TEST REPORT

Report on the testing for the establishment of the Mitigation Values/Ratios of the Marsh EN858 Hydroil Separator and the "Assessment as a Treatment Device Designed to Treat Surface Water Runoff"

NSFR 6

Marsh Industries Ltd.

Test report No. PIA2020-NW-2009-1039.02

Germany, Aachen, May 2021

PIA GmbH
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Notified Body No. 1739

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1 Introduction

The company

Marsh Industries Ltd.
Units 2-20 Addington Park Industrial estate
Little Addington
NN14 4AS Northants
Great Britain

assigned the

Prüfinstitut für Abwassertechnik (PIA GmbH)
Hergenrather Weg 30
52074 Aachen
Germany

to test a EN858 separator to establish the mitigation values/ratio for the "Assessment as a Treatment Device Designed to Treat Surface Water Runoff" designed by Marsh Industries Limited.

The test was performed on the premises of PIA GmbH Aachen, Germany in November 2020.

PIA GmbH has a certified quality management system according to EN ISO 9001:2015 for the field "testing of wastewater equipment". PIA GmbH is accredited as testing laboratory based on EN ISO/IEC 17025:2005 and is approved by the European Commission as a testing laboratory "Notified Body" (NB 1739) according to the Construction Products Regulation (CPR) for small wastewater treatment systems for up to 50 PT according to EN 12566 Part 1, 3, 4, 6 and 7.

The test results contained in this report refer solely to the tested objects. This report may only be reproduced and published – completely or in parts – if written consent has been given by PIA GmbH.

1.1 Annotation

This report No. PIA2020-NW-2009-1039.02 replaces the report No. PIA2020-NW-2009-1039. Reason for change is a change in wording within the header as well as on page 1,2 6 and 10.

2 Description of tested system

The tested system was designed as a light liquid separator. The tank is equipped with a coalescer pipe with an attached foam.

The volume of the tank was determined as 1,572 l.

Figure 1: Tank in testing set up

3 Test for retention of different substances

Table 3.1: Overview of performed tests

Test	Test assembly (CoP principles)	Connected surface	Note
Particle capture and retention	Test assembly 1	340 m^2	-
Heavy metal retention & test with de-icing salt	Test assembly 2	-	No test was performed
Hydro carbon retention	Test assembly according to EN 858-1	-	Class I Less than 5 mg/l Check PIA report PIA2017-1607-1089.01

3.1 Test for particle capture and retention

Related Test standard: Code of Practice "Assessment of a Manufactured Treatment Device Designed to Treat Surface Water Runoff"

Chapter 7.1

Comment: Due to high testing times of up to 25 hours at a connected surface area of 340 m², the required volume exchange of 10 times the tank volume was adapted. The volume of the tank was exchanged 3 times with the assumption, that stationary conditions can be reached within this time (check NJDEP,2013)

Test medium: Quartz powder (Millisil W4)

Table 3.2: Test defaults of test for particle capture and retention

Assessment order	Date	Duration	Rainfall intensity/ Flow		Feed water volume	Feed of Millisil W4	
			Rainfall intensity	Flow		Millisil load 200 mg/l	Dosage ± 5 %
		min	l/(s*ha)	l/s	l	g	g/min
1		462	5.0	0.17	4,716	943	2.04
2		231	10.0	0.34	4,716	943	4.08
3		154	15.0	0.51	4,716	943	6.12
4		73	31.5	1.07	4,716	943	12.85
5		42*	110.0	3.74	9,432	0	0

*Samples were taken every minute within the first 15 minutes, afterwards 5 additional samples were taken evenly distributed over the remaining time period

The total load and concentration at the outlet are calculated following the respective formula:

$$M_{out} = V_{fr,1} \times C_1 + V_{fr,2} \times C_2 + V_{fr,3} \times C_3 + V_{fr,4} \times C_4 + V_{fr,5} \times C_5 \quad \text{Formula 1}$$

$$\mu = \left(1 - \frac{M_{out}}{M_{in}}\right) \times 100 \quad \text{Formula 2}$$

M_{out}: Total mass of non-retained sediment, in mg

C_n: Supply volume for test flow rate "n", in l

$V_{fr,n}$: Averaged sediment concentration in discharge for test flow rate "n", in mg/l

M_{in}: Total input mass, in mg, of sediment delivered over all test flow-rates

The results of the test for particle retention are summarized in table 4.3. The analysis results of each sample can be found in the attachments. The samples were analysed in the laboratory of PIA GmbH.

Table 3.3: Results of test for particle retention

	AO 1	AO 2	AO 3	AO 4	AO 5
Volume [l]	4,716	4,716	4,716	4,716	9,432
Dosed particles [mg]	943,200	943,200	943,200	943,200	0
Concentration inlet [mg/l]	200	200	200	200	0
Total input mass [mg]	3,772,800				
Concentration outlet [mg/l]	9	13	17	21	33*
Average load at outlet according to formula 1 [mg]	590,600				
Total retention [%]	**84.35**				

**Only the first 15 samples were taken into account. Taken all 20 sample into account, the efficiency improves to 86.23%.*

$$M_{in} = 943{,}200\ mg\ \times 4 = 3{,}772{,}800\ mg$$

$$M_{out} = \big((4{,}716 \times 9) + (4{,}716 \times 13) + (4{,}716 \times 17) + (4{,}716 \times 21) + (4{,}716 \times 33)\big)\ mg$$
$$= 590{,}600\ mg$$

$$Retention = \left(1 - \frac{590{,}600\ mg}{3{,}772{,}800\ mg}\right) \times 100 = 84.35\%$$

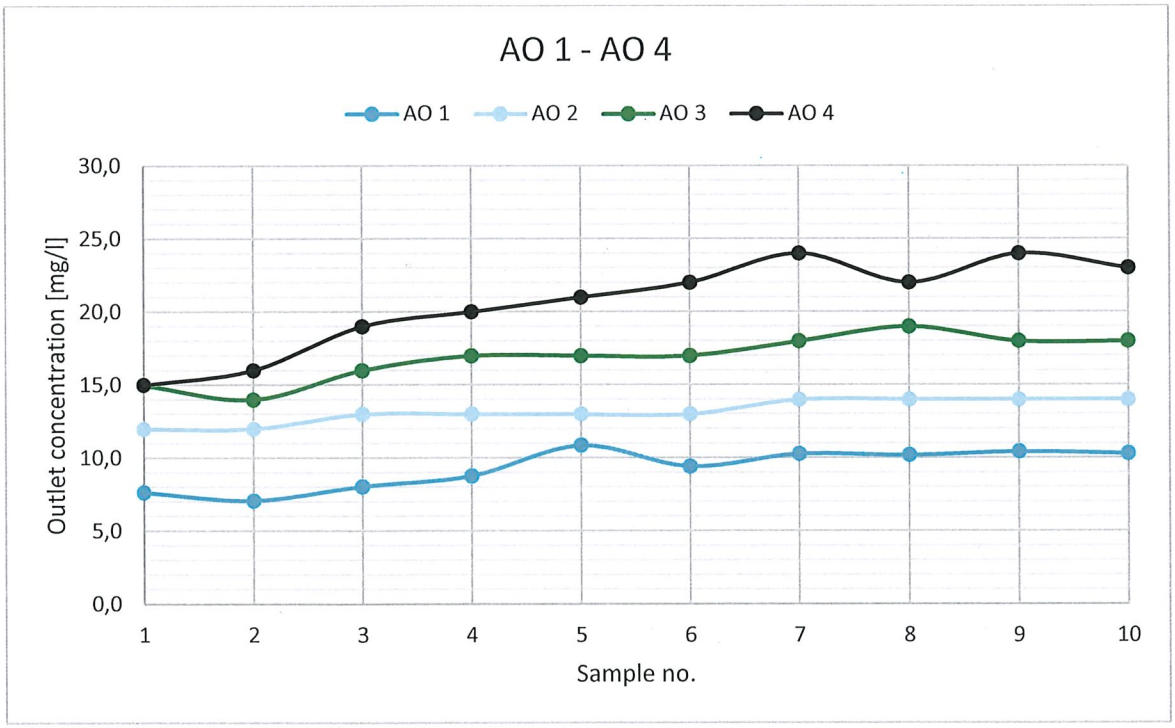


Figure 2: Outlet concentrations of samples in AO 1 - AO 4

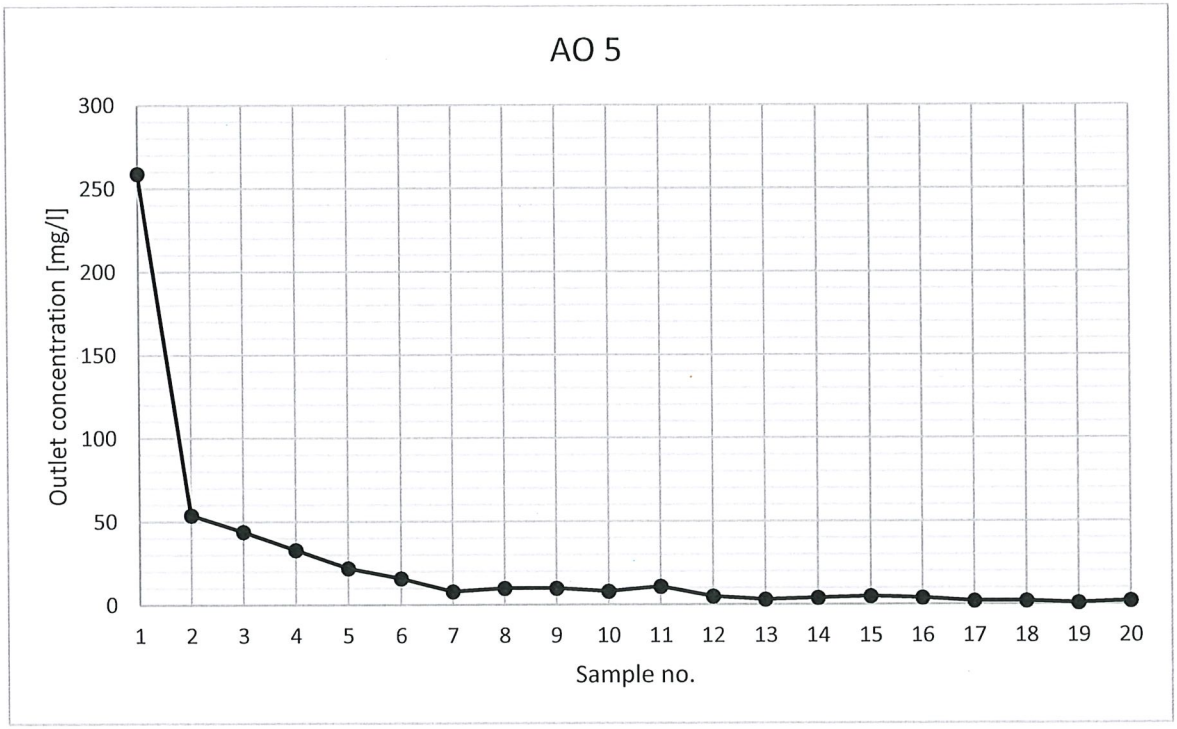


Figure 3: Outlet concentrations of samples in AO 5

4 Summary

Table 4.1: Summary of results

Name of system/tank:	**NSFR 6**
Manufacturer:	**Marsh Industries**
Retention and capture of particles with a connected surface of 340 m²	
Parameter: fine-grained, mineral filterable substances	
Test substance:	Quartz powder MILLISIL W4 Grain size range 0 µm – 400 µm
Result:	84.35 % retention

Comment: Due to high testing times of up to 25 hours at a connected surface area of 340 m², the required volume exchange of 10 times the tank volume was adapted. The volume of the tank was exchanged 3 times with the assumption, that stationary conditions can be reached within this time (check NJDEP,2013)

End of report.

5 Attachments

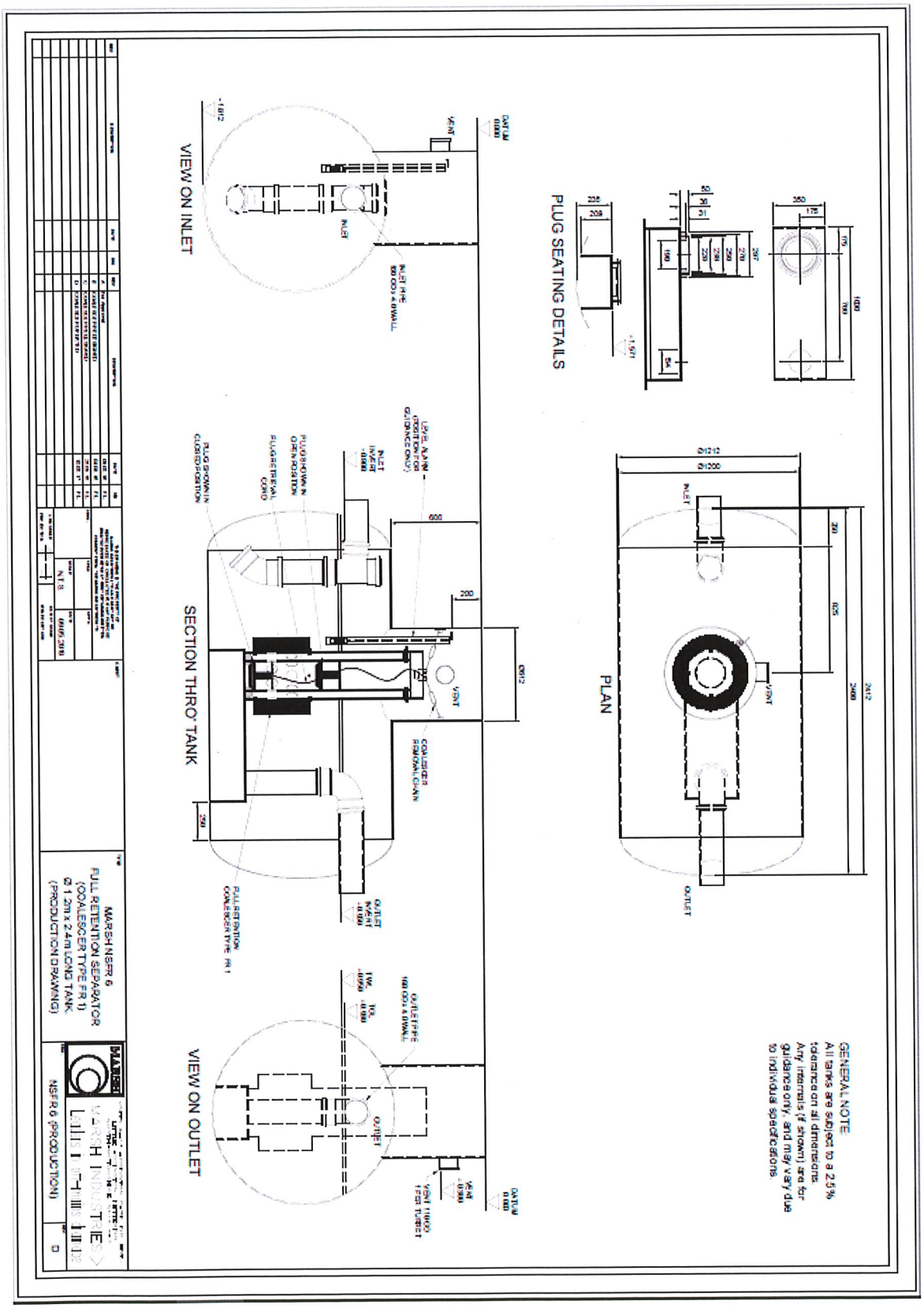
5.1 Analysis results

Table 5.1: Analysis results of test for particle retention

		Assessment order 1									
Sample no.		101	102	103	104	105	106	107	108	109	110
Time	**min**	+154	+154	+231	+231	+308	+308	+385	+385	+462	+462
Concentration TSS	**mg/l**	7.66	7.09	8.06	8.78	10.87	9.44	10.29	10.19	10.43	10.31
		Assessment order 2									
Sample no.		201	202	203	204	205	206	207	208	209	210
Time	**min**	+77	+77	+116	+116	+154	+154	+193	+193	+231	+231
Concentration TSS	**mg/l**	12.18	12.42	12.88	12.59	12.73	13.00	13.66	13.97	14.48	13.82
		Assessment order 3									
Sample no.		301	302	303	304	305	306	307	308	309	310
Time	**min**	+51	+51	+77	+77	+103	+103	+128	+128	+154	+154
Concentration TSS	**mg/l**	15.00	13.97	16.33	16.94	17.20	17.14	17.97	18.86	18.08	17.92
		Assessment order 4									
Sample no.		401	402	403	404	405	406	407	408	409	410
Time	**min**	+24	+24	+37	+37	+49	+49	+61	+61	+73	+73
Concentration TSS	**mg/l**	15.02	16.45	19.13	20.20	21.08	22.28	23.76	21.64	23.99	22.68
		Assessment order 5									
Sample no.		PPA 401	PPA 402	PPA 403	PPA 404	PPA 405	PPA 406	PPA 407	PPA 408	PPA 409	PPA 410
Time	**min**	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
Concentration TSS	**mg/l**	258.53	54.21	44.27	33.33	21.63	16.18	8.24	9.90	10.10	8.11

Sample no.		411	412	413	414	415	416	417	418	419	420
Time	min	+11	+12	+13	+14	+15	+20	+26	+31	+37	+42
Concentration TSS	mg/l	11.25	5.39	3.31	4.04	4.58	3.55	2.32	2.41	1.08	1.85

5.2 Technical drawing (manufacturer's information)



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