900			


2.5
2
1.5
1
0.5
0
150
1429
1954
52
1264

Determination of Chlorides, Organic on Benzene sample #16020; results in mg/kg

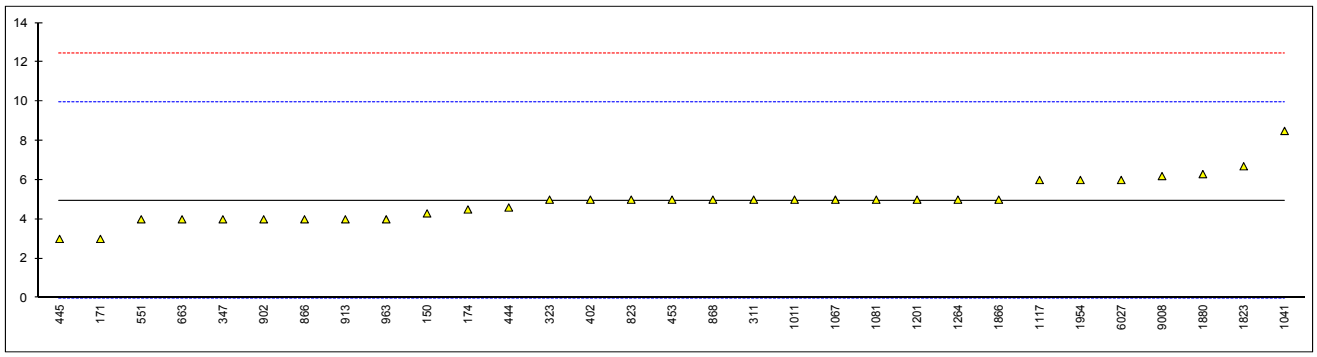
lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D7359	1.1	ex	-0.03	Result exclude as test method is for total chlorides only
171	D7536	1.13	C	0.04	Was reported as total Chlorides, used test method is for org. chlorides
174		-----		-----	
311	D5808	1		-0.24	
317	UOP779	1.2		0.19	
322	UOP779	1.1		-0.03	
323	D5808	1.5		0.83	
333		-----		-----	
334		-----		-----	
336		-----		-----	
347	D5808	1.03		-0.18	
357		-----		-----	
402	D5808	0.98		-0.29	
444	IP510	1.4		0.62	
445		-----		-----	
453		-----		-----	
551	D5808	1		-0.24	
555		-----		-----	
663	D5808	0.7		-0.89	
823	D5808	1		-0.24	
852	D5808	1.0		-0.24	
855	D5808	1.1		-0.03	
862	D5808	1.1		-0.03	
864	D5808	1.2		0.19	
865	D5808	1.1		-0.03	
866		-----		-----	
868	D5808	1.1		-0.03	
870	D5808	1.1		-0.03	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D5808	0.84		-0.59	
1011	D5808	1.2		0.19	
1040	EN14077	1.304		0.41	
1041		-----		-----	
1067	UOP779	1.05		-0.14	
1081	D5808	1.44		0.70	
1117		-----		-----	
1151		-----		-----	
1201		-----		-----	
1264		-----		-----	
1429		-----		-----	
1467		-----		-----	
1530	EN14077	< 1		-----	
1823		-----		-----	
1846		-----		-----	
1866		-----		-----	
1880	D5808	0.96		-0.33	
1954	D5808	1.26		0.32	
6027		-----		-----	
9008	D5808	1.16		0.10	
	normality	OK			
	n	26			
	outliers	0 (+1 excl)	Spike		
	mean (n)	1.114	1.30		Recovery <86%
	st.dev. (n)	0.1757			
	R(calc.)	0.492			
	R(D5808:09a)	1.300			

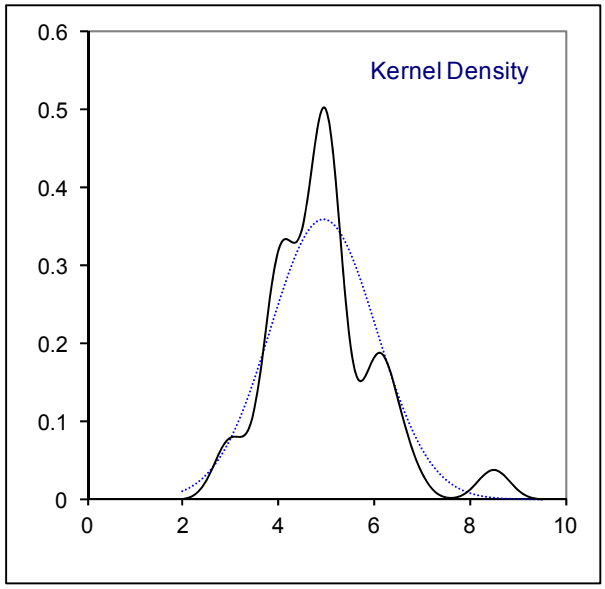

3
2.5
2
1.5
1
0.5
0
663
963
1880
402
823
311
852
551
347
1067
150
322
855
862
865
868
870
171
9008
317
864
1011
1954
1040
444
1081
323


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

Determination of Color (Pt-Co scale) on Benzene sample #16020

lab	method	value	mark	z(targ)	remarks
52	D5386	<5		-----	
150	D5386	4.3		-0.26	
171	D5386	3		-0.78	
174	D1209	4.5		-0.18	
311	D1209	5		0.02	
317	D1209	<5		-----	
322	D1209	<5		-----	
323	D1209	5		0.02	
333		-----		-----	
334		-----		-----	
336		-----		-----	
347	D5386	4		-0.38	
357	D1209	< 5		-----	
402	D1209	5		0.02	
444	D5386	4.6		-0.14	
445	D1209	3		-0.78	
453	D1209	5		0.02	
551	D1209	4		-0.38	
555		-----		-----	
663	D1209	4		-0.38	
823	D5386	5		0.02	
852	D1209	<5		-----	
855	D1209	<5		-----	
862	D1209	<5		-----	
864	D1209	<5		-----	
865	D1209	<5		-----	
866	D1209	4		-0.38	
868	D1209	5		0.02	
870	D1209	<5		-----	
902	D5386	4		-0.38	
912		-----		-----	
913	D5386	4		-0.38	
963	D1209	4		-0.38	
1011	D1209	5		0.02	
1040	ISO6271	<5		-----	
1041	ISO6271	8.5		1.42	
1067	D5386	5		0.02	
1081	D5386	5		0.02	
1117	D1209	6		0.42	
1151		-----		-----	
1201	D1209	5		0.02	
1264	D1209	5		0.02	
1429	D1209	< 5		-----	
1467		-----		-----	
1530	D1209	< 3		-----	
1823	D1209	6.7		0.70	
1846		-----		-----	
1866	D1209	5		0.02	
1880	D5386	6.3		0.54	
1954	D1209	6		0.42	
6027	D1209	6		0.42	
9008	D5386	6.2		0.50	
	normality	not OK			
	n	31			
	outliers	0			
	mean (n)	4.94			
	st.dev. (n)	1.111			
	R(calc.)	3.11			
	R(D1209:05e1)	7.00			Compare R(D5386:10) = 5.36

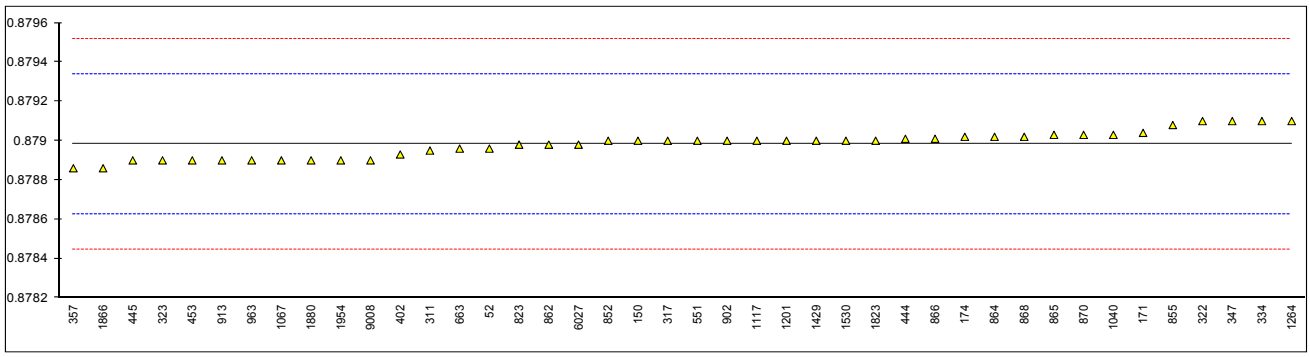

14
12
10
8
6
4
2
0
445
171
551
663
347
902
866
913
963
150
174
444
323
402
823
453
868
311
1011
1067
1081
1201
1264
1866
1117
1954
6027
9008
1880
1823
1041

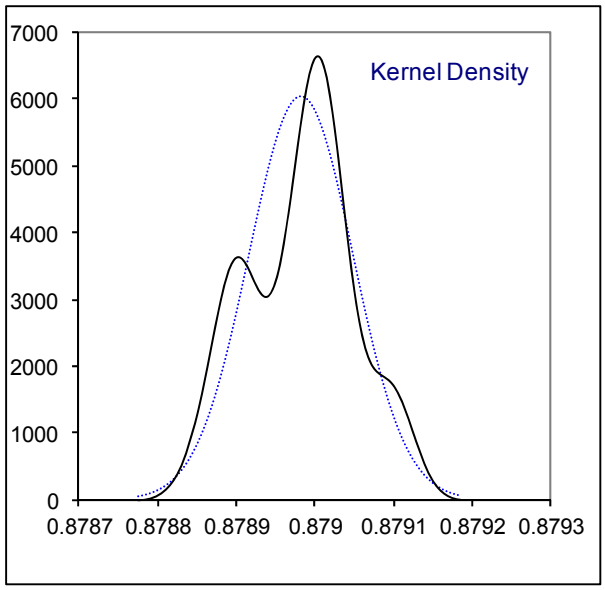

Kernel Density
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10

Determination of Density at 20°C on Benzene sample #16020; results in kg/L

lab	method	value	mark	z(targ)	remarks
52	D4052	0.87896		-0.12	
150	D4052	0.8790	C	0.10	First reported 879.0 kg/L
171	D4052	0.87904		0.32	
174	D4052	0.87902		0.21	
311	D4052	0.87895		-0.18	
317	ISO12185	0.8790		0.10	
322	ISO12185	0.8791		0.66	
323	D4052	0.8789		-0.46	
333		-----		-----	
334	ISO12185	0.8791		0.66	
336		-----		-----	
347	D4052	0.8791		0.66	
357	D4052	0.87886		-0.68	
402	ISO12185	0.87893		-0.29	
444	D4052	0.87901		0.16	
445	D4052	0.8789		-0.46	
453	ISO12185	0.8789		-0.46	
551	D4052	0.8790		0.10	
555		-----		-----	
663	D4052	0.87896		-0.12	
823	ISO12185	0.87898		-0.01	
852	D4052	0.8790		0.10	
855	D4052	0.87908		0.55	
862	D4052	0.87898		-0.01	
864	D4052	0.87902		0.21	
865	D4052	0.87903	C	0.27	First reported 879.03 kg/L
866	D4052	0.87901		0.16	
868	D4052	0.87902		0.21	
870	D4052	0.87903		0.27	
902	D4052	0.8790		0.10	
912		-----		-----	
913	D4052	0.8789		-0.46	
963	ISO12185	0.8789		-0.46	
1011		-----		-----	
1040	ISO12185	0.87903		0.27	
1041		-----		-----	
1067	D4052	0.8789		-0.46	
1081		-----		-----	
1117	D4052	0.8790		0.10	
1151		-----		-----	
1201	D4052	0.8790		0.10	
1264	D4052	0.8791		0.66	
1429	D4052	0.8790		0.10	
1467		-----		-----	
1530	ISO12185	0.8790		0.10	
1823	D4052	0.8790	C	0.10	First reported 879.0 kg/L
1846		-----		-----	
1866	D4052	0.87886		-0.68	
1880	D4052	0.8789		-0.46	
1954	D4052	0.8789	C	-0.46	First reported 878.9 kg/L
6027	D4052	0.87898		-0.01	
9008	D4052	0.8789		-0.46	

normality	OK
n	42
outliers	0
mean (n)	0.87898
st.dev. (n)	0.000066
R(calc.)	0.00019
R(ISO12185:96)	0.00050

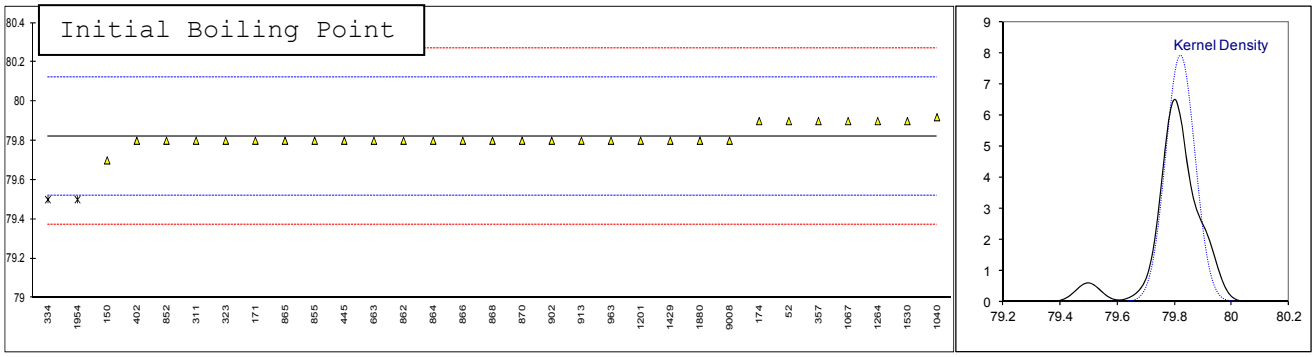

0.8796
0.8794
0.8792
0.879
0.8788
0.8786
0.8784
0.8782
357 1866 445 323 453 913 963 1067 1880 1954 9008 402 311 663 52 823 862 6027 852 150 317 551 902 1117 1201 1429 1530 1823 444 866 174 864 868 865 870 1040 171 855 322 347 334 1264

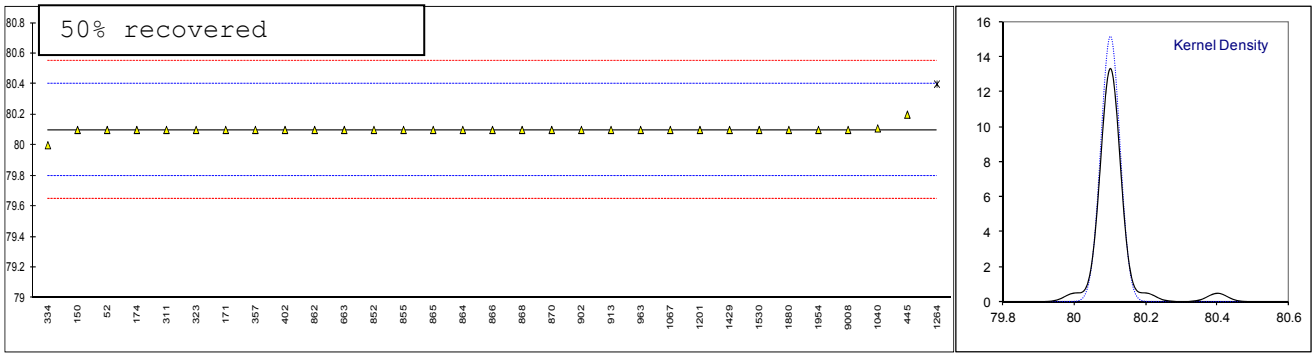

Kernel Density
7000
6000
5000
4000
3000
2000
1000
0
0.8787 0.8788 0.8789 0.879 0.8791 0.8792 0.8793

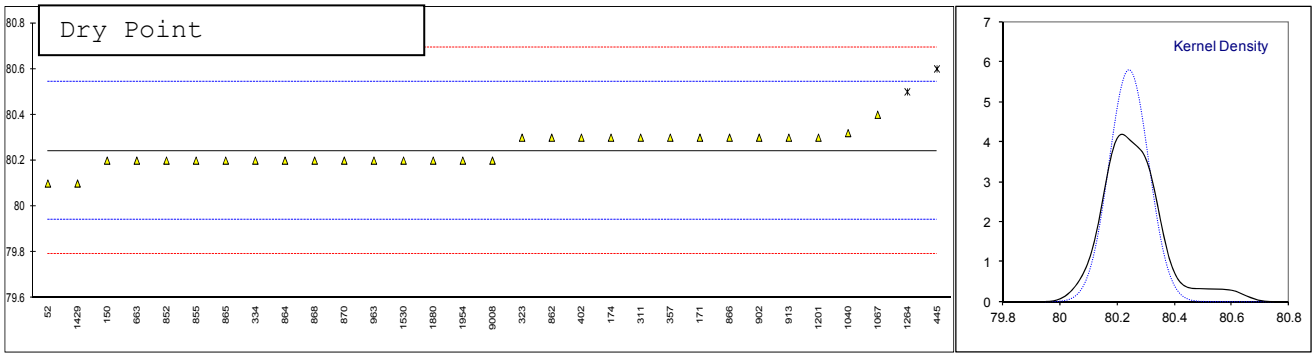
Determination of Distillation on Benzene sample #16020; results in °C

Lab	method	mode	IBP	mark	z(targ)	50%	mark	z(targ)	DP	mark	z(targ)
52	D850	Automated	79.9		0.52	80.1		0.00	80.1		-0.95
150	D850	Automated	79.7		-0.81	80.1		0.00	80.2		-0.28
171	D850	Automated	79.8		-0.14	80.1		0.00	80.3		0.39
174	D850	Automated	79.9		0.52	80.1		0.00	80.3		0.39
311	D850	Automated	79.8		-0.14	80.1		0.00	80.3		0.39
317			-----		-----	-----		-----	-----		-----
322			-----		-----	-----		-----	-----		-----
323	D850	Manual	79.8		-0.14	80.1		0.00	80.3		0.39
333			-----		-----	-----		-----	-----		-----
334	D850	Automated	79.5	R(0.01)	-2.14	80		-0.67	80.2		-0.28
336			-----		-----	-----		-----	-----		-----
347			-----		-----	-----		-----	-----		-----
357	D850	Automated	79.9		0.52	80.1		0.00	80.3		0.39
402	D850	Manual	79.8		-0.14	80.1		0.00	80.3		0.39
444			-----		-----	-----		-----	-----		-----
445	D850	Manual	79.8		-0.14	80.2		0.66	80.6	R(0.01)	2.39
453			-----		-----	-----		-----	-----		-----
551			-----		-----	-----		-----	-----		-----
555			-----		-----	-----		-----	-----		-----
663	D850	Automated	79.8		-0.14	80.1		0.00	80.2		-0.28
823		Automated	-----		-----	-----		-----	-----		-----
852	D850	Manual	79.8		-0.14	80.1		0.00	80.2		-0.28
855	D850	Manual	79.8		-0.14	80.1		0.00	80.2		-0.28
862	D850	Manual	79.8		-0.14	80.1		0.00	80.3		0.39
864	D850	Manual	79.8		-0.14	80.1		0.00	80.2		-0.28
865	D850	Manual	79.8		-0.14	80.1		0.00	80.2		-0.28
866	D850	Manual	79.8		-0.14	80.1		0.00	80.3		0.39
868	D850	Manual	79.8		-0.14	80.1		0.00	80.2		-0.28
870	D850	Manual	79.8		-0.14	80.1		0.00	80.2		-0.28
902	D850	Manual	79.8		-0.14	80.1		0.00	80.3	C	0.39
912			-----		-----	-----		-----	-----		-----
913	D850	Manual	79.8		-0.14	80.1		0.00	80.3		0.39
963	D850	Automated	79.8		-0.14	80.1		0.00	80.2		-0.28
1011			-----		-----	-----		-----	-----		-----
1040	DIN51761	Manual	79.92		0.66	80.11		0.06	80.32		0.52
1041			-----		-----	-----		-----	-----		-----
1067	D850	Manual	79.9		0.52	80.1		0.00	80.4		1.05
1081			-----		-----	-----		-----	-----		-----
1117			-----		-----	-----		-----	-----		-----
1151			-----		-----	-----		-----	-----		-----
1201	D850	Automated	79.8		-0.14	80.1		0.00	80.3		0.39
1264	D850	Automated	79.9		0.52	80.4	R(0.05)	2.00	80.5	R(0.05)	1.72
1429	D850	Automated	79.8		-0.14	80.1		0.00	80.1		-0.95
1467			-----		-----	-----		-----	-----		-----
1530	D850	Manual	79.9	C	0.52	80.1	C	0.00	80.2	C	-0.28
1823			-----		-----	-----		-----	-----		-----
1846			-----		-----	-----		-----	-----		-----
1866			-----		-----	-----		-----	-----		-----
1880	D850	Automated	79.8		-0.14	80.1		0.00	80.2		-0.28
1954	D850	Automated	79.5	R(0.01)	-2.14	80.1		0.00	80.2		-0.28
6027			-----		-----	-----		-----	-----		-----
9008	D850	Automated	79.8		-0.14	80.1		0.00	80.2		-0.28
	normality		OK			not OK			OK		
	n		29			30			29		
	outliers		2			1			2		
	mean (n)		79.82			80.10			80.24		
	st.dev. (n)		0.050			0.026			0.069		
	R(calc.)		0.14			0.07			0.19		
	R(D850:11)	Manual	0.42			0.42			0.42		

Lab 902: first reported 82.3
Lab 1530: first reported: 79.4 / 79.8 / 80.0

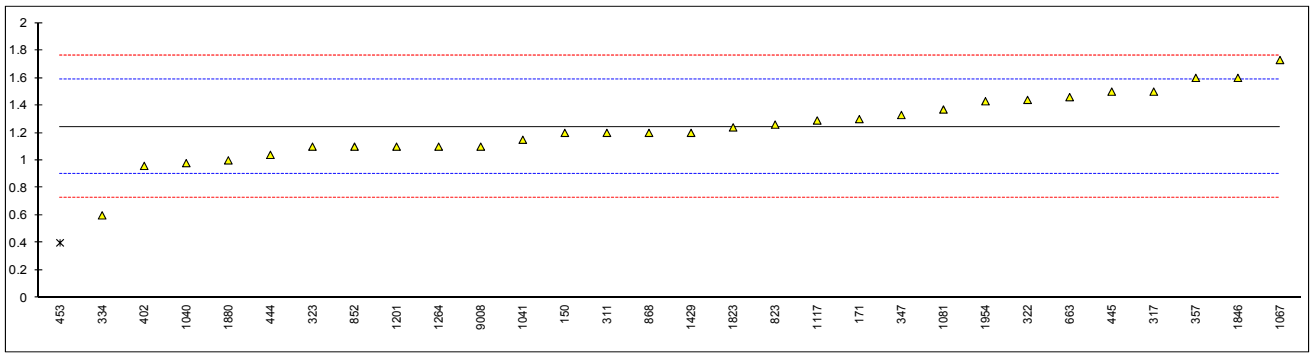

Initial Boiling Point
Kernel Density

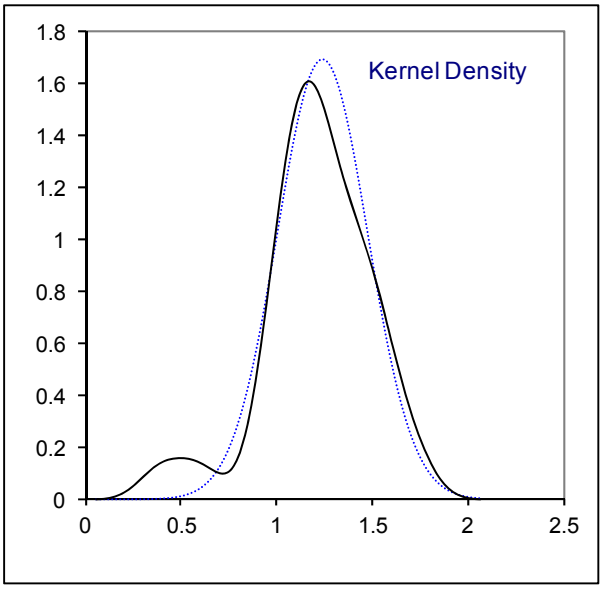

50% recovered
Kernel Density


Dry Point
Kernel Density

Determination of Total Nitrogen on Benzene sample #16020; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D6069	<1		-----	
150	D4629	1.2		-0.26	
171	D4629	1.3		0.33	
174		-----		-----	
311	D6069	1.2		-0.26	
317	D4629	1.5		1.49	
322	D4629	1.44		1.14	
323	D6069	1.1		-0.84	
333		-----		-----	
334	D6069	0.6		-3.75	
336		-----		-----	
347	D4629	1.33		0.50	
357	D4629	1.6		2.07	
402	D4629	0.96		-1.66	
444	D4629	1.04		-1.19	
445	D4629	1.5		1.49	
453	D4629	0.4	C,R(0.05)	-4.92	First reported 2.32
551		-----		-----	
555		-----		-----	
663	D6069	1.46		1.26	
823	D6069	1.26		0.09	
852	D6069	1.1		-0.84	
855		-----		-----	
862		-----		-----	
864		-----		-----	
865		-----		-----	
866		-----		-----	
868	D6069	1.2		-0.26	
870		-----		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963		-----		-----	
1011		-----		-----	
1040	D6069	0.98		-1.54	
1041	D6069	1.15		-0.55	
1067	D6069	1.73		2.83	
1081	D6069	1.37		0.73	
1117	D7184	1.29		0.27	
1151		-----		-----	
1201	D4629	1.1		-0.84	
1264	D6069	1.1		-0.84	
1429	D4629	1.2		-0.26	
1467		-----		-----	
1530		-----		-----	
1823	D6069	1.24		-0.02	
1846	D4629	1.6		2.07	
1866		-----		-----	
1880	D6069	1.0		-1.42	
1954	D4629	1.43		1.08	
6027		-----		-----	
9008	D6069	1.10		-0.84	
	normality	OK			
	n	29			
	outliers	1	Spike		
	mean (n)	1.244	1.20		Recovery <104%
	st.dev. (n)	0.2357			
	R(calc.)	0.660			
	R(D6069:01)	0.481			Compare R(D4629) = 0.906

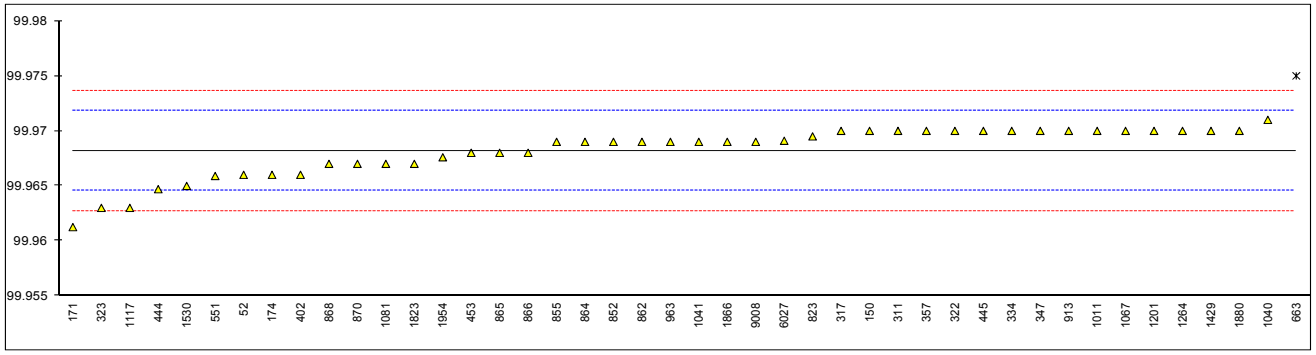

2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
453
334
402
1040
1880
444
323
852
1201
1264
9008
1041
150
311
868
1429
1823
823
1117
171
347
1081
1954
322
663
445
317
357
1846
1067

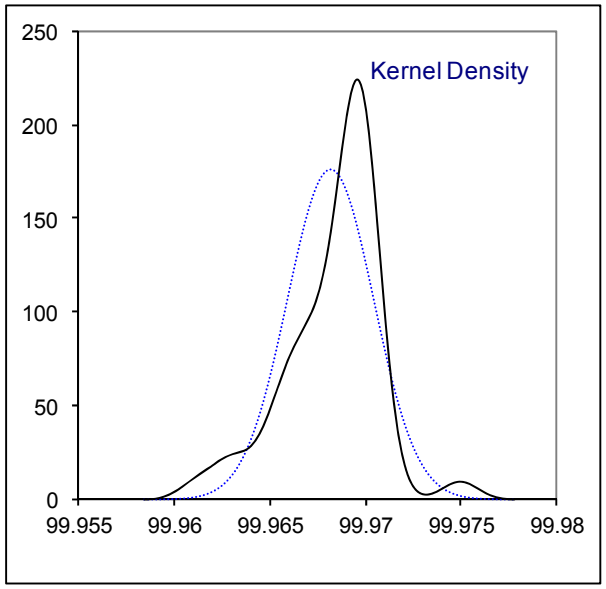

Kernel Density
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
0.5
1
1.5
2
2.5

Determination of Purity on Benzene sample #16020; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D4492	99.966		-1.20	
150	D4492	99.97		0.99	
171	D4492	99.96125	C	-3.81	First reported 99.95297
174	D4492	99.966	C	-1.20	First reported 99.946
311	D4492	99.97		0.99	
317	D5713	99.97		0.99	
322	D4492	99.97		0.99	
323	D4492	99.963	C	-2.85	First reported 99.96
333		-----		-----	
334	D4492	99.97		0.99	
336		-----		-----	
347	D4492	99.9700		0.99	
357	D4492	99.970		0.99	
402	D4492	99.966		-1.20	
444	D4492	99.9647		-1.92	
445	D4492	99.97		0.99	
453	INH-4492	99.968		-0.11	
551	D4492	99.9659		-1.26	
555		-----		-----	
663	D4492	99.975	R(0.05)	3.74	
823	D4492	99.9695		0.72	
852	D4492	99.969		0.44	
855	D4492	99.969		0.44	
862	D4492	99.969		0.44	
864	D4492	99.969		0.44	
865	D4492	99.968		-0.11	
866	D4492	99.968		-0.11	
868	D4492	99.967		-0.66	
870	D4492	99.967		-0.66	
902		-----		-----	
912		-----		-----	
913	D4492	99.97		0.99	
963	D4492	99.969		0.44	
1011	D2360	99.97		0.99	
1040	D4492	99.971		1.54	
1041	D4492	99.969		0.44	
1067		99.970		0.99	
1081		99.967		-0.66	
1117	D4492	99.963		-2.85	
1151		-----		-----	
1201	D4492	99.97		0.99	
1264	D4492	99.97		0.99	
1429	D4492	99.970		0.99	
1467		-----		-----	
1530	D4492	99.965		-1.75	
1823	D4492	99.967		-0.66	
1846		-----		-----	
1866	D4492	99.969		0.44	
1880	D4492	99.97		0.99	
1954	D4492	99.9676		-0.33	
6027	D7504	99.9691		0.50	
9008	D4492	99.969		0.44	

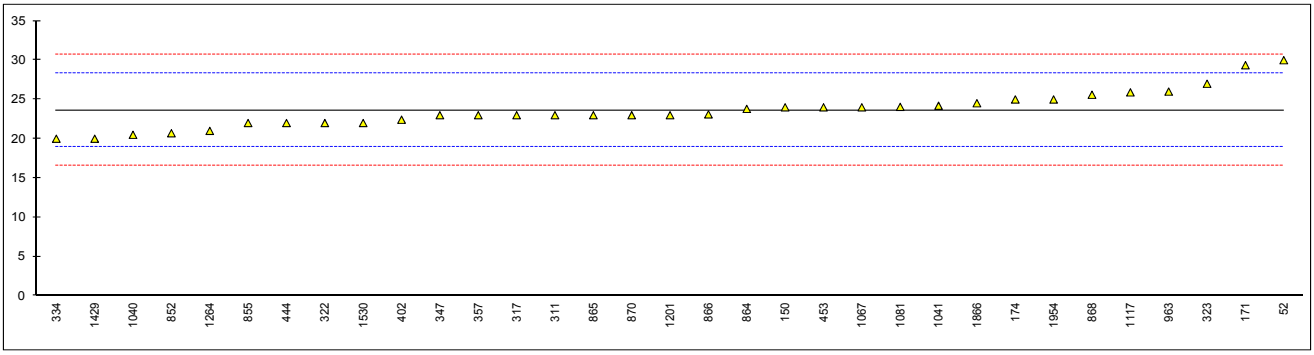
normality	suspect
n	43
outliers	1
mean (n)	99.9682
st.dev. (n)	0.00226
R(calc.)	0.0063
R(D4492:10)	0.0051

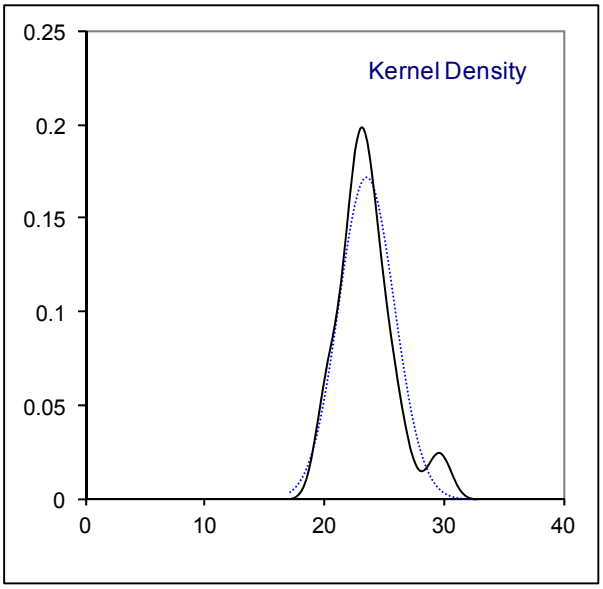

99.98
99.975
99.97
99.965
99.96
99.955
171 323 1117 444 1530 551 52 174 402 868 870 1081 1823 1954 453 865 866 855 864 852 862 963 1041 1866 9008 6027 823 317 150 311 357 322 445 334 347 913 1011 1067 1201 1264 1429 1880 1040 663


Kernel Density
250
200
150
100
50
0
99.955
99.96
99.965
99.97
99.975
99.98

Determination of Methylcyclohexane on Benzene sample #16020 in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D4492	30		2.72	
150	D5713	24		0.17	
171	D4492	29.36		2.45	
174	D4492	25		0.59	
311	D5713	23		-0.26	
317	D5713	23		-0.26	
322	D4492	22		-0.69	
323	D4492	27		1.44	
333		-----		-----	
334	D4492	20		-1.54	
336		-----		-----	
347	D4492	23		-0.26	
357	D4492	23		-0.26	
402	D4492	22.42		-0.51	
444	D4492	22	C	-0.69	First reported <10
445	D4492	<50		-----	
453	INH-4492	24		0.17	
551	D4492	<10		<-5.80	False negative test result?
555		-----		-----	
663		-----		-----	
823		-----		-----	
852	D4492	20.7		-1.24	
855	D4492	22		-0.69	
862		-----		-----	
864	D4492	23.8		0.08	
865	D4492	23		-0.26	
866	D5713	23.1		-0.22	
868	D4492	25.6		0.85	
870	D4492	23		-0.26	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D4492	26		1.02	
1011		-----		-----	
1040	D4492	20.5		-1.33	
1041		24.2		0.25	
1067		24		0.17	
1081		24.06		0.19	
1117	D4492	25.9		0.98	
1151		-----		-----	
1201	D4492	23		-0.26	
1264	D4492	21		-1.11	
1429	D4492	20		-1.54	
1467		-----		-----	
1530	D4492	22		-0.69	
1823		-----		-----	
1846		-----		-----	
1866	D4492	24.52		0.39	
1880		-----		-----	
1954	D4492	25		0.59	
6027		-----		-----	
9008		-----		-----	
	normality	suspect			
	n	33			
	outliers	0	Spike		
	mean (n)	23.61	23.5		Recovery <100%
	st.dev. (n)	2.316			
	R(calc.)	6.49			
	R(Horwitz)	6.57			

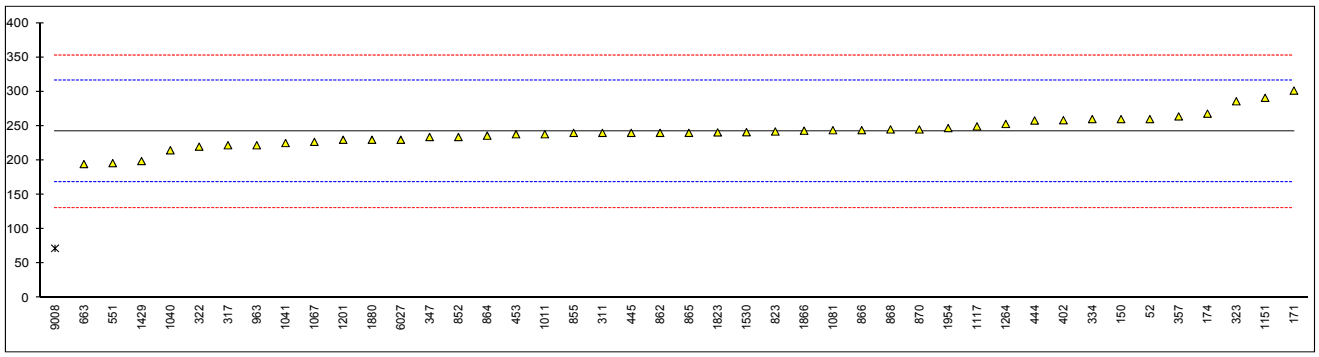

35
30
25
20
15
10
5
0
334
1429
1040
852
1264
855
444
322
1530
402
347
357
317
311
865
870
1201
866
864
150
453
1067
1081
1041
1866
174
1954
868
1117
963
323
171
52

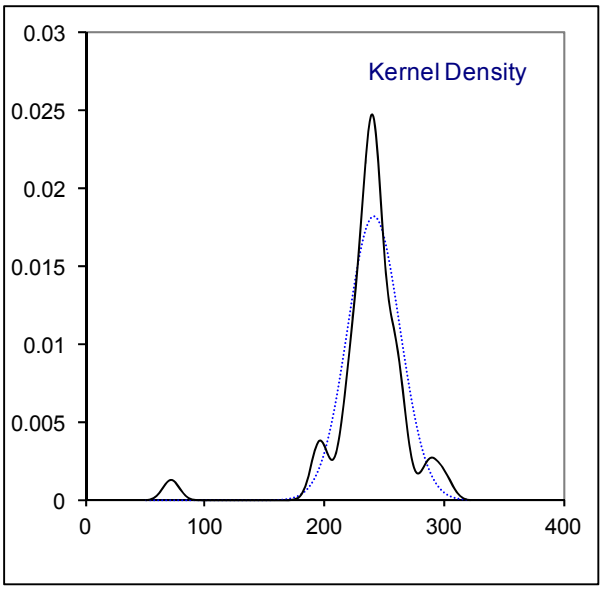

Kernel Density
0.25
0.2
0.15
0.1
0.05
0
0
10
20
30
40

Determination of Toluene on Benzene sample #16020; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D4492	260		0.50	
150	D4492	260		0.50	
171	D4492	301.534		1.62	
174	D4492	268		0.71	
311	D4492	240		-0.05	
317	D5713	222		-0.53	
322	D4492	220		-0.59	
323	D4492	286		1.20	
333		-----		-----	
334	D4492	260		0.50	
336		-----		-----	
347	D4492	234		-0.21	
357	D4492	264		0.60	
402	D4492	258.45		0.45	
444	D4492	258		0.44	
445	D4492	240		-0.05	
453	INH-4492	238		-0.10	
551	D4492	196		-1.23	
555		-----		-----	
663	D4492	194.6		-1.27	
823	D4492	242		0.01	
852	D4492	234		-0.21	
855	D4492	240		-0.05	
862	D4492	240		-0.05	
864	D4492	236		-0.15	
865	D4492	240		-0.05	
866	D4492	244		0.06	
868	D4492	245		0.09	
870	D4492	245		0.09	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D4492	222		-0.53	
1011	D2360	238		-0.10	
1040	D4492	214.7		-0.73	
1041	D4492	225.2		-0.45	
1067		227		-0.40	
1081		243.87		0.06	
1117	D4492	249.4		0.21	
1151	In house	291		1.33	
1201	D4492	230		-0.32	
1264	D4492	253		0.31	
1429	D4492	199		-1.15	
1467		-----		-----	
1530	D4492	241		-0.02	
1823	D4492	240.7		-0.03	
1846		-----		-----	
1866	D4492	243.15		0.04	
1880	D4492	230		-0.32	
1954	D4492	247		0.14	
6027	D7504	230		-0.32	
9008	D4492	72	R(0.01)	-4.59	

normality	suspect
n	43
outliers	1
mean (n)	241.67
st.dev. (n)	21.910
R(calc.)	61.35
R(D4492:10)	103.57

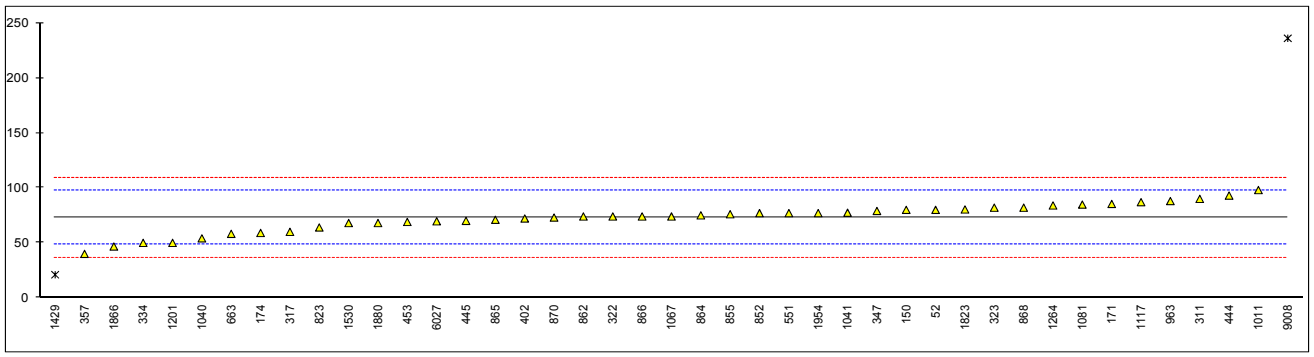

400
350
300
250
200
150
100
50
0
9008 663 551 1429 1040 322 317 963 1041 1067 1201 1880 6027 347 852 864 453 1011 855 311 445 862 865 1823 1530 823 1866 1081 866 868 870 1954 1117 1264 444 402 334 150 52 357 174 323 1151 171

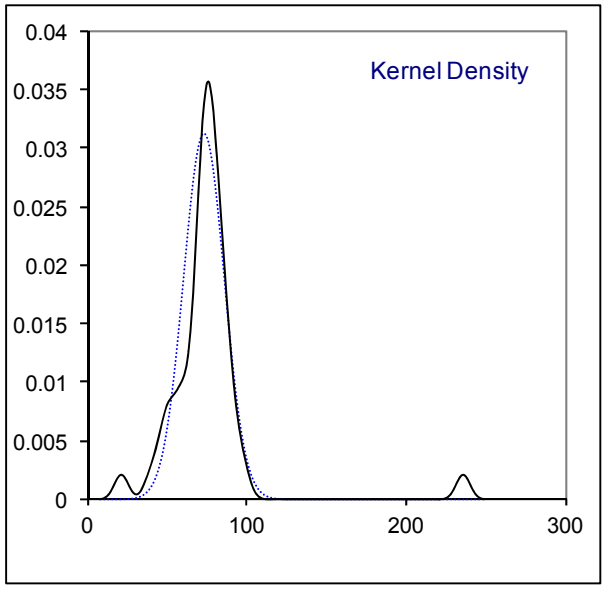

Kernel Density
0.03
0.025
0.02
0.015
0.01
0.005
0
0
100
200
300
400

Determination of Nonaromatics on Benzene sample #16020; results in mg/kg

lab	method	value	mark	z(targ)	Remarks
52	D4492	80		0.58	
150	D4492	80		0.58	
171	D4492	85.4	C	1.02	First reported 159.74
174	D4492	59	C	-1.15	First reported 273
311	D4492	90		1.40	
317	D5713	60		-1.07	
322	D4492	74		0.09	
323	D4492	82		0.74	
333		-----		-----	
334	D4492	50		-1.89	
336		-----		-----	
347	D4492	79		0.50	
357	D4492	40		-2.72	
402	D4492	72.16		-0.07	
444	D4492	93		1.65	
445	D4492	70		-0.24	
453	INH-4492	69		-0.33	
551	D4492	77		0.33	
555		-----		-----	
663	D4492	58.2		-1.22	
823	D4492	64		-0.74	
852	D4492	77		0.33	
855	D4492	76		0.25	
862	D4492	74		0.09	
864	D4492	75		0.17	
865	D4492	71		-0.16	
866	D4492	74		0.09	
868	D4492	82		0.74	
870	D4492	73		0.00	
902		-----		-----	
912		-----		-----	
913		-----		-----	
963	D4492	88		1.24	
1011	D2360	98		2.06	
1040	D4492	54.1		-1.56	
1041	D4492	77.4		0.37	
1067		74		0.09	
1081		84.8		0.98	
1117	D4492	87		1.16	
1151		-----		-----	
1201	D4492	50		-1.89	
1264	D4492	84		0.91	
1429	D4492	21	R(0.05)	-4.28	
1467		-----		-----	
1530	D4492	68		-0.41	
1823	D4492	80.36		0.61	
1846		-----		-----	
1866	D4492	46.70		-2.17	
1880	D4492	68		-0.41	
1954	D4492	77		0.33	
6027	D7504	69.6		-0.28	
9008	D4492	236	R(0.01)	13.44	

normality	OK
n	41
outliers	2
mean (n)	72.97
st.dev. (n)	12.783
R(calc.)	35.79
R(D4492:10)	33.96

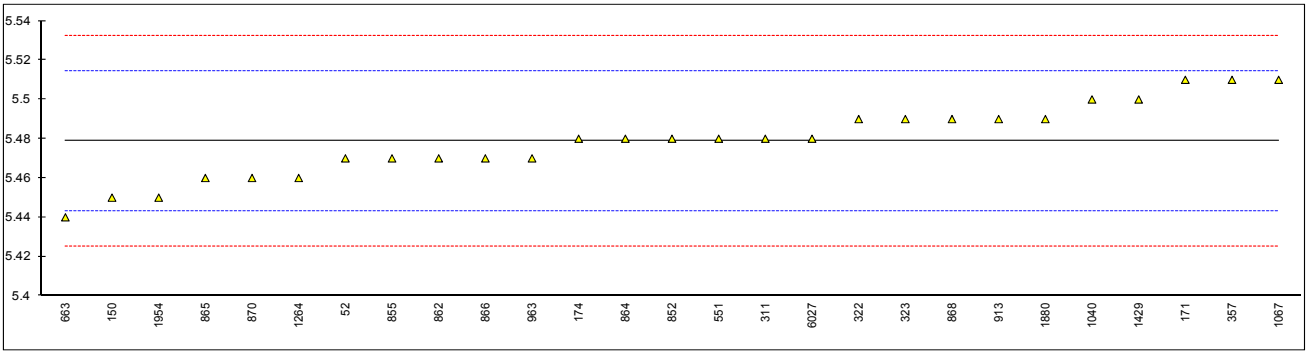

250
200
150
100
50
0
1429 357 1866 334 1201 1040 663 174 317 823 1530 1880 453 6027 445 865 402 870 862 322 866 1067 864 855 852 551 1954 1041 347 150 52 1823 323 868 1264 1081 171 1117 963 311 444 1011 9008

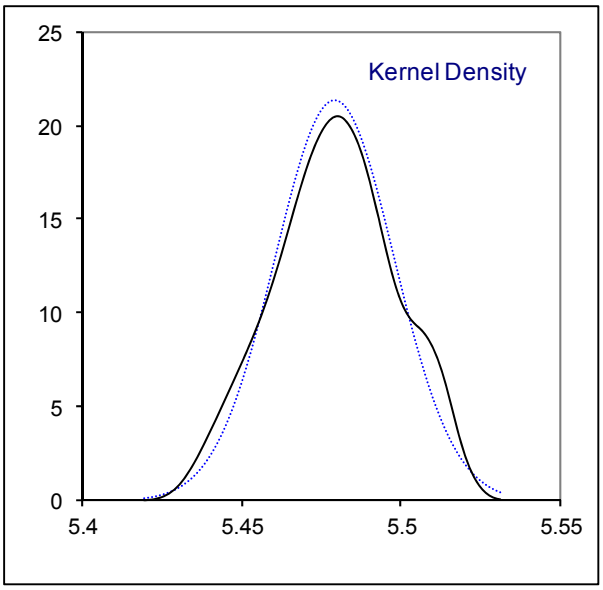

Kernel Density
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0
100
200
300

Determination of Solidification Point (anhydrous) on Benzene sample #16020; results in °C

lab	method	value	mark	z(targ)	remarks
52	D852	5.47		-0.50	
150	D852	5.45		-1.62	
171	D852	5.51	C	1.74	First reported 5.57
174	D852	5.48		0.06	
311	D852	5.48		0.06	
317		-----		-----	
322	D852	5.49		0.62	
323	D852	5.49		0.62	
333		-----		-----	
334		-----		-----	
336		-----		-----	
347		-----		-----	
357	D852	5.51		1.74	
402		-----		-----	
444		-----		-----	
445		-----		-----	
453		-----		-----	
551	D852	5.48		0.06	
555		-----		-----	
663	D852	5.44		-2.18	
823		-----		-----	
852	D852	5.48		0.06	
855	D852	5.47		-0.50	
862	D852	5.47		-0.50	
864	D852	5.48		0.06	
865	D852	5.46		-1.06	
866	D852	5.47		-0.50	
868	D852	5.49		0.62	
870	D852	5.46		-1.06	
902		-----		-----	
912		-----		-----	
913	D852	5.49		0.62	
963	D852	5.47		-0.50	
1011		-----		-----	
1040	DIN51798	5.50		1.18	
1041		-----		-----	
1067	D852	5.51		1.74	
1081		-----		-----	
1117		-----		-----	
1151		-----		-----	
1201		-----		-----	
1264	D852	5.46		-1.06	
1429	D852	5.50		1.18	
1467		-----		-----	
1530		-----		-----	
1823		-----		-----	
1846		-----		-----	
1866		-----		-----	
1880	D852	5.49		0.62	
1954	D852	5.45		-1.62	
6027	D852	5.48		0.06	
9008		-----		-----	

normality	OK
n	27
outliers	0
mean (n)	5.479
st.dev. (n)	0.0187
R(calc.)	0.052
R(D852:13)	0.050


5.54
5.52
5.5
5.48
5.46
5.44
5.42
5.4
663
150
1954
865
870
1264
52
855
862
866
963
174
864
852
551
311
6027
322
323
868
913
1880
1040
1429
171
357
1067


Kernel Density
25
20
15
10
5
0
5.4
5.45
5.5
5.55

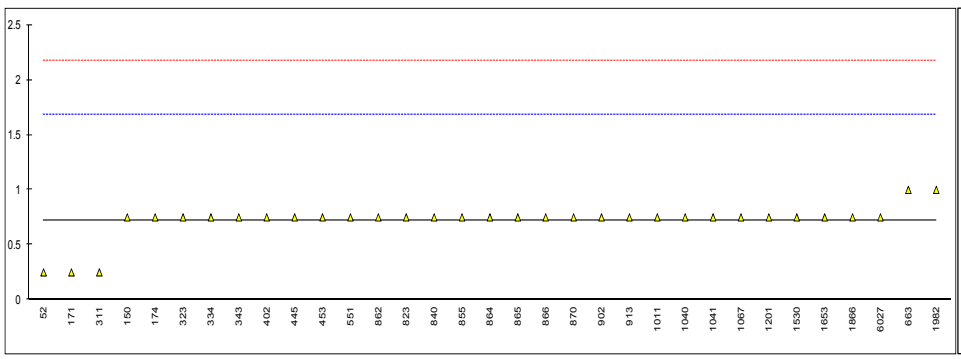
-- Empty page --

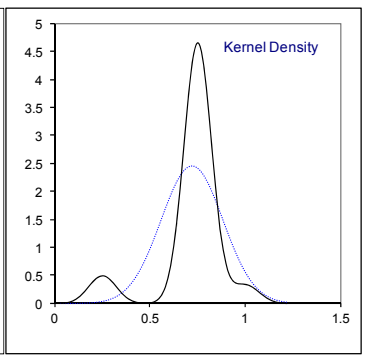
Determination of Acid Wash Color (acid layer) on Toluene sample #16021

lab	method	value	mark	z(targ)	remarks
52	D848	0+		-0.65	
150	D848	1-		0.04	
158		-----		-----	
171	D848	0+		-0.65	
174	D848	1-		0.04	
311	D848	0+		-0.65	
323	D848	1-		0.04	
333		-----		-----	
334	D848	1-		0.04	
343	D848	-1		0.04	
372		-----		-----	
402	D848	1-		0.04	
445	D848	1-		0.04	
453	D848	1-		0.04	
551	D848	1-		0.04	
555		-----		-----	
663	D848	1		0.39	
823	D848	1-		0.04	
840	D848	1-		0.04	
855	D848	1-		0.04	
862	D848	1-		0.04	
864	D848	1-		0.04	
865	D848	1-		0.04	
866	D848	1-		0.04	
870	D848	1-		0.04	
902	D848	1-		0.04	
912		-----		-----	
913	D848	<1.0		0.04	
1011	D848	1-		0.04	
1040	D848	1-		0.04	
1041	D848	1-		0.04	
1067	D848	1-		0.04	
1151		-----		-----	
1201	D848	1-		0.04	
1429		-----		-----	
1530	D848	< 1		0.04	
1653	D848	1-		0.04	
1783		-----		-----	
1866	D848	1-		0.04	
1982	D848	1		0.39	
6027	D848	1-		0.04	

normality	not OK
n	33
outliers	0
mean (n)	0.72 (1-)
st.dev. (n)	0.162
R(calc.)	0.45
R(D848:14)	2.03

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





Determination of Appearance on Toluene sample #16021

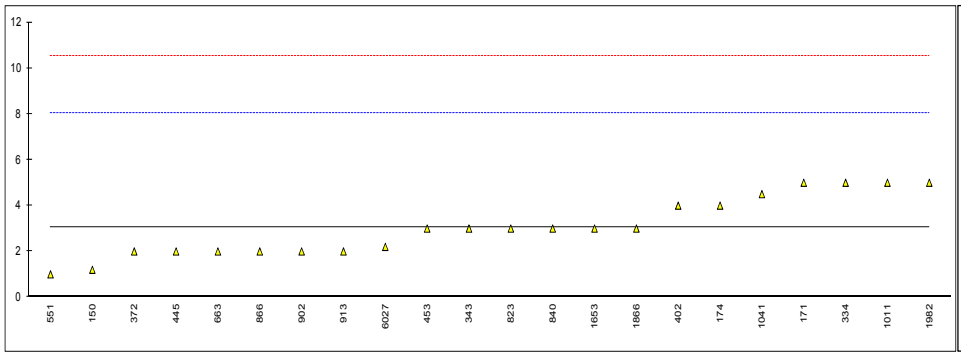
lab	method	value	mark	z(targ)	remarks
52	D4176	Pass		-----	
150	E2680	Pass		-----	
158	Visual	clear & bright		-----	
171	E2680	Pass		-----	
174	E2680	PASS		-----	
311	INH-402	bright & clear		-----	
323	E2680	clear & bright		-----	
333		-----		-----	
334		-----		-----	
343	E2680	Pass		-----	
372	E2680	pass		-----	
402		-----		-----	
445	E2680	C & B		-----	
453	D4176	c&b		-----	
551	E2680	Pass		-----	
555		-----		-----	
663	Visual	CFSH		-----	
823	E2680	Pass		-----	
840	E2680	Pass		-----	
855	E2680	Pass		-----	
862	E2680	PASS		-----	
864	E2680	Pass		-----	
865	E2680	clear & bright		-----	
866	E2680	Pass		-----	
870	E2680	Pass		-----	
902	E2680	PASS		-----	
912		-----		-----	
913	Visual	CFSM		-----	
1011		-----		-----	
1040	Visual	C&B		-----	
1041		-----		-----	
1067	E2680	Pass		-----	
1151		-----		-----	
1201	D4176	bright & clear		-----	
1429		-----		-----	
1530		-----		-----	
1653	Visual	CLFS		-----	
1783	Visual	clear & bright		-----	
1866	Visual	Clear		-----	
1982	Visual	colourless		-----	
6027	Visual	Clear		-----	
	normality	Unknown			
	n	31			
	outliers	n.a.			
	mean (n)	Pass			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	R(E2680:09e1)	n.a.			

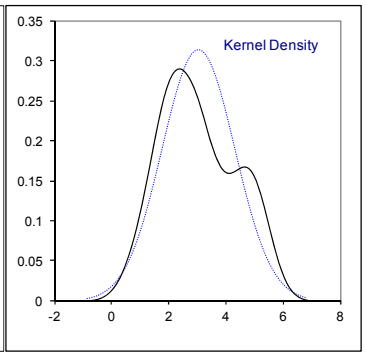
Abbreviations:
C&B = clear and bright
CLFS = clear liquid free from suspended matter
CFSH = clear liquid free from sediment and haze

Determination of Colour (Pt-Co scale) on Toluene sample #16021

lab	method	value	mark	z(targ)	remarks
52	D5386	<5		-----	
150	D5386	1.2		-0.74	
158		-----		-----	
171	D1209	5		0.78	
174	D1209	4		0.38	
311	D1209	<5		-----	
323	D1209	<5		-----	
333		-----		-----	
334	D1209	5		0.78	
343	D5386	3		-0.02	
372	D1209	2		-0.42	
402	D1209	4.0		0.38	
445	D1209	2		-0.42	
453	D1209	3		-0.02	
551	D1209	1		-0.82	
555		-----		-----	
663	D1209	2		-0.42	
823	D5386	3		-0.02	
840	D1209	3		-0.02	
855	D1209	<5		-----	
862	D1209	<5		-----	
864	D1209	<5		-----	
865	D1209	<5		-----	
866	D1209	2		-0.42	
870	D1209	<5		-----	
902	D5386	2		-0.42	
912		-----		-----	
913	D5386	2		-0.42	
1011	D1209	5		0.78	
1040	ISO6271	<5		-----	
1041	ISO6271	4.5		0.58	
1067	D1209	< 5		-----	
1151		-----		-----	
1201	D1209	<5		-----	
1429		-----		-----	
1530	D1209	< 3		-----	
1653	D5386	3		-0.02	
1783	D156	>+30	ex	-----	Result excluded, test method is deviating from D1209
1866	D1209	3		-0.02	
1982	D1209	5		0.78	
6027	D5386	2.2		-0.34	

normality	OK
n	22
outliers	0
mean (n)	3.04
st.dev. (n)	1.274
R(calc.)	3.57
R(D1209:05e1)	7.00





Determination of Copper Corrosion on Toluene sample #16021

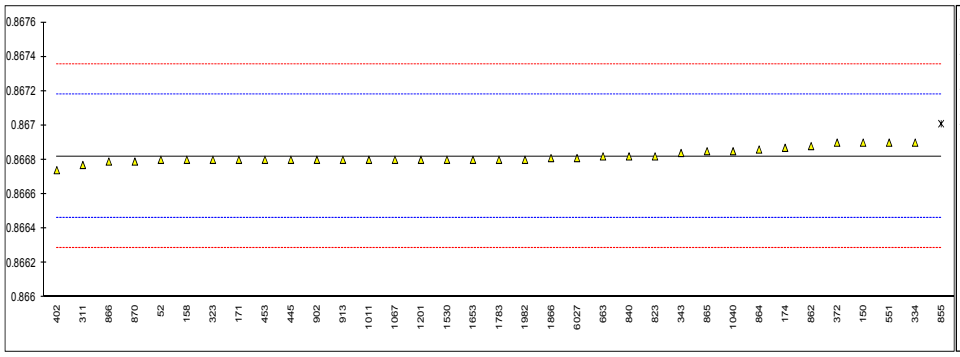
lab	method	value	mark	z(targ)	remarks
52	D849	1a		-----	
150	D849	1a		-----	
158		-----		-----	
171	D849	1a		-----	
174	D849	1A		-----	
311	D849	1A		-----	
323	D849	1a		-----	
333		-----		-----	
334	D849	1		-----	
343	D849	1a		-----	
372		-----		-----	
402		-----		-----	
445	D849	1A		-----	
453		-----		-----	
551	D849	1A		-----	
555		-----		-----	
663		-----		-----	
823	D849	1a		-----	
840	D849	1A		-----	
855	D849	1a		-----	
862	D849	1a		-----	
864	D849	1a		-----	
865	D849	1a		-----	
866	D849	1a		-----	
870	D849	1a		-----	
902		-----		-----	
912		-----		-----	
913	D849	1a		-----	
1011	D849	1a		-----	
1040		-----		-----	
1041		-----		-----	
1067	D849	1a		-----	
1151		-----		-----	
1201	D849	1A		-----	
1429		-----		-----	
1530		-----		-----	
1653	D849	1A		-----	
1783		-----		-----	
1866		-----		-----	
1982	D849	1A		-----	
6027	D849	1a		-----	

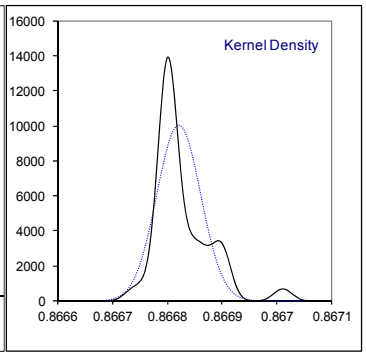
normality	unknown
n	25
outliers	n.a.
mean (n)	1
st.dev. (n)	n.a.
R(calc.)	n.a.
R(D849:15)	n.a.

Determination of Density at 20°C on Toluene sample #16021: results in kg/L

lab	method	value	mark	z(targ)	remarks
52	D4052	0.8668		-0.12	
150	D4052	0.8669	C	0.44	First reported 866.9 kg/L
158		0.8668		-0.12	
171	D4052	0.8668		-0.12	
174	D4052	0.86687		0.27	
311	D4052	0.86677		-0.29	
323	D4052	0.8668		-0.12	
333		-----		-----	
334	ISO12185	0.8669		0.44	
343	D4052	0.86684		0.11	
372	ISO12185	0.8669		0.44	
402	ISO12185	0.86674		-0.45	
445	D4052	0.8668	C	-0.12	First reported 0.8688
453	ISO12185	0.8668		-0.12	
551	D4052	0.8669		0.44	
555		-----		-----	
663	D4052	0.86682		-0.01	
823	ISO12185	0.86682	C	-0.01	First reported 0.88682
840	D4052	0.86682		-0.01	
855	D4052	0.86701	R(0.01)	1.06	
862	D4052	0.86688		0.33	
864	D4052	0.86686		0.22	
865	D4052	0.86685	C	0.16	First reported 866.95 kg/L
866	D4052	0.86679		-0.17	
870	ISO12185	0.86679		-0.17	
902	D4052	0.8668		-0.12	
912		-----		-----	
913	D4052	0.8668		-0.12	
1011	D4052	0.8668		-0.12	
1040	ISO12185	0.86685		0.16	
1041		-----		-----	
1067	D4052	0.8668		-0.12	
1151		-----		-----	
1201	ISO12185	0.8668		-0.12	
1429		-----		-----	
1530	ISO12185	0.8668		-0.12	
1653	D4052	0.8668		-0.12	
1783	D4052	0.8668		-0.12	
1866	D4052	0.86681		-0.06	
1982	D4052	0.8668	C	-0.12	First reported 866.8 kg/L
6027	D4052	0.86681		-0.06	

normality	OK
n	34
outliers	1
mean (n)	0.86682
st.dev. (n)	0.000040
R(calc.)	0.00011
R(ISO12185:96)	0.00050

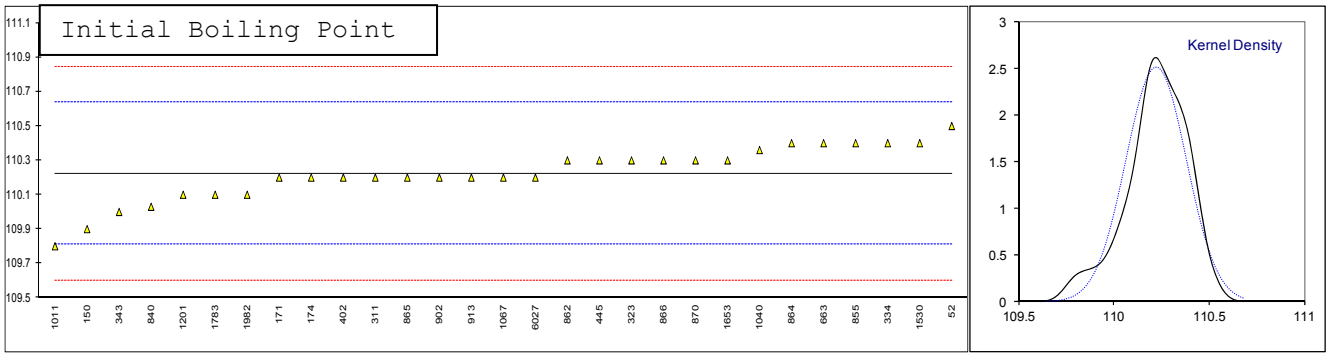


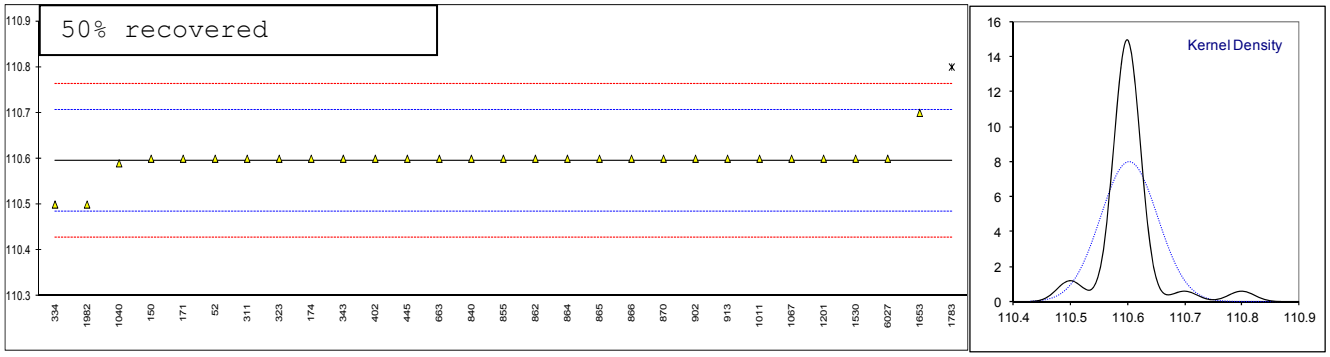


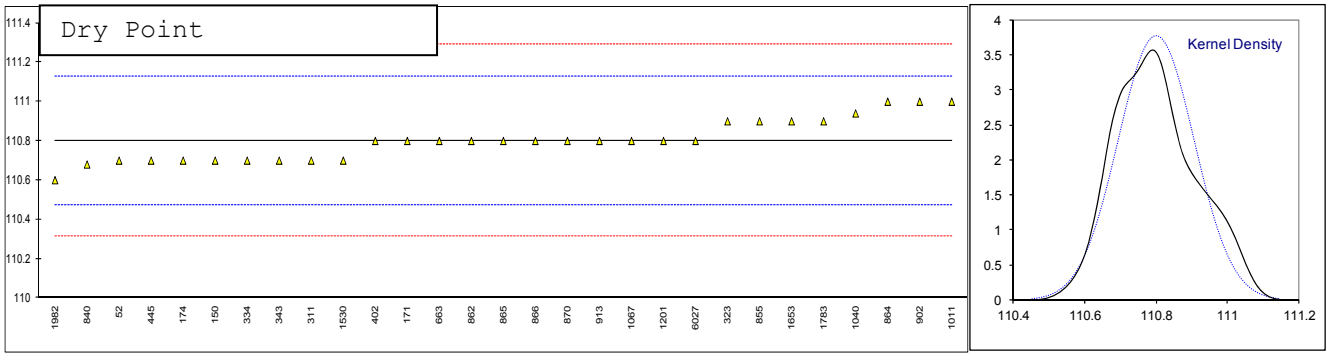
Determination of Distillation on Toluene sample #16021; results in °C

lab	method	mode	IBP	mark	z(targ)	50%	mark	z(targ)	DP	mark	z(targ)
52	D850	Automated	110.5		1.33	110.6		0.07	110.7		-0.62
150	D850	Automated	109.9		-1.56	110.6		0.07	110.7		-0.62
158			-----		-----	-----		-----	-----		-----
171	D850	Automated	110.2		-0.11	110.6		0.07	110.8		0.00
174	D850	Automated	110.2		-0.11	110.6		0.07	110.7		-0.62
311	D850	Automated	110.2		-0.11	110.6		0.07	110.7		-0.62
323	D850	Manual	110.3		0.37	110.6		0.07	110.9		0.61
333			-----		-----	-----		-----	-----		-----
334	D850	Automated	110.4		0.85	110.5		-1.72	110.7		-0.62
343	D850	Automated	110.0	C	-1.08	110.6		0.07	110.7		-0.62
372			-----		-----	-----		-----	-----		-----
402	D850	Manual	110.2		-0.11	110.6		0.07	110.8		0.00
445	D850	Manual	110.3		0.37	110.6		0.07	110.7		-0.62
453			-----		-----	-----		-----	-----		-----
551			-----		-----	-----		-----	-----		-----
555			-----		-----	-----		-----	-----		-----
663	D850	Automated	110.4		0.85	110.6		0.07	110.8		0.00
823		Automated	-----		-----	-----		-----	-----		-----
840	D850	Automated	110.03		-0.93	110.60		0.07	110.68		-0.74
855	D850	Manual	110.4		0.85	110.6		0.07	110.9		0.61
862	D850	Manual	110.3		0.37	110.6		0.07	110.8		0.00
864	D850	Manual	110.4		0.85	110.6		0.07	111.0		1.22
865	D850	Manual	110.2		-0.11	110.6		0.07	110.8		0.00
866	D850	Manual	110.3		0.37	110.6		0.07	110.8		0.00
870	D850	Manual	110.3		0.37	110.6		0.07	110.8		0.00
902	D850	Manual	110.2		-0.11	110.6		0.07	111.0		1.22
912			-----		-----	-----		-----	-----		-----
913	D850	Manual	110.2		-0.11	110.6		0.07	110.8		0.00
1011			109.8		-2.04	110.6		0.07	111.0		1.22
1040	DIN51761	Manual	110.36		0.66	110.59		-0.11	110.94		0.86
1041			-----		-----	-----		-----	-----		-----
1067	D850	Manual	110.2		-0.11	110.6		0.07	110.8		0.00
1151			-----		-----	-----		-----	-----		-----
1201	D850	Automated	110.1		-0.60	110.6		0.07	110.8		0.00
1429			-----		-----	-----		-----	-----		-----
1530	D850	Manual	110.4	C	0.85	110.6	C	0.07	110.7		-0.62
1653	D850	Automated	110.3		0.37	110.7		1.87	110.9		0.61
1783	D1078	Automated	110.1		-0.60	110.8	R(0.01)	3.66	110.9		0.61
1866			-----		-----	-----		-----	-----		-----
1982	D850	Automated	110.1		-0.60	110.5	C	-1.72	110.6		-1.23
6027	D850	Manual	110.2		-0.11	110.6		0.07	110.8		0.00
	normality		OK			not OK			OK		
	n		29			28			29		
	outliers		0			1			0		
	mean (n)		110.22			110.60			110.80		
	st.dev. (n)		0.159			0.033			0.106		
	R(calc.)		0.45			0.09			0.30		
	R(D850:11)	Automated	0.58			0.16			0.46		

Lab 343: first reported 109.7
Lab 1530: first reported 109.7 / 110.4
Lab 1982: first reported 110.4


Initial Boiling Point
Kernel Density

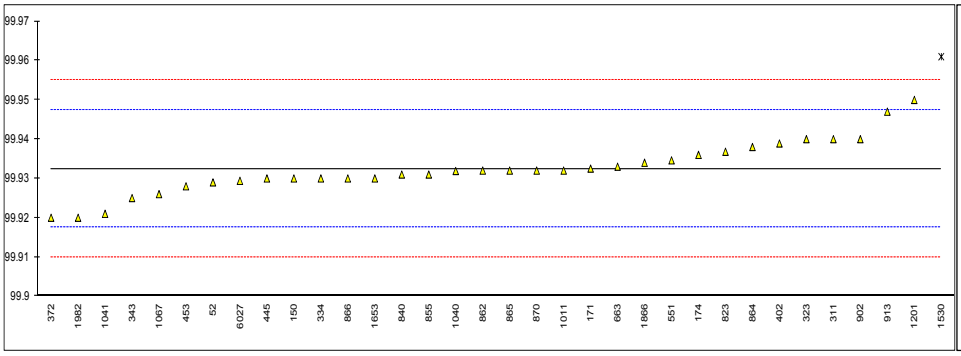

50% recovered
Kernel Density

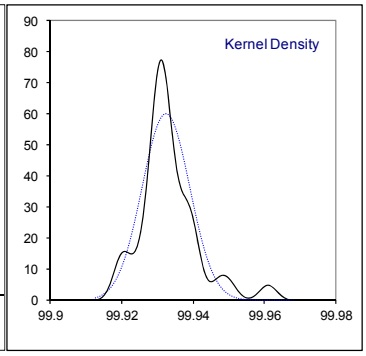

Dry Point
Kernel Density

Determination of Purity on Toluene sample #16021; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	99.929		-0.46	
150	D2360	99.93		-0.33	
158		-----		-----	
171	D2360	99.93251		0.01	
174	D6526	99.936		0.47	
311	D2360	99.94		1.00	
323	D2360	99.94		1.00	
333		-----		-----	
334	D2360	99.93		-0.33	
343	D2360	99.925		-1.00	
372	D6526	99.92		-1.66	
402	D2360	99.9389		0.86	
445	D6526	99.93	C	-0.33	First reported 99.32
453	D2360	99.928		-0.60	
551	D2360	99.9346		0.28	
555		-----		-----	
663	D2360	99.933		0.07	
823	D2360	99.9368		0.58	
840	D2360	99.931		-0.20	
855	D2360	99.931		-0.20	
862	D2360	99.932		-0.06	
864	D7504	99.938		0.74	
865	D7504	99.932		-0.06	
866	D2360	99.930		-0.33	
870	D2360	99.932		-0.06	
902	INH-135	99.94		1.00	
912		-----		-----	
913	D2360	99.947	C	1.94	First reported 99.97
1011	D2360	99.932		-0.06	
1040	D2360	99.9319		-0.08	
1041	D2360	99.921		-1.53	
1067	D2360	99.926		-0.86	
1151		-----		-----	
1201	D2360	99.95	C	2.34	First reported 99.97
1429		-----		-----	
1530	D2360	99.961	C,R(0.01)	3.81	First reported 99.958
1653	D6526	99.930		-0.33	
1783		-----		-----	
1866	D2360	99.934	C	0.20	First reported 99.953
1982	D2360	99.920		-1.66	
6027	D7504	99.9294		-0.41	

normality	OK
n	33
outliers	1
mean (n)	99.9325
st.dev. (n)	0.00665
R(calc.)	0.0186
R(D2360:11)	0.0210

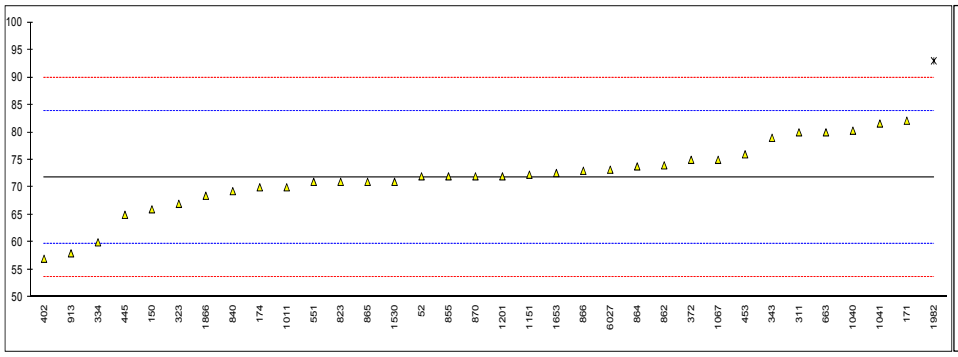


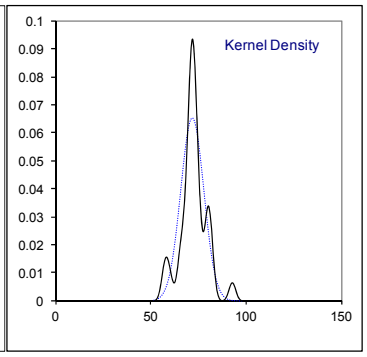


Determination of Benzene on Toluene sample #16021; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D7504	72		0.03	
150	D2360	66		-0.97	
158		-----		-----	
171	D2360	82.1150		1.70	
174	D6526	70		-0.30	
311	D2360	80		1.35	
323	D2360	67		-0.80	
333		-----		-----	
334	D2360	60		-1.96	
343	D2360	79		1.19	
372	D6526	75		0.52	
402	D2360	57.01		-2.45	
445	D6526	65		-1.13	
453	INH-2360	76		0.69	
551	D2360	71		-0.14	
555		-----		-----	
663	D2360	80		1.35	
823	D2360	71		-0.14	
840	D2360	69.3		-0.42	
855	D2360	72		0.03	
862	D2360	74		0.36	
864	D7504	73.8		0.32	
865	D7504	71		-0.14	
866	D2360	73		0.19	
870	D7504	72		0.03	
902		-----		-----	
912		-----		-----	
913	D2360	58		-2.29	
1011	D2360	70		-0.30	
1040	D2360	80.3		1.40	
1041	D2360	81.6		1.62	
1067	D2360	75		0.52	
1151	In house	72.296		0.08	
1201	D2360	72		0.03	
1429		-----		-----	
1530	D2360	71		-0.14	
1653	D6526	72.6		0.13	
1783		-----		-----	
1866	D2360	68.47		-0.56	
1982	D2360	93	R(0.05)	3.50	
6027	D7504	73.2		0.23	

normality	OK
n	33
outliers	1
mean (n)	71.84
st.dev. (n)	6.098
R(calc.)	17.08
R(Horwitz)	16.91

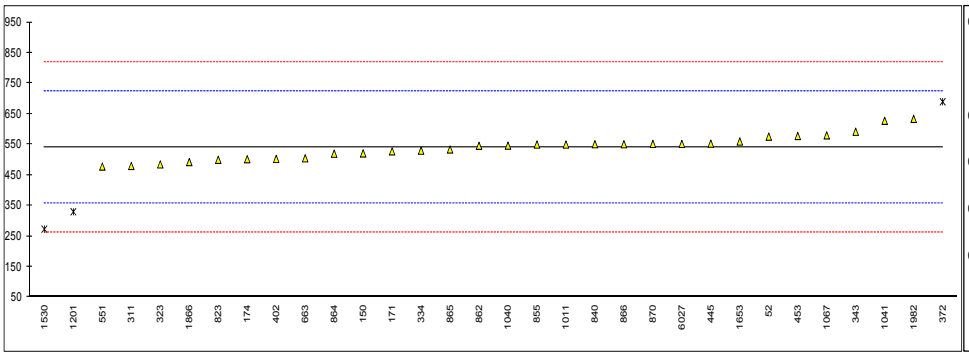


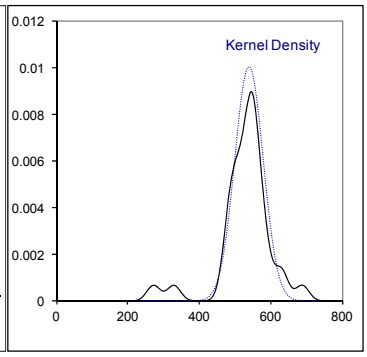


Determination of Nonaromatics on Toluene sample #16021; results in mg/kg

lab	method	value	mark	z(targ)	remarks
52	D7504	576		0.38	
150	D2360	521		-0.21	
158		-----		-----	
171	D2360	527.8		-0.14	
174	D6526	502		-0.42	
311	D2360	480		-0.66	
323	D2360	485		-0.60	
333		-----		-----	
334	D2360	530		-0.11	
343	D2360	592		0.56	
372	D6526	690	R(0.05)	1.62	
402	D2360	502.94		-0.41	
445	D6526	553		0.13	
453	INH-2360	578		0.40	
551	D2360	478		-0.68	
555		-----		-----	
663	D2360	505		-0.39	
823	D2360	500		-0.44	
840	D2360	551		0.11	
855	D2360	550		0.10	
862	D2360	546		0.06	
864	D7504	520		-0.22	
865	D7504	534		-0.07	
866	D2360	551		0.11	
870	D6526	552		0.12	
902		-----		-----	
912		-----		-----	
913		-----		-----	
1011	D2360	550		0.10	
1040	D2360	546.5		0.06	
1041	D2360	627.8		0.94	
1067	D2360	580		0.43	
1151		-----		-----	
1201	D2360	330	C,R(0.01)	-2.28	First reported 150
1429		-----		-----	
1530	D2360	273	C,R(0.01)	-2.90	First reported 346
1653	D6526	559.9		0.21	
1783		-----		-----	
1866	D2360	492.72	C	-0.52	First reported 325.05
1982	D2360	634		1.01	
6027	D7504	552		0.12	

normality	OK
n	29
outliers	3
mean (n)	540.61
st.dev. (n)	39.796
R(calc.)	111.43
R(D2360:11)	258.55

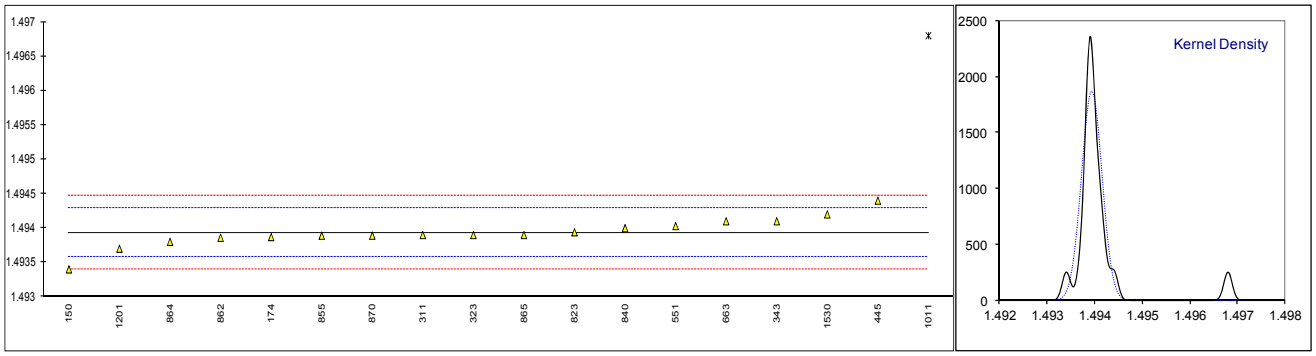




Determination of Refractive Index at 25 °C on Toluene sample #16021;

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D1218	1.4934		-2.99	
158		-----		-----	
171		-----		-----	
174	D1218	1.49387		-0.36	
311	D1218	1.4939		-0.19	
323	D1218	1.4939		-0.19	
333		-----		-----	
334		-----		-----	
343	D1218	1.4941		0.93	
372		-----		-----	
402		-----		-----	
445	D1218	1.4944		2.61	
453		-----		-----	
551	D1218	1.49403		0.54	
555		-----		-----	
663	D1218	1.4941		0.93	
823	D1218	1.49394		0.03	
840	D1218	1.4940		0.37	
855	D1218	1.49389		-0.25	
862	D1218	1.49386		-0.42	
864	D1218	1.4938		-0.75	
865	D1218	1.4939		-0.19	
866		-----		-----	
870	D1218	1.49389		-0.25	
902		-----		-----	
912		-----		-----	
913		-----		-----	
1011	D1218	1.4968	G(0.01)	16.05	
1040		-----		-----	
1041		-----		-----	
1067		-----		-----	
1151		-----		-----	
1201	D1218	1.4937		-1.31	
1429		-----		-----	
1530	D1218	1.4942		1.49	
1653		-----		-----	
1783		-----		-----	
1866		-----		-----	
1982		-----		-----	
6027		-----		-----	

normality	not OK
n	17
outliers	1
mean (n)	1.49393
st.dev. (n)	0.000214
R(calc.)	0.00060
R(D1218)	0.00050



APPENDIX 2

Number of participants in the Benzene PT

1 lab in BELGIUM
2 labs in BRAZIL
1 lab in CANADA
10 labs in CHINA, People's Republic
1 lab in FINLAND
3 labs in FRANCE
3 labs in GERMANY
3 labs in INDIA
2 labs in KUWAIT
8 labs in NETHERLANDS
1 lab in PORTUGAL
1 lab in ROMANIA
4 lab in SAUDI ARABIA
1 lab in SOUTH KOREA
1 lab in SPAIN
1 lab in THAILAND
1 lab in TURKEY
1 lab in UNITED ARAB EMIRATES
4 labs in UNITED KINGDOM
3 labs in UNITED STATES OF AMERICA

Number of participants in the Toluene PT

1 lab in AUSTRALIA
1 lab in BELGIUM
3 labs in BRAZIL
1 lab in CANADA
7 labs in CHINA, People's Republic
1 lab in ESTONIA
2 labs in FRANCE
4 labs in GERMANY
2 labs in INDIA
3 labs in NETHERLANDS
1 lab in PORTUGAL
1 lab in ROMANIA
2 labs in SAUDI ARABIA
1 lab in SOUTH KOREA
1 lab in SPAIN
1 lab in THAILAND
1 lab in TURKEY
3 labs in UNITED KINGDOM
4 labs in UNITED STATES OF AMERICA
1 lab in VIETNAM

APPENDIX 3

Abbreviations:

C	= final test 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 outlier test
R(0.05)	= straggler in Rosner outlier test
E	= probably an error in calculations
U	= test result probably reported in a different unit
W	= test result withdrawn on request of participant
ex	= test result excluded from calculations
n.a.	= not applicable
n.d.	= not detected
fr.	= first reported
SDS	= Safety Data Sheet

Literature:

1 iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, April 2014

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.

16 Bernard Rosner, Percentage Points for a Generalized ESD Many-Outlier Procedure, *Technometrics*, 25(2), pp. 165-172, (1983)