

Microesferas

Test IFTS
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Notario

TEST REPORT N. RA_2021_00007015



**Determination of the filtration efficiency
and the retention capacity according to NF P 90-319 § 4 with derogations**

**Domestic swimming pools - Filtration groups and systems - Test method for evaluating the filtration efficiency, the retention capacity and the mechanical resistance
§4 : Filtration efficiency and retention capacity**

Sample ref. Sacs de 20 kg - batch N° 5-6-2018-2 - Glass pearl, Waterco x 3

CUSTOMER IDENTIFICATION	
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<i>Purchase order nb</i>	P14278

IFTS REFERENCES	
<i>Purchase order nb</i>	ARC_00006372
<i>IFTS Order n.</i>	AFF_00005280
<i>Quotation n.</i>	DEV_00006563.01

Written by
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Validated and signed by
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REVISION TABLE			
<i>Date</i>	<i>Version</i>	<i>Reason for revision</i>	<i>Revision Description</i>
17/03/2021	RA_2021_00007015	Initial release	

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1 - SCOPE

NATURE WORKS TECNOLOGIAS has requested IFTS (Institut de la Filtration et des Techniques Séparatives) as per purchase order number PO acc. to DEV_00006541.01 to evaluate the performance of a specified number of samples according to NF P 90-319 §4 with derogations - Domestic swimming pools - Filtration groups and systems - Test method for evaluating the filtration efficiency, the retention capacity and the mechanical resistance §4 : Filtration efficiency and retention capacity.

The data contained in the following paragraphs establishes the report of the test performed on the sample identified in paragraph 2 of this document. A separate test report is issued for any other test requested as per the purchase order. This test has been performed with qualified personnel using thoroughly selected equipments in order to comply with test conditions summarized in paragraph 3 of this document. IFTS is accredited by the COFRAC to carry out tests and perform modular activities dealt with by the ISO/IEC 17025.

2 - TEST SAMPLE

<i>Sample ref.</i>	<i>IFTS ref.</i>
Sacs de 20 kg - batch N° 5-6-2018-2 Glass pearl, Waterco x 3	ECH_00038353



Sample ref. : Sacs de 20 kg - batch N° 5-6-2018-2 - Glass pearl, Waterco x 3
supplied by NIRVANA Chauffe Piscine

3- TEST CONDITIONS

3.1 Determination of the filtration efficiency and the retention capacity

The following test conditions have been applied :

- Standard : NF P 90-319 §4 with derogations*
- Multipass circulation of contaminant
- Test liquid : Filtered water
- Temperature : 23°C
- Contaminant : specified according to ISO 12103-1 A4 (ISO CTD)
- Flow velocity : 20 m³/h.m²
- Test flow rate : 0,37 m³/h
- Test volume : 41,9 L
- Counting sizes : 1, 2, 5, 10, 20, 30, 40, 50 µm
- Test concentrations :
 - Counting step : 5 mg/L
 - Clogging step : 50 mg/L
- On line particle counting
- Test end criteria
 - Final ΔP - Initial ΔP = 500 hPa or
 - Maximal test duration as specified by the customer reached or
 - Upstream pressure

* Derogation in term of fluid circulation (IFTTS's pump instead of customer's pump in order to maintain constant flow rate)

3.2 Test rig

The main pump of the test circuit is installed upstream the tested filter

- Column size H=205 cm ; d=15,4 cm ; $\Omega=0,0186\text{m}^2$
- Filtration's beds sizes :
 - Glass pearl, Waterco : H=70 cm
 - Support layer supplied by IFTTS : H=30 cm
- Backwash procedure :
 - 5 minutes at 30 m³/h.m²
 - Resulting bed expansion : 10,7%



Fig 1. : Picture of test rig

4- TEST RESULTS

4.1 Test end criteria

	Test end criteria	Actual value	End criteria
Final ΔP - Initial ΔP (hPa)	500	0	NO
Test duration (min)	≥ 360	360	YES

4.2 Filtration performances

Retention capacity at Final ΔP (g)	Filtration ratio 80% (μm)*	Filtration efficiency 45 μm (%)*	Comments
78,6	13,67	97,86	/

*Results based on initial efficiency (see comment p.5).

4.3 Filtration performances

TEST IDENTIFICATION

Test date : 03/02/2021	Operator : ML	IFTS Number : ECH_00038353
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FILTER IDENTIFICATION

Sample ref. : Sacs de 20 kg - batch N° 5-6-2018-2 - Glass pearl, Waterco x 3	Tool ref. :
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OPERATING CONDITIONS

Test fluid	Type : Microfiltered water	Temperature (°C) : 23,1								
Initial cleanliness level	Upstream : 157,0 > 1 µm/mL	Downstream : 193,5 > 1 µm/mL								
Test contaminant	Type : ISO 12103-1 A4 (ISO CTD)	Batch n. : 14151C								
Fluid circuit										
Period	Filter test		Contaminant injection			Particle counting				
	Initial flow rate (L/min)	6,2	Flow rate (L/h)	Concentration (mg/L)			Counter	Sensor	Flow rate (mL/min)	Volume (mL)
Test volume (L)	41,91	Initial		Final	Average					
Counting	Concentration (mg/L)	4,9	10,0	197,0	168,8	182,9	PAMAS 2132	Waterviewer	25	25
Clogging		53,0	10,0	2023,0	1924,0	1973,5				

Test parameters evolution (Fig. 5)

- Término de Filtración: Pérdida de carga
- Término Técnico (Inglés): Filtering media (hPa)
- Cálculo: $\text{Presión entrada - salida}$
- Valor: 93 hPa

TEST RESULTS

Differential pressure at test flow rate

Filter housing (hPa) : <2
 Filtering media (hPa) : 93

Clean loss (hPa) : 0,3
 Final filtering media (hPa) : 93

Table 1 : Clogging curve (Fig. 4)

Period n.	1		2		3		4		5	
Concentration (mg/L)	-	4,9	53,0	4,9	53,0	4,9	53,0	4,9	53,0	4,9
Test duration (min)	0	30	92	123	179	210	270	302	360	392
Differential pressure (hPa)	92	91	91	92	92	93	94	94	93	94
Injected mass (g)	0	0,9	21,3	22,3	40,7	41,6	61,0	62,0	81,1	82,1

Total injected mass : 81,1 g
 Final test concentration (CF-1) : 58,9 mg/L
 Non-retained mass : 2,5 g
 Retention capacity : 78,6 g

- Término de Filtración: Poder de Filtración
- Término Técnico (Inglés): Retention Capacity (%)
- Cálculo: $\frac{\text{Masa retenida (78,6 g)}}{\text{masa inyectada (81,1 g)}} = 0,9964 \times 100\%$
- Valor: 96,92 %

Raw counting results (Fig. 1-2-3)

Sample ref. Sacs de 20 kg - batch N° 5-6-2018-2 - Glass pearl, Waterco x 3 (IFTS n. ECH_00038353)

Table 2 : Average filtration ratio and efficiency vs. Test period

Counting period	Particle size (µm)	> 1		> 2		> 5		> 10		> 20		> 30		> 40		> 50	
		R10	E%	R11	E%	R12	E%	R13	E%	R14	E%	R15	E%	R16	E%	R17	E%
Upstream initial counts		157		108,6		31,26		5,662		0,721		0,16		0,04		0,024	
1	Upstream	21201	2,001	14428	2,081	3827	2,427	471,8	3,603	49,7	10,92	12,91	27,47	4,107	45,47	1,624	43,95
	Downstream	10595	50,03	6934	51,94	1576	58,8	130,9	72,25	4,552	90,84	0,47	96,36	0,09	97,8	0,037	97,72
2	Upstream	Saturation of counting system															
	Downstream																
3	Upstream																
	Downstream																
4	Upstream																
	Downstream																
5	Upstream																
	Downstream																
Average	Upstream																
	Downstream																

During counting period 2, 3, 4, and 5, number of particles is higher than saturation level due to multipass circulation and filter efficiency.

*Note: Efficiency value is rounded to 100% when above 99.995

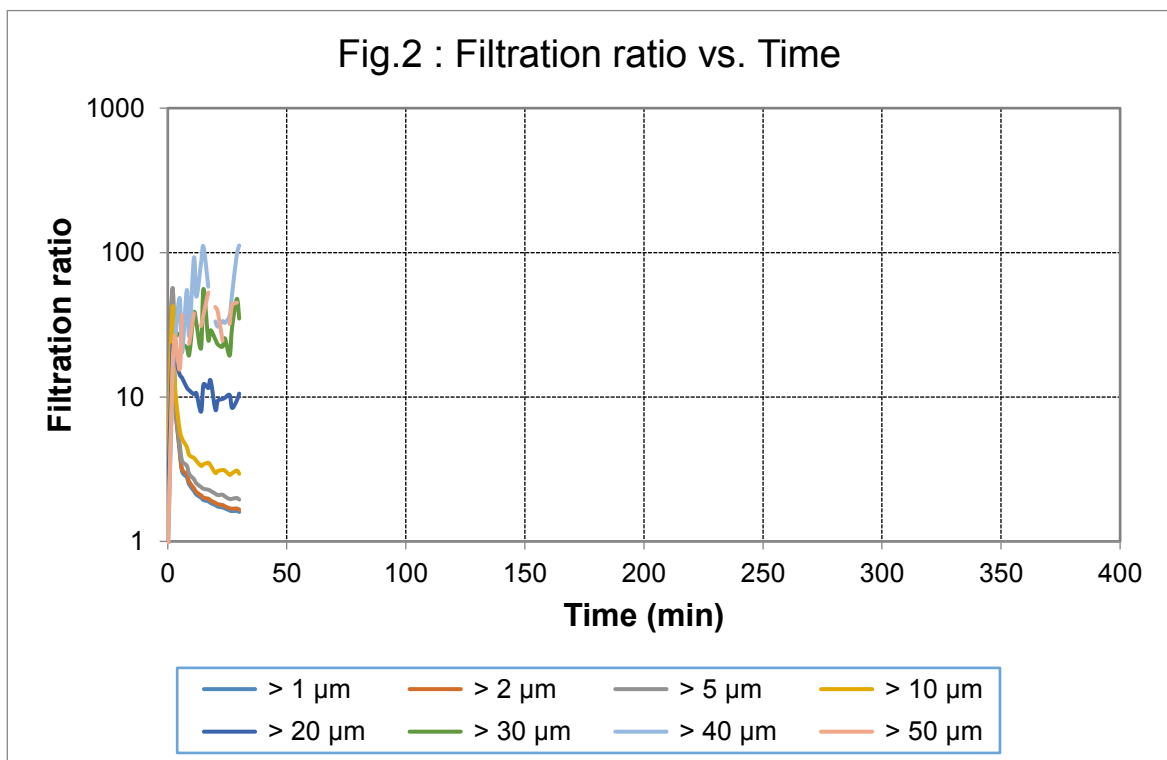
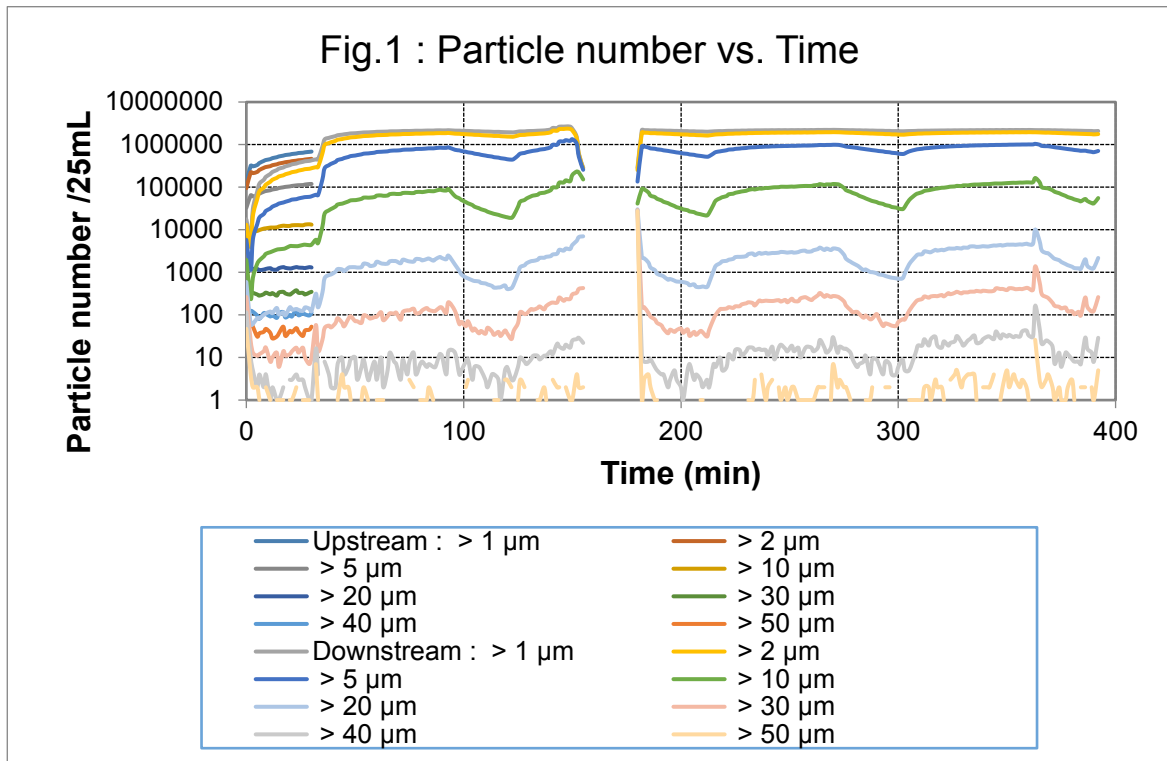


Fig.3 : Filtration efficiency vs. Time

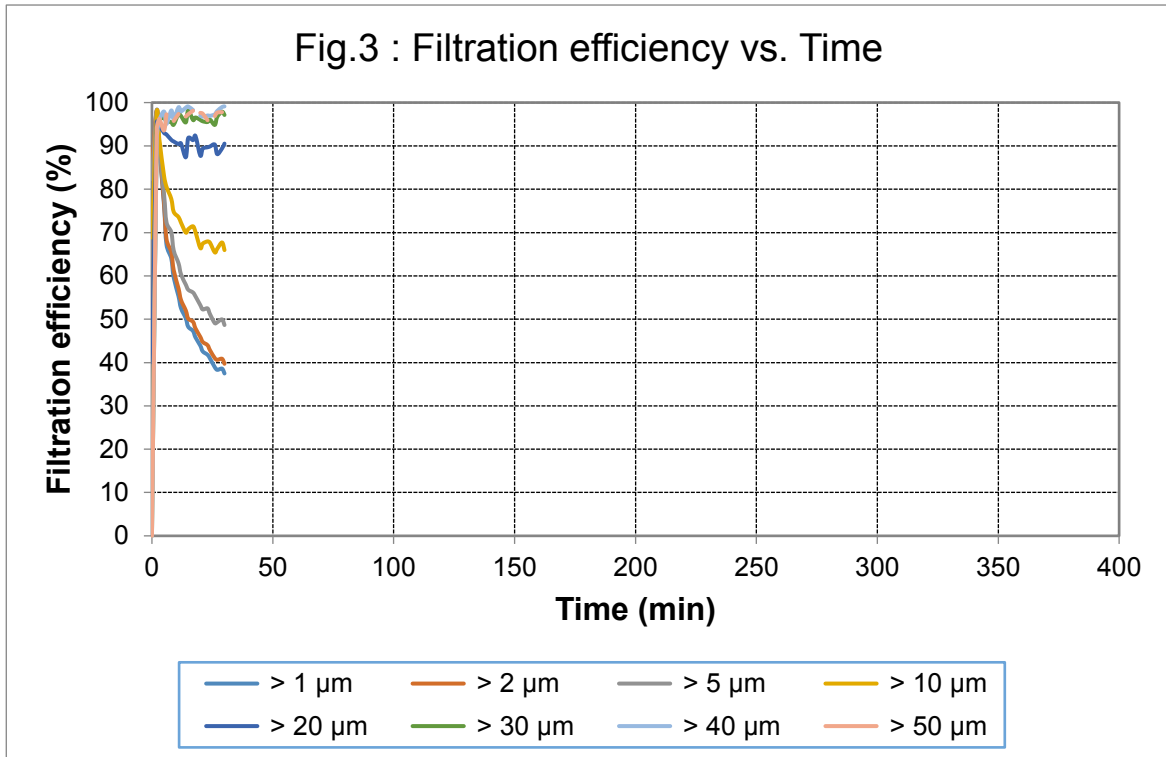


Fig.4 : Clogging curve

