

Test report no.: C38/P453/23-1-E

#### DTNW ÖP GmbH - Adlerstr. 1 - 47798 Krefeld

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No.	Description	Sample
1	CARBBIND® Loose Fiber®	ECRE Marca M
2	Used engine oil	
3	Metal tub	No.

The sampling was carried out by the purchaser. The samples were sent by mail.

Order entry date	Receipt of the samples (no.)	Editing period
	15.11.2023 (1-3)	15.11 27.11.2023
15.11.2023		16.01.2024

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# Task

The client submitted test materials to have the absorption capacity of his product "CARBBIND® Loose Fiber®" (sample 1) tested against used engine oil (sample 2) as a film on an aqueous phase. This was done on the basis of total organic carbon (TOC). One treatment step was to be carried out and the TOC content was to be compared with the initial state. A metal tub (sample 3), also provided by the client, was used for the experiment.

## Test procedure and results

#### Implementation and observations:

The metal tub (sample 3) was filled with approx. 5.5 liters of ultrapure water. Then 15 mL of used engine oil (test sample 2) was poured onto the surface of the water so that an oil film/droplets of varying degrees were formed on the surface of the water. A sample of this oil-water mixture was taken from the surface for TOC determination. The ultrapure water without oil was also tested for TOC content as a blank value. The tank prepared with ultrapure water and oil is shown in Figure 1.



Figure 1: Metal tub filled with ultrapure water and used engine oil. The oil formed a film/droplet of varying degrees on the surface of the water.

Around 80 g of **CARBBIND® Loose Fiber®** (sample 1) was sprinkled evenly onto the water/oil surface in the tub so that the entire surface was covered. This was then allowed to interact briefly (about one to two minutes of contact ime). The covered surface is shown in Figure 2.



Figure 2: Metal tub filled with ultrapure water and used engine oil after covering the surface with about 80 g of CARBBIND® Loose Fiber® product (sample 1).

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After the contact time had elapsed, the **CARBBIND® Loose Fiber®** material from sample 1 was removed from the surface using a slide. As soon as the material was pushed together, it became apparent that no large oil droplets were visible on the water surface. When looking at the water surface from the side, only a minimal rainbow effect was visible on the surface in places, presumably due to remaining oil residue. Unfortunately, this could not be captured photographically due to the very small amount of oil. The material was gradually lifted completely out of the water using the slide and then another sample was taken from the surface to determine the TOC content. Only a few small aggregates of material and oil as well as material from **CARBBIND® Loose Fiber®** alone were observed at the bottom of the vessel. These will presumably have sunk due to the higher density of the mixtures or the material soaked up with water as water in the course of removing the remaining material with the slide. The tub at the end of the treatment step is shown in Figure 3.



Figure 3: Metal tub initially filled with ultrapure water and used engine oil, after the CARBBIND® Loose Fiber® product (sample 1) has been lifted out of the tub with the aid of a slide after a contact time.

The next section shows the TOC results of the different samples (ultrapure water, ultrapure water/oil mixture and water after treatment with CARBBIND® Loose Fiber® (sample 1)). Directly before the determination by taking a small aliquot, the respective sample was always shaken intensively in order to obtain a liquid or homogeneous suspension that was as homogeneous as possible, in the case of remaining oil, which is hardly soluble to insoluble in water.

#### TOC°

based on DIN EN 1484, Determination of total organic carbon (TOC), edition: 2019-04; TOC cell test LCK 385 (3 - 30 mg/L) from Hach-Lange

No.	Measured values of the TOC [mg/l]
Ultrapure water	< 3
Ultrapure water + oil	> 300
Water after treatment	3

The ultrapure water used for the test has a TOC content of < 3 mg/L. This was to be expected due to the special treatment of the water for laboratory purposes. The oil-water mixture before dosing **CARBBIND® Loose Fiber®** (sample 1) had a very high TOC content of > 300 mg/L. This was measured despite dilution of the mixture. The 15 mL of oil used (sample 2) had a weight of around 12 g. This results in a theoretical content of slightly more than 2 g/L oil due to the 5.5 L ultrapure water. Due to the high carbon content of engine oil of over 50 %, the theoretical carbon content in the water is at least 1000 mg/L. This is consistent with the TOC results. These are given as > 300 mg/L, as above this value no further meaningful dilution with the suspension for use of the test kit was possible. After treatment with **CARBBIND® Loose Fiber®** (sample 1), the TOC value of the water was exactly at the lower end of the determination range of the test kit at 3.0 mg/L.



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# Conclusion

The experiments showed that the client's **CARBBIND® Loose Fiber®** material (sample 1) removed an oil film on a water surface / drops very well. After just one treatment step, no clear oil film was visible on the surface. Only a minimal fog caused by presumably remaining oil could be detected in places by a rainbow effect on the surface.

The TOC content could be significantly reduced from > 300 mg/L for the oil-water mixture before the first treatment to values in the low single-digit range (3 mg/L). The resulting value for the water is well below the values for eluates in the Landfill Ordinance (50 - 100 mg/L for DOC)<sup>[1]</sup>. For slightly polluted rivers, values in the range of 2 - 4 mg/L are given for TOC<sup>[2]</sup>.

DTNW Öffentliche Prüfstelle GmbH, Krefeld 16.01.2024



Dr. Florian Metzelder (Manager)

### References

[1] PDF-Document GUBD (Geotechnical, environmental and construction services): Allocation values of the DepV (Landfill Ordinance), allocation Abs. 29 values DepV of 27.04.2009, last amended by Art. 5, G 24.02.2012 (Issue: 2017-01). ٧. https://gubd.de/content/pdf/043\_DepV\_Zuordnungswerte\_Deponieklassen\_Bayern\_ 2016-04.pdf (date of access: 30.11.2023).

[2] https://shimadzu-laborwelt.de/application/toc-bestimmung-im-oberflaechenwasser-und-grundwasser/. (date of access: 30.11.2023) with reference to Wikipedia as primary source.

#### Note:

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