

RAMEKO

DETERMINATION OF THE RETENTION PROPERTIES OF THE UNIVERSAL SORBENT ECOLLOSE H-LIC SORBENT

TEST REPORT

Cedre L.17.31

PLG

November 2017



**CENTRE OF DOCUMENTATION, RESEARCH AND
EXPERIMENTATION ON ACCIDENTAL WATER
POLLUTION**

715, rue Alain Colas - CS 41836 - 29218 BREST CEDEX 2 - FRANCE
Tél. : 02 98 33 10 10 - Fax : 02 98 44 91 38 - E-mail : contact@cedre.fr
International : 33 2 98 33 10 10 - Fax : 33 2 98 44 91 38

TEST REPORT

Report L.17.31	<u>Date</u> : November 7, 2017	<u>Contact</u> : Pascale Le Guerroué Pascale.Le.Guerroue@cedre.fr
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Request for analysis

<u>Organism</u> : Rameko <u>Contact</u> : Mr. Yurenkov	<u>Objective</u> : Determination of the retention properties of the universal sorbent ECOLLOSE H-LIC SORBENT
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Sample

<u>Received</u> : August 31 st , 2017	<u>Type/origin</u> : Universal sorbent	<u>Quantity</u> : 6 L <u>References</u> : AL-17-53
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Report

<u>Written by</u> : P. Le Guerroué	<u>Reviewed by</u> : J.Guyomarch	<u>External diffusion</u> : Rameko	<u>Internal Copies</u> : <i>Analysis and Resources Department</i>
			Confidential: <input checked="" type="checkbox"/>

Summary

The tests were carried out according to standard the NF T 90-361, but, due to the low density of the sorbent and the low speed of sorption, 5 and 10 g of sorbent for the retention tests towards water, and 10 g for retention tests towards oil, were used instead of 20 g as mentioned in the norm. The values selected for the retention towards water correspond to the test using 5 g of sorbent.

The sorbent **ECOLLOSE H-LIC** sorbent in bulk form (type A, NF T 90-362) shows, **for water, a retention capacity by weight of 1573 %** expressed according to French standard NF T 90-361, *i.e.* a retention capacity by volume (d=0.032) of 51 %.

By relating the results to the mass of the dry cylinder, it can be concluded that this sorbent has, **for Arabian Light crude oil (ALC 110), a retention capacity by weight of 1330 %**, *i.e.* a retention capacity by volume (d=0.032) of 48 % (respectively 1282 % and 46% based on the wet cylinder procedure).

The sorbent **ECOLLOSE H-LIC** sorbent can be recommended as an universal sorbent. Therefore, this product can appear on the lists of validated product.

MEASUREMENT OF THE SORPTION CAPACITY OF A UNIVERSAL SORBENT ACCORDING TO THE FRENCH STANDARD NF T 90-361

1. Objective of the tests

The objective of these tests was to determine the retention properties of a universal sorbent, the ECOLLOSE H-C LIQ product, according to the French standard NF T 90-361, and to carry out complementary measurements performed according to Cedre's procedure which derives from this standard.

2. Characteristics of the ECOLLOSE H-LIC sorbent

Table 1 presents the main characteristics of the ECOLLOSE H-C LIQ sorbent, as stated by the supplier or measured by Cedre.

Table 1 main characteristics of the ECOLLOSE H-C LIQ sorbent

Characteristic	Description / value
Sorbent name (<i>supplier data</i>)	ECOLLOSE H-LIC SORBENT
Sorbent type (conditioning)	Bulk product type A (NF T 90-362)
Origin	Sample of ECOLLOSE H-LIC SORBENT received from the company Rameko on August 10, 2017.
Cedre's reference sample	AL-17-53
Nature and colour of the material (<i>supplier data</i>)	Vegetal (Cellulose)
Appearance	Beige flake
Mean surface density estimated by Cedre	0.032
Manufacturer (<i>supplier data</i>)	Rameko
Size grading	As the product is in the form of flakes, it is impossible to achieve a particle size measurement.

3. Testing method

The retention properties of saturated universal sorbents and/or sorbents for use on land in relation to water and oil, were determined according to the French standard NF T 90-361, as well as complementary measurements performed according to the Cedre procedure derived from this standard (Appendix 1).

Considering the low density of the sorbent and the low speed of sorption, it was not possible to carry out the tests with 20 g of sorbent as mentioned in the norm. Therefore, concerning the water retention capacity, a first series was carried out taking 10 g of sorbent. As sorbent didn't seem to be saturated with water, a second series was conducted using 5 g of sorbent. Concerning the hydrocarbon retention tests, 10 g of sorbent were used.

Water purified by reverse osmosis was used, and as regards the oil, an Arabian light crude oil topped at 110°C (ALC 110). Density of the oil at 20°C has to be 0.88 ± 0.02 (measured density of ALC 110: 0.895), and dynamic viscosity at 20°C has to be in the range 42 – 45 cP.

3. RESULTS

3.1 Determination of water retention capacity relatively the wet cylinder mass

Table 2 and 3 presents the results of the water retention tests performed on the ECOLLOSE H-C LIQ sorbent, for respectively 10 and 5 grams of product.

Table 2 results of the water retention tests for 10 grams of the ECOLLOSE H-C LIQ sorbent (wet cylinder)

Sorbent mass (g)	Mass of water retained (g)	Mass of water retained per gram of sorbent (g)	Water retention capacity (%)
10.101	109.171	10.81	1081
10.084	111.740	11.08	1108
10.007	113.915	11.38	1138

Table 3 results of the water retention tests for 5 grams of the ECOLLOSE H-C LIQ sorbent (wet cylinder)

Sorbent mass (g)	Mass of water retained (g)	Mass of water retained per gram of sorbent (g)	Water retention capacity (%)
5,038	78.217	15.52	1552
5,086	77.937	15.32	1532
5,027	83.076	16.53	1653
5,073	78.003	15.38	1538
5,040	80.256	15.92	1592

3.2. Determination of oil retention on ALC 110

Table 4 and 5 presents the results of the oil retention tests performed on the ECOLLOSE H-C LIQ sorbent, for 10 grams of product, considering respectively the dry and wet cylinder conditions.

Table 4 results of the oil retention tests for 10 grams of the ECOLLOSE H-C LIQ sorbent (dry cylinder)

Sorbent mass (g)	Mass of oil retained (g)	Mass of oil retained per gram of sorbent (g)	Oil retention capacity (%)
10,065	131,368	13.05	1305
10,079	136,298	13.52	1352
10,072	134,341	13.34	1334

Table 5 results of the oil retention tests for 10 grams of the ECOLLOSE H-C LIQ sorbent (wet cylinder)

Sorbent mass (g)	Mass of oil retained (g)	Mass of oil retained per gram of sorbent (g)	Oil retention capacity (%)
10,065	126,353	12.55	1255
10,079	131,173	13.01	1301
10,072	129,773	12.88	1288

4. Interpretation of results

4.1 Water retention capacity

4.1.1 Results

The laboratory tests show that, relatively to the mass of the wet cylinder, for the test using 10 grams of sorbent, the retention capacity in terms of water mass to sorbent mass, is 11.1 (mean value), *i.e.* a retention capacity by **weight of 1109 %** (retention capacity in volume of 36 %).

Based on the test using 5 grams of sorbent, these retention capacities are respectively **1573 % in weight** and 51% in volume.

4.1.2 Validity

For the test conducted by using 10 grams of sorbent, compared to the average, the various results differ by 2.6%, less than the 5 % stated by the norm. Considering a 95 % confidence interval, according to the Student's law is, the corresponding relative margin of error is 5.3 %.

For the test conducted by using 5 grams of sorbent, compared to the average, the various results differ by 5%. Considering a 95 % confidence interval, according to the Student's law is, the corresponding relative margin of error is 3.5 %.

4.2 Oil (ALC 110) retention capacity

4.2.1 Results

The laboratory tests show that, relatively to the mass of the **dry cylinder**, the retention capacity in terms of oil mass to sorbent mass, is 13.3 (mean value), *i.e.* a retention capacity by **weight of 1330 %** (retention capacity in volume of 48 %).

Relatively to the mass of the **wet cylinder**, the retention capacity in terms of oil mass to sorbent mass, is 12.82 (mean value), *i.e.* a retention capacity by **weight of 1282 %** (retention capacity in volume of 46 %).

4.2.2 Validity

For the test conducted with the **dry cylinder**, compared to the average, the various results differ by 1.9%, less than the 5 % stated by the norm. Considering a 95 % confidence interval, according to the Student's law is, the corresponding relative margin of error is 3.6 %.

For the test conducted with the **wet cylinder**, compared to the average, the various results differ by 2.0%, less than the 5 % stated by the norm. Considering a 95 % confidence interval, according to the Student's law is, the corresponding relative margin of error is 3.8 %.

5. Conclusions

The **ECOLLOSE H-LIC** sorbent in bulk form (type A, NF T 90-362) shows retention properties, expressed according to the French standard NF T 90-361 and for an estimated density of 0.032, as follows:

- **11.09 to 15.73 its weight in water** (according to the amount of product tested), giving a retention capacity by weight of **1109% to 1573%**, which corresponds to a retention capacity of 36% to 51% in volume.
- **12.82 (wet cylinder) and 13.30 (dry cylinder) its weight in oil**, giving a retention capacity by weight of **1282% and 1330%**, which corresponds to a retention capacity respectively of 46% to 48% in volume.

APPENDIX 1

Cedre method derived from French standard NF T 90-361

The Cedre method derived from standard NF T 90-361, in the same way as the standardised procedure, consists in measuring the water and oil retention capacities of a universal sorbent. Among the complementary measurements performed in the method applied by Cedre, the retention results are calculated according to the mathematical expression provided in standard NF T 90-361, based on the mass of the wet cylinders for both tests, i.e. for water and for oil. The aim of these tests is to compare the water retention values to the oil retention values in the same experimental conditions.