Results of Proficiency Test
Styrene
October 2019

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Appendices:

1   INTRODUCTION

Since 1999 the Institute for Interlaboratory Studies (iis) organizes a proficiency scheme for Styrene every year. During the annual proficiency testing program 2019/2020, it was decided to continue the round robin for the analysis of Styrene in accordance with the latest applicable version of the product specification ASTM D2827.
In this interlaboratory study 39 laboratories in 18 different countries registered for participation. See appendix 3 for the number of participants per country. In this report, the results of the 2019 Styrene proficiency test are presented and discussed. This report is also electronically available through the iis website www.iisnl.com.

2   SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organizer of this proficiency test (PT). Sample analyses for fit-for-use and homogeneity testing were subcontracted to an ISO/IEC17025 accredited laboratory. It was decided to send 1 x 0.5L bottle with Styrene labelled #19195.
The participants were requested to report rounded and unrounded test results. The unrounded test results were preferably used for the statistical evaluation.

2.1   ACCREDITATION

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

2.2   PROTOCOL

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

2.3   CONFIDENTIALITY STATEMENT

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

2.4 SAMPLES

The necessary batch of Styrene of approximately 30 liters was obtained from a local supplier. This batch was spiked with Chloroform, Dibenzothiophene, Benzene, Toluene and mix-Xylenes. After homogenization 56 amber glass bottles of 0.5L were filled and labelled #19195. The homogeneity of the subsamples #19195 was checked by determination of Density at 20°C in accordance with ASTM D4052 and by determination of Toluene in accordance with ASTM D5135 on 8 stratified randomly selected samples.

	Density at 20°C in kg/L	Toluene in mg/kg
sample #19195-1	0.90626	25
sample #19195-2	0.90628	25
sample #19195-3	0.90628	25
sample #19195-4	0.90628	24
sample #19195-5	0.90628	25
sample #19195-6	0.90628	24
sample #19195-7	0.90628	25
sample #19195-8	0.90627	25

Table 1: homogeneity test results of subsamples #19195

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

	Density at 20°C in kg/L	Toluene in mg/kg
r (observed)	0.00002	1.3
reference method	ISO12185:96	Horwitz
0.3 x R (reference method)	0.00015	2.1

Table 2: evaluation of repeatabilities of the subsamples #19195

The calculated repeatabilities were in agreement with 0.3 times the corresponding reproducibility of the reference methods. Therefore, homogeneity of the subsamples #19195 was assumed.

To each of the participating laboratories 1* 0.5L bottle, labelled #19185 was sent on September 18, 2019. An SDS was added to the sample package.

2.5 STABILITY OF THE SAMPLES

The stability of Styrene 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 sample #19195: Aldehydes as Benzaldehyde, Appearance, Chloride (Organic), Color Pt/Co, Density at 20°C, Inhibitor as TBC, Peroxides as H_2O_2, Polymer, Sulfur (total), Water, Purity and Impurities by GC: Benzene, Toluene, Ethylbenzene, sum of m- and p-Xylenes, iso-Propylbenzene (Cumene), o-Xylene, n-Propylbenzene, sum of m- and p-Ethyltoluenes, alpha-Methylstyrene, 1,2-Diethylbenzene, sum of alpha-Methylstyrene and 1,2-Diethylbenzene, Phenylacetylene, 3/4-Methylstyrenes, sum of Phenylacetylene and 3/4-Methylstyrenes, Benzaldehyde and Non-aromatics.
It was also requested to report some analytical details on the determination of Aldehydes as Benzaldehyde and on the determination of Peroxides.

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

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

3 RESULTS

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

Directly after the deadline, a reminder was sent to those laboratories that had not reported test results at that moment. Shortly after the deadline, the available test results were screened for suspect data. A test result was called suspect in case the Huber Elimination Rule (a robust outlier test) found it to be an outlier. The laboratories that produced these suspect data were asked to check the reported test results (no reanalyzes). Additional or corrected test results are used for data analysis and the original test results are placed under 'Remarks' in the 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 Organisation, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5).

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

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

According to ISO5725 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's test, by G(0.01) or DG(0.01) for the Grubbs' test and by R(0.01) for the Rosner's test. Stragglers are marked by D(0.05) for the Dixon's test, by G(0.05) or DG(0.05) for the Grubbs' test and by R(0.05) for the Rosner's test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.

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

Finally, the reproducibilities were calculated from the standard deviations by multiplying these 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 method. Outliers and other data, which were excluded from the calculations, are represented as a cross. Accepted data are represented as a triangle.

Furthermore, Kernel Density Graphs were made. 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 or ISO reproducibilities, the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the variation in this interlaboratory study.

The target standard deviation was calculated from the literature reproducibility by division with 2.8. In case no literature reproducibility was available, other target values were used (e.g. Horwitz). 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 according to:

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

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

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

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

4   EVALUATION

In this proficiency test some problems were encountered with the dispatch of the samples due to several reasons (e.g. customs clearance), especially to Brazil, China and Indonesia. Three participants reported the test results after the final reporting date and ten other participants did not report any test results. Not all laboratories were able to report all analyses requested.
In total 29 participants reported 468 test results. Observed were 10 outlying test results, which is 2.1% of the numerical test results. In proficiency studies, outlier percentages of 3% - 7.5% are quite normal.

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.

4.1   EVALUATION PER TEST

In this section, the results are discussed per test. The test methods, which were used by various laboratories, were taken into account for explaining the observed differences when possible and applicable. These test methods are also in the tables together with the original data. The abbreviations, used in these tables, are explained in appendix 4.

Unfortunately, a suitable reference test method, providing the precision data, is not available for all determinations. For the tests, that have no available precision data, the calculated reproducibility was compared against the reproducibility estimated from the Horwitz equation.

Aldehydes as Benzaldehyde: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D7704:16. Only two laboratories reported to have used ASTM D7704 as test method. All other participants reported the used of ASTM D2119 which was withdrawn in 2018.

Appearance: Allthough not mentioned in the specification of Styrene (ASTM D2827), it is advised to use test method ASTM E2680:16 for the appearance determination. All participants agreed about the appearance of sample #19195 to be 'clear', 'bright' or 'pass'. Participants who used ASTM E2680 should report the appearance as 'pass' or as 'fail' as test result.

Chloride, Organic: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D5808:18.

Color Pt/Co: 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 D5386:16.

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

Inhibitor as TBC: This determination was not problematic. No statisticals outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D4590:18.

Peroxides as H_2O_2: This determination was problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirements of ASTM D2340:18. The requested analytical details did not clarify the variation of the group (see appendix 2).

Polymer: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D2121-A:16.

Sulfur (total):   This determination was problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirements of ASTM D5453:19a.

Water: This determination was problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirement of ASTM E1064:16.

Purity by GC: This determination was problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirements of ASTM D5135:16e1.

Benzene: This determination was problematic for a number of laboratories. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outrliers is in agreement with the requirements of ASTM D5135:16e1.

Toluene: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the estimated reproducibility using the Horwitz equation.

Ethylbenzene: 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 D5135:16e1.

m- and p-Xylenes: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in full agreement with the requirements of ASTM D5135:16e1.

iso-Propylbenzene: This determination was very problematic. No statistical outliers were observed. However, the calculated reproducibility is not at all in agreement with the requirements of ASTM D5135:16e1.

o-Xylene: This determination was not problematic. Two statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D5135:16e1.

n-Propylbenzene: This determination was very problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not at all in agreement with the requirements of ASTM D5135:16e1.

m- and p-Ethyltoluenes: 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 D5135:16e1.

alpha-Methylstyrene: 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 D5135:16e1.

1,2-Diethylbenzene: Five laboratories reported a test result below 10 mg/kg. Therefore, no z-scores were calculated.

Sum alpha-Methylstyrene and 1,2-Diethylbenzene: Seven laboratories reported a numerical test result for the sum of the two components. Because 1,2-Diethylbenzene is below the detection limit, the test results are similar to alpha-Methylstyrene. Therefore, no z-scores were calculated.

Phenylacetylene: This determination was problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirements of ASTM D5135:16e1.

3/4-Methylstyrenes: Four laboratories reported a test result below 10 mg/kg. Therefore, no z-scores were calculated.

Sum Phenylacetylene and 3/4-Methylstyrenes: Four laboratories reported a test result below 20 mg/kg. Therefore, no z-scores were calculated.

Benzaldehyde: This determination was problematic. No statistical outliers were observed. The calculated reproducibility is not in agreement with the requirements of ASTM D5135:16e1.

Non-aromatics: This determination was problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirements of ASTM D5135:16e1.

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 or as declared by the estimated target reproducibility using Horwitz equation and the reproducibility as found for the group of participating laboratories. The number of significant test results, the average result, the calculated reproducibility (2.8 * standard deviation) and the target reproducibilities derived from reference test methods (in casu ASTM and ISO test methods) or the estimated target reproducibility are presented in the next table.

Parameter	unit	n	average	2.8 * sd	R (lit)
Aldehydes as Benzaldehyde	mg/kg	19	71.9	47.1	106
Appearance		26	pass	n.a.	n.a.
Chloride, Organic	mg/kg	9	1.9	1.3	1.3
Color Pt/Co		27	8.4	4.1	5.9
Density at 20°C	kg/L	23	0.9063	0.0002	0.0005
Inhibitor as TBC	mg/kg	26	9.1	2.6	3.1
Peroxides as H_2O_2	mg/kg	21	28.2	19.8	13
Polymer	mg/kg	26	1.6	1.6	3.6
Sulfur (total)	mg/kg	20	1.9	1.1	0.9
Water	mg/kg	29	175	53	45
Purity by GC	%M/M	28	99.938	0.033	0.029
Benzene	mg/kg	18	2.7	0.9	1.1
Toluene	mg/kg	20	23.6	5.8	6.6
Ethylbenzene	mg/kg	26	108.7	20.1	23.8
m- and p-Xylenes	mg/kg	23	26.7	9.4	9.4
iso-Propylbenzene (Cumene)	mg/kg	23	25.9	9.4	3.8
o-Xylene	mg/kg	23	18.9	4.2	4.7
n-Propylbenzene	mg/kg	20	14.2	7.4	3.6
m- and p-Ethyltoluenes	mg/kg	9	7.7	5.4	4.1
alpha-Methylstyrene	mg/kg	23	247.0	27.7	39.6
1,2-Diethylbenzene	mg/kg	5	<10	n.e.	n.e.
alpha-Methylstyrene + 1,2-Diethylbenzene	mg/kg	7	243.8	n.e.	n.e.
Phenylacetylene	mg/kg	15	10.5	15.4	10.5
3/4-Methylstyrenes	mg/kg	4	<10	n.e.	n.e.
Phenylacetylene + 3/4-Methylstyrenes	mg/kg	4	<20	n.e.	n.e.
Benzaldehyde	mg/kg	14	60.6	37.6	22.7
Non-aromatics	mg/kg	13	28.8	38.8	33.6

Table 3: reproducibilities of tests on sample #19195

Without further statistical calculations, it could be concluded that for several components there is a good compliance of the group of participating laboratories with the relevant reference test methods. The components that are problematic have been discussed in paragraph 4.1.

4.3   COMPARISON OF THE PROFICIENCY TEST OF OCTOBER 2019 WITH PREVIOUS PTS

	October 2019	October 2018	October 2017	October 2016	October 2015
Number of reporting laboratories	29	39	38	38	37
Number of test results reported	468	649	524	521	447
Number of statistical outliers	10	25	24	14	20
Percentage outliers	2.1%	3.9%	4.6%	2.7%	4.5%

Table 4: 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 reference test methods. The conclusions are given in the following table.

Parameter	October 2019	October 2018	October 2017	October 2016	October 2015
Aldehydes as Benzaldehyde	++	--	-	-	--
Chloride, Organic	+/-	+	+	+	n.e.
Color Pt/Co	+	+	++	+	++
Density at 20°C	++	++	++	++	++
Inhibitor as TBC	+	+/-	+	+/-	+
Peroxides as H_2O_2	-	-	-	-	-
Polymer	++	++	+	-	++
Sulfur (total)	-	+/-	+/-	+	n.e.
Water	-	+	++	+	+
Purity by GC	-	--	+	+/-	+
Benzene	+	+	++	-	n.e.
Toluene	+	+/-	n.e.	n.e.	n.e.
Ethylbenzene	+	+	++	+	++
m- and p-Xylenes	+/-	+	n.e.	n.e.	++
iso-Propylbenzene (Cumene)	--	-	n.e.	n.e.	-
o-Xylene	+	+	+	n.e.	++
n-Propylbenzene	--	-	n.e.	+	(--)
m- and p-Ethyltoluenes	-	+	n.e.	+	(-)
alpha-Methylstyrene	+	-	+	--	++
1,2-Diethylbenzene	n.e.	n.e.	n.e.	(--)	n.e.
alpha-Methylstyrene + 1,2-Diethylbenzene	n.e.	(--)	+/-	+/-	++
Phenylacetylene	-	+/-	n.e.	n.e.	n.e.

Parameter	October 2019	October 2018	October 2017	October 2016	October 2015
3/4-Methylstyrenes	n.e.	+/-	n.e.	n.e.	n.e.
Phenylacetylene + 3/4-Methylstyrenes	n.e.	(--)	n.e.	+	n.e.
Benzaldehyde	-	--	+	-	-
Non-aromatics	-	+/-	+	--	n.e.

Table 5: comparison determinations of sample #19195 against the reference test methods
Results between brackets should be used with due care

The following performance categories were used:

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

APPENDIX 1

Determination of Aldehydes as Benzaldehyde on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D2119	70		-0.05	
169	D2119	61.49		-0.28	
171	D2119	110		1.01	
173	D2119	58		-0.37	
273		-----		-----	
311	D2119	100		0.74	
323	D2119	85		0.35	
333	D2119	60		-0.31	
343	D2119	81.8		0.26	
347		-----		-----	
357	D2119	67		-0.13	
446	D2119	58	C	-0.37	First reported <10
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902	D2119	71		-0.02	
913		-----		-----	
1067	D2119	67		-0.13	
1117	D7704	58.91		-0.34	
1135		-----		-----	
1169		-----		-----	
1201		-----		-----	
1264	D2119	62		-0.26	
1509	D2119	73.01		0.03	
1515		-----		-----	
1823	D2119	105		0.87	
1880	D7704	65		-0.18	
6013		-----		-----	
6201	D2119	58	C	-0.37	Possibly a unit error? Reported 0.058 mg/kg
6202		-----		-----	
6262		-----		-----	
7014		-----		-----	
9008	D2119	55		-0.45	
9014		-----		-----	

normality	suspect
n	19
outliers	0
mean (n)	71.906
st.dev. (n)	16.8155
R(calc.)	47.083
st.dev.(D7704:16)	37.8571
R(D7704:16)	106
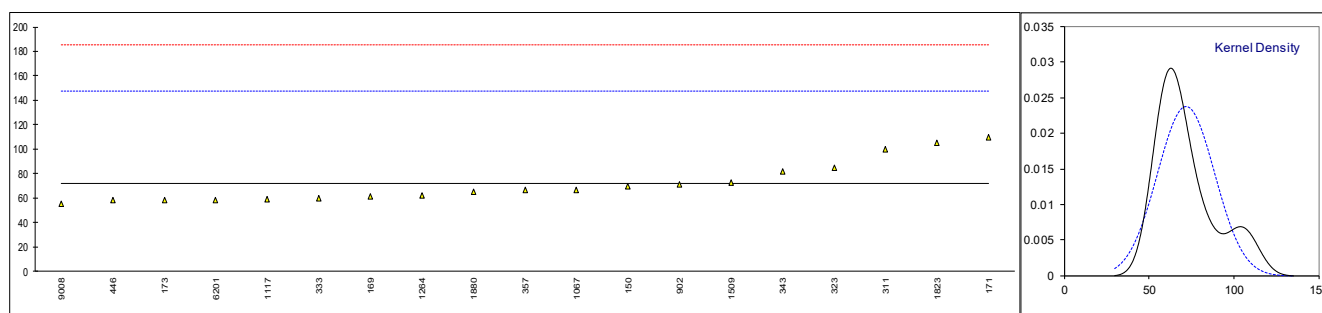
Determination of Appearance on sample #19195;

lab	method	value	mark	z(targ)	remarks
150	E2680	Pass		-----	
169	E2680	Pass		-----	
171	E2680	Pass		-----	
173	D4176	Pass		-----	
273	Visual	Bright & Clear		-----	
311	E2680	pass		-----	
323	Visual	clear & bright		-----	
333		-----		-----	
343	E2680	PASS		-----	
347	E2680	Pass		-----	
357	E2680	Pass		-----	
446	D4176	Pass		-----	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902	E2680	PASS		-----	
913	E2680	Pass		-----	
1067		CFSM		-----	
1117	D4176	Pass		-----	
1135	Visual	CFSM		-----	
1169	D4176	Pass		-----	
1201	Visual	Bright & Clear		-----	
1264	Visual	Pass		-----	
1509	E2680	Clear & FFSM		-----	
1515	E2680	Pass		-----	
1823	D4176	Clear/FFSM		-----	
1880	Visual	Pass		-----	
6013		-----		-----	
6202	Visual	CLEAR		-----	
6262		-----		-----	
7014		CLEAR		-----	
9008	Visual	Clear		-----	
9014		-----		-----	
	n	26			
	mean (n)	Pass			

Determination of Chloride, Organic on sample #19195; results in mg/kg

lab	method	Value	mark	z(targ)	remarks
150	D7359	1.9		0.00	
169		-----		-----	
171		-----		-----	
173		-----		-----	
273		-----		-----	
311	D5808	<1		-----	
323	D5808	2		0.21	
333		-----		-----	
343		-----		-----	
347		-----		-----	
357		-----		-----	
446		-----		-----	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902		-----		-----	
913		-----		-----	
1067	D5808	1.8		-0.22	
1117		-----		-----	
1135	D5808	2.2		0.64	
1169		-----		-----	
1201	D5808	1.4		-1.08	
1264		-----		-----	
1509	D5808	1.52		-0.82	
1515		-----		-----	
1823		-----		-----	
1880	D7359	2.4		1.07	
6013		-----		-----	
6201	UOP779	1.3		-1.30	
6202		-----		-----	
6262		-----		-----	
7014		-----		-----	
9008	D5808	2.6		1.50	
9014		-----		-----	

normality	OK
n	9
outliers	0
mean (n)	1.902
st.dev. (n)	0.4478
R(calc.)	1.254
st.dev.(D5808:18)	0.4643
R(D5808:18)	1.3
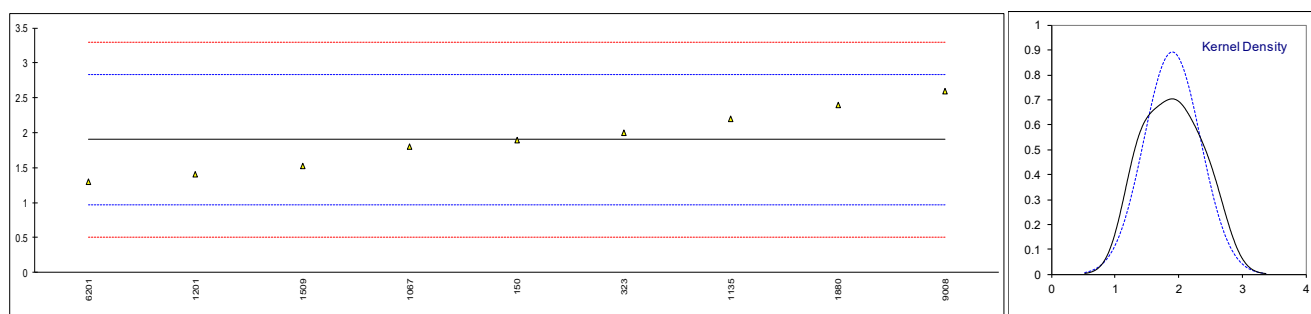
Determination of Color Pt/Co on sample #19195;

lab	method	value	mark	z(targ)	remarks
150	D5386	8		-0.18	
169	D5386	8		-0.18	
171		-----		-----	
173	D5386	9		0.29	
273	D1209	5		-1.61	
311	D5386	8		-0.18	
323	D5386	9		0.29	
333	D5386	8		-0.18	
343	D5386	9		0.29	
347	D5386	9		0.29	
357	D5386	9.3		0.43	
446	D5386	7		-0.66	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902	D5386	7		-0.66	
913	D5386	7		-0.66	
1067	D1209	5		-1.61	
1117	D1209	8		-0.18	
1135	D5386	9		0.29	
1169	D5386	10.7		1.10	
1201	D5386	10.8		1.15	
1264	D1209	8		-0.18	
1509	D1209	10		0.77	
1515	D1209	9		0.29	
1823	D5386	9.8		0.67	
1880	D5386	10.19		0.86	
6013	D1209	7		-0.66	
6201	D5386	19	R(0.01)	5.04	
6202	D1209	7.55		-0.40	
6262		-----		-----	
7014	D1209	8.5		0.05	
9008	D1209	9.6		0.58	
9014		-----		-----	

normality	OK
n	27
outliers	1
mean (n)	8.39
st.dev. (n)	1.465
R(calc.)	4.10
st.dev.(D5386:16)	2.106
R(D5386:16)	5.90
Compare	
R(D1209:05)	7
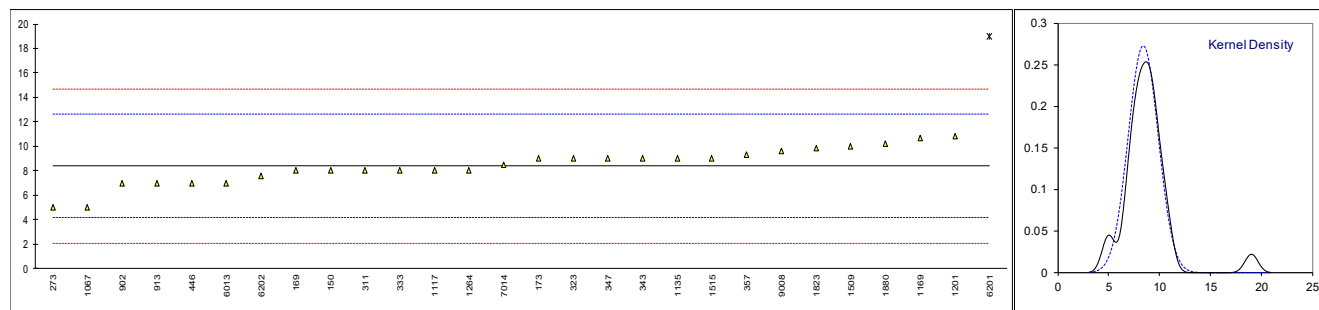
Determination of Density at 20°C on sample #19195; results in kg/L

lab	method	value	mark	z(targ)	remarks
150	D4052	0.9062		-0.42	
169	D4052	0.9064		0.70	
171	D4052	0.9063		0.14	
173	D4052	0.9062		-0.42	
273	D4052	0.9062		-0.42	
311	D4052	0.9063		0.14	
323	D4052	0.9062		-0.42	
333		-----		-----	
343	D4052	0.9063		0.14	
347	D4052	0.90632		0.25	
357	D4052	0.90630		0.14	
446	D4052	0.9063		0.14	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902	D4052	0.9063		0.14	
913	D4052	0.90626		-0.09	
1067	D4052	0.9064		0.70	
1117	D4052	0.9063		0.14	
1135	ISO12185	0.9063		0.14	
1169		-----		-----	
1201	D4052	0.9063		0.14	
1264	D4052	0.9062		-0.42	
1509	D4052	0.90620		-0.42	
1515		-----		-----	
1823	D4052	0.9063		0.14	
1880	D4052	0.9062		-0.42	
6013		-----		-----	
6201	ISO12185	0.9063		0.14	
6202		-----		-----	
6262		-----		-----	
7014	D4052	0.90626		-0.09	
9008		-----		-----	
9014		-----		-----	

normality	OK
n	23
outliers	0
mean (n)	0.90628
st.dev. (n)	0.000060
R(calc.)	0.00017
st.dev.(ISO12185:96)	0.000179
R(ISO12185:96)	0.0005
Compare	
R(D4052:18)	0.0005
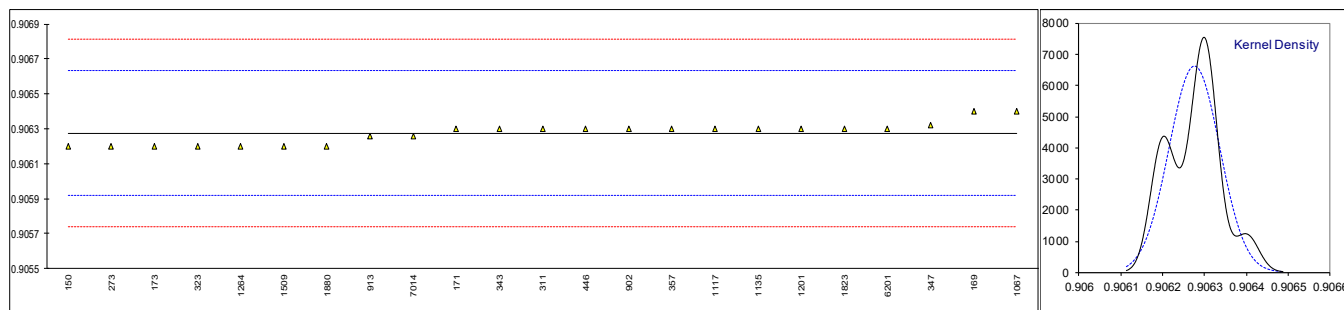
Determination of Inhibitor as TBC on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D4590	10		0.78	
169	D4590	9		-0.14	
171	D4590	10		0.78	
173		-----		-----	
273	D4590	9.8		0.59	
311	D4590	9.0		-0.14	
323	D4590	8		-1.05	
333	D4590	9.3		0.14	
343		-----		-----	
347	D4590	8.1		-0.96	
357	D4590	8.8		-0.32	
446	D4590	10		0.78	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902	D4590	9.1		-0.04	
913	D4590	9.1		-0.04	
1067	D4590	11		1.69	
1117	D4590	10.13		0.89	
1135	D4590	10.3		1.05	
1169	D4590	8.6		-0.50	
1201	D4590	10.26		1.01	
1264	D4590	8.5		-0.59	
1509	D4590	8.5042		-0.59	
1515	D4590	9.2024		0.05	
1823	D4590	8.874		-0.25	
1880	D4590	7.1		-1.87	
6013		9.5		0.32	
6201	D4590	9.5		0.32	
6202	D4590	7.46		-1.54	
6262		-----		-----	
7014	D4590	8.74		-0.37	
9008		-----		-----	
9014		-----		-----	

normality	OK
n	26
outliers	0
mean (n)	9.149
st.dev. (n)	0.9130
R(calc.)	2.556
st.dev.(D4590:18)	1.0967
R(D4590:18)	3.071
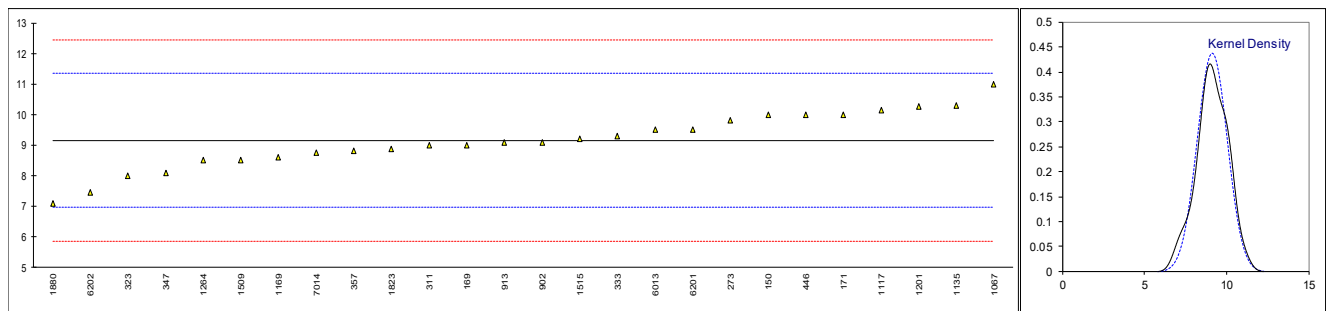
Determination of Peroxides as H_2O_2 on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D2340	24		-0.90	
169	D2340	27		-0.25	
171		-----		-----	
173	D2340	40		2.55	
273		-----		-----	
311	D2340	30		0.40	
323	D2340	23		-1.11	
333	D2340	32		0.83	
343	D2340	15		-2.83	
347	D2340	26		-0.46	
357	D2340	18.7		-2.04	
446	D2340	35		1.47	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902	D2340	34		1.26	
913		-----		-----	
1067	D2340	22		-1.33	
1117	D2340	19.85		-1.79	
1135	D2340	27		-0.25	
1169		-----		-----	
1201	D2340	38.9		2.31	
1264	D2340	31		0.61	
1509	D2340	27.42		-0.16	
1515		-----		-----	
1823	D2340	28.1		-0.01	
1880	D2340	37.0		1.90	
6013		-----		-----	
6201	D2340	19.3		-1.91	
6202		-----		-----	
6262		-----		-----	
7014		-----		-----	
9008	D2340	36		1.69	
9014		-----		-----	

normality	OK
n	21
outliers	0
mean (n)	28.156
st.dev. (n)	7.0790
R(calc.)	19.821
st.dev.(D2340:18)	4.6429
R(D2340:18)	13
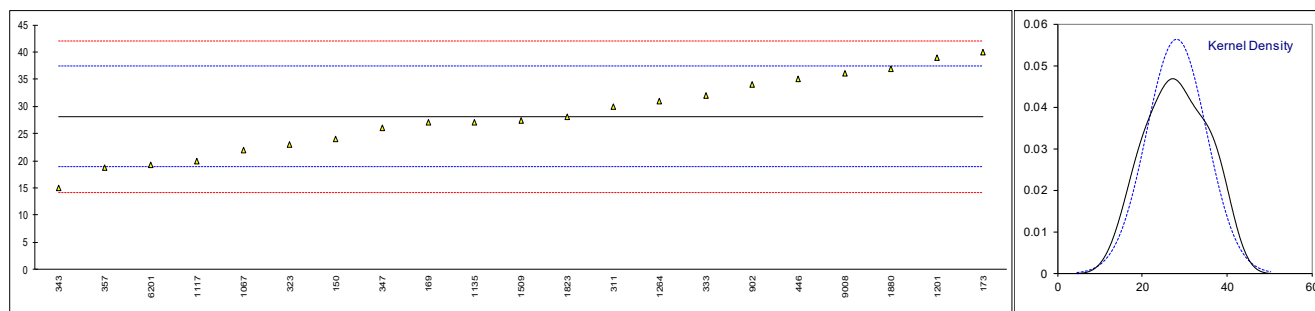
Determination of Polymer on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D2121-A	1		-0.49	
169	D2121-A	2		0.29	
171	D2121-A	1		-0.49	
173		-----		-----	
273	D2121-A	1		-0.49	
311	D2121-A	2		0.29	
323	D2121-A	1		-0.49	
333		-----		-----	
343	D2121-A	1		-0.49	
347	D2121-A	1.7		0.05	
357	D2121-A	1.3		-0.26	
446	D2121-A	1		-0.49	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902	D2121-A	1.2		-0.34	
913	D2121-A	1.5		-0.10	
1067	D2121-A	1		-0.49	
1117	D2121-A	2.56		0.73	
1135	D2121-A	2		0.29	
1169	D2121-A	2.2		0.45	
1201	D2121-A	1.9		0.21	
1264	D2121-A	0.78		-0.66	
1509	D2121-A	2.261		0.49	
1515	D2121-A	2.4901		0.67	
1823	D2121-A	1.835		0.16	
1880	D2121-A	1.6		-0.02	
6013		2.0		0.29	
6201	D2121-A	<1		-----	
6202	D2121-A	2.496		0.68	
6262		-----		-----	
7014	D2121	2.17		0.42	
9008	D2121-A	1.4		-0.18	
9014		-----		-----	

normality	OK
n	26
outliers	0
mean (n)	1.630
st.dev. (n)	0.5622
R(calc.)	1.574
st.dev.(D2121-A:16)	1.2792
R(D2121-A:16)	3.582
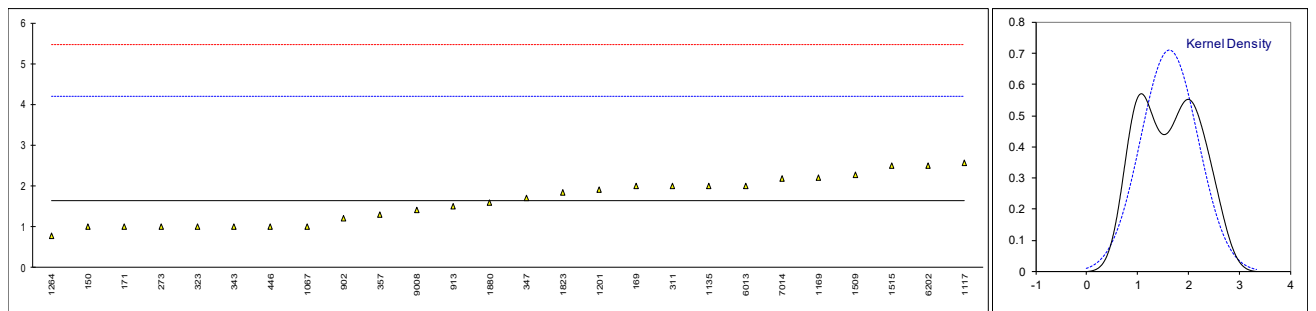
Determination of Sulfur (total) on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5453	1.8		-0.27	
169		-----		-----	
171	D5453	1.7		-0.57	
173		-----		-----	
273		-----		-----	
311	D5453	2.0		0.32	
323	D5453	<1		-----	
333	D5453	1.9		0.03	
343	D5453	1.8		-0.27	
347	D5453	2.0		0.32	
357	D5453	2.2		0.92	
446		-----		-----	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902		-----		-----	
913	D5453	1.0		-2.67	
1067	D5453	1.7		-0.57	
1117	D5453	1.76		-0.39	
1135	D5453	1.9		0.03	
1169		-----		-----	
1201	D5453	1.65		-0.72	
1264	D5453	1.6		-0.87	
1509	D5453	2.138		0.74	
1515		-----		-----	
1823	D5453	2.71		2.45	
1880	D5453	2.3		1.22	
6013		-----		-----	
6201	D5453	2.09		0.59	
6202	D5453	1.555		-1.01	
6262		-----		-----	
7014	D5453	1.53		-1.08	
9008	D5453	2.5		1.82	
9014		-----		-----	

normality	suspect
n	20
outliers	0
mean (n)	1.892
st.dev. (n)	0.3780
R(calc.)	1.059
st.dev.(D5453:19a)	0.3339
R(D5453:19a)	0.935
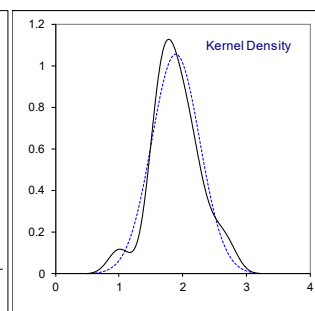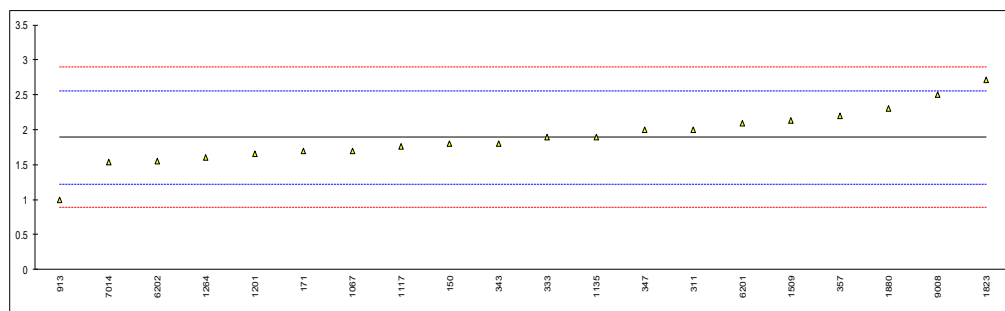
Determination of Water on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	E1064	204		1.79	
169	E1064	168		-0.46	
171	E1064	203		1.73	
173	E1064	190		0.91	
273	E203	186		0.67	
311	E1064	160		-0.95	
323	E1064	170		-0.33	
333	D1364	167		-0.52	
343	E1064	160		-0.95	
347	E1064	160	C	-0.95	First reported 230
357	E1064	150		-1.58	
446	E203	216		2.54	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902	E1064	180		0.29	
913	E1064	167		-0.52	
1067	E1064	160		-0.95	
1117	E1064	163.6		-0.73	
1135	E1064	167		-0.52	
1169	E1064	185		0.60	
1201	E1064	163		-0.77	
1264	E1064	182		0.42	
1509	E1064	212.3		2.30	
1515	E1064	139		-2.26	
1823	E1064	172.6		-0.17	
1880	E1064	165		-0.64	
6013	D1364	205		1.85	
6201	E1064	186		0.67	
6202	D6304	172.5		-0.18	
6262		-----		-----	
7014	E1064	167.32		-0.50	
9008		163		-0.77	
9014		-----		-----	

normality	OK
n	29
outliers	0
mean (n)	175.32
st.dev. (n)	18.814
R(calc.)	52.68
st.dev.(E1064:16)	16.044
R(E1064:16)	44.92
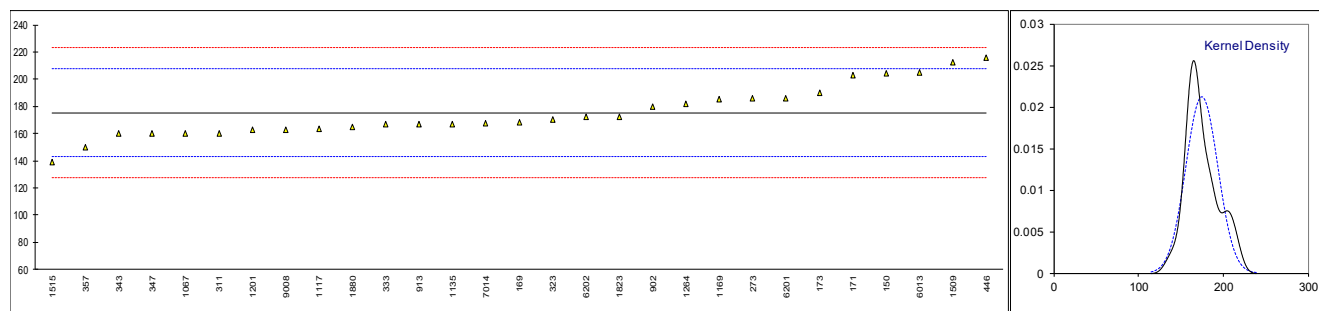
Determination of Purity by GC on sample #19195; results in %M/M

lab	method	value	mark	z(targ)	remarks
150	D5135	99.93		-0.78	
169	D5135	99.91		-2.69	
171	D5135	99.94		0.17	
173		-----		-----	
273	D5135	99.97		3.03	
311	D5135	99.94		0.17	
323	D5135	99.93		-0.78	
333	D5135	99.94		0.17	
343	D5135	99.94		0.17	
347	D5135	99.939		0.08	
357	D5135	99.941		0.27	
446	D5135	99.95		1.12	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902	D5135	99.919		-1.83	
913	D5135	99.95		1.12	
1067	In house	99.93		-0.78	
1117	D5135	99.935		-0.31	
1135	D5135	99.94		0.17	
1169	D5135	99.956		1.70	
1201	D5135	99.95		1.12	
1264	D5135	99.9409		0.26	
1509	D5135	99.938		-0.02	
1515	D5135	99.9492		1.05	
1823	D5153	99.9374		-0.08	
1880	D5135	99.94		0.17	
6013	In house	99.93		-0.78	
6201	D5135	99.92		-1.74	
6202	D5135	99.9288		-0.90	
6262		-----		-----	
7014	D5135	99.936		-0.21	
9008		99.94		0.17	
9014		-----		-----	

normality	suspect	
n	28	
outliers	0	
mean (n)	99.9382	
st.dev. (n)	0.01182	
R(calc.)	0.0331	
st.dev.(D5135:16e1)	0.01049	
R(D5135:16e1)	0.0294	
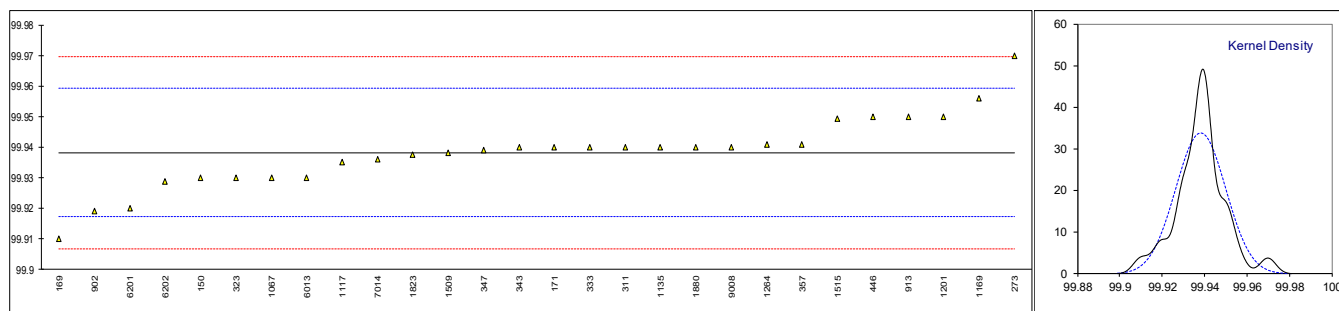
Determination of Benzene on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	Remarks
150	D5135	3		0.78	
169	D5135	3		0.78	
171	D6229	2.7		0.04	
173		-----		-----	
273		-----		-----	
311	D6229	2.5		-0.44	
323	D5135	3		0.78	
333		-----		-----	
343	INH-1456	2.66		-0.05	
347		-----		-----	
357	D5135	1	R(0.05)	-4.10	
446	D5135	<10		-----	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902	INH-123	2.8		0.29	
913	D5135	<10		-----	
1067	In house	2		-1.66	
1117	D5135	3.13		1.09	
1135		2.6		-0.20	
1169		-----		-----	
1201	In house	2.5		-0.44	
1264	D5135	4.0	R(0.05)	3.21	
1509	In house	2.64		-0.10	
1515		3.98	R(0.05)	3.16	
1823	In house	<0.5		<-5.32	Possibly a false negative test result?
1880	D4535	2.4		-0.69	
6013	In house	2		-1.66	
6201	D5135	3		0.78	
6202	D5135	3.1		1.02	
6262		-----		-----	
7014	D5135	2.54		-0.35	
9008		2.7		0.04	
9014		-----		-----	

normality	OK	
n	18	
outliers	3	
mean (n)	2.682	
st.dev. (n)	0.3343	
R(calc.)	0.936	
st.dev.(D5135:16e1)	0.4105	
R(D5135:16e1)	1.149	
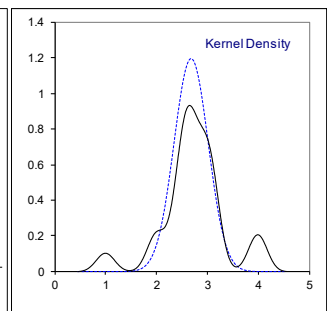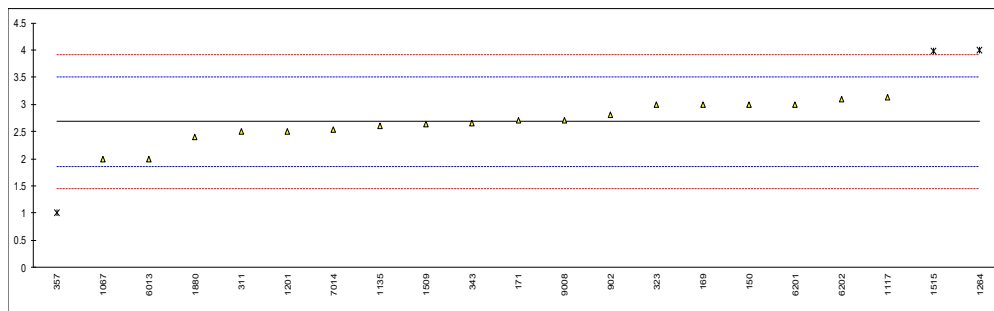
Determination of Toluene on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	28		1.85	
169	D5135	26		1.00	
171	D5135	24		0.15	
173		-----		-----	
273		-----		-----	
311	D5135	20		-1.55	
323	D5135	22		-0.70	
333		-----		-----	
343		-----		-----	
347		-----		-----	
357	D5135	23		-0.28	
446	D5135	25		0.58	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902		-----		-----	
913	D5135	25	C	0.58	First reported <10
1067	In house	20		-1.55	
1117	D5135	26.7	C	1.30	First reported 8.4
1135	D5135	23		-0.28	
1169		-----		-----	
1201	D5135	22		-0.70	
1264	D5135	23		-0.28	
1509	D5135	23.21		-0.19	
1515	D5135	21		-1.13	
1823	D5135	25.11		0.62	
1880		-----		-----	
6013		-----		-----	
6201	D5135	24		0.15	
6202	D5135	23.5		-0.06	
6262		-----		-----	
7014	D5135	24.74		0.46	
9008		23.7		0.02	
9014		-----		-----	

	normality	OK
	n	20
	outliers	0
	mean (n)	23.648
	st.dev. (n)	2.0718
	R(calc.)	5.801
	st.dev.(Horwitz)	2.3504
	R(Horwitz)	6.581
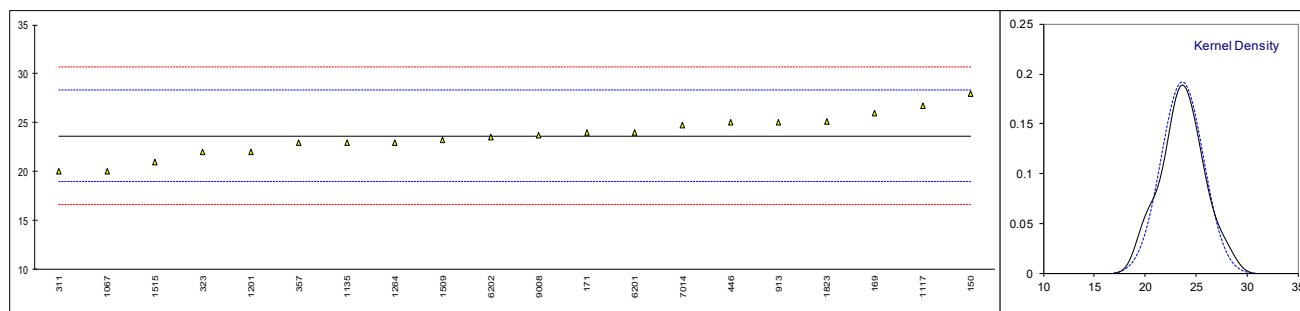
Determination of Ethylbenzene on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	116		0.86	
169	D5135	106		-0.32	
171	D5135	106		-0.32	
173		-----		-----	
273		-----		-----	
311	D5135	110		0.15	
323	D5135	116		0.86	
333	D5135	129		2.39	
343	D5135	102		-0.79	
347	D5135	106		-0.32	
357	D5135	110		0.15	
446	D5135	110		0.15	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902	D5135	110		0.15	
913	D5135	102		-0.79	
1067	In house	120		1.33	
1117	D5135	111.3		0.31	
1135	D5135	103		-0.67	
1169	D5135	120.6		1.40	
1201	D5135	100		-1.02	
1264	D5135	107.7		-0.12	
1509	D5135	109.77		0.13	
1515	D5135	96		-1.49	
1823	D5135	107.44		-0.15	
1880	D5135	104		-0.55	
6013	In house	107		-0.20	
6201	D5135	149.9	R(0.01)	4.84	
6202	D5135	109		0.04	
6262		-----		-----	
7014	D5135	99.98		-1.02	
9008		107		-0.20	
9014		-----		-----	

normality	suspect
n	26
outliers	1
mean (n)	108.684
st.dev. (n)	7.1842
R(calc.)	20.116
st.dev.(D5135:16e1)	8.5135
R(D5135:16e1)	23.838
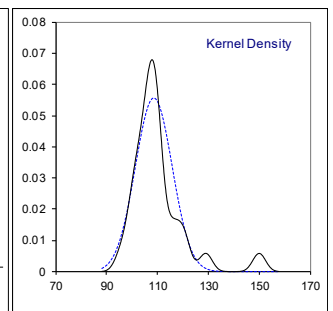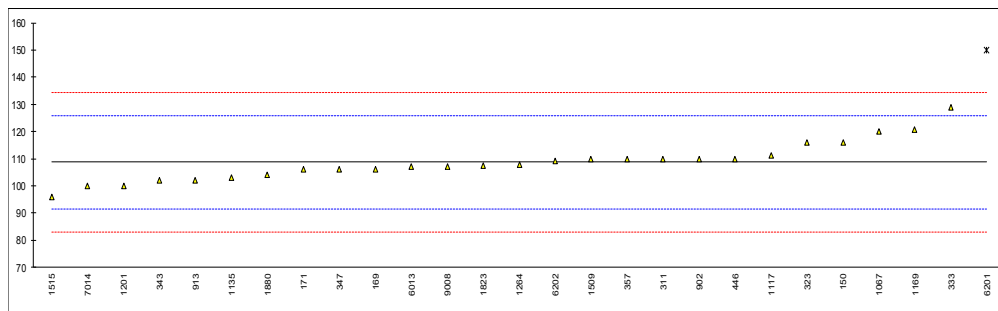
Determination of sum of m- and p-Xylenes on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	32		1.57	
169	D5135	26		-0.22	
171	D5135	26		-0.22	
173		-----		-----	
273		-----		-----	
311	D5135	30		0.97	
323	D5135	23		-1.12	
333	D5135	33		1.87	
343	D5135	27		0.08	
347	D5135	25		-0.52	
357	D5135	26		-0.22	
446		-----		-----	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902		-----		-----	
913		-----		-----	
1067	In house	20		-2.02	
1117	D5135	29.3		0.76	
1135	D5135	25		-0.52	
1169	D5135	31.12		1.31	
1201	D5135	24		-0.82	
1264	D5135	27		0.08	
1509	D5135	27.29		0.16	
1515	D5135	24		-0.82	
1823	D5135	30.80		1.21	
1880	D5135	25		-0.52	
6013		-----		-----	
6201	D5135	29		0.67	
6202	D5135	20.5		-1.87	
6262		-----		-----	
7014	D5135	27.22		0.14	
9008		27		0.08	
9014		-----		-----	

normality	OK	
n	23	
outliers	0	
mean (n)	26.749	
st.dev. (n)	3.3686	
R(calc.)	9.432	
st.dev.(D5135:16e1)	3.3396	
R(D5135:16e1)	9.351	
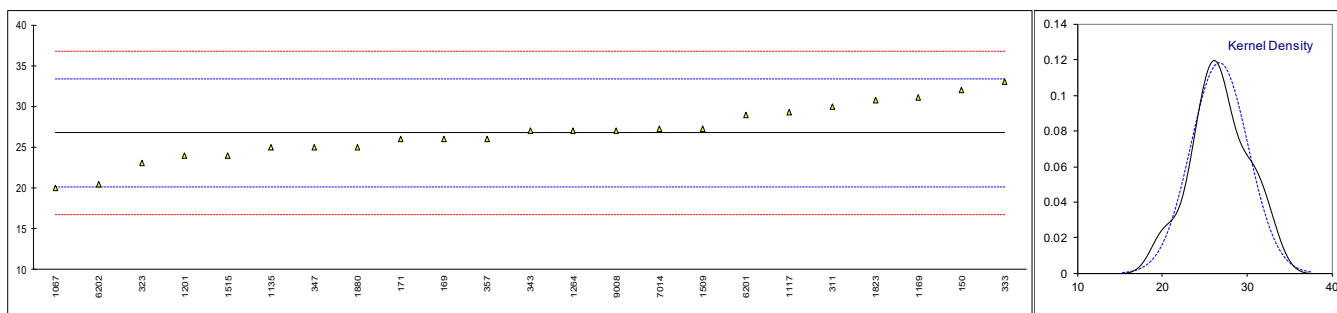
Determination of iso-Propylbenzene (Cumene) on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	28		1.57	
169	D5135	25		-0.63	
171	D5135	31		3.78	
173		-----		-----	
273		-----		-----	
311	D5135	30		3.04	
323	D5135	27		0.84	
333	D5135	32		4.51	
343		-----		-----	
347	D5135	27	C	0.84	First reported 17
357	D5135	26		0.10	
446	D5135	26		0.10	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902		-----		-----	
913	D5135	20	C	-4.31	First reported <10
1067	In house	30		3.04	
1117	D5135	26.1		0.17	
1135	D5135	24		-1.37	
1169		-----		-----	
1201	D5135	22		-2.84	
1264	D5135	25		-0.63	
1509	D5135	25.71		-0.11	
1515	D5135	22		-2.84	
1823	D5135	26.44		0.42	
1880	D5135	25		-0.63	
6013		-----		-----	
6201	D5135	26		0.10	
6202	D5135	17.5		-6.15	
6262		-----		-----	
7014	D5135	27.1		0.91	
9008		26		0.10	
9014		-----		-----	

	normality	OK	
	n	23	
	outliers	0	
	mean (n)	25.863	
	st.dev. (n)	3.3529	
	R(calc.)	9.388	
	st.dev.(D5135:16e1)	1.3603	
	R(D5135:16e1)	3.809	
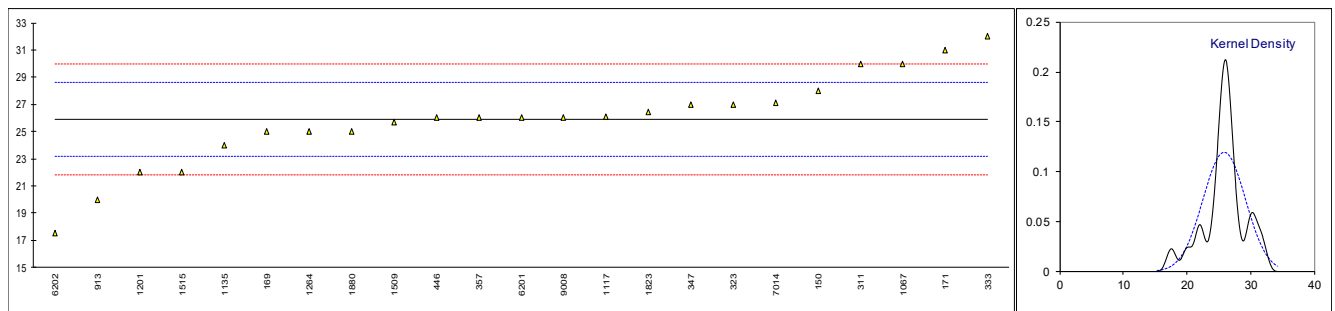
Determination of o-Xylene on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	Remarks
150	D5135	21		1.25	
169	D5135	19		0.06	
171	D5135	20		0.65	
173		-----		-----	
273		-----		-----	
311	D5135	20		0.65	
323	D5135	18		-0.53	
333	D5135	27	R(0.01)	4.80	
343	D5135	19		0.06	
347	D5135	21		1.25	
357	D5135	18		-0.53	
446	D5135	19		0.06	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902		-----		-----	
913	D5135	16	C	-1.72	First reported <10
1067	In house	20		0.65	
1117	D5135	19.8		0.53	
1135	D5135	17		-1.13	
1169	D5135	16.1	C	-1.66	First reported 29.8
1201	D5135	20		0.65	
1264	D5135	19		0.06	
1509	D5135	20.07		0.69	
1515	D5135	16		-1.72	
1823	D5135	20.06		0.69	
1880	D5135	18		-0.53	
6013		-----		-----	
6201	D5135	20		0.65	
6202	D5135	8.5	R(0.01)	-6.16	
6262		-----		-----	
7014	D5135	18.64		-0.15	
9008		19		0.06	
9014		-----		-----	

normality	OK	
n	23	
outliers	2	
mean (n)	18.899	
st.dev. (n)	1.4956	
R(calc.)	4.188	
st.dev.(D5135:16e1)	1.6874	
R(D5135:16e1)	4.725	
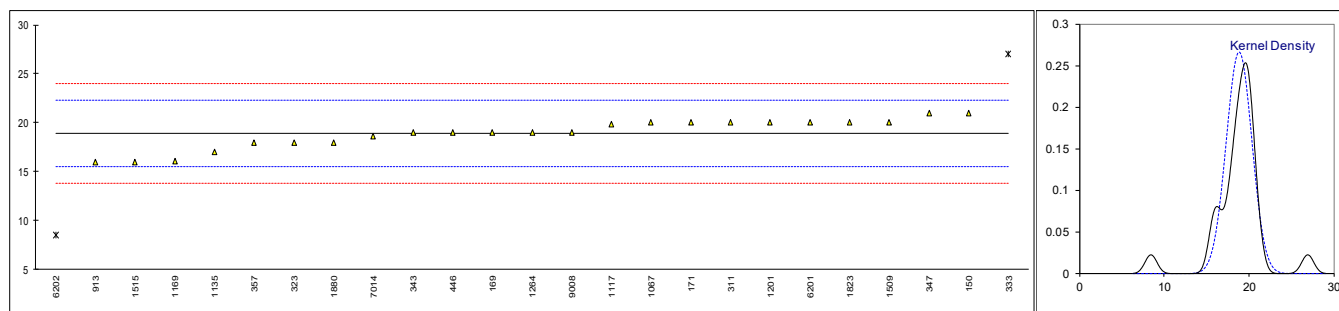
Determination of n-Propylbenzene on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	16		1.39	
169	D5135	13.9	C	-0.26	First reported 5
171	D5135	16		1.39	
173		-----		-----	
273		-----		-----	
311	D5135	20		4.54	
323	D5135	15		0.60	
333	D5135	19		3.75	
343	D5135	10		-3.33	
347	D5135	10		-3.33	
357	D5135	14		-0.18	
446		-----		-----	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902		-----		-----	
913		-----		-----	
1067	In house	10		-3.33	
1117	D5135	14.9		0.53	
1135	D5135	13		-0.97	
1169		-----		-----	
1201	D5135	12		-1.76	
1264	D5135	15		0.60	
1509	D5135	15.16		0.73	
1515	D5135	12		-1.76	
1823	D5135	15.79		1.23	
1880	D5135	14		-0.18	
6013		-----		-----	
6201	D5135	56	R(0.01)	32.87	
6202		-----		-----	
6262		-----		-----	
7014	D5135	13.9		-0.26	
9008		15		0.60	
9014		-----		-----	

	normality	OK
	n	20
	outliers	1
	mean (n)	14.233
	st.dev. (n)	2.6487
	R(calc.)	7.416
	st.dev.(D5135:16e1)	1.2708
	R(D5135:16e1)	3.558
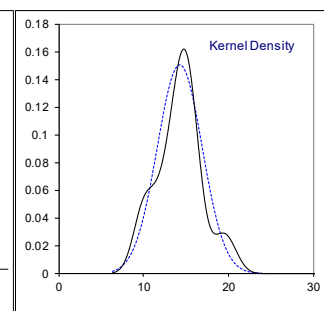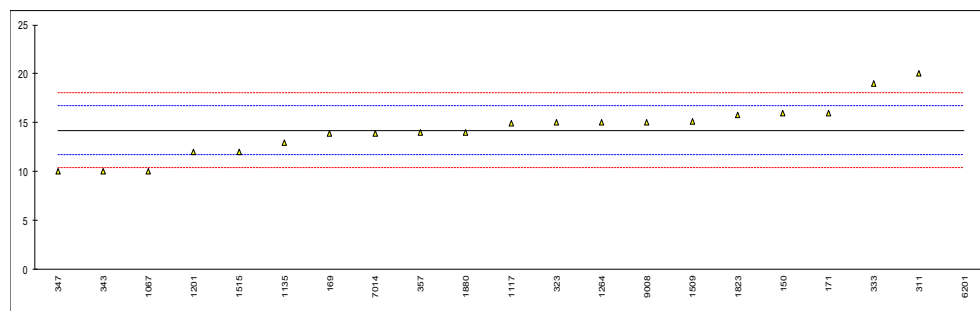
Determination of sum of m- and p-Ethyltoluenes on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	9		0.85	
169		-----		-----	
171		-----		-----	
173		-----		-----	
273		-----		-----	
311	D5135	<20		-----	
323	D5135	<10		-----	
333		-----		-----	
343	D5135	<10		-----	
347		-----		-----	
357	D5135	7		-0.51	
446		-----		-----	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902		-----		-----	
913		-----		-----	
1067	In house	5		-1.88	
1117	D5135	6.6		-0.78	
1135	D5135	11		2.22	
1169		-----		-----	
1201		-----		-----	
1264	D5135	10		1.54	
1509	D5135	7.6		-0.10	Only p-ethyltolueen reported.
1515	D5135	6		-1.19	
1823		-----		-----	
1880	D5135	<10		-----	
6013		-----		-----	
6201	D5135	73	G(0.01)	44.58	
6202		-----		-----	
6262		-----		-----	
7014	D5135	7.54		-0.14	
9008		<10		-----	
9014		-----		-----	

normality	OK
n	9
outliers	1
mean (n)	7.749
st.dev. (n)	1.9289
R(calc.)	5.401
st.dev.(D5135:16e1)	1.4636
R(D5135:16e1)	4.098
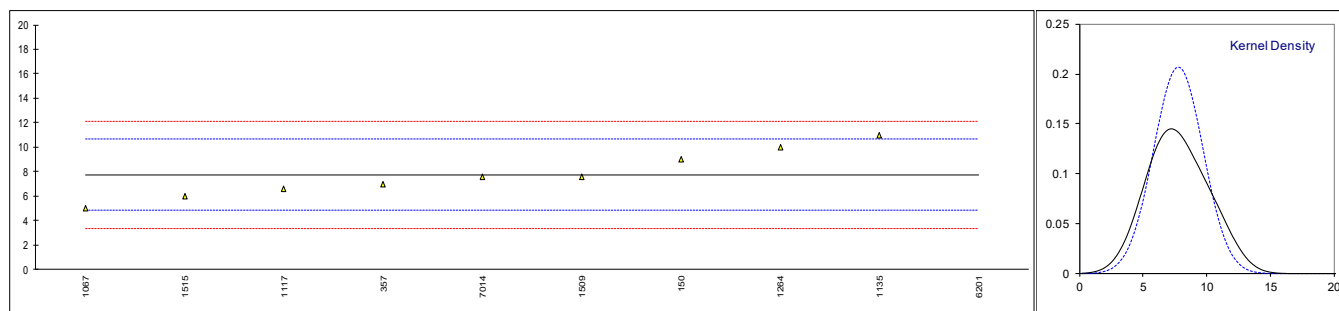
Determination of alpha-Methylstyrene on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	253	C	0.43	First reported 285
169	D5135	245		-0.14	
171	D5135	257		0.71	
173		-----		-----	
273		-----		-----	
311	D5135	250		0.21	
323	D5135	252		0.36	
333	D5135	292	R(0.01)	3.19	
343	D5135	233		-0.99	
347	D5135	240		-0.49	
357	D5135	246		-0.07	
446	D5135	270		1.63	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902		-----		-----	
913		-----		-----	
1067	In house	250		0.21	
1117	D5135	253.4		0.46	
1135	D5135	237		-0.70	
1169	D5135	256.6		0.68	
1201	D5135	234	C	-0.92	First reported 109
1264	D5135	239		-0.56	
1509	D5135	250.11		0.22	
1515	D5135	222		-1.77	
1823	D5135	252.89		0.42	
1880	D5135	245		-0.14	
6013		-----		-----	
6201	D5135	247		0.00	
6202	D5135	244		-0.21	
6262		-----		-----	
7014	D5135	250.12		0.22	
9008		253		0.43	
9014		-----		-----	

|	
normality	suspect
n	23
outliers	1
mean (n)	246.962
st.dev. (n)	9.8907
R(calc.)	27.694
st.dev.(D5135:16e1)	14.1400
R(D5135:16e1)	39.592
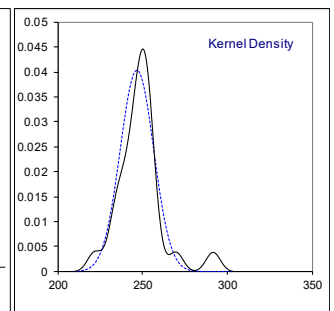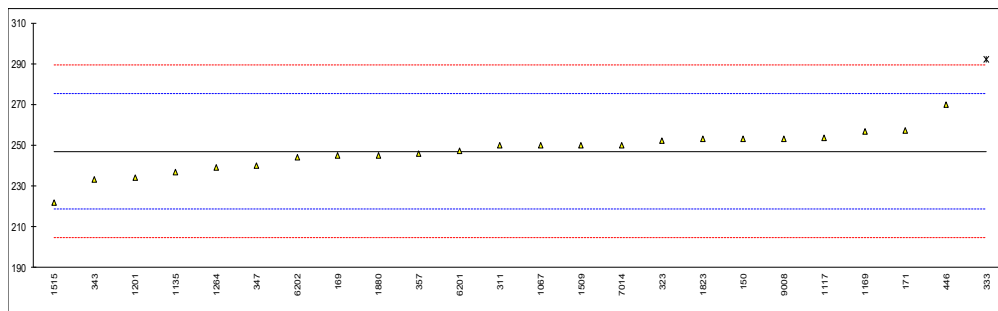
Determination of 1,2-Diethylbenzene and Sum alpha-Methylstyrene + 1,2-Diethylbenzene on sample #19195; results in mg/kg

lab	method	1,2-DeB.	mark	z(targ)	Sum a-MS + 1,2-DeB	mark	z(targ)	remarks
150		-----		-----	-----		-----	
169		-----		-----	-----		-----	
171		-----		-----	-----		-----	
173		-----		-----	-----		-----	
273		-----		-----	-----		-----	
311		-----		-----	-----		-----	
323		-----		-----	-----		-----	
333		-----		-----	-----		-----	
343		-----		-----	-----		-----	
347		-----		-----	-----		-----	
357		-----		-----	-----		-----	
446		-----		-----	-----		-----	
551		-----		-----	-----		-----	
557		-----		-----	-----		-----	
857		-----		-----	-----		-----	
858		-----		-----	-----		-----	
860		-----		-----	-----		-----	
863		-----		-----	-----		-----	
868		-----		-----	-----		-----	
869		-----		-----	-----		-----	
902		-----		-----	-----		-----	
913		-----		-----	-----		-----	
1067	In house	< 10		-----	250		-----	
1117	D5135	< 5		-----	253.4		-----	
1135		-----		-----	-----		-----	
1169		-----		-----	-----		-----	
1201	D5135	0		-----	234	C	-----	First reported 109
1264		-----		-----	-----		-----	
1509		-----		-----	-----		-----	
1515	D5135	<0.0001	Unit error?	-----	222		-----	
1823		-----		-----	252.89		-----	
1880		-----		-----	-----		-----	
6013		-----		-----	-----		-----	
6201	D5135	<6		-----	250		-----	
6202		-----		-----	244		-----	
6262		-----		-----	-----		-----	
7014		-----		-----	-----		-----	
9008		-----		-----	-----		-----	
9014		-----		-----	-----		-----	
	n	5			7			
	mean (n)	<10			243.8			

Determination of Phenylacetylene on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	11		0.12	
169	D5135	7		-0.94	
171	D5135	4		-1.74	
173		-----		-----	
273		-----		-----	
311	D5135	<10		-----	
323	D5135	<10		-----	
333		-----		-----	
343		-----		-----	
347		-----		-----	
357	D5135	6		-1.21	
446	D5135	<10		-----	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902		-----		-----	
913		-----		-----	
1067	In house	< 10		-----	
1117	D5135	16.4		1.56	
1135	D5135	12		0.39	
1169	D5135	6.25		-1.14	
1201	D5135	5		-1.47	
1264	D5135	10		-0.14	
1509	D5135	9.58		-0.25	
1515	D5135	6		-1.21	
1823	D5135	17.70		1.90	
1880	D5135	10		-0.14	
6013		-----		-----	
6201	D5135	24		3.58	
6202		-----		-----	
6262		-----		-----	
7014	D5135	13.11		0.68	
9008		-----		-----	
9014		-----		-----	

|	
normality	not OK
n	15
outliers	0
mean (n)	10.536
st.dev. (n)	5.4958
R(calc.)	15.388
st.dev.(D5135:16e1)	3.7629
R(D5135:16e1)	10.536
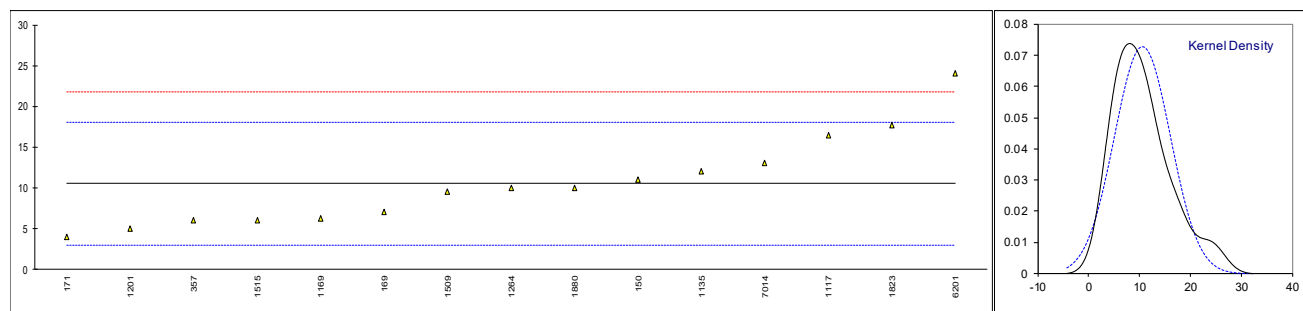
Determination of 3/4-Methylstyrenes and Sum Phenylacetylene + 3/4-Methylstyrenes on sample #19195; results in mg/kg

lab	method	3/4-Met.St.	mark	z(targ)	Sum Phenyl + 3/4-MS	mark	z(targ)	remarks
150		-----		-----	-----		-----	
169		-----		-----	-----		-----	
171		-----		-----	-----		-----	
173		-----		-----	-----		-----	
273		-----		-----	-----		-----	
311		-----		-----	-----		-----	
323		-----		-----	-----		-----	
333		-----		-----	-----		-----	
343		-----		-----	-----		-----	
347		-----		-----	-----		-----	
357		-----		-----	-----		-----	
446		-----		-----	-----		-----	
551		-----		-----	-----		-----	
557		-----		-----	-----		-----	
857		-----		-----	-----		-----	
858		-----		-----	-----		-----	
860		-----		-----	-----		-----	
863		-----		-----	-----		-----	
868		-----		-----	-----		-----	
869		-----		-----	-----		-----	
902		-----		-----	-----		-----	
913		-----		-----	-----		-----	
1067	In house	< 10		-----	< 10		-----	
1117	D5135	< 5		-----	16.4		-----	
1135		-----		-----	-----		-----	
1169		-----		-----	-----		-----	
1201	D5135	0		-----	5		-----	
1264		-----		-----	-----		-----	
1509		-----		-----	-----		-----	
1515	D5135	8		-----	14		-----	
1823		-----		-----	-----		-----	
1880		-----		-----	-----		-----	
6013		-----		-----	-----		-----	
6201	D5135	43		-----	67		-----	Possibly false positive test results?
6202		-----		-----	-----		-----	
6262		-----		-----	-----		-----	
7014		-----		-----	-----		-----	
9008		-----		-----	-----		-----	
9014		-----		-----	-----		-----	
	n	4			4			
	mean (n)	<10			<20			

Determination of Benzaldehyde on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	66		0.67	
169		-----		-----	
171	D5135	68		0.92	
173		-----		-----	
273		-----		-----	
311	D5135	70		1.16	
323	D5135	34		-3.27	
333		-----		-----	
343		-----		-----	
347	D5135	60		-0.07	
357		-----		-----	
446		-----		-----	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902		-----		-----	
913		-----		-----	
1067	In house	60		-0.07	
1117	D5135	61.6		0.13	
1135	D7504	49		-1.42	
1169		-----		-----	
1201	D5135	45		-1.92	
1264		-----		-----	
1509	D5135	60.78		0.03	
1515		-----		-----	
1823	D5135	79.36		2.32	
1880		-----		-----	
6013		-----		-----	
6201	D5135	53		-0.93	
6202	D5135	86		3.14	
6262		-----		-----	
7014		-----		-----	
9008		55		-0.68	
9014		-----		-----	

normality	OK
n	14
outliers	0
mean (n)	60.553
st.dev. (n)	13.4327
R(calc.)	37.612
st.dev.(D5135:16e1)	8.1098
R(D5135:16e1)	22.707
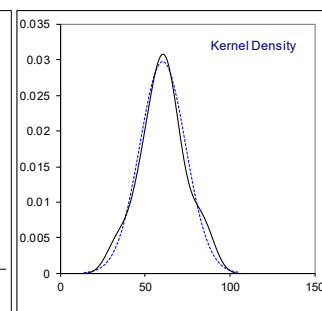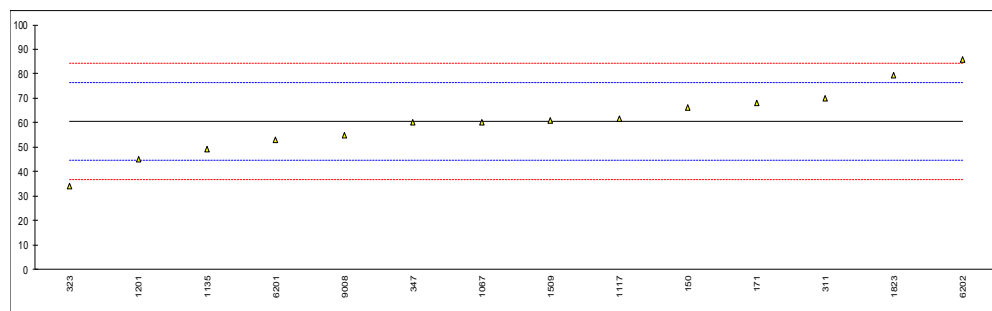
Determination of Non-aromatics on sample #19195; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	41		1.02	
169		-----		-----	
171		-----		-----	
173		-----		-----	
273		-----		-----	
311	D5135	20		-0.73	
323	D5135	33		0.35	
333		-----		-----	
343		-----		-----	
347	D5135	60		2.60	
357	D5135	28		-0.07	
446	D5135	14		-1.23	
551		-----		-----	
557		-----		-----	
857		-----		-----	
858		-----		-----	
860		-----		-----	
863		-----		-----	
868		-----		-----	
869		-----		-----	
902		-----		-----	
913	D5135	<10		-----	
1067	In house	< 10		-----	
1117	D5135	36.9	C	0.68	First reported 171.8
1135	D5135	22		-0.57	
1169		-----		-----	
1201		-----		-----	
1264	D5135	40		0.93	
1509		-----		-----	
1515	D5135	7		-1.82	
1823	D5135	16.39		-1.03	
1880		-----		-----	
6013		-----		-----	
6201	D5135	28		-0.07	
6202	D5135	28		-0.07	
6262		-----		-----	
7014		-----		-----	
9008		-----		-----	
9014		-----		-----	

normality	OK	
n	13	
outliers	0	
mean (n)	28.792	
st.dev. (n)	13.8590	
R(calc.)	38.805	
st.dev.(D5135:16e1)	11.9965	
R(D5135:16e1)	33.590	
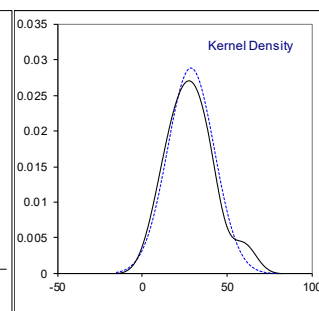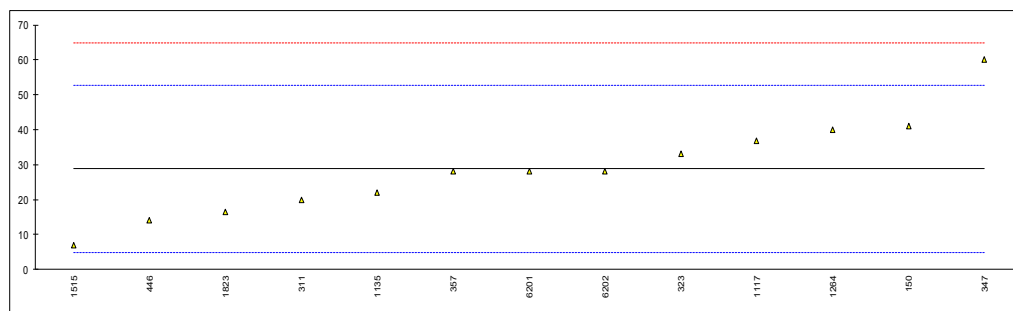
APPENDIX 2

Analytical details

lab	Molarity NaOH sol. Aldehyde determination	Density of Styrene in calculation Peroxide determination	Molarity Thiosulfate sol. Peroxide determination
150	---	---	---
169	---	---	---
171	0.02 N NaOH	---	---
173	0.05 N NaOH	0.9062 kg/l	0.01 N $Na_2S_2O_3$
273	---	---	---
311	0.05 N NaOH	0.9063	0.01 N $Na_2S_2O_3$
323	0.05 N NaOH	---	0.01 N $Na_2S_2O_3$
333	0.05 N NaOH	0.9106	0.01 N $Na_2S_2O_3$
343	0.05 N NaOH	---	0.01 N $Na_2S_2O_3$
347	---	0.9063	0.01 N $Na_2S_2O_3$
357	0.05 N NaOH	0.9063	0.01 N $Na_2S_2O_3$
446	0.05 N NaOH	0.9063	0.01 N $Na_2S_2O_3$
551	---	---	---
557	---	---	---
857	---	---	---
858	---	---	---
860	---	---	---
863	---	---	---
868	---	---	---
869	---	---	---
902	---	---	---
913	---	---	0.01 N $Na_2S_2O_3$
1067	0.05 N NaOH	---	0.01 N $Na_2S_2O_3$
1117	0.02mol/L KOH in MEOH	---	0.01 N $Na_2S_2O_3$
1135	---	---	0.01 N $Na_2S_2O_3$
1169	---	---	---
1201	---	0.9063	0.01 N $Na_2S_2O_3$
1264	0.05 N NaOH	---	0.01 N $Na_2S_2O_3$
1509	0.05 N NaOH	0.9062	0.01 N $Na_2S_2O_3$
1515	---	---	---
1823	0.05 N NaOH	0.906	0.01 N Na2S2O3
1880	0.02 N NaOH	0.9062	0.01 N $Na_2S_2O_3$
6013	---	---	---
6201	---	---	---
6202	---	---	---
6262	---	---	---
7014	---	---	---
9008	---	---	0.01 N $Na_2S_2O_3$
9014	---	---	---

APPENDIX 3

Number of participants per country

    3 labs in BELGIUM
    2 labs in BRAZIL
    1 lab in CANADA
    7 labs in CHINA, People's Republic
    1 lab in FINLAND
    1 lab in FRANCE
    1 lab in INDIA
    1 lab in INDONESIA
    1 lab in IRAN, Islamic Republic of
    2 labs in KUWAIT
    5 labs in NETHERLANDS
    1 lab in SAUDI ARABIA
    1 lab in SOUTH AFRICA
    2 labs in SPAIN
    3 labs in TURKEY
    1 lab in UNITED ARAB EMIRATES
    1 lab in UNITED KINGDOM
    5 labs in UNITED STATES OF AMERICA

APPENDIX 4

Abbreviations

C			= final test result after checking of first reported suspect test result
D(0.01)		= outlier in Dixon's outlier test
D(0.05)		= straggler in Dixon's outlier test
G(0.01)		= outlier in Grubbs' outlier test
G(0.05)		= straggler in Grubbs' outlier test
DG(0.01)	= outlier in Double Grubbs' outlier test
DG(0.05)	= straggler in Double Grubbs' outlier test
R(0.01)		= outlier in Rosner's outlier test
R(0.05)		= straggler in Rosner's outlier test
W			= test result withdrawn on request of participant
ex			= test result excluded from statistical evaluation
n.a.		= not applicable
n.e.		= not evaluated
n.d.		= not detected
SDS			= Safety Data Sheet

Literature

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3	ASTM E1301:03
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8	W.J. Youden and E.H. Steiner, Statistical Manual of the AOAC, (1975)
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