

Comments on the EC regulations on dioxin controls in fish oil

Intention

Bioceval GmbH & Co KG located in Cuxhaven (Germany) produces crude fishoil from fish by-products sampled at EC approved companies processing fish for human consumption. Fish by-products are either mixed, or selected to species. The latter may be derived from farmed fish (mainly salmon from Northern European Aquaculture) or fish from fishery (cod, saithe, herring, plaice etc.). In particular with regard to the salmon oil produced from farmed salmon (*Salmo salar*) the obligation to analyze each batch of fish oil on dioxin and dioxin-like PCB seems not based on risk analysis because our analyses are always well below critical values. Since production batches are usually quite small (20-50 t), high analysis costs are generated.

We propose to modify the relevant EC regulation 183/2005 (incl. updates according to EC 2015/1905) in a way that it becomes clear that fish oil derived from farmed fish does not fall into the group of fish oil for which a 100% analysis on dioxin / dioxin-like PCB is needed.

Causal Reasoning

Limits for crude (native, not refined) fish oil used as feedstuff are defined in regulations (EC) 277/2012 and 744/2012 concerning maximum contents of dioxins, dioxin-like PCB and indicator PCB. Frequency and scale of fish oil analyses on dioxins are defined in regulation (EC) 183/2005 (incl. updates according to EC 2015/1905). According to annex II, section "DIOXIN MONITORING FOR OILS, FATS AND DERIVED PRODUCTS", point 2c an analysis on dioxin has to be done:

(c) Feed business operators producing fish oil:

(i) 100 % of the batches of fish oil if it is produced from:

- products derived from fish oil other than refined fish oil;*
- fisheries with no monitoring history, of unspecified origin or from the Baltic Sea;*
- fish by-products from establishments manufacturing fish for human consumption that are not EU approved;*
- blue whiting or menhaden;*

(ii) 100 % of the outgoing batches of products derived from fish oil other than refined fish oil;

(iii) one representative analysis per 2 000 tonnes as regards fish oil not referred to in (i);

*(iv) fish oil decontaminated by an officially approved treatment as referred to in Annex VIII of Regulation (EC) No 767/2009 and in Commission Regulation (EU) 2015/786 (***) shall be analysed and documented as part of the HACCP system.*

The interpretation of legal requirements in particular concerning the frequency and scale of dioxin analyses differs between veterinary authorities, certifying private institutions (e.g. QS, GMP+) and Bioceval GmbH.

Veterinary authorities refer to 2 c (i) first punctuation mark and demand a 100% control (= each batch). Private certifiers also demand 100% analysis (without reference to EC regulations, but based upon own risk analysis for which the basic data remain unknown to us).

Bioceval considers 2 c (iii) as appropriate because no products derived from fish oil (as in 2 c (i) first punctuation or 2 c (ii)) are produced but a crude fish oil derived from fish by-products, of which the origin is known and not the Baltic Sea (2 c (i) second punctuation), which are sampled at EC approved fish processors (2 c (i) third punctuation), and which do not include Menhaden or Blue Whiting (2 c (i) fourth punctuation).

However, obviously 2 c of the regulation requires some clarification (also concerning the difference between (i) first punctuation and (ii)) in particular with regard to fish oil produced from farmed fish (salmon). Based on evaluation of the numerous dioxin analyses carried out at certified laboratories on fish oil produced at Bioceval, there is evidently no increased risk for high dioxin loads in salmon oil. This is supported by the analysis data (Tab. 1, Figs 1-2) which are always well below limits set in EC regulations (for feed, but also those for food), but also by the fact that farmed fish is fed with aquafeed which in turn is controlled for its dioxin contents. Thus the major cause of increased dioxin loads in wild fish via feeding is almost absent in farmed fish such as salmon (*Salmo salar*) from Northern European aquaculture.

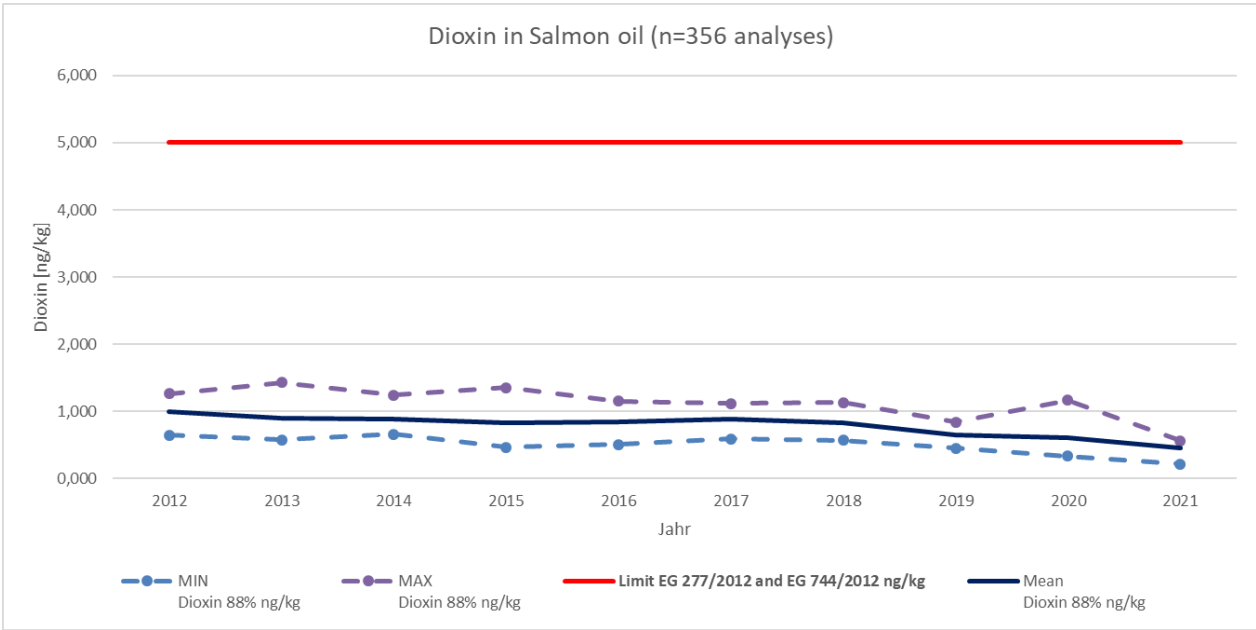


Fig 1

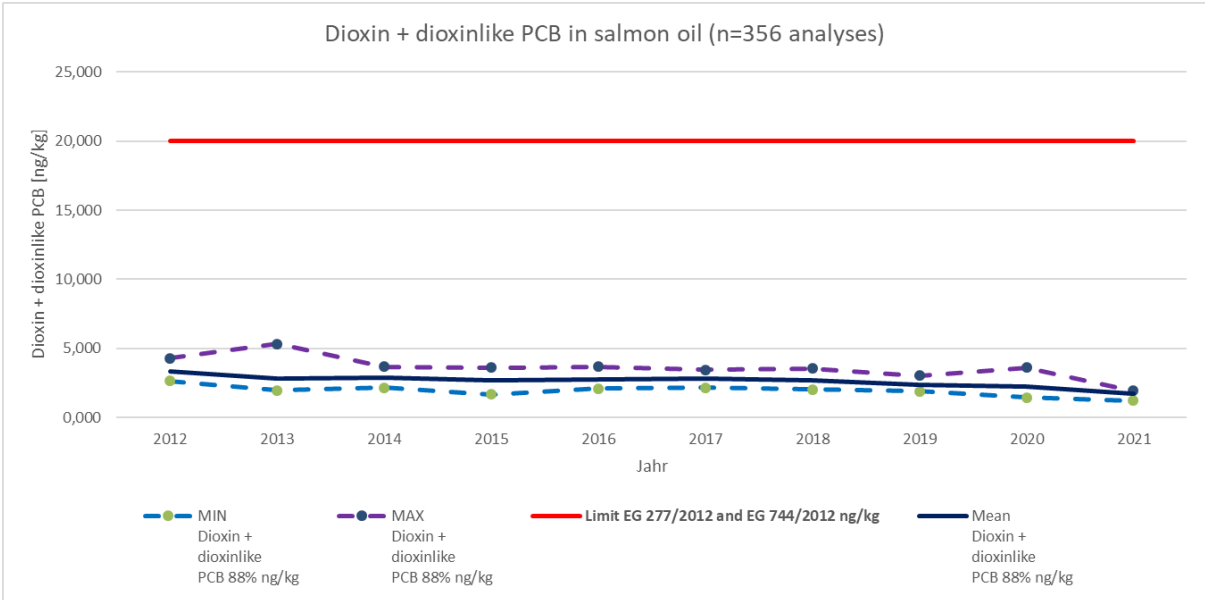


Fig. 2

The more than 350 analyses carried out between 2012-2021 did not only delay availability due to the time needed to sent samples for analysis, but also add up to a considerable portion (>100.000 €) of

total analysis costs at Bioceval. According to our risk analysis, one representative analysis per 2000 t or at least one analysis per year would be sufficient to monitor the risk.

We want to emphasize, that our proposal concerns fish oil exclusively produced from farmed fish, but not fish oil from captured fish or any mix of captured and farmed fish.

Tab 1: Dioxin and dioxin-like PCB in fish oil produced from farmed salmon (*Salmo salar*)

(calculated as WHO-TEQ (2005) based on 88% raw material, all analysis carried out at external, certified laboratories)

<u>Date</u>	<u>Analysis code</u>	<u>Dioxin</u>	<u>dioxin-like PCB</u>	<u>Dioxin + dioxin-like PCB</u>
		[ng/kg]	[ng/kg]	[ng/kg]
09.01.2012	VFC 02-12	1,0958	2,8201	3,9159
17.01.2012	VFC 08-12	0,9286	3,1561	4,0847
01.03.2012	VFC 82-12	1,2618	3,0526	4,3145
02.04.2012	VFC 137-12	0,9629	2,5316	3,4945
26.04.2012	VFC 172-12	1,2579	2,4469	3,7048
22.05.2012	VFC 220-12	1,1485	1,9151	3,0636
12.06.2012	VFC 273-12	1,1973	1,8396	3,037
13.07.2012	VFC 323-12	1,0508	2,2529	3,3037
02.08.2012	VFC 356-12	0,9034	1,8399	2,7433
05.09.2012	VFC 425-12	0,8892	2,2226	3,1118
24.09.2012	VFC 448-12	0,903	2,0424	2,9454
22.10.2012	VFC 504-12	0,9225	2,2875	3,21
08.11.2012	VFC 536-12	1,1353	1,9203	3,0556
19.11.2012	VFC 552-12	0,9559	2,7894	3,7453
20.11.2012	VFC 575-12	0,9696	2,4081	3,3777
03.12.2012	VFC 606-12	0,7822	2,3698	3,1521
18.12.2012	VFC 631-12	0,6489	1,9923	2,6412
21.12.2012	VFC 632-12	0,8898	2,2584	3,1482
31.01.2013	VFC 63-13	0,6413	1,4591	2,1005
04.02.2013	VFC 64-13	0,7975	1,958	2,7555
19.02.2013	VFC 81-13	0,8475	2,1821	3,0297
19.03.2013	VFC 128-13	0,8149	1,9143	2,7291
04.04.2013	VFC 150-13	0,5805	1,5617	2,1423
22.04.2013	VFC 177-13	0,9632	1,7562	2,7194
10.05.2013	VFC 214-13	0,9918	1,8284	2,8201
29.05.2013	VFC 248-13	0,8256	2,2737	3,0993
10.06.2013	VFC 263-13	0,7344	1,929	2,6634
17.06.2013	VFC 294-13	1,43	1,59	3,02
01.07.2013	VFC 331-13	1,13	1,7	2,83
15.07.2013	VFC 364-13	1,09	1,91	3
26.07.2013	VFC 390-13	1,14	2,39	3,53
02.08.2013	VFC 410-13	1,12	2,16	3,28
22.08.2013	VFC 449-13	0,845	2,21	3,055
29.08.2013	VFC 468-13	0,776	1,8	2,576

<u>Date</u>	<u>Analysis code</u>	<u>Dioxin</u>	<u>dioxin-like PCB</u>	<u>Dioxin + dioxin-like PCB</u>
		[ng/kg]	[ng/kg]	[ng/kg]
12.09.2013	VFC 508-13	1,01	1,88	2,89
16.09.2013	VFC 510-13	0,856	1,96	2,816
25.09.2013	VFC 530-13	0,818	2,13	2,948
10.10.2013	VFC 552-13	1,03	2,09	3,12
22.10.2013	VFC 577-13	0,767	1,7	2,467
30.10.2013	VFC 601-13	0,841	1,13	1,971
06.11.2013	VFC 619-13	0,6692	1,7697	2,4388
08.11.2013	VFC 624-13	0,6436	2,0518	2,6954
27.11.2013	VFC 664-13	0,9682	1,942	2,9102
06.12.2013	VFC 691-13	0,9345	1,8102	2,7446
17.12.2013	VFC 712-13	0,9155	1,9593	2,8748
17.12.2013	VFC 713-13	1,0991	2,5616	3,6607
30.12.2013	VFC 734-13	0,8122	1,7353	2,5475
08.01.2014	VFC 02-14	0,8923	1,8277	2,72
17.01.2014	VFC 35-14	0,7518	1,9921	2,7438
13.02.2014	VFC 57-14	0,8068	1,7987	2,6055
27.02.2014	VFC 89-14	0,6853	1,7025	2,3878
12.03.2014	VFC 120-14	0,7317	1,8444	2,576
27.03.2014	VFC 139-14	0,9024	2,2126	3,0288
25.03.2014	VFC 143-14	0,9476	2,2297	3,1773
09.04.2014	VFC 171-14	0,6861	1,6354	2,3214
15.04.2014	VFC 186-14	0,7537	1,7531	2,5069
29.04.2014	VFC 212-14	1,0732	2,2634	3,3365
22.04.2014	VFC 202-14	0,6631	1,503	2,166
29.04.2014	VFC 212-14	1,0732	2,2834	3,3385
05.05.2014	VFC 213-14	1,1686	2,4759	3,6444
20.05.2014	VFC 236-14	0,8809	2,1109	2,9917
16.06.2014	VFC 274-14	0,6665	1,7381	2,4046
16.06.2014	VFC 275-14	0,8468	2,0819	2,9287
07.07.2014	VFC 314-14	1,162	2,2309	3,3928
04.08.2014	VFC 354-14	0,9068	2,2169	3,1237
14.08.2014	VFC 372-14	1,0071	2,1008	3,1079
25.08.2014	VFC 390-14	0,9203	2,4147	3,335
05.09.2014	VFC 405-14	1,0446	2,2331	3,2776
15.09.2014	VFC 417-14	0,8761	2,0768	2,9529
24.09.2014	VFC 434-14	0,9291	2,0495	2,9786
02.10.2014	VFC 451-14	1,1065	2,5862	3,6927
09.10.2014	VFC 459-14	0,9426	2,1292	3,0718
21.10.2014	VFC 489-14	0,9208	2,0811	3,0019
03.11.2014	VFC 517-14	0,7951	1,9594	2,7545
17.11.2014	VFC 576-14	0,8066	2,0231	2,8297
17.11.2014	VFC 577-14	0,863	1,8689	2,732

<u>Date</u>	<u>Analysis code</u>	<u>Dioxin</u>	<u>dioxin-like PCB</u>	<u>Dioxin + dioxin-like PCB</u>
		[ng/kg]	[ng/kg]	[ng/kg]
24.11.2014	VFC 600-14	0,6872	1,6729	2,3601
17.12.2014	VFC 647-14	1,2441	1,9835	3,2277
22.12.2014	VFC 657-14	0,9418	2,2457	3,1875
30.12.2014	VFC 673-14	0,7558	1,5746	2,3304
07.01.2015	VFC 03-15	0,6882	0,9904	1,6786
21.01.2015	VFC 28-15	0,8361	1,8623	2,6983
10.02.2015	VFC 60-15	0,6159	1,7258	2,3417
16.02.2015	VFC 67-15	0,524	1,5694	2,0933
27.02.2015	VFC 90-15	0,8751	2,3989	3,274
02.03.2015	VFC 98-15	1,0874	2,5405	3,6279
16.03.2015	VFC 130-15	0,9852	1,8997	2,8848
13.04.2015	VFC 208-15	0,8192	1,8989	2,7181
24.04.2015	VFC 232-15	0,8888	1,7545	2,6433
29.04.2015	VFC 239-15	0,9144	1,9886	2,903
22.05.2015	VFC 269-15	0,7537	2,1968	2,9506
01.06.2015	VFC 281-15	1,2023	2,1696	3,3719
18.06.2015	VFC 309-15	0,8549	1,6789	2,5338
26.06.2015	VFC 320-15	1,0888	2,1909	3,2798
13.07.2015	VFC 358-15	1,3526	2,1427	3,4953
16.07.2015	VFC 362-15	0,489	1,5411	2,0302
23.07.2015	VFC 400-15	0,8142	2,4099	3,2241
03.08.2015	VFC 442-15	1,1231	1,9518	3,075
20.08.2015	VFC 472-15	0,5973	2,1479	2,7452
08.09.2015	VFC 505-15	0,7947	1,8657	2,6604
21.09.2015	VFC 544-15	0,8834	2,0271	2,9105
01.10.2015	VFC 573-15	0,6645	1,6018	2,2663
07.10.2015	VFC 588-15	0,9325	2,1278	3,0603
15.10.2015	VFC 609-15	0,759	1,896	2,655
21.10.2015	VFC 622-15	0,723	2,0009	2,7239
29.10.2015	VFC 636-15	0,7325	1,9269	2,6594
04.11.2015	VFC 643-15	0,6981	1,9075	2,6056
12.11.2015	VFC 657-15	0,7411	1,9247	2,6658
23.11.2015	VFC 673-15	0,4636	1,6479	2,1115
07.12.2015	VFC 700-15	0,7411	1,6466	2,3876
08.12.2015	VFC 702-15	0,9449	1,7078	2,6527
21.12.2015	VFC 713-15	0,7737	1,6035	2,3772
06.01.2016	OCE 05-16	0,8386	2,0813	2,9199
08.01.2016	OCE 31-16	0,9545	2,3312	3,2857
01.02.2016	OCE 45-16	0,9486	1,9342	2,8828
08.02.2016	OCE 51-16	0,6273	1,8586	2,4858
12.02.2016	OCE 57-16	0,5988	2,195	2,7938
17.02.2016	OCE 69-16	0,8436	2,0786	2,9221

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		[ng/kg]	[ng/kg]	[ng/kg]
01.03.2016	OCE 82-16	0,8604	1,9275	2,7878
01.03.2016	OCE 84-16	0,8995	1,7261	2,6257
08.03.2016	OCE 98-16	0,8037	1,8865	2,6902
05.04.2016	OCE 136-16	0,81	1,6932	2,5032
15.04.2016	OCE 153-16	0,8823	2,1814	3,0637
21.04.2016	OCE 162-16	1,0226	1,8929	2,9154
10.05.2016	OCE 191-16	1,0159	1,9448	2,9607
10.05.2016	OCE 192-16	0,8284	2,1644	2,9929
13.05.2016	OCE 203-16	0,8163	1,6376	2,4539
27.05.2016	OCE 223-16	0,7734	1,8464	2,6198
06.06.2016	OCE 230-16	1,0278	2,0867	3,1145
16.06.2016	OCE 248-16	0,9054	2,1845	3,0899
21.06.2016	OCE 254-16	0,7487	2,1176	2,8663
07.07.2016	OCE 304-16	0,7098	2,0045	2,7143
12.07.2016	OCE 315-16	0,7139	1,8547	2,5685
14.07.2016	OCE 319-16	0,8195	1,9462	2,7658
18.07.2016	OCE 322-16	1,1499	2,548	3,6978
25.07.2016	OCE 331-16	0,9503	1,7505	2,7008
03.08.2016	OCE 349-16	0,7123	1,7967	2,509
12.08.2016	OCE 359-16	0,7368	1,7978	2,5347
23.08.2016	OCE 373-16	0,98	1,7244	2,7044
05.09.2016	OCE 393-16	0,511	2,1568	2,6678
13.09.2016	OCE 407-16	0,7061	1,7193	2,4255
19.09.2016	OCE 412 -16	0,7875	1,7658	2,5533
19.09.2016	OCE 413 -16	0,9241	2,1044	2,1044
26.09.2016	OCE 423 -16	0,766	1,9405	2,7064
04.10.2016	OCE 431 -16	0,6515	1,8305	2,482
10.10.2016	OCE 441-16	0,9954	2,2061	3,2014
10.10.2016	OCE 442-16	0,9011	2,1161	3,0173
17.10.2016	OCE 457 -16	0,8202	1,8979	2,7181
19.10.2016	OCE 461 -16	0,8431	2,2966	3,1398
24.10.2016	OCE 468 -16	0,8145	1,8734	2,688
25.10.2016	OCE 472-16	1,0981	2,2164	3,3144
31.10.2016	OCE 483-16	0,7352	1,523	2,2582
04.11.2016	OCE 497-16	0,8802	1,5619	2,4421
14.11.2016	OCE 510-16	0,8209	1,7432	2,5632
21.11.2016	OCE 515-16	0,7889	1,6711	2,46
29.11.2016	OCE 528-16	0,8812	1,6271	2,5084
06.12.2016	OCE 542-16	0,9317	1,9782	2,9098
02.01.2017	OCE 01-17	0,7272	1,5371	2,2643
06.01.2017	OCE 09-17	0,8332	1,8116	2,644
10.01.2017	OCE 11-17	0,7665	1,8384	2,6049

<u>Date</u>	<u>Analysis code</u>	<u>Dioxin</u>	<u>dioxin-like PCB</u>	<u>Dioxin + dioxin-like PCB</u>
		[ng/kg]	[ng/kg]	[ng/kg]
20.01.2017	OCE 22-17	0,8811	2,0977	2,9789
24.01.2017	OCE 24-17	1,0226	2,4289	3,4514
27.01.2017	OCE 29-17	0,961	2,0619	3,0229
01.02.2017	OCE 31-17	0,9442	1,7655	2,7097
10.02.2017	OCE 49-17	0,767	1,8303	2,5973
14.02.2017	OCE 50-17	0,865	1,8866	2,7516
24.02.2017	OCE 70-17	0,8903	2,4209	3,3112
07.03.2017	OCE 88-17	0,8586	1,6466	2,5052
09.03.2017	OCE 94-17	0,8675	2,0509	2,9184
10.03.2017	OCE 96-17	0,7223	2,1131	2,8354
21.03.2017	OCE 106-17	0,9826	2,0484	3,031
05.04.2017	OCE 128-17	0,939	1,964	2,902
11.04.2017	OCE 137-17	0,9914	2,0535	3,0449
13.04.2017	OCE 148-17	1,0046	1,867	2,8716
13.04.2017	OCE 149-17	1,0005	1,8598	2,8603
24.04.2017	OCE 156-17	0,7965	1,7767	2,5732
24.04.2017	OCE 159-17	0,8076	1,8352	2,6428
05.05.2017	OCE 181-17	0,9431	1,7507	2,6938
22.05.2017	OCE 220-17	0,8349	1,6969	2,5318
01.06.2017	OCE 266-17	0,9527	1,9331	2,8858
01.06.2017	OCE 267-17	0,8316	1,9331	2,7915
08.06.2017	OCE 270-17	0,8328	2,0478	2,8806
22.06.2017	OCE 336-17	0,9948	1,9976	2,9924
04.07.2017	OCE 351-17	0,846	2,1297	2,9757
07.07.2017	OCE 361-17	1,1194	1,9564	3,0758
10.07.2017	OCE 362-17	0,8553	2,4065	3,2618
13.07.2017	OCE 366-17	0,886	1,9253	2,8112
18.07.2017	OCE 380-17	0,8628	2,1693	3,0321
01.08.2017	OCE 400-17	1,0331	2,0527	3,0858
07.08.2017	OCE 416-17	0,9259	2,0733	2,9991
14.08.2017	OCE 429-17	0,922	2,1514	3,0734
28.08.2017	OCE 445-17	0,7931	2,3838	3,177
28.08.2017	OCE 446-17	0,9244	2,3118	3,2362
31.08.2017	OCE 454-17	0,8861	2,0557	2,9418
01.09.2017	OCE 455-17	0,8929	1,8946	2,7875
05.09.2017	OCE 462-17	0,5911	1,6921	2,2832
13.09.2017	OCE 467-17	0,9363	1,877	2,8134
13.09.2017	OCE 468-17	0,9379	1,813	2,7509
18.09.2017	OCE 476-17	0,9525	2,1558	3,1083
21.09.2017	OCE 484-17	0,8251	1,6611	2,4862
26.09.2017	OCE 488-17	0,6703	1,6082	2,2785
05.10.2017	OCE 497-17	0,9965	1,996	2,9925

<u>Date</u>	<u>Analysis code</u>	<u>Dioxin</u>	<u>dioxin-like PCB</u>	<u>Dioxin + dioxin-like PCB</u>
		[ng/kg]	[ng/kg]	[ng/kg]
05.10.2017	OCE 498-17	0,9675	1,9114	2,8788
13.10.2017	OCE 518-17	0,9606	2,2407	3,2014
11.10.2017	OCE 509-17	0,9221	1,8823	2,8044
19.10.2017	OCE 522-17	0,8913	1,8642	2,7555
30.10.2017	OCE 556-17	0,8804	1,9704	2,8535
02.11.2017	OCE 559-17	0,7522	2,0553	2,8076
10.11.2017	OCE 564-17	0,8912	1,8956	2,7868
21.11.2017	OCE 587-17	0,773	1,3884	2,1614
22.11.2017	OCE 588-17	0,8094	1,8087	2,6181
27.11.2017	OCE 595-17	0,8058	1,8575	2,6633
30.11.2017	OCE 598-17	0,7206	1,8122	2,5328
01.12.2017	OCE 604-17	0,7928	1,6272	2,42
09.12.2017	OCE 612-17	0,9698	1,6898	2,6595
12.12.2017	OCE 615-17	0,7721	1,9459	2,7181
20.12.2017	OCE 662-17	0,9134	1,5785	2,4918
20.12.2017	OCE 672-17	0,9569	2,2622	3,2191
21.12.2017	OCE 675-17	0,8887	1,9914	2,8802
02.01.2018	OCE 02-18	0,8758	1,4774	2,3532
09.01.2018	OCE 15-18	1,0167	2,5329	3,5496
19.01.2018	OCE 28-18	0,8907	1,8469	2,7375
01.02.2018	OCE 48-18	0,7002	2,3431	3,0433
07.02.2018	OCE 55-18	1,0245	1,86	2,8845
23.02.2018	OCE 88-18	0,9455	1,7987	2,7442
02.03.2018	OCE 99-18	0,7328	2,1072	2,84
07.03.2018	OCE 110-18	0,981	2,0785	3,0595
08.03.2018	OCE 118-18	0,8188	2,0775	2,8963
09.03.2018	OCE 119-18	0,8217	1,9536	2,7753
16.03.2018	OCE 133-18	0,7195	1,9965	2,716
16.03.2018	OCE 134-18	0,764	2,1524	2,9164
20.03.2018	OCE 142-18	0,8655	1,9901	2,8556
26.03.2018	OCE 151-18	1,0467	2,327	3,3737
03.04.2018	OCE 155-18	0,7517	1,6147	2,3664
05.04.2018	OCE 165-18	1,0313	2,1764	3,2077
20.04.2018	OCE 202-18	1,0684	1,8449	2,9133
26.04.2018	OCE 211-18	1,031	1,7235	2,7545
27.04.2018	OCE 220-18	0,8312	1,5414	2,3726
11.05.2018	OCE 246-18	1,0329	2,003	3,0358
15.05.2018	OCE 250-18	0,756	1,5875	2,3238
24.05.2018	OCE 266-18	1,0619	1,8326	2,8945
06.06.2018	OCE 292-18	0,9833	1,8881	2,8714
11.06.2018	OCE 298-18	0,9893	2,2318	3,2211
15.06.2018	OCE 308-18	0,9193	1,5728	2,4921

<u>Date</u>	<u>Analysis code</u>	<u>Dioxin</u>	<u>dioxin-like PCB</u>	<u>Dioxin + dioxin-like PCB</u>
		[ng/kg]	[ng/kg]	[ng/kg]
25.06.2018	OCE 323-18	0,6825	1,3459	2,0284
27.06.2018	OCE 337-18	1,1299	2,0034	3,1333
11.07.2018	OCE 365-18	1,0035	1,7415	2,745
23.07.2018	OCE 384-18	0,8979	2,0705	2,9883
25.07.2018	OCE 391-18	0,9618	1,7815	2,7432
02.08.2018	OCE 408-18	1,0975	1,9142	3,0117
07.08.2018	OCE 416-18	0,8322	1,684	2,5162
10.08.2018	OCE 423-18	1,0014	1,6672	2,6687
20.08.2018	OCE 438-18	0,9148	1,7052	2,6199
21.08.2018	OCE 449-18	0,7782	1,7095	2,4877
29.08.2018	OCE 466-18	0,8799	1,5321	2,412
30.08.2018	OCE 468-18	0,8064	1,5631	2,3695
18.09.2018	OCE 692-18	0,5944	1,7077	2,3021
21.09.2018	OCE 698-18	0,614	1,9004	2,5143
21.09.2018	OCE 699-18	0,6384	1,6239	2,2622
04.10.2018	OCE 721-18	0,6083	1,5726	2,1809
08.10.2018	OCE 726-18	0,687	2,2387	2,9257
18.10.2018	OCE 758-18	0,6887	2,1538	2,8425
29.10.2018	OCE 780-18	0,6816	2,2135	2,895
01.11.2018	OCE 782-18	0,6795	1,5851	2,2646
09.11.2018	OCE 803-18	0,6826	1,8527	2,5353
13.11.2018	OCE 805-18	0,7371	1,9475	2,6846
23.11.2018	OCE 906-18	0,5723	1,7442	2,3164
28.11.2018	OCE 937-18	0,7821	2,326	3,1082
28.11.2018	OCE 938-18	0,788	2,0917	2,8796
05.12.2018	OCE 1036-18	0,6406	1,85	2,4906
11.12.2018	OCE 1056-18	0,587	1,6683	2,2553
20.12.2018	OCE 1072-18	0,5996	1,6077	2,2013
20.12.2018	OCE 1073-18	0,6761	1,8493	2,5254
04.01.2019	OCE 06-19	0,5515	1,733	2,2845
07.01.2019	<u>OCE 09-19</u>	0,7346	2,0933	2,8279
18.01.2019	<u>OCE 26-19</u>	0,6385	1,8572	2,4958
24.01.2019	<u>OCE 36-19</u>	0,5935	1,542	2,1355
31.01.2019	<u>OCE 46-19</u>	0,5865	1,6306	2,2172
31.01.2019	<u>OCE 47-19</u>	0,665	1,8923	2,5573
11.02.2019	<u>OCE 57-19</u>	0,7026	1,6956	2,3982
20.02.2019	<u>OCE 66-19</u>	0,5141	1,5157	2,0298
25.02.2019	<u>OCE 84-19</u>	0,8376	2,1715	3,0091
06.03.2019	<u>OCE 104-19</u>	0,6516	2,0322	2,6838
18.03.2019	<u>OCE 123-19</u>	0,5913	1,7971	2,3884
20.03.2019	<u>OCE 127-19</u>	0,7067	1,7647	2,4714
29.03.2019	<u>OCE 146-19</u>	0,7493	1,7024	2,4517

<u>Date</u>	<u>Analysis code</u>	<u>Dioxin</u>	<u>dioxin-like PCB</u>	<u>Dioxin + dioxin-like PCB</u>
		[ng/kg]	[ng/kg]	[ng/kg]
08.04.2019	<u>OCE 155-19</u>	0,6708	1,6704	2,3412
16.04.2019	<u>OCE 170-19</u>	0,7292	1,9159	2,6451
18.04.2019	<u>OCE 173-19</u>	0,689	1,4142	2,1032
18.04.2019	<u>OCE 175-19</u>	0,6279	1,274	1,9019
30.04.2019	<u>OCE 190-19</u>	0,6741	2,3566	3,0306
13.05.2019	<u>OCE 214-19</u>	0,5115	1,4498	1,9613
14.05.2019	<u>OCE 231-19</u>	0,78	1,6141	2,3941
28.05.2019	<u>OCE 266-19</u>	0,7899	1,7881	2,578
05.06.2019	<u>OCE 280-19</u>	0,5605	1,3906	1,951
27.06.2019	<u>OCE 311-19</u>	0,7851	1,9298	2,7149
04.07.2019	<u>OCE 319-19</u>	0,5272	1,3735	1,9007
04.07.2019	<u>OCE 329-19</u>	0,6278	1,5955	2,2233
05.07.2019	<u>OCE 334-19</u>	0,6058	1,4967	2,1025
11.07.2019	<u>OCE 362-19</u>	0,5082	1,577	2,0852
23.07.2019	<u>OCE 390-19</u>	0,4534	1,7181	2,1715
23.07.2019	<u>OCE 396-19</u>	0,7837	2,1316	2,9154
08.01.2020	<u>OCE 27-20</u>	0,50644	1,462	1,9685
08.01.2020	<u>OCE 29-20</u>	0,51744	1,9287	2,4461
29.01.2020	<u>OCE 70-20</u>	0,66642	1,6717	2,3382
03.02.2020	<u>OCE 89-20</u>	0,47441	1,4123	1,8867
17.02.2020	<u>OCE 126-20</u>	0,54921	1,484	2,0332
21.02.2020	<u>OCE 133-20</u>	0,63525	1,6364	2,2716
28.02.2020	<u>OCE 153-20</u>	0,50574	1,3391	1,8448
02.03.2020	<u>OCE 154-20</u>	0,62682	1,9897	2,6165
16.03.2020	<u>OCE 187-20</u>	0,65886	1,5987	2,2576
30.03.2020	<u>OCE 216-20</u>	0,7018	1,734	2,4358
15.04.2020	<u>OCE 268-20</u>	0,6827	1,8648	2,5475
28.04.2020	<u>OCE 296-20</u>	0,6886	1,6447	2,3333
14.05.2020	<u>OCE 327-20</u>	0,53258	1,7407	2,2733
14.05.2020	<u>OCE 334-20</u>	0,44	1,2299	1,6699
19.05.2020	<u>OCE 405-20</u>	0,69142	1,9928	2,6842
12.06.2020	<u>OCE 420-20</u>	0,63738	2,2944	2,9318
19.06.2020	<u>OCE 437-20</u>	0,55062	1,7683	2,3189
29.06.2020	<u>OCE 462-20</u>	0,80414	1,9297	2,7338
14.07.2020	<u>OCE 493-20</u>	0,42794	1,2786	1,7066
24.07.2020	<u>OCE 522-20</u>	0,58071	1,613	2,1938
28.07.2020	<u>OCE 568-20</u>	0,75161	1,8313	2,5829
10.08.2020	<u>OCE 619-20</u>	0,58573	1,5385	2,1242
01.09.2020	<u>OCE 620-20</u>	0,52114	1,3162	1,8374
02.09.2020	<u>OCE 639-20</u>	0,79825	1,8715	2,6697
11.09.2020	<u>OCE 662-20</u>	0,54674	1,672	2,2187
25.09.2020	<u>OCE 663-20</u>	0,42918	1,4611	1,8902

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		[ng/kg]	[ng/kg]	[ng/kg]
25.09.2020	<u>OCE 674-20</u>	0,65648	1,6829	2,3394
05.10.2020	<u>OCE 693-20</u>	0,40049	1,2662	1,6667
14.10.2020	<u>OCE 694-20</u>	0,84146	1,5785	2,4199
14.10.2020	<u>OCE 703-20</u>	0,93914	1,3693	2,3084
21.10.2020	<u>OCE 712-20</u>	0,52008	1,3863	1,9063
26.10.2020	<u>OCE 721-20</u>	0,76771	1,9962	2,7639
03.11.2020	<u>OCE 725-20</u>	0,53935	1,6812	2,2205
05.11.2020	<u>OCE 735-20</u>	0,47969	1,5361	2,0158
11.11.2020	<u>OCE 742-20</u>	0,33519	1,2473	1,5825
13.11.2020	<u>OCE 747-20</u>	1,1643	2,4503	3,6146
17.11.2020	<u>OCE 767-20</u>	0,52342	1,402	1,9254
24.11.2020	<u>OCE 781-20</u>	0,6358	1,4063	2,0421
02.12.2020	<u>OCE 792-20</u>	0,68631	1,5722	2,2585
10.12.2020	<u>OCE 796-20</u>	0,54622	1,3793	1,9255
12.01.2021	<u>OCE 006-21</u>	0,56065	1,3207	1,8814
12.01.2021	<u>OCE 008-21</u>	0,48585	1,173	1,6589
25.01.2021	<u>OCE 044-21</u>	0,4715	1,3126	1,7841
27.01.2021	<u>OCE 049-21</u>	0,55255	1,3844	1,937
08.02.2021	<u>OCE 075-21</u>	0,56373	1,3339	1,8976
25.02.2021	<u>OCE 105-21</u>	0,35693	1,4754	1,8323
25.02.2021	<u>OCE 107-21</u>	0,21991	1,0126	1,2325

Cuxhaven, 04.03.2021

Bodo von Holten, Managing Director

P.S.: This is an update of the original proposal submitted 3.9.2019