

University of Stuttgart
Germany



Analytische Qualitätssicherung Baden-Württemberg

Proficiency Test 5/21
- Hydrocarbon oil index -

Final report

provided by

AQS Baden-Württemberg at
Institute for Sanitary Engineering, Water Quality and Solid Waste Management,
University of Stuttgart
Bandtäle 2, 70569 Stuttgart-Büsnau, Germany



on behalf of the Ministry of the Environment, Climate Protection
and the Energy Sector Baden-Württemberg

Stuttgart, in August 2021

**AQS Baden-Württemberg at
Institute of Sanitary Engineering,
Water Quality and Solid Waste Management
at University of Stuttgart
Bandtäle 2
70569 Stuttgart-Büsnau
Germany
<http://www.aqsbw.de>
Tel.: +49 (0)711 / 685-65446
Fax: +49 (0)711 / 685-63769
E-Mail: info@aqsbw.de**

Responsibilities:

Scientific director:	Dr.-Ing. Michael Koch	
PT coordinator:	Dr.-Ing. Frank Baumeister	
Assistant PT coordinator	Dipl.-Biol. Biljana Marić	
Sample preparation	Gertrud Joas Cornelia Orth Ellen Raith-Bausch	
Release of the report:	Dr.-Ing. Frank Baumeister	on 20.08.2021
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1. General

This PT was provided by AQS Baden-Württemberg in the framework of the nation-wide conducted waste water PT scheme in Germany. This PT scheme is based on the requirements of the German Working Group on water issues of the Federal States and the Federal Government (LAWA), which fixed the way of doing PTs in the regulated environmental sector in its AQS-leaflet A-3 for the analysis of water, waste water and sludge. These PTs are conducted together with several PT providers nationwide in Germany in a harmonised way.

The PT was executed and evaluated according to the requirements of DIN 38402-A45 and ISO/TS 20612.

2. PT design

Each participant received the following samples:

- 3 samples for the determination of the hydrocarbon oil index in 1000-ml-ground bottles with ground-in stopper. Preservation by acidification with hydrochloric acid (pH 2,1) and by cooling.

9 different concentration levels/batches were produced. The concentration levels were randomly allocated to the participants. It was ensured that each participant received one concentration level from the lower concentration levels 1-3.

3. Sample preparation

The samples for the above mentioned parameters were based on a real waste ground water matrix.

The ground water was filtered by using 5 µm and 1 µm filter cartridges to eliminate particles. To reduce germs, the ground water was irradiated with ultraviolet light. For further preparation, the matrix was pasteurised at 80 °C over night in a steel vessel . During pasteurisation the matrix was aerated with a mixture of carbon dioxide and nitrogen in a ratio of 1:1 to prevent calcium carbonate precipitation. For the preparation of the samples, each bottle was filled with matrix and was spiked with a mixture of commercial available diesel and oil (mass ratio 1:1).

The samples were cooled directly after preparation.

4. Sample distribution

The samples were dispatched on 03 May 2021 by express service (GoExpress).

5. Analytical methods

The participants were restricted to use one analytical method according to the requirements of the “Technical Module Water” from the German Working group on water issues of the Federal States and the Federal Government (LAWA).

parameter	analytical method	issue
hydrocarbon oil index	EN ISO 9377-2	2000-10

The samples had to be analysed in duplicate over the complete method (sample preparation and measurement). The participants were asked to submit the results as average values in mg/l with three significant digits.

Following limit of quantification was required:

parameter	limit of quantification
hydrocarbon oil index	0,1 mg/l

6. Submission of the results

The deadline for the submission of results was on 31 May 2021.

7. Basic principle of evaluation and assessment

The basic principle of the evaluation and assessment of the PTs from AQS Baden-Württemberg are described in the document „Evaluation of the PTs and information for the report“, which can be downloaded from www.agsbw.de/pdf/ausw_berichte_v1_en.pdf.

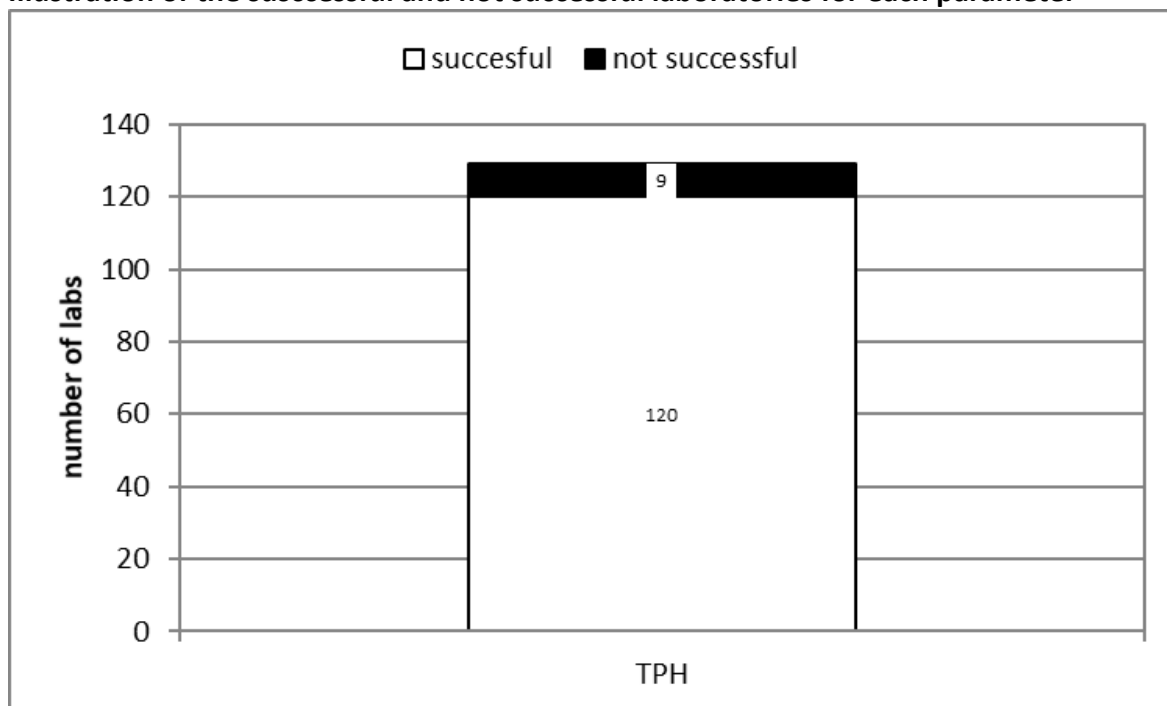
This PT was evaluated as follows:

Assigned value x_{pt}:	Consensus value (Hampel estimator)
Standard deviation for proficiency assessment σ_{pt}:	Q method Variance function
Upper limit of σ_{pt}:	30%
Lower limit of σ_{pt}:	10%
Assessment:	z_U -Score
Classification of the single results:	$ z_U \leq 2,0$ successful $2,0 < z_U < 3,0$ questionable $ z_U \geq 3,0$ unsatisfactory
Parameter assessment:	A parameter was assessed as successful, if more than half of the values were correctly determined (2 out of 3 values are within the tolerance limits).

8. Evaluation

Number of participants:	131 2 laboratories did not report results
Number of reported values	387
Number of accepted values:	355 (91,7 %)

Illustration of the successful and not successful laboratories for each parameter



9. Explanation for the appendices

The explanations for the appendices can be found in the document „Evaluation of the PTs and information for the report“ which can be downloaded from www.agsbw.de/pdf/ausw_berichte_v1_en.pdf.

10. Measurement uncertainty

General:

Number of labs with valid values	129
Number of labs with valid values and reported measurement uncertainties	83 (64,3 %)
Number of valid values	387
Number of valid values with measurement uncertainties	249 (64,3 %)

Measurement uncertainties against the accreditation status

Accreditation status of the values	Number of values	Number of values with measurement uncertainty	
accredited	294	213 (72,4 %)	
not accredited	57	21 (36,8 %)	
not specified	36	15 (41,7 %)	228
			63 (27,6 %)

Interpretation of the reported measurement uncertainties:

If measurement uncertainties are underestimated values assessed as “satisfactory” in the PT ($|z_U| \leq 2$), will have a large ζ -score. $|\zeta| > 2$ means that the “own” requirements (defined in terms of estimated uncertainty) are not fulfilled.

Number of values with reported measurement uncertainty having a $z_U \leq 2,0$	228
Number of values with a magnitude of ζ-scores > 2 The own requirements of the laboratory are not fulfilled and the estimation of the measurement uncertainty is too low	63 (27,6 %)

11. Traceable reference values

The explanations about traceable reference values can be found in the document „Evaluation of the PTs and information for the report“, which can be downloaded from www.aqsbw.de/pdf/ausw_berichte_v1.pdf.

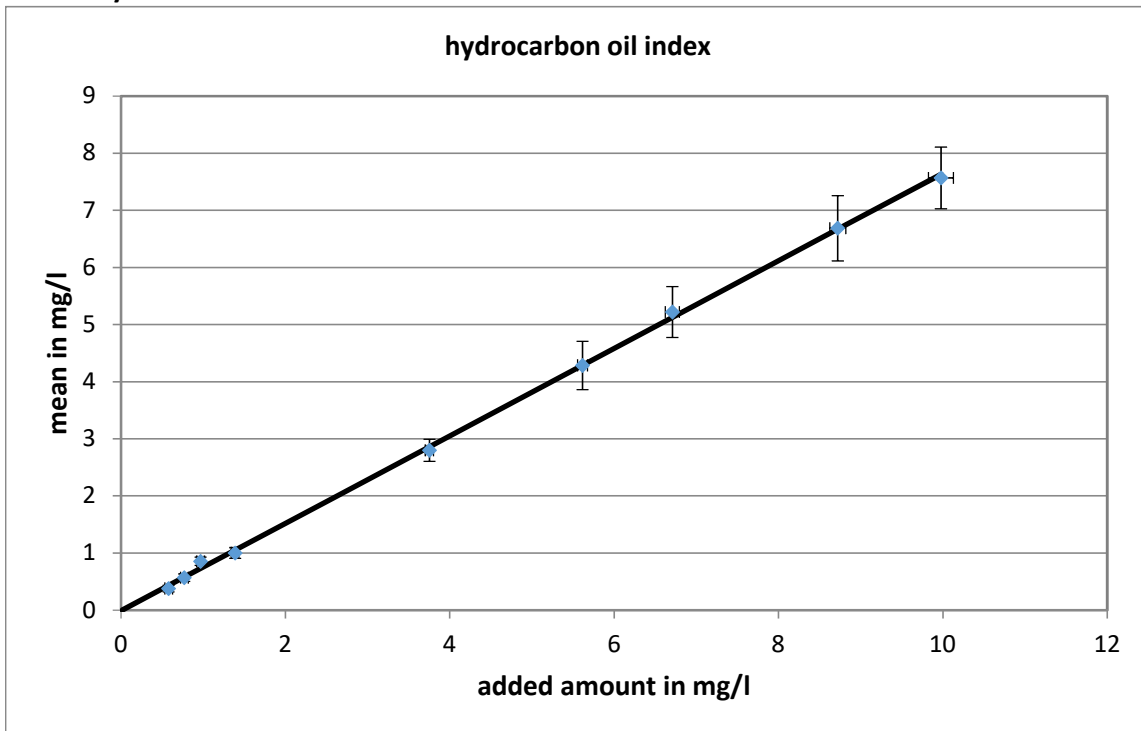
12. Internet

The report is available on the following webpage:
http://www.aqsbw.de/pdf/251/report_251.pdf

hydrocarbon oil index

level	assigned value [mg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [mg/l]	standard deviation from variance function [mg/l]	standard deviation for proficiency assessment [mg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [mg/l]	lower tolerance limit [mg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,3787	15,51	0,1541	0,1201	0,1136	30,00	0,6514	0,1767	72,02	-53,33	43	4	1	11,4
2	0,5688	11,62	0,1733	0,1691	0,1691	29,73	0,9741	0,2679	71,24	-52,90	43	2	2	9,3
3	0,8546	8,56	0,1897	0,2382	0,2382	27,87	1,418	0,4280	65,94	-49,91	42	2	1	7,1
4	1,001	9,31	0,2417	0,2721	0,2721	27,18	1,642	0,5126	64,00	-48,79	42	1	0	2,4
5	2,799	6,95	0,5162	0,6463	0,6463	23,09	4,279	1,624	52,87	-42,00	44	2	1	6,8
6	4,285	9,87	1,110	0,9248	0,9248	21,58	6,381	2,595	48,92	-39,45	43	2	2	9,3
7	5,219	8,50	1,150	1,092	1,092	20,92	7,683	3,219	47,20	-38,32	42	3	0	7,0
8	6,687	8,55	1,517	1,345	1,345	20,11	9,705	4,216	45,15	-36,95	44	2	3	11,4
9	7,566	7,14	1,401	1,492	1,492	19,72	10,91	4,821	44,16	-36,28	42	3	1	9,5
sum											385	21	11	8,3

Recovery and matrix content

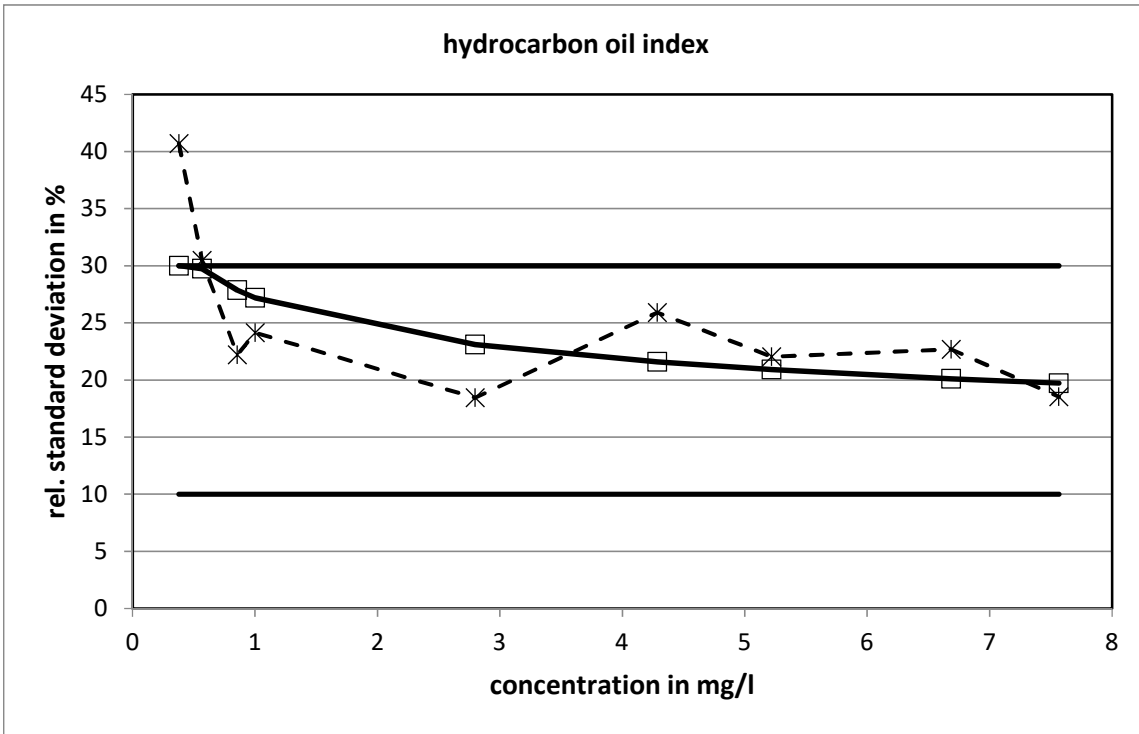


slope of the regression: 0,766; recovery rate: 76,6 %

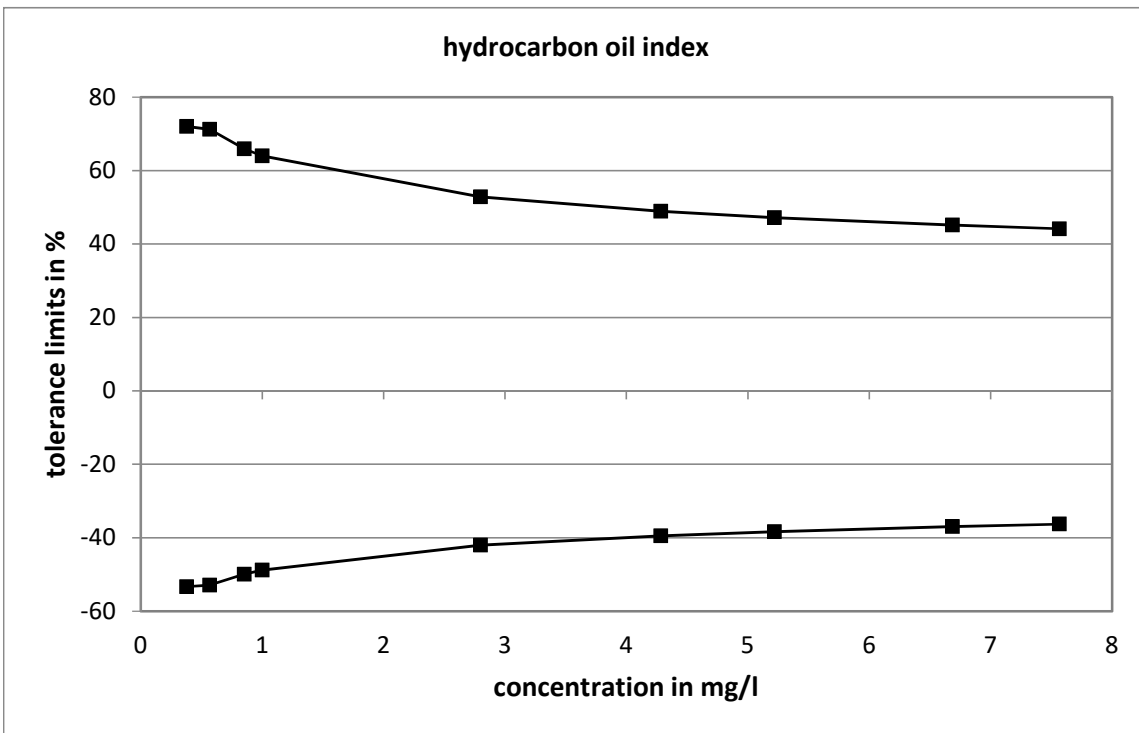
neg. x-axis intercept = matrix content: 0 mg/l

expanded uncertainty of the matrix content: 0,0159 mg/l = 0 %

Relative standard deviation and tolerance limits

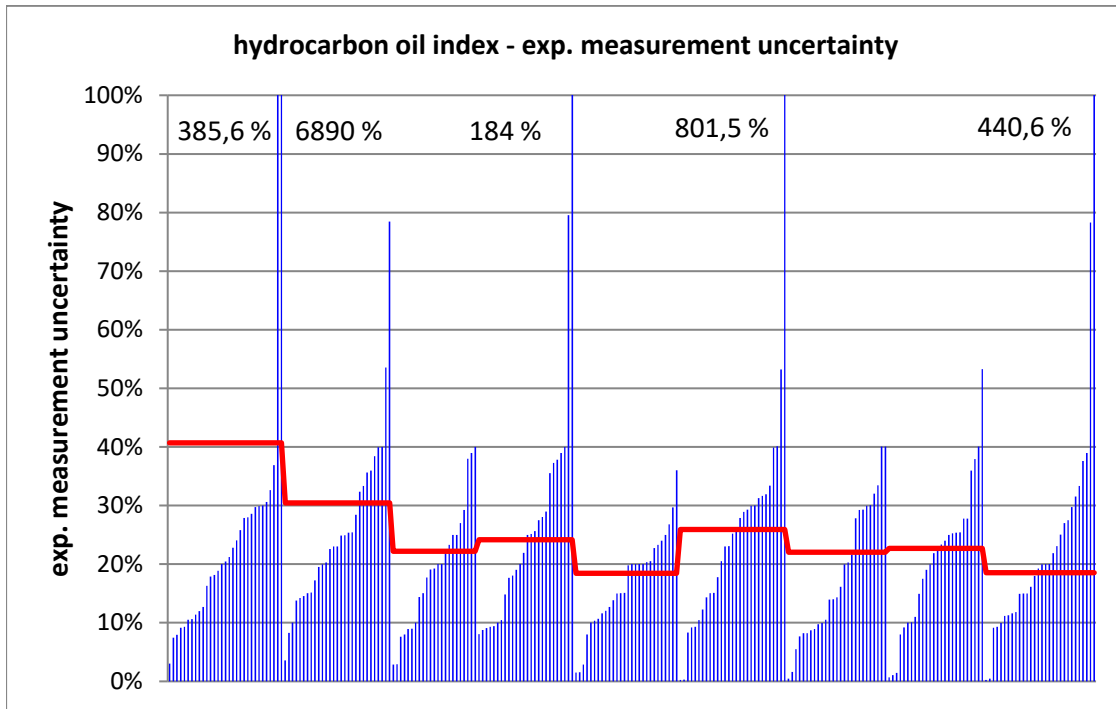


The relative standard deviations calculated from the variance function reached the upper limit with one concentration level.



Method specific evaluation

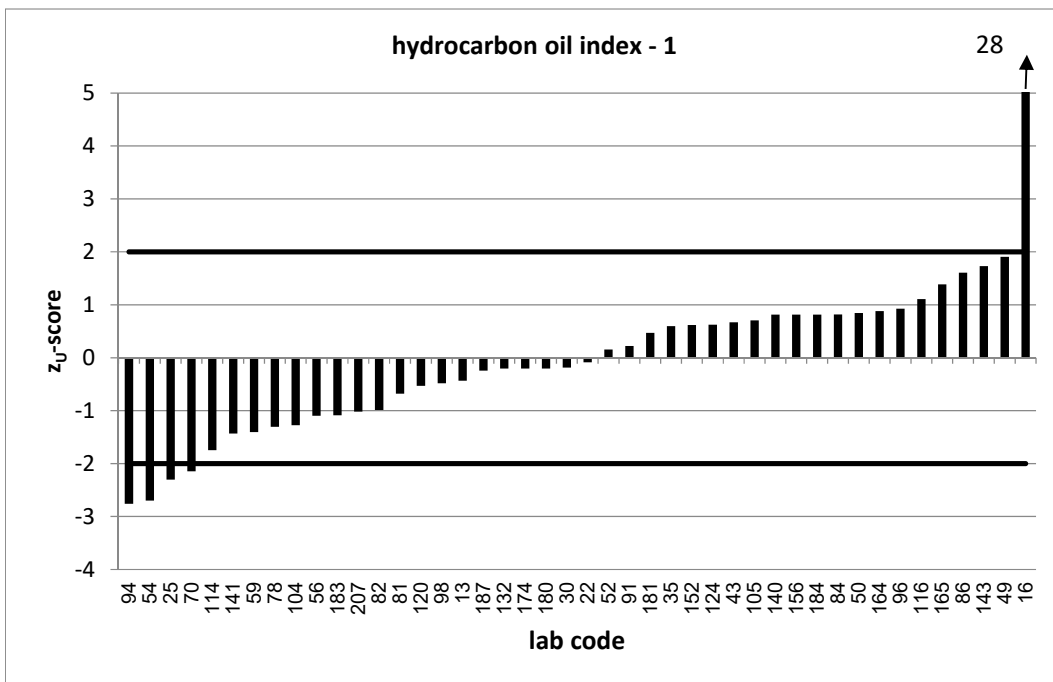
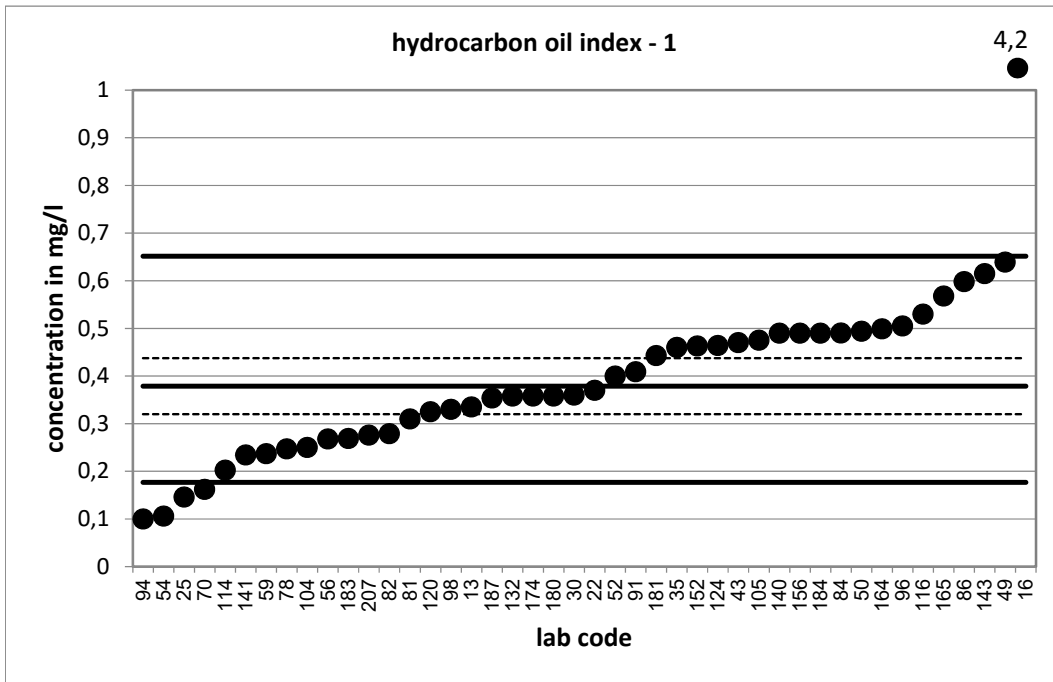
There is no method specific evaluation, because only GC after solvent extraction was applied.

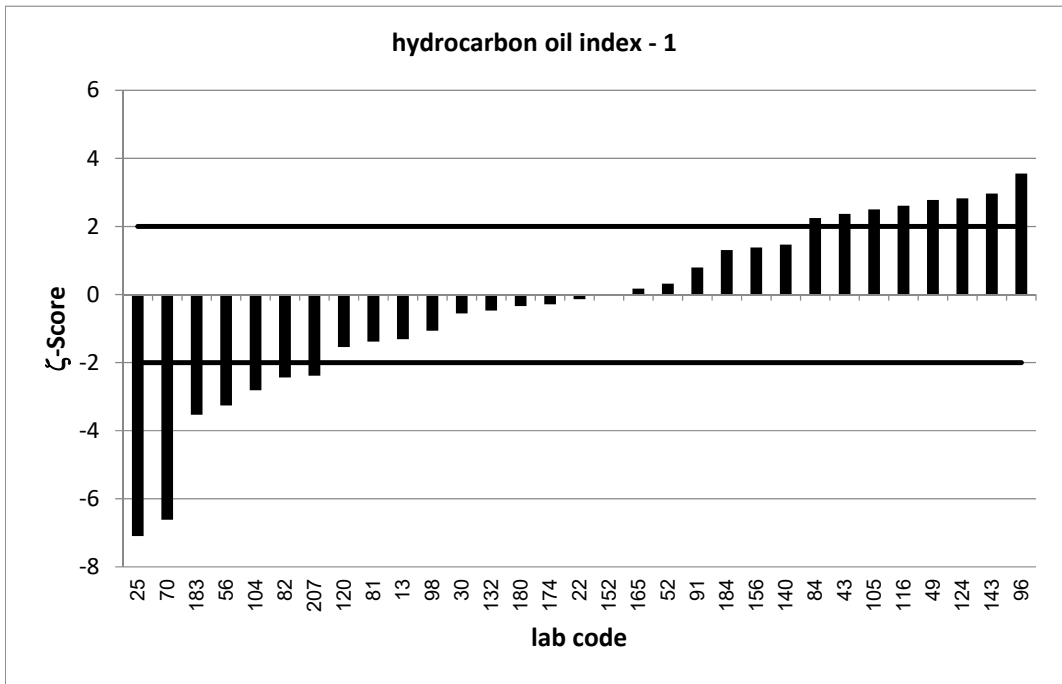
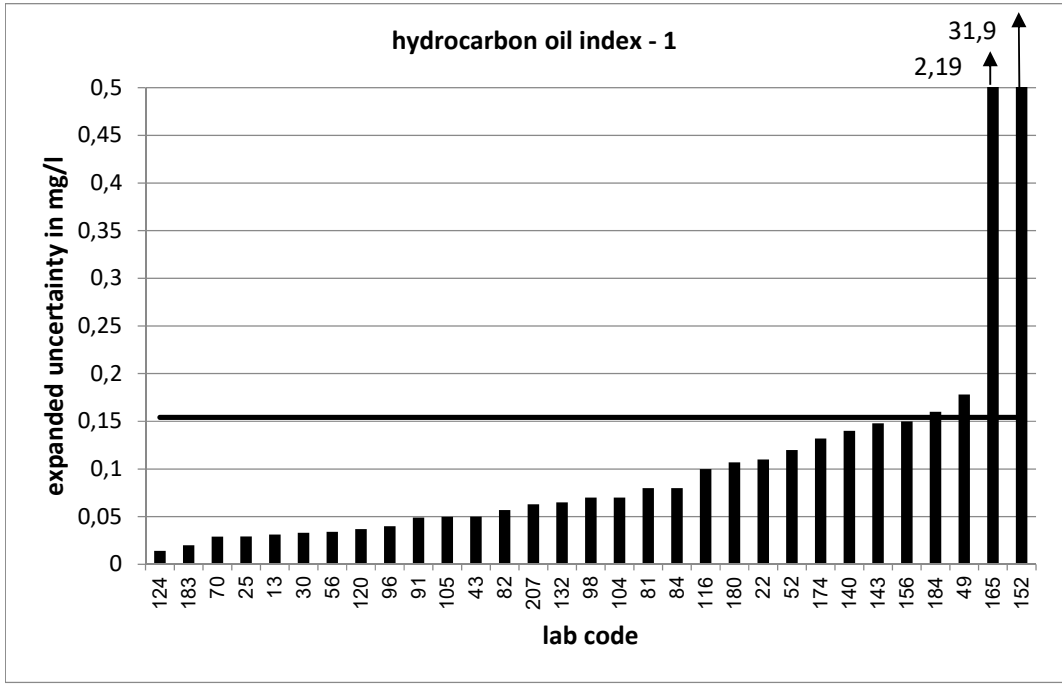


PT 5/21		hydrocarbon oil index - 1			
assigned value [mg/l]*		0,3787 ± 0,0588			
upper tolerance limit [mg/l]		0,6514			
lower tolerance limit [mg/l]		0,1767			
lab code	result [mg/l]	±	ζ-score	z _U -score	assessm.**
13	0,335	0,031	-1,3	-0,4	s
16	4,2			28,0	u
22	0,37	0,11	-0,1	-0,1	s
25	0,146	0,029	-7,1	-2,3	q
30	0,36	0,033	-0,6	-0,2	s
35	0,46			0,6	s
43	0,47	0,05	2,4	0,7	s
49	0,639	0,178	2,8	1,9	s
50	0,494			0,8	s
52	0,4	0,12	0,3	0,2	s
54	0,106			-2,7	q
56	0,268	0,034	-3,3	-1,1	s
59	0,237			-1,4	s
70	0,162	0,029	-6,6	-2,1	q
78	0,247			-1,3	s
81	0,31	0,08	-1,4	-0,7	s
82	0,279	0,057	-2,4	-1,0	s
84	0,4903	0,08	2,2	0,8	s
86	0,598			1,6	s
91	0,409	0,049	0,8	0,2	s
94	0,1			-2,8	q
96	0,505	0,04	3,6	0,9	s
98	0,33	0,07	-1,1	-0,5	s
104	0,25	0,07	-2,8	-1,3	s
105	0,475	0,05	2,5	0,7	s
114	0,2022			-1,7	s
116	0,53	0,1	2,6	1,1	s
120	0,325	0,037	-1,5	-0,5	s
124	0,464	0,014	2,8	0,6	s
132	0,358	0,065	-0,5	-0,2	s
140	0,49	0,14	1,5	0,8	s
141	0,2341			-1,4	s
143	0,615	0,148	3,0	1,7	s
152	0,463	31,9	0,0	0,6	s
156	0,49	0,15	1,4	0,8	s
164	0,499			0,9	s
165	0,568	2,19	0,2	1,4	s
174	0,358	0,132	-0,3	-0,2	s
180	0,358	0,107	-0,3	-0,2	s
181	0,443			0,5	s
183	0,269	0,02	-3,5	-1,1	s
184	0,49	0,16	1,3	0,8	s
187	0,354			-0,2	s
207	0,276	0,063	-2,4	-1,0	s

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

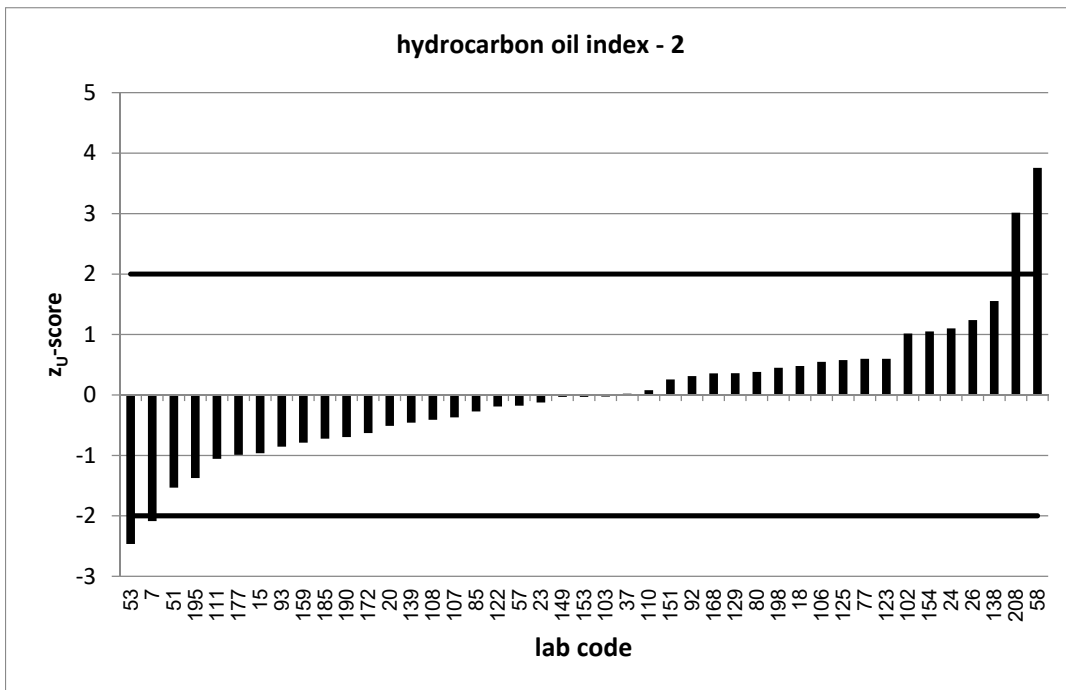
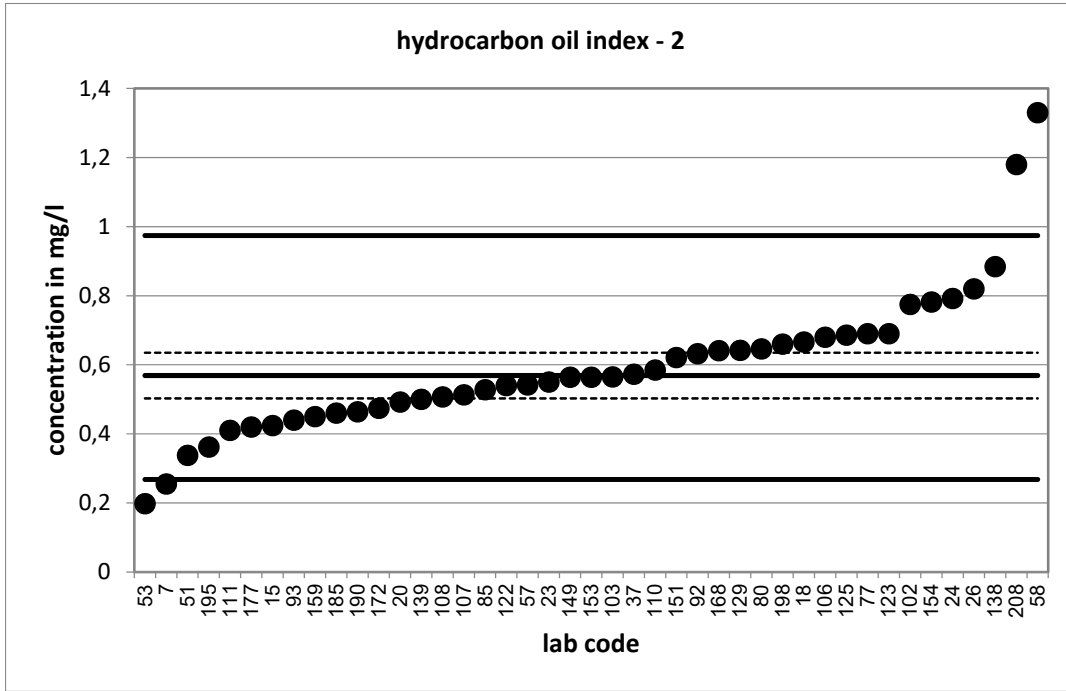


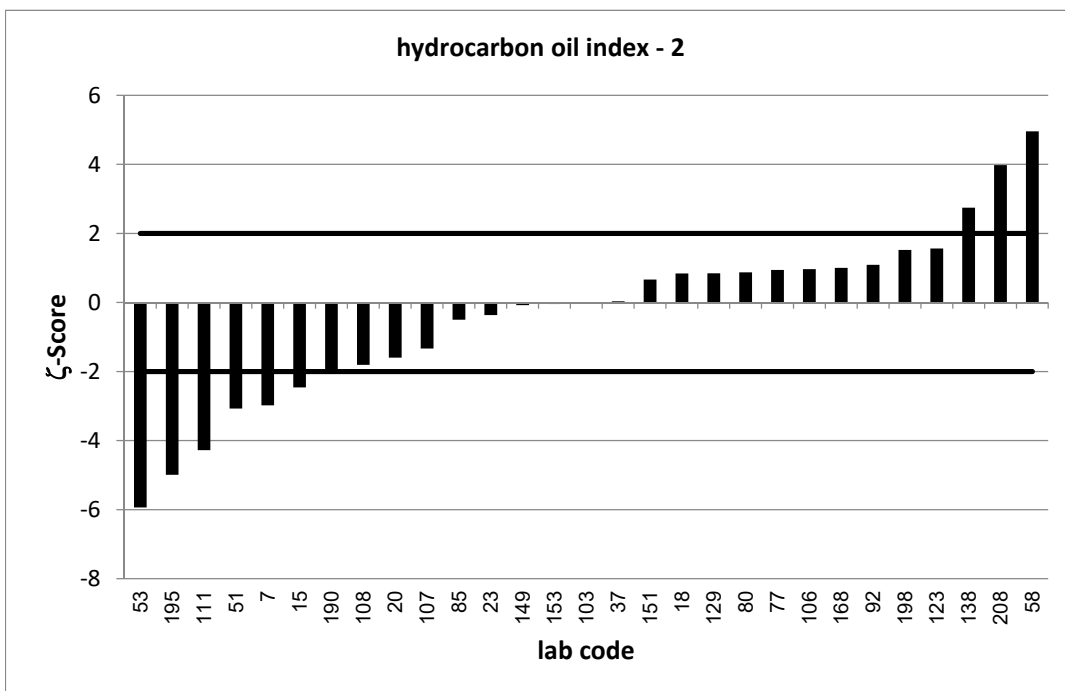
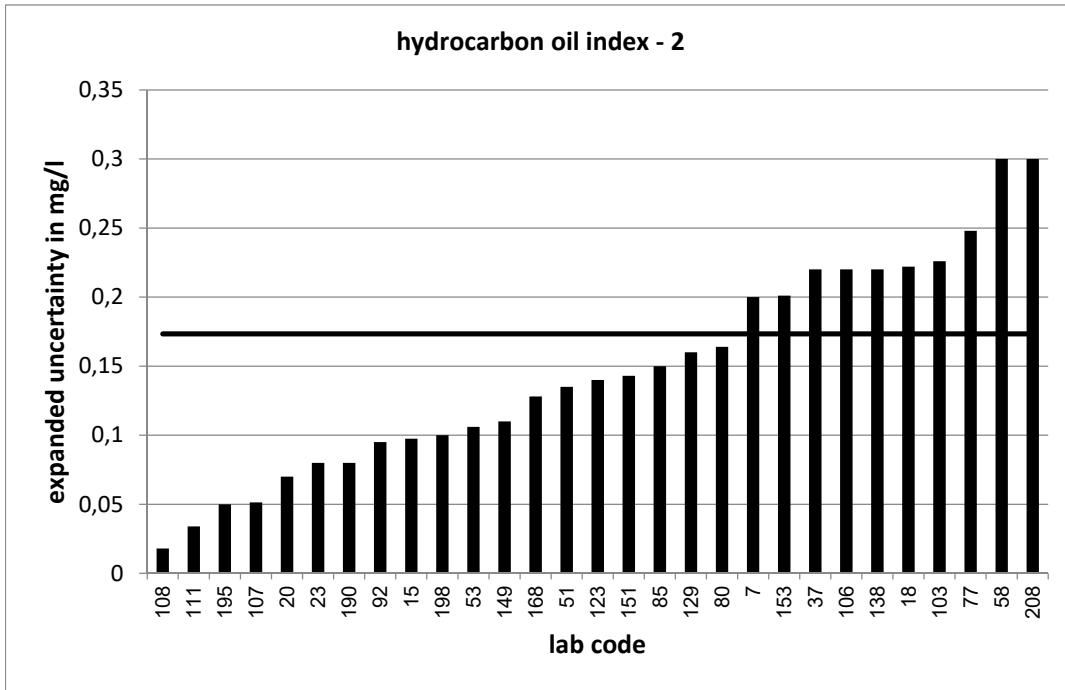


PT 5/21		hydrocarbon oil index - 2			
assigned value [mg/l]*		0,5688 ± 0,0661			
upper tolerance limit [mg/l]		0,9741			
lower tolerance limit [mg/l]		0,2679			
lab code	result [mg/l]	±	ζ-score	z _U -score	assessm.**
7	0,255	0,2	-3,0	-2,1	q
15	0,424	0,098	-2,5	-1,0	s
18	0,666	0,222	0,8	0,5	s
20	0,492	0,07	-1,6	-0,5	s
23	0,55	0,08	-0,4	-0,1	s
24	0,792			1,1	s
26	0,82			1,2	s
37	0,573	0,22	0,0	0,0	s
51	0,338	0,135	-3,1	-1,5	s
53	0,198	0,106	-5,9	-2,5	q
57	0,542			-0,2	s
58	1,33	0,3	5,0	3,8	u
77	0,69	0,248	0,9	0,6	s
80	0,646	0,164	0,9	0,4	s
85	0,528	0,15	-0,5	-0,3	s
92	0,632	0,095	1,1	0,3	s
93	0,44			-0,9	s
102	0,775			1,0	s
103	0,565	0,226	0,0	0,0	s
106	0,68	0,22	1,0	0,5	s
107	0,513	0,051	-1,3	-0,4	s
108	0,507	0,018	-1,8	-0,4	s
110	0,585			0,1	s
111	0,41	0,034	-4,3	-1,1	s
122	0,54			-0,2	s
123	0,69	0,14	1,6	0,6	s
125	0,686			0,6	s
129	0,642	0,16	0,8	0,4	s
138	0,884	0,22	2,7	1,6	s
139	0,5			-0,5	s
149	0,564	0,11	-0,1	0,0	s
151	0,621	0,143	0,7	0,3	s
153	0,564	0,201	0,0	0,0	s
154	0,782			1,1	s
159	0,45			-0,8	s
168	0,641	0,128	1,0	0,4	s
172	0,474			-0,6	s
177	0,42			-1,0	s
185	0,46			-0,7	s
190	0,464	0,08	-2,0	-0,7	s
195	0,362	0,05	-5,0	-1,4	s
198	0,66	0,1	1,5	0,4	s
208	1,18	0,3	4,0	3,0	u

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

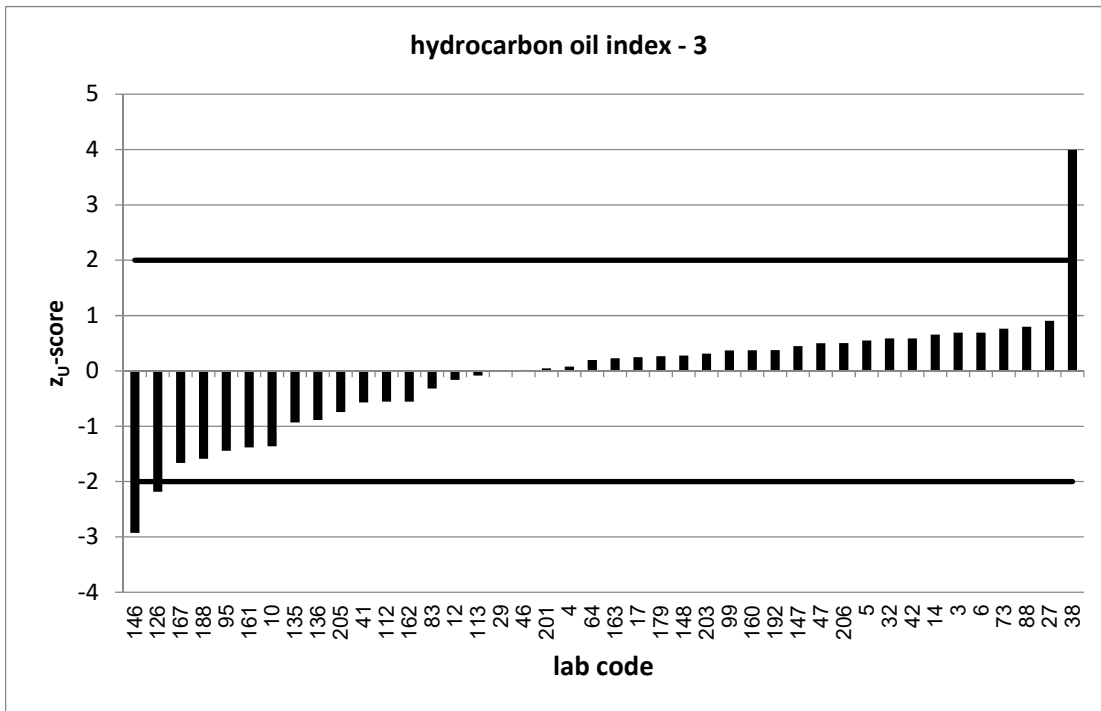
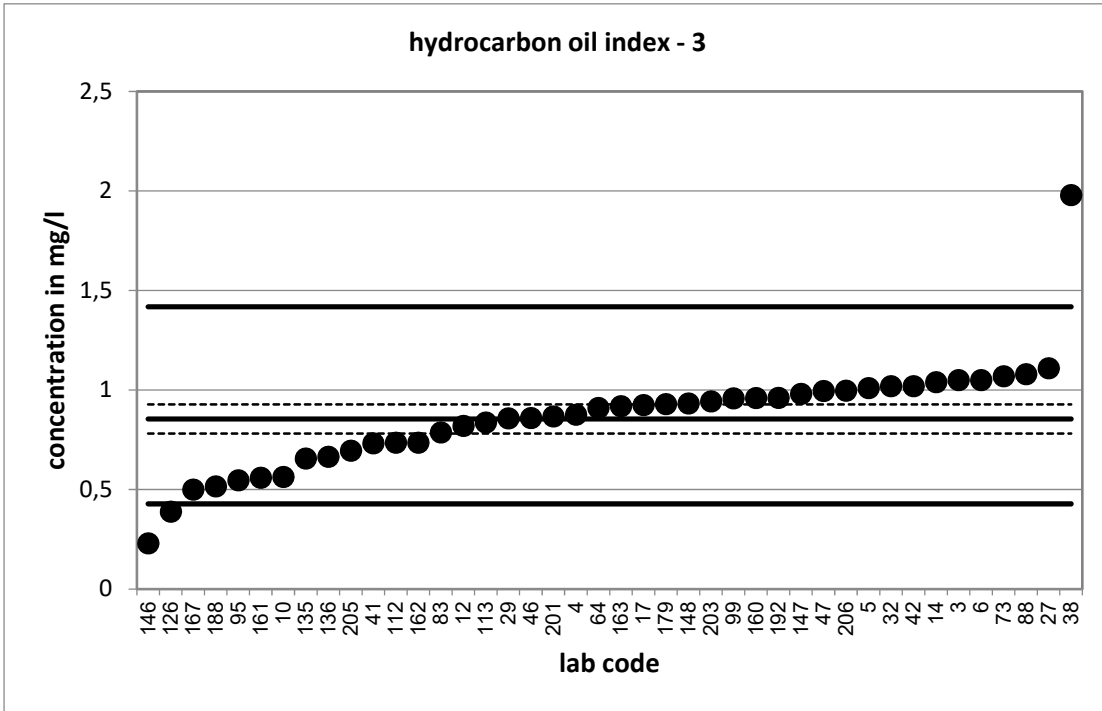


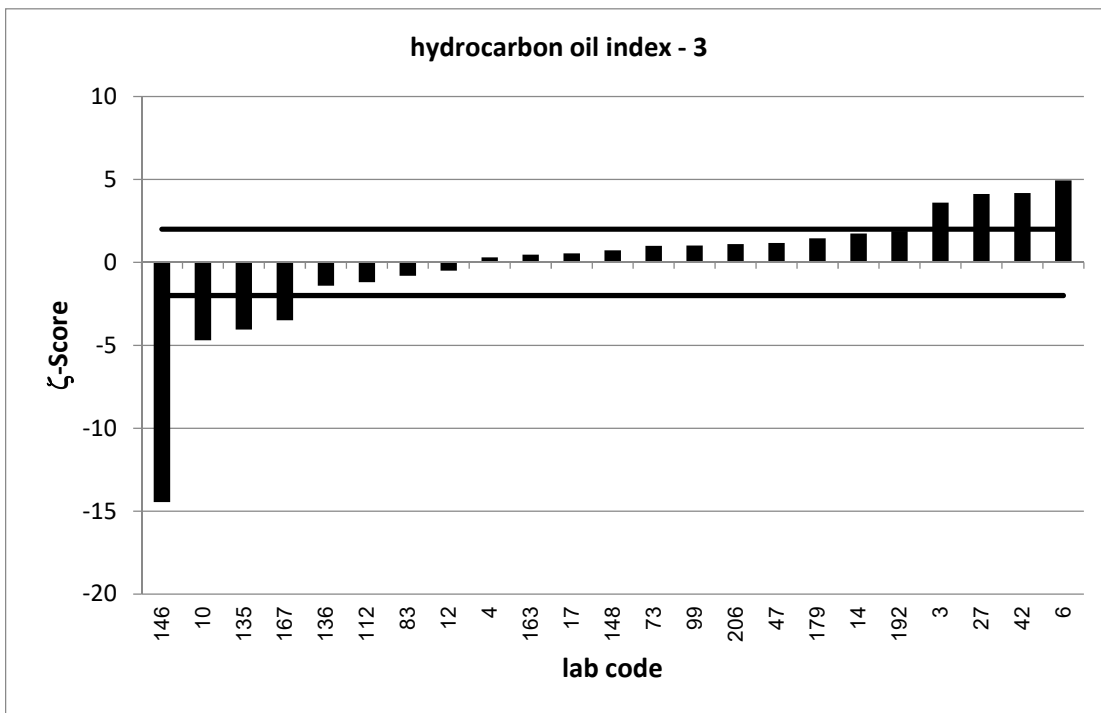
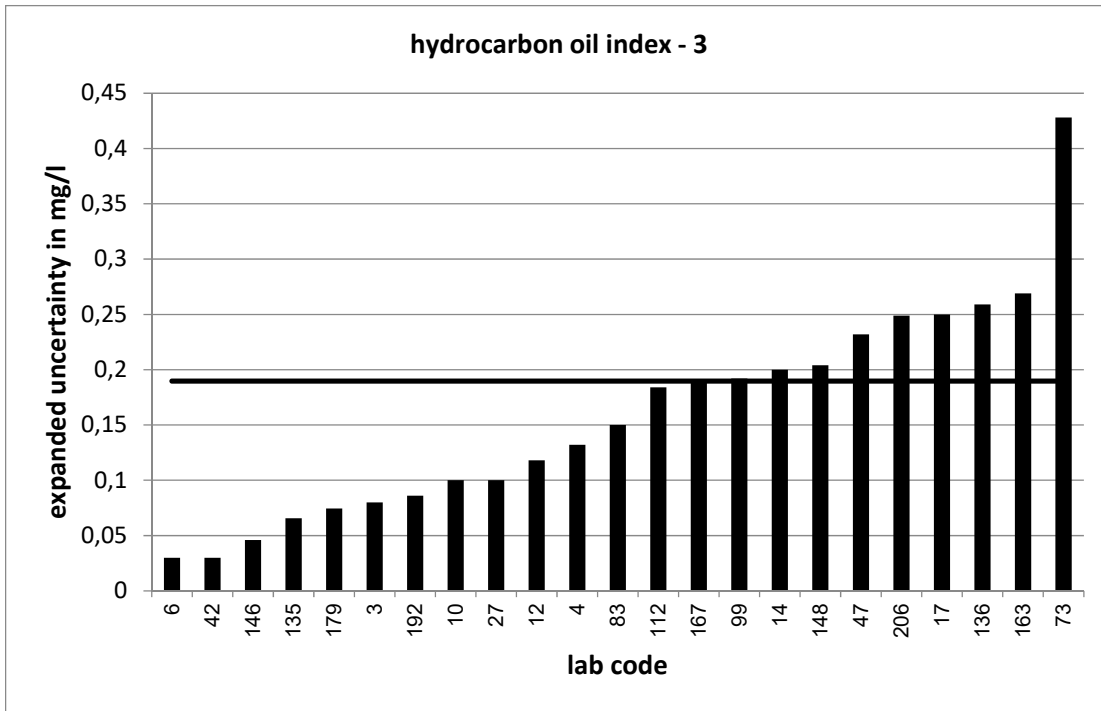


PT 5/21		hydrocarbon oil index - 3			
assigned value [mg/l]*		0,8546 ± 0,0732			
upper tolerance limit [mg/l]		1,418			
lower tolerance limit [mg/l]		0,428			
lab code	result [mg/l]	±	ζ-score	z _U -score	assessm. **
3	1,05	0,08	3,6	0,7	s
4	0,877	0,132	0,3	0,1	s
5	1,01			0,6	s
6	1,05	0,03	4,9	0,7	s
10	0,564	0,1	-4,7	-1,4	s
12	0,82	0,118	-0,5	-0,2	s
14	1,04	0,2	1,7	0,7	s
17	0,925	0,25	0,5	0,2	s
27	1,11	0,1	4,1	0,9	s
29	0,858			0,0	s
32	1,02			0,6	s
38	1,98			4,0	u
41	0,733			-0,6	s
42	1,02	0,03	4,2	0,6	s
46	0,86			0,0	s
47	0,996	0,232	1,2	0,5	s
64	0,91			0,2	s
73	1,07	0,428	1,0	0,8	s
83	0,787	0,15	-0,8	-0,3	s
88	1,08			0,8	s
95	0,547			-1,4	s
99	0,959	0,192	1,0	0,4	s
112	0,736	0,184	-1,2	-0,6	s
113	0,837			-0,1	s
126	0,389			-2,2	q
135	0,656	0,066	-4,0	-0,9	s
136	0,665	0,259	-1,4	-0,9	s
146	0,23	0,046	-14,5	-2,9	q
147	0,981			0,4	s
148	0,933	0,204	0,7	0,3	s
160	0,96			0,4	s
161	0,56			-1,4	s
162	0,736			-0,6	s
163	0,919	0,269	0,5	0,2	s
167	0,5	0,19	-3,5	-1,7	s
179	0,93	0,074	1,4	0,3	s
188	0,516			-1,6	s
192	0,961	0,086	1,9	0,4	s
201	0,868			0,0	s
203	0,943			0,3	s
205	0,696			-0,7	s
206	0,997	0,249	1,1	0,5	s

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

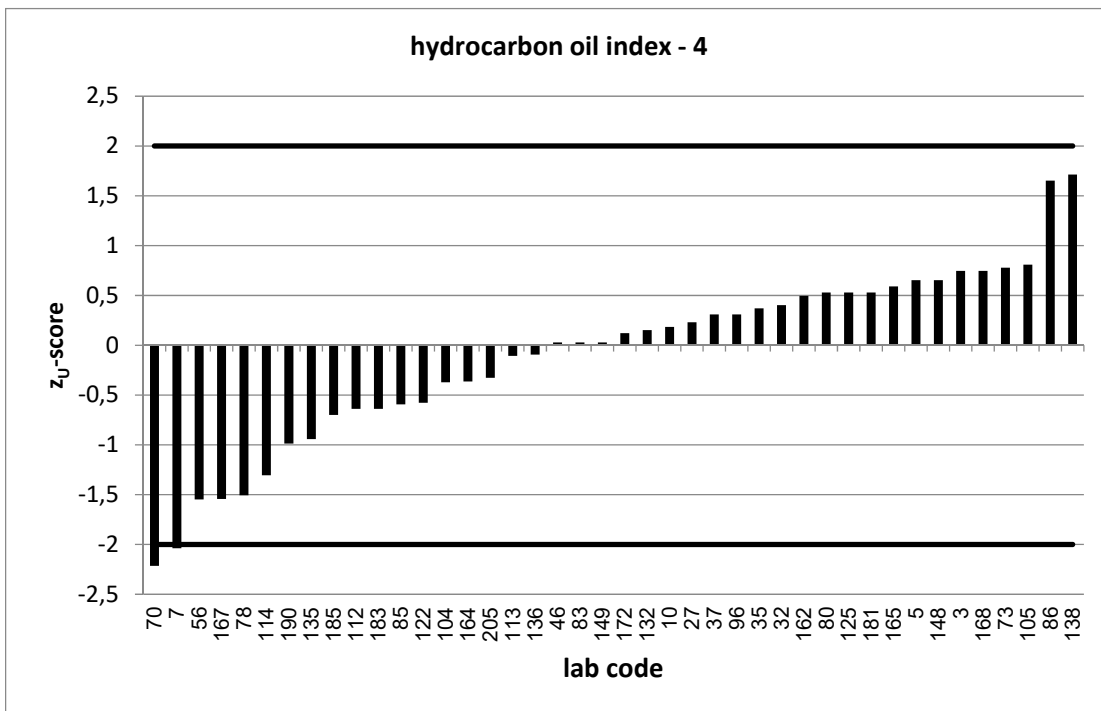
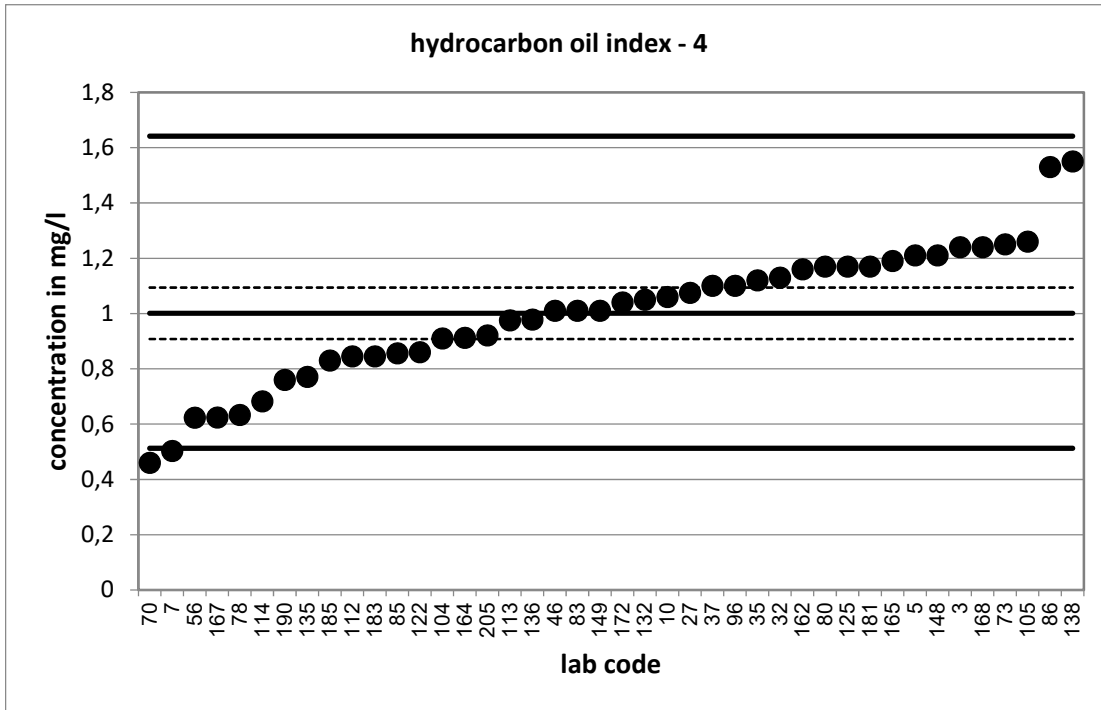


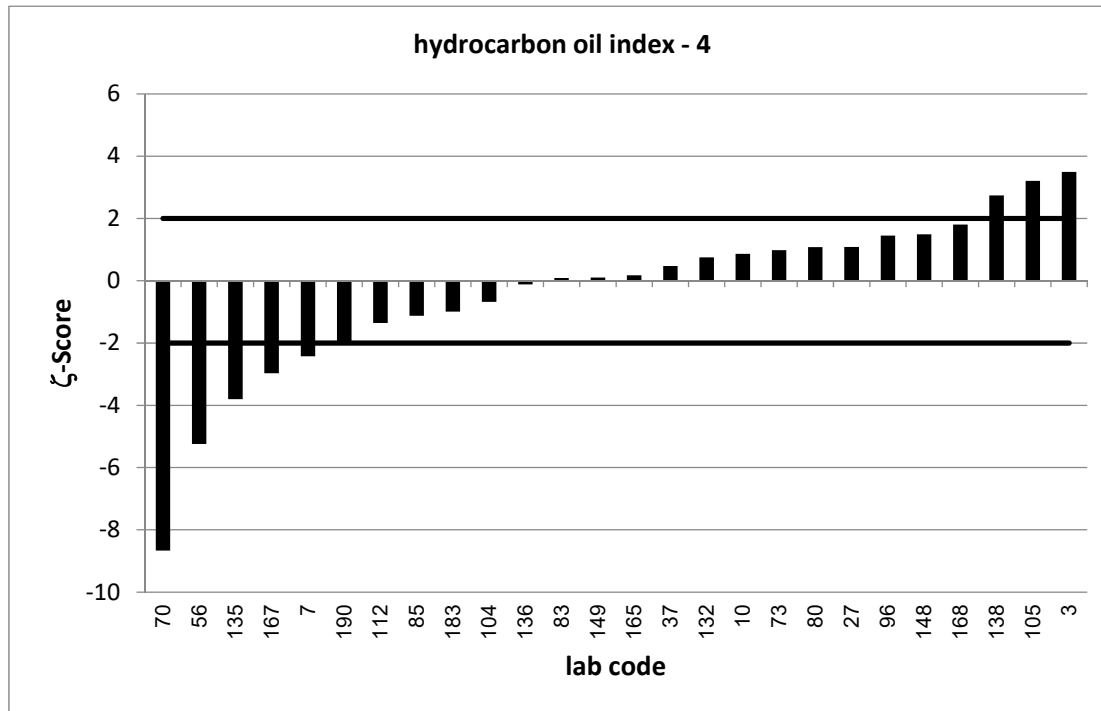
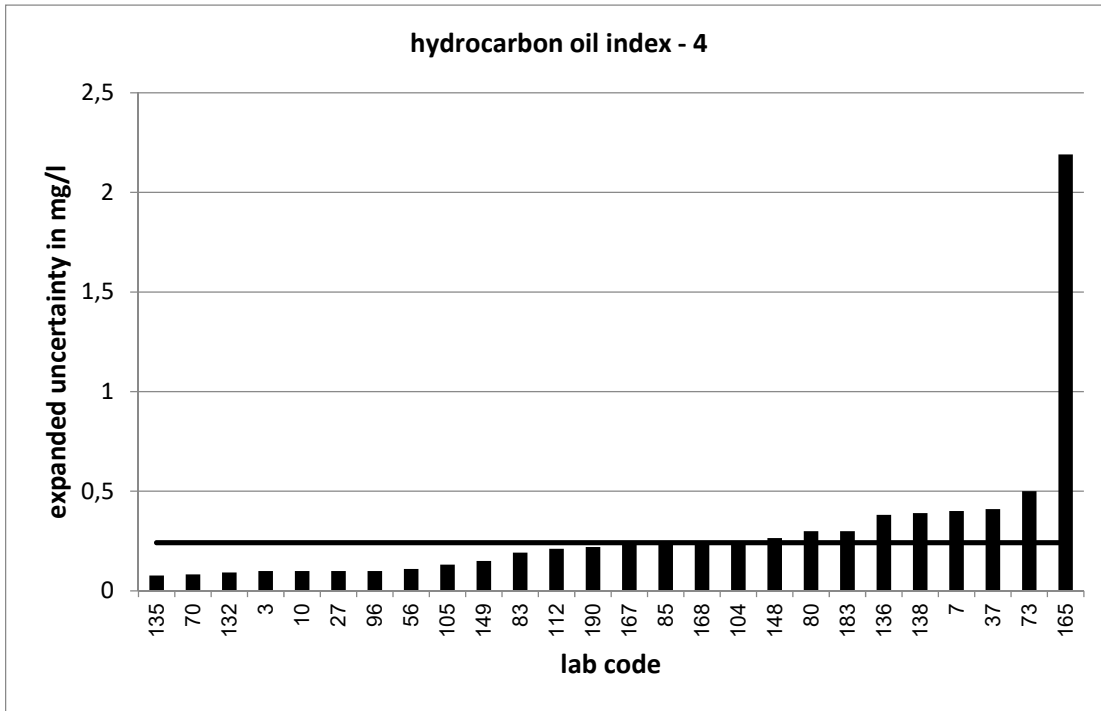


PT 5/21		hydrocarbon oil index - 4			
assigned value [mg/l]*		1,001 ± 0,093			
upper tolerance limit [mg/l]		1,642			
lower tolerance limit [mg/l]		0,5126			
lab code	result [mg/l]	±	ζ-score	z _U -score	assessm. **
3	1,24	0,1	3,5	0,7	s
5	1,21			0,7	s
7	0,503	0,4	-2,4	-2,0	s
10	1,06	0,1	0,9	0,2	s
27	1,075	0,1	1,1	0,2	s
32	1,13			0,4	s
35	1,12			0,4	s
37	1,1	0,41	0,5	0,3	s
46	1,01			0,0	s
56	0,623	0,11	-5,2	-1,5	s
70	0,46	0,083	-8,7	-2,2	q
73	1,25	0,5	1,0	0,8	s
78	0,633			-1,5	s
80	1,17	0,3	1,1	0,5	s
83	1,01	0,192	0,1	0,0	s
85	0,856	0,24	-1,1	-0,6	s
86	1,53			1,7	s
96	1,1	0,1	1,4	0,3	s
104	0,91	0,25	-0,7	-0,4	s
105	1,26	0,132	3,2	0,8	s
112	0,845	0,211	-1,4	-0,6	s
113	0,975			-0,1	s
114	0,6822			-1,3	s
122	0,86			-0,6	s
125	1,17			0,5	s
132	1,05	0,092	0,7	0,2	s
135	0,771	0,077	-3,8	-0,9	s
136	0,978	0,381	-0,1	-0,1	s
138	1,55	0,39	2,7	1,7	s
148	1,21	0,265	1,5	0,7	s
149	1,01	0,15	0,1	0,0	s
162	1,16			0,5	s
164	0,912			-0,4	s
165	1,19	2,19	0,2	0,6	s
167	0,624	0,236	-3,0	-1,5	s
168	1,24	0,248	1,8	0,7	s
172	1,04			0,1	s
181	1,17			0,5	s
183	0,845	0,3	-1,0	-0,6	s
185	0,83			-0,7	s
190	0,76	0,22	-2,0	-1,0	s
205	0,921			-0,3	s

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

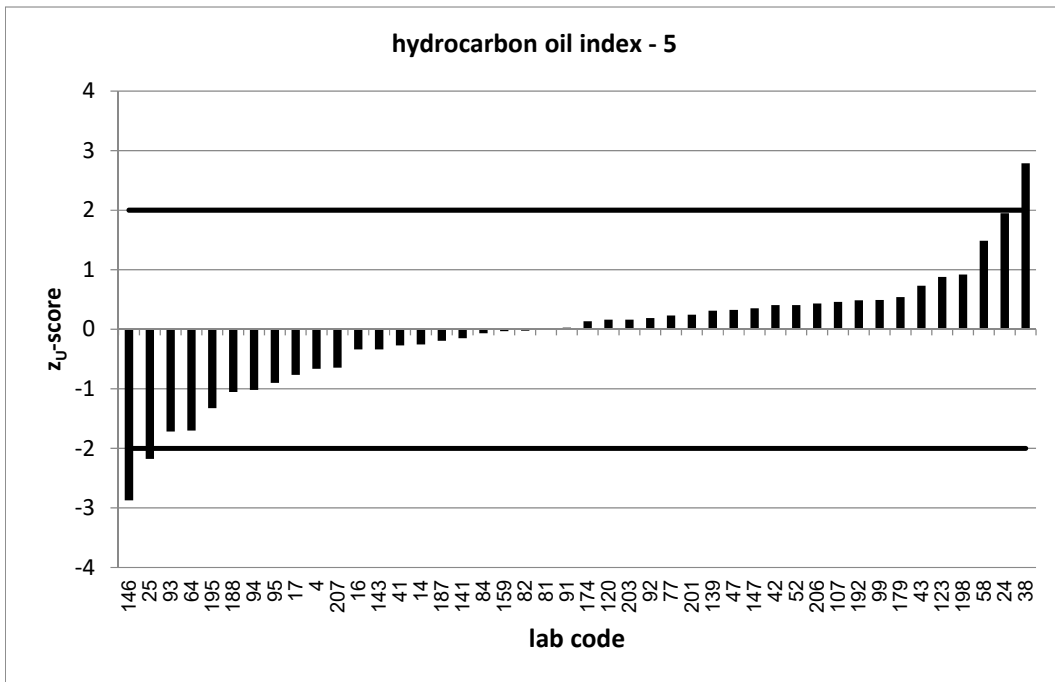
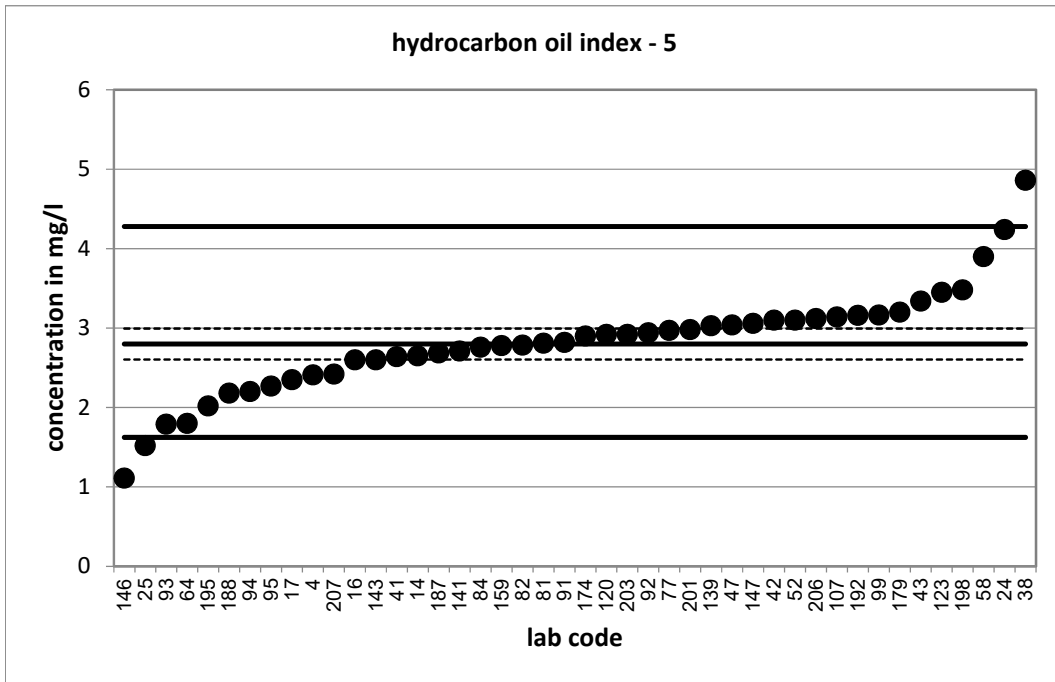


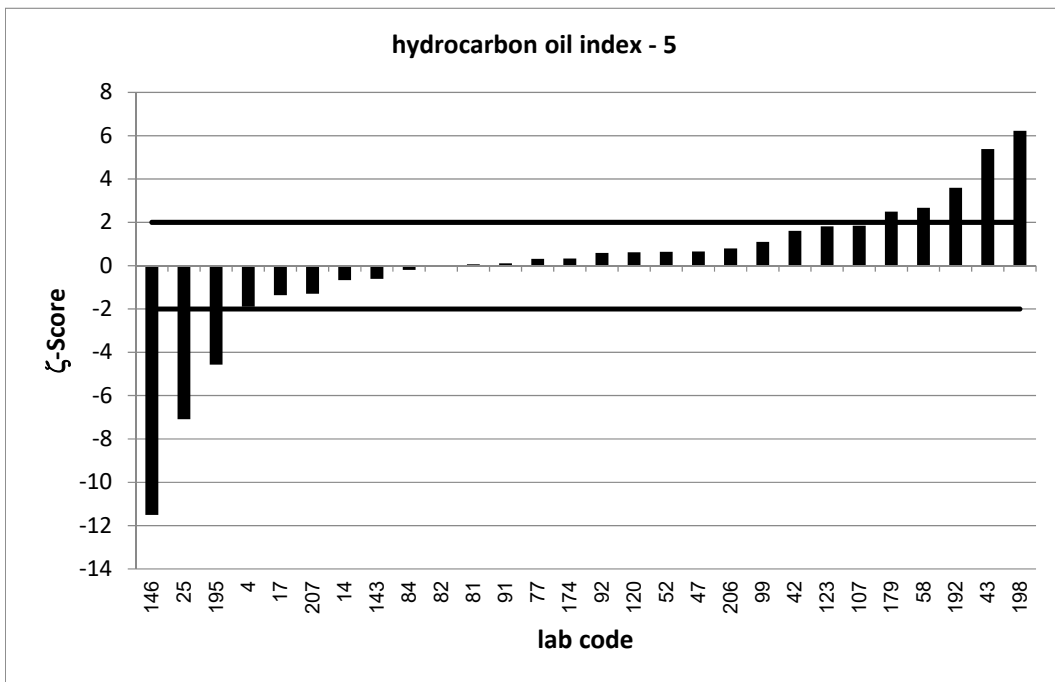
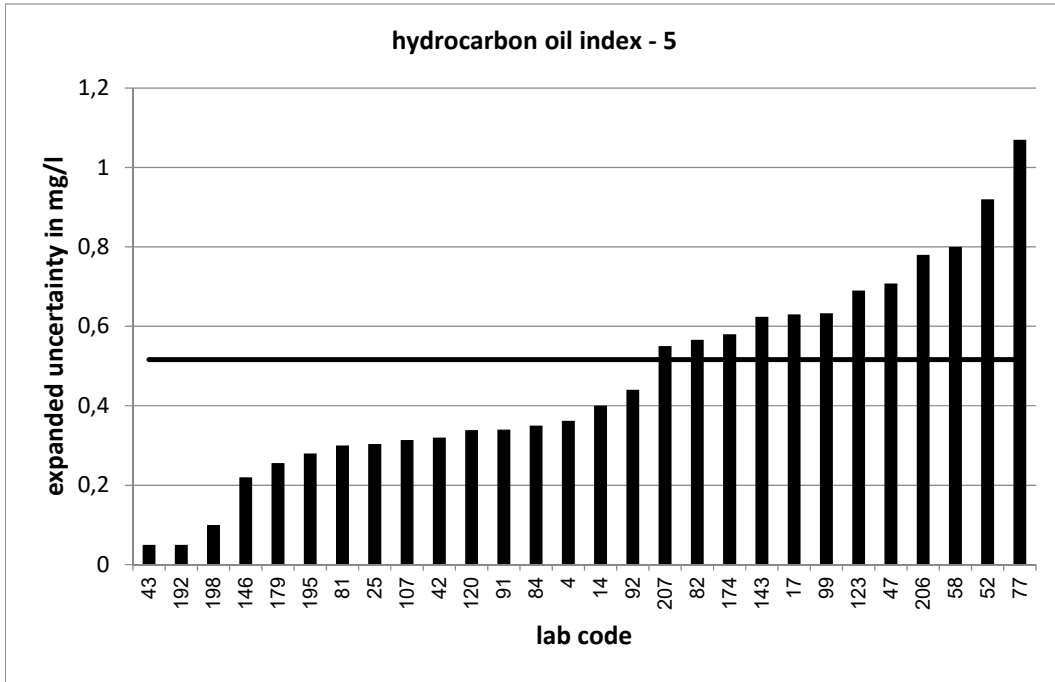


PT 5/21		hydrocarbon oil index - 5			
assigned value [mg/l]*		2,799 ± 0,195			
upper tolerance limit [mg/l]		4,279			
lower tolerance limit [mg/l]		1,624			
lab code	result [mg/l]	±	ζ-score	z _U -score	assessm.**
4	2,41	0,362	-1,9	-0,7	s
14	2,65	0,4	-0,7	-0,3	s
16	2,6			-0,3	s
17	2,35	0,63	-1,4	-0,8	s
24	4,24			1,9	s
25	1,52	0,304	-7,1	-2,2	q
38	4,86			2,8	q
41	2,64			-0,3	s
42	3,1	0,32	1,6	0,4	s
43	3,34	0,05	5,4	0,7	s
47	3,04	0,708	0,7	0,3	s
52	3,1	0,92	0,6	0,4	s
58	3,9	0,8	2,7	1,5	s
64	1,8			-1,7	s
77	2,97	1,07	0,3	0,2	s
81	2,81	0,3	0,1	0,0	s
82	2,786	0,566	0,0	0,0	s
84	2,76	0,35	-0,2	-0,1	s
91	2,82	0,34	0,1	0,0	s
92	2,94	0,44	0,6	0,2	s
93	1,79			-1,7	s
94	2,2			-1,0	s
95	2,27			-0,9	s
99	3,164	0,633	1,1	0,5	s
107	3,14	0,314	1,8	0,5	s
120	2,92	0,339	0,6	0,2	s
123	3,45	0,69	1,8	0,9	s
139	3,03			0,3	s
141	2,711			-0,1	s
143	2,6	0,624	-0,6	-0,3	s
146	1,11	0,22	-11,5	-2,9	q
147	3,06			0,4	s
159	2,78			0,0	s
174	2,9	0,58	0,3	0,1	s
179	3,2	0,256	2,5	0,5	s
187	2,686			-0,2	s
188	2,18			-1,1	s
192	3,16	0,05	3,6	0,5	s
195	2,02	0,28	-4,6	-1,3	s
198	3,48	0,1	6,2	0,9	s
201	2,98			0,2	s
203	2,92			0,2	s
206	3,12	0,78	0,8	0,4	s
207	2,42	0,55	-1,3	-0,6	s

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

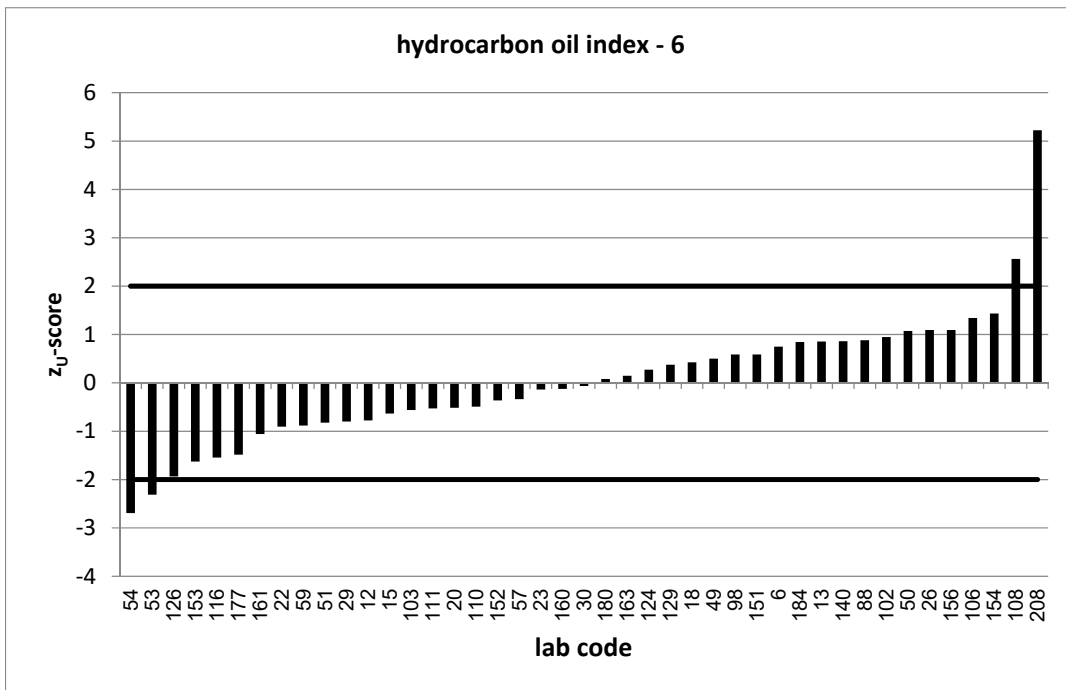
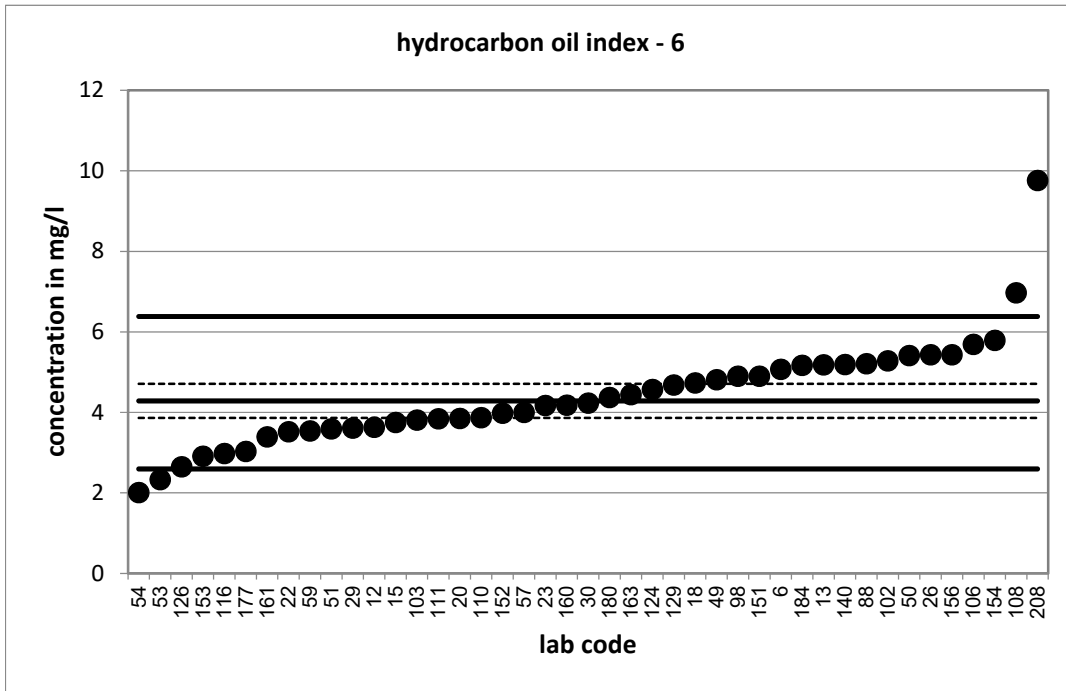


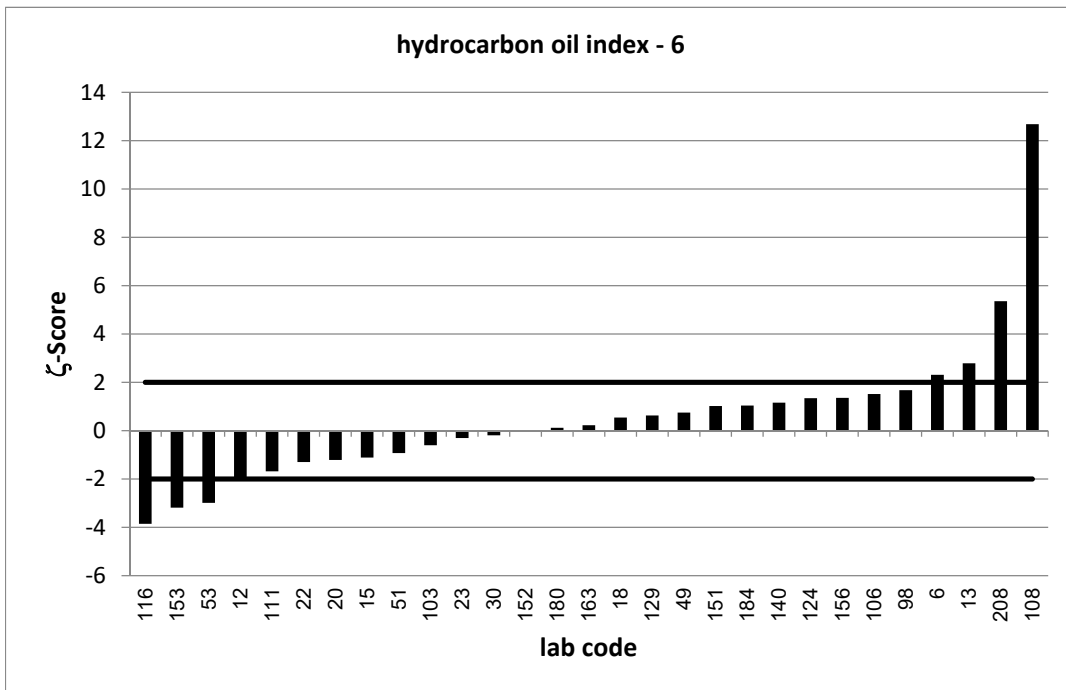
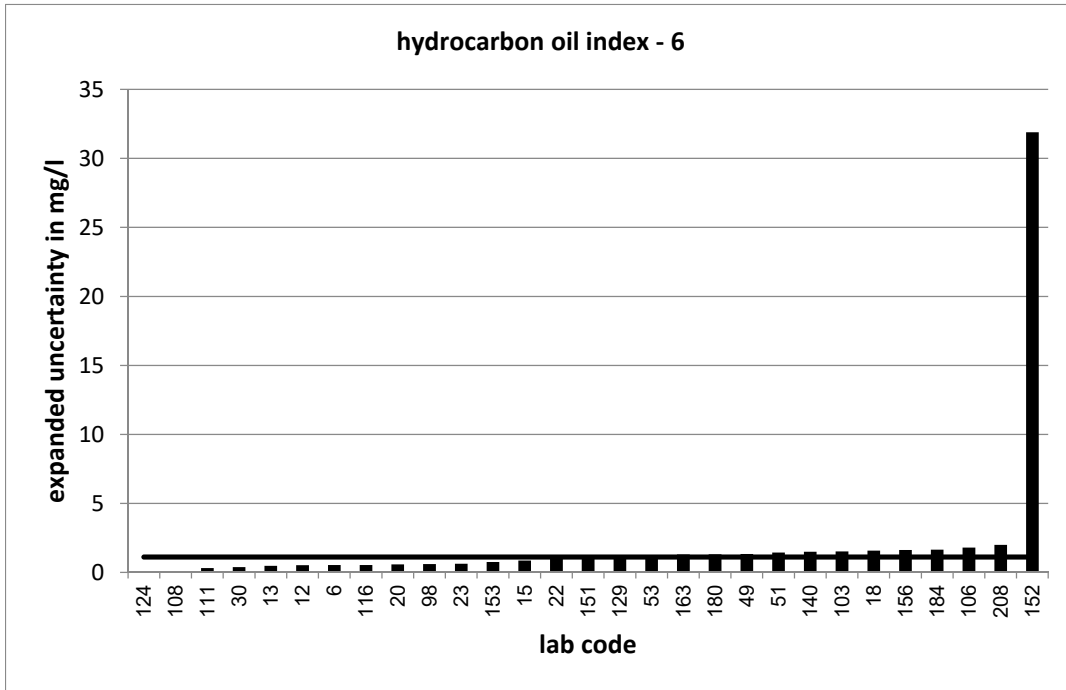


PT 5/21		hydrocarbon oil index - 6			
assigned value [mg/l]*		4,285 ± 0,423			
upper tolerance limit [mg/l]		6,381			
lower tolerance limit [mg/l]		2,595			
lab code	result [mg/l]	±	ζ-score	z _U -score	assessm.**
6	5,07	0,53	2,3	0,7	s
12	3,63	0,52	-2,0	-0,8	s
13	5,18	0,482	2,8	0,9	s
15	3,75	0,863	-1,1	-0,6	s
18	4,73	1,58	0,5	0,4	s
20	3,85	0,58	-1,2	-0,5	s
22	3,52	1,1	-1,3	-0,9	s
23	4,17	0,63	-0,3	-0,1	s
26	5,43			1,1	s
29	3,61			-0,8	s
30	4,23	0,39	-0,2	-0,1	s
49	4,81	1,34	0,7	0,5	s
50	5,41			1,1	s
51	3,59	1,44	-0,9	-0,8	s
53	2,33	1,24	-3,0	-2,3	q
54	2,01			-2,7	q
57	4			-0,3	s
59	3,54			-0,9	s
88	5,21			0,9	s
98	4,9	0,6	1,7	0,6	s
102	5,28			0,9	s
103	3,81	1,52	-0,6	-0,6	s
106	5,69	1,8	1,5	1,3	s
108	6,97	0,018	12,7	2,6	q
110	3,87			-0,5	s
111	3,84	0,32	-1,7	-0,5	s
116	2,98	0,53	-3,8	-1,5	s
124	4,57	0,014	1,3	0,3	s
126	2,65			-1,9	s
129	4,68	1,18	0,6	0,4	s
140	5,19	1,5	1,2	0,9	s
151	4,9	1,13	1,0	0,6	s
152	3,98	31,9	0,0	-0,4	s
153	2,91	0,753	-3,2	-1,6	s
154	5,79			1,4	s
156	5,43	1,63	1,4	1,1	s
160	4,18			-0,1	s
161	3,39			-1,1	s
163	4,44	1,3	0,2	0,1	s
177	3,03			-1,5	s
180	4,37	1,31	0,1	0,1	s
184	5,17	1,65	1,0	0,8	s
208	9,76	2	5,4	5,2	u

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

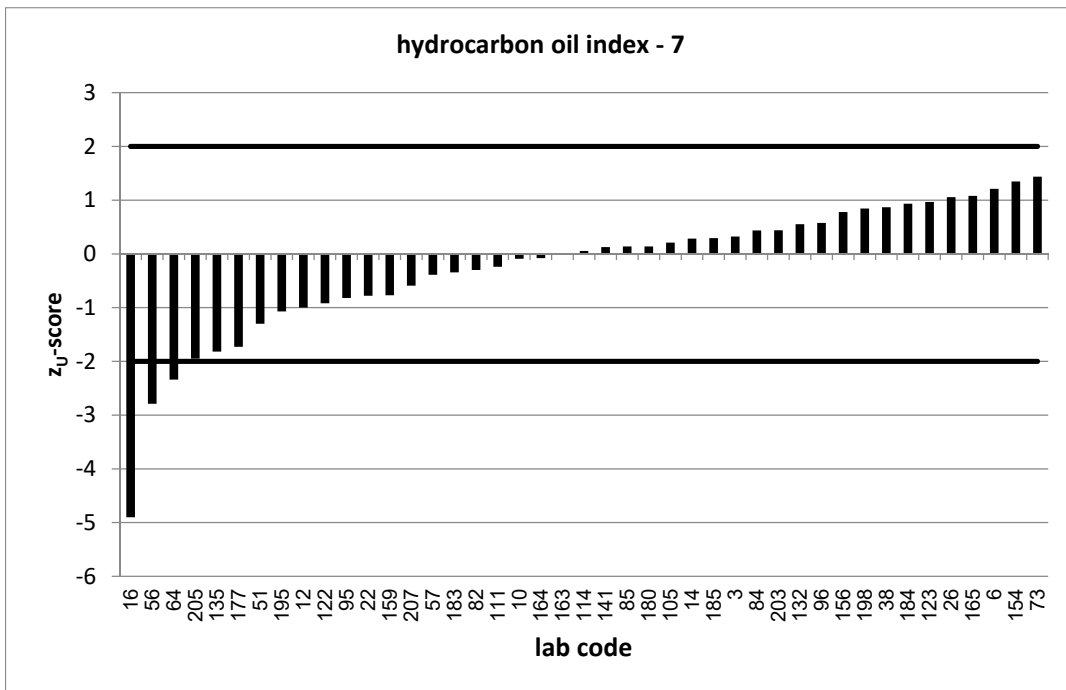
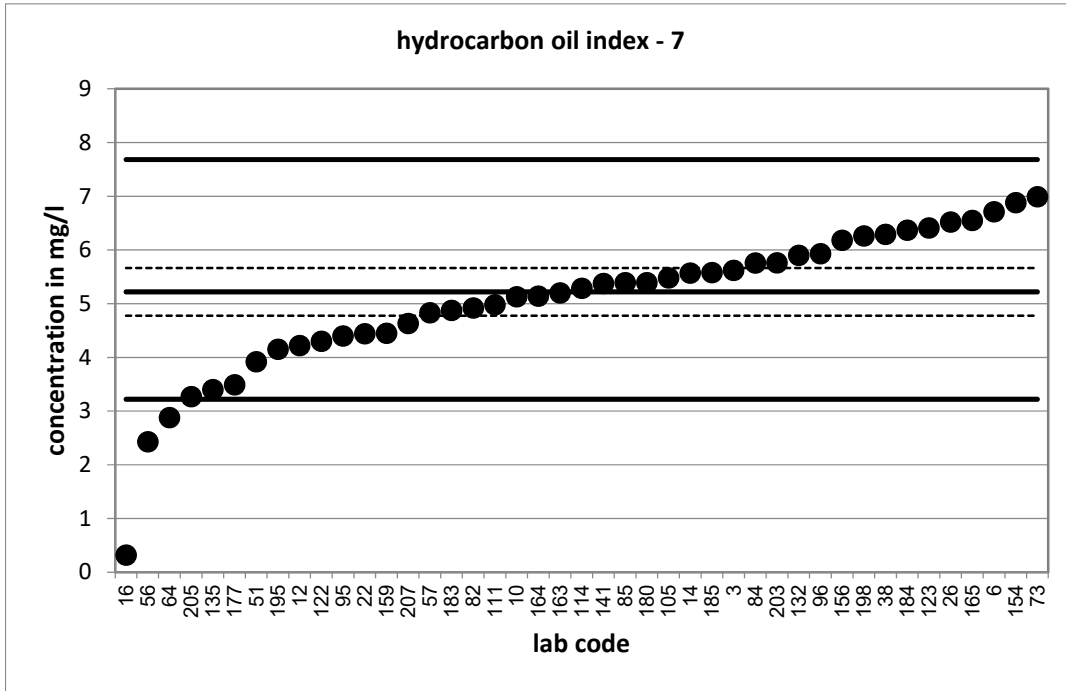


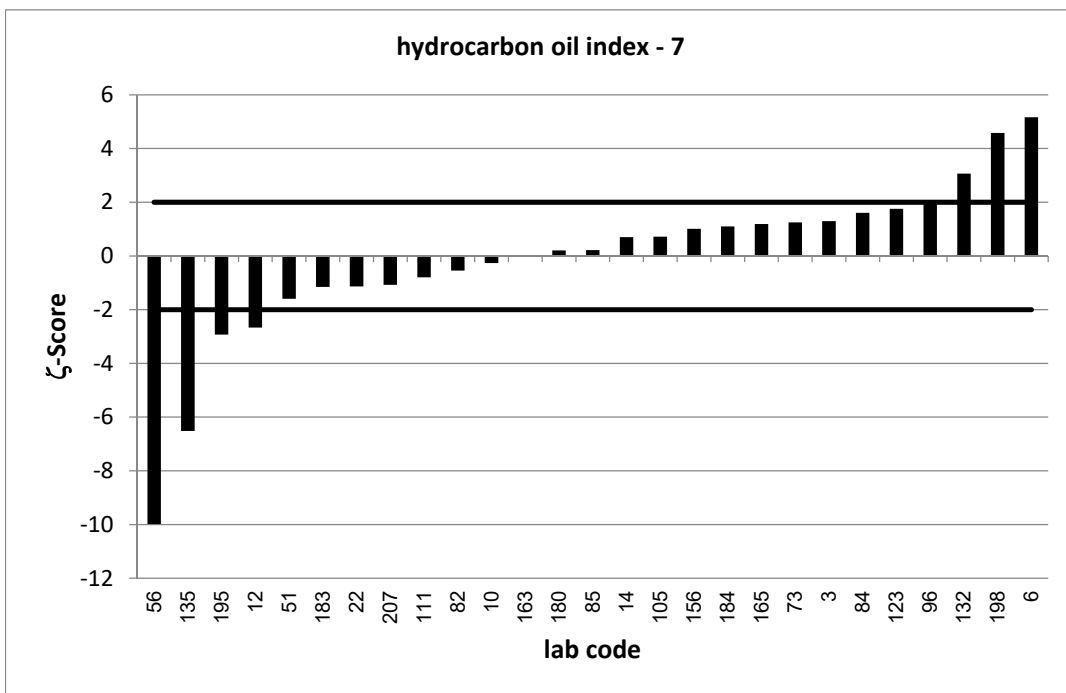
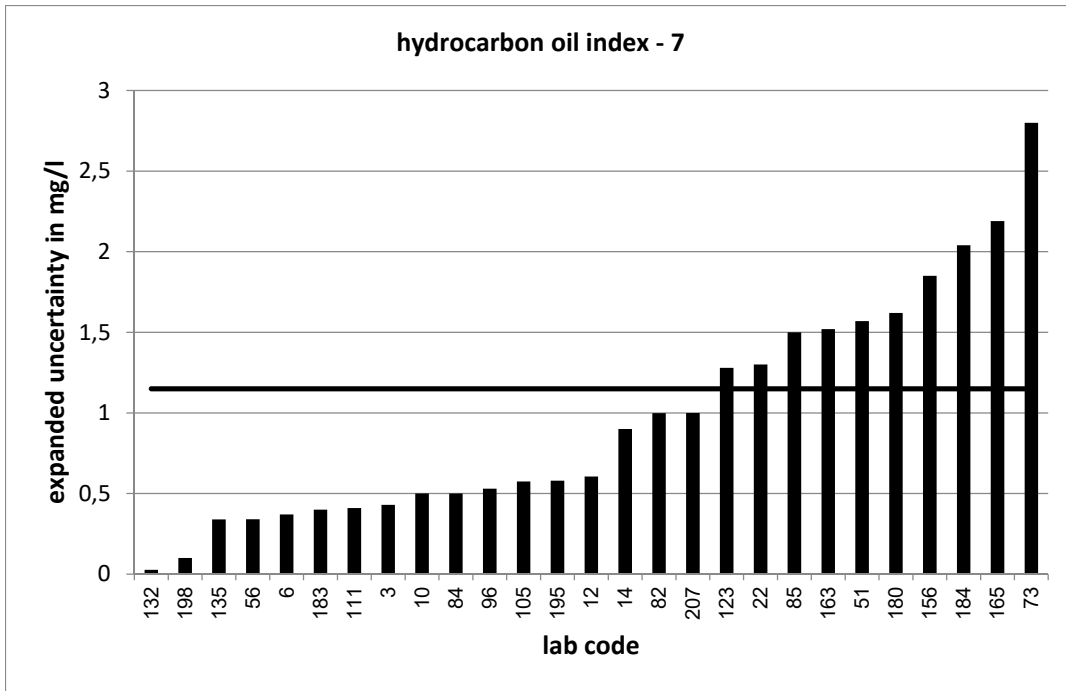


PT 5/21		hydrocarbon oil index - 7			
assigned value [mg/l]*		5,219 ± 0,444			
upper tolerance limit [mg/l]		7,683			
lower tolerance limit [mg/l]		3,219			
lab code	result [mg/l]	±	ζ-score	z _U -score	assessm.**
3	5,62	0,43	1,3	0,3	s
6	6,71	0,37	5,2	1,2	s
10	5,13	0,5	-0,3	-0,1	s
12	4,22	0,605	-2,7	-1,0	s
14	5,57	0,9	0,7	0,3	s
16	0,32			-4,9	u
22	4,44	1,3	-1,1	-0,8	s
26	6,52			1,1	s
38	6,29			0,9	s
51	3,92	1,57	-1,6	-1,3	s
56	2,43	0,34	-10,0	-2,8	q
57	4,83			-0,4	s
64	2,88			-2,3	q
73	6,99	2,8	1,2	1,4	s
82	4,92	0,999	-0,5	-0,3	s
84	5,757	0,5	1,6	0,4	s
85	5,39	1,5	0,2	0,1	s
95	4,4			-0,8	s
96	5,93	0,53	2,1	0,6	s
105	5,48	0,575	0,7	0,2	s
111	4,98	0,41	-0,8	-0,2	s
114	5,2868			0,1	s
122	4,3			-0,9	s
123	6,41	1,28	1,8	1,0	s
132	5,9	0,027	3,1	0,6	s
135	3,4	0,34	-6,5	-1,8	s
141	5,375			0,1	s
154	6,88			1,3	s
156	6,18	1,85	1,0	0,8	s
159	4,45			-0,8	s
163	5,2	1,52	0,0	0,0	s
164	5,14			-0,1	s
165	6,55	2,19	1,2	1,1	s
177	3,49			-1,7	s
180	5,39	1,62	0,2	0,1	s
183	4,875	0,4	-1,2	-0,3	s
184	6,37	2,04	1,1	0,9	s
185	5,58			0,3	s
195	4,15	0,58	-2,9	-1,1	s
198	6,26	0,1	4,6	0,8	s
203	5,76			0,4	s
205	3,27			-1,9	s
207	4,63	1	-1,1	-0,6	s

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

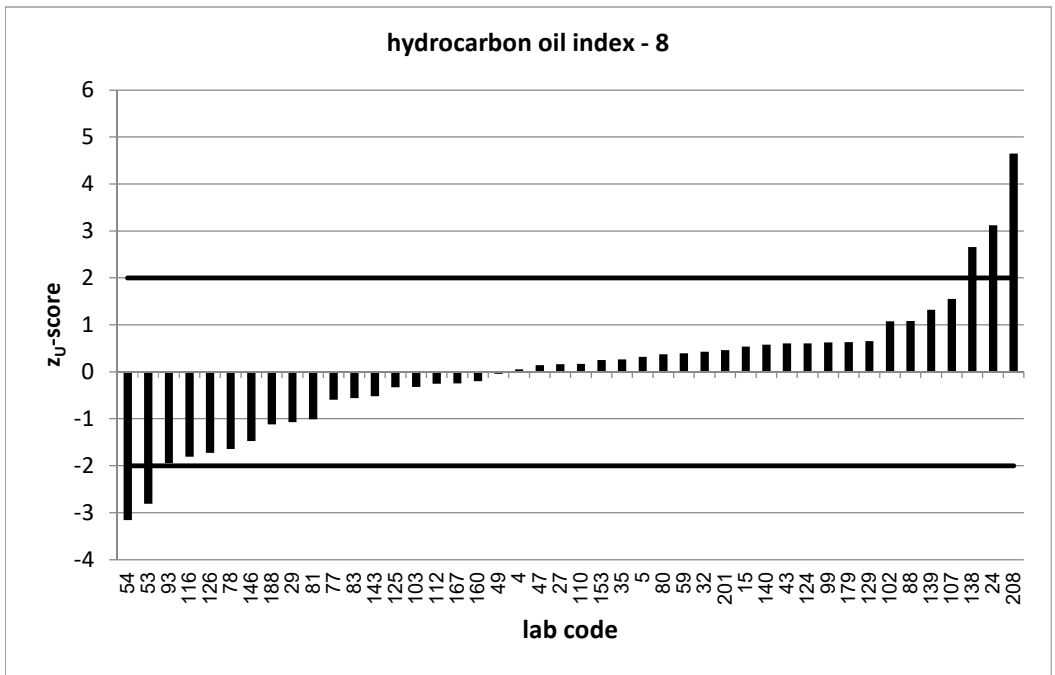
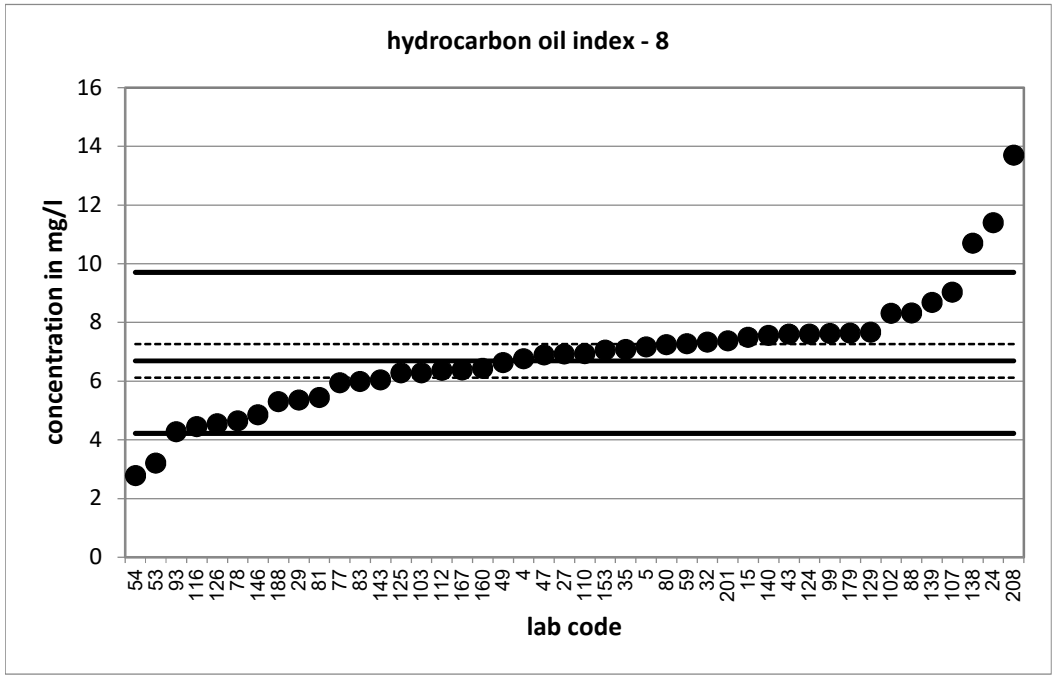


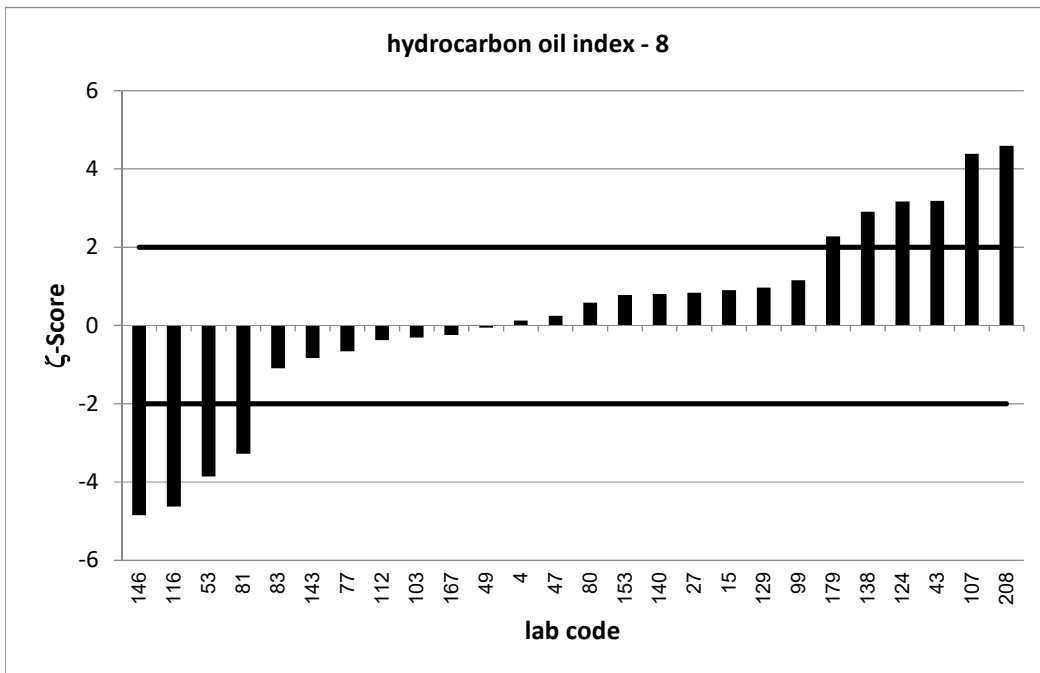
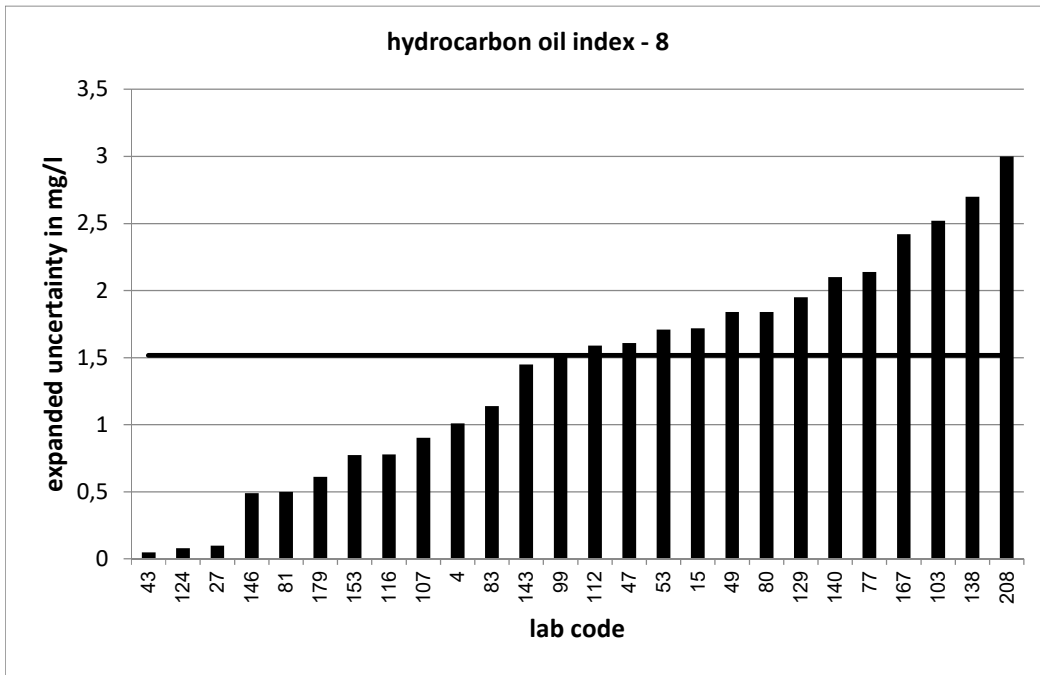


PT 5/21		hydrocarbon oil index - 8			
assigned value [mg/l]*		6,687 ± 0,572			
upper tolerance limit [mg/l]		9,705			
lower tolerance limit [mg/l]		4,216			
lab code	result [mg/l]	±	ζ-score	z _U -score	assessm.**
4	6,76	1,01	0,1	0,0	s
5	7,17			0,3	s
15	7,5	1,72	0,9	0,5	s
24	11,4			3,1	u
27	6,93	0,1	0,8	0,2	s
29	5,36			-1,1	s
32	7,33			0,4	s
35	7,08			0,3	s
43	7,6	0,05	3,2	0,6	s
47	6,9	1,61	0,2	0,1	s
49	6,63	1,84	-0,1	0,0	s
53	3,21	1,71	-3,9	-2,8	q
54	2,78			-3,2	u
59	7,28			0,4	s
77	5,95	2,14	-0,7	-0,6	s
78	4,65			-1,6	s
80	7,25	1,84	0,6	0,4	s
81	5,44	0,5	-3,3	-1,0	s
83	5,99	1,14	-1,1	-0,6	s
88	8,32			1,1	s
93	4,28			-1,9	s
99	7,625	1,52	1,2	0,6	s
102	8,31			1,1	s
103	6,29	2,52	-0,3	-0,3	s
107	9,03	0,903	4,4	1,6	s
110	6,94			0,2	s
112	6,37	1,59	-0,4	-0,3	s
116	4,45	0,78	-4,6	-1,8	s
124	7,6	0,079	3,2	0,6	s
125	6,28			-0,3	s
126	4,55			-1,7	s
129	7,67	1,95	1,0	0,7	s
138	10,7	2,7	2,9	2,7	q
139	8,68			1,3	s
140	7,56	2,1	0,8	0,6	s
143	6,04	1,45	-0,8	-0,5	s
146	4,86	0,49	-4,9	-1,5	s
153	7,06	0,775	0,8	0,2	s
160	6,44			-0,2	s
167	6,38	2,42	-0,2	-0,2	s
179	7,64	0,611	2,3	0,6	s
188	5,3			-1,1	s
201	7,38			0,5	s
208	13,7	3	4,6	4,6	u

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory





PT 5/21		hydrocarbon oil index - 9			
assigned value [mg/l]*		7,566 ± 0,541			
upper tolerance limit [mg/l]		10,91			
lower tolerance limit [mg/l]		4,821			
lab code	result [mg/l]	±	ζ-score	z _U -score	assessm.**
7	5,11	4	-1,2	-1,8	s
13	10,12	0,942	4,7	1,5	s
17	6,67	1,8	-1,0	-0,7	s
18	7,32	2,44	-0,2	-0,2	s
20	6,81	1,02	-1,3	-0,6	s
23	7,69	1,15	0,2	0,1	s
25	4,4	0,88	-6,1	-2,3	q
30	8,19	0,75	1,3	0,4	s
37	7,87	2,96	0,2	0,2	s
41	8,5			0,6	s
42	7,79	0,87	0,4	0,1	s
46	7,17			-0,3	s
50	7,56			0,0	s
52	7,74	2,3	0,1	0,1	s
58	10,4	2	2,7	1,7	s
70	5,23	0,941	-4,3	-1,7	s
86	9,82			1,3	s
91	7,77	0,92	0,4	0,1	s
92	7,94	1,19	0,6	0,2	s
94	5,9			-1,2	s
98	8,85	1	2,3	0,8	s
104	8	2,2	0,4	0,3	s
106	9,2	2,9	1,1	1,0	s
108	3,79	0,018	-14,0	-2,8	q
113	7,29			-0,2	s
120	7,71	0,894	0,3	0,1	s
136	7,13	2,78	-0,3	-0,3	s
147	7,82			0,2	s
148	6,18	1,35	-1,9	-1,0	s
149	8,84	0,88	2,5	0,8	s
151	8,33	1,92	0,8	0,5	s
152	7,24	31,9	0,0	-0,2	s
161	4,95			-1,9	s
162	11,1			2,1	q
168	9,02	1,804	1,5	0,9	s
172	6,22			-1,0	s
174	6,96	1,39	-0,8	-0,4	s
181	7,93			0,2	s
187	7,906			0,2	s
190	4,71	0,76	-6,1	-2,1	q
192	8,19	0,02	2,3	0,4	s
206	8,59	2,15	0,9	0,6	s

* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor k=2 corresponding to a confidence level of about 95%

** s = satisfactory, q = questionable, u = unsatisfactory

