

**EN 16713-1 DOMESTIC SWIMMING POOLS - WATER SYSTEMS -
PART1: FILTRATION SYSTEMS REQUIREMENTS AND TEST METHODS**

§ 7.3 FILTRATION EFFICIENCY WITH ONLINE PARTICLES COUNT

Filter ref. 20kg Hi -tech glass filter media n°1

CUSTOMER IDENTIFICATION	
<i>Company</i>	NATURE WORKS TECNOLOGIAS
<i>Address</i>	C/ Tabarca n° 16, 3580 ALICANTE, SPAIN
<i>Contact</i>	Mr Guillermo GIL VENEZIANI
<i>Purchase Order nb</i>	Email Mr VENEZIANI 30/12/2015

IFTS REFERENCES	
<i>IFTS order number</i>	9382
<i>Quotation nb</i>	DEV_00000105.00
<i>Test date</i>	03/02/2016
<i>Date of receipt of samples</i>	04/01/2016

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Validated and signed by
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Date: 04/02/2016

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NATURE WORKS TECHNOLOGIAS

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1 - SCOPE

NATURE WORKS TECNOLOGIAS has requested IFTS (Institut de la Filtration et des Techniques Séparatives), as per Email from Mr GIL VENEZIANI dated 30/12/2015, to evaluate the performance of a specified number of samples according to EN 16713 domestic swimming pools - water system - part 1: filtration systems requirements and test methods, §7.3 Filtration efficiency & 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

Sample Ref.	IFTs Ref.
20kg Hi -tech glass filter media n°1	984



Fig.1 : Filter ref. 20kg Hi -tech glass filter media n°1 supplied by NATURE WORKS TECNOLOGIAS

3- TEST CONDITIONS

The following conditions have been applied to measure the filtration efficiency and the retention capacity of the test filter :

The filter medium is initially washed three times (back washing at 30 m/h (8,7 L/min)).

- Procedure: EN 16713-1 §7.3
- Multipass test mode
- Test liquid : microfiltered water
- Test temperature : 23°C (+/- 3°C)
- Test contaminant : ISO CTD as per ISO 12103-A4
- On line particle count at : 20, 30, 40,45,50, 60, 70, and 80 µm
- Contaminant concentration: 50 mg/l
- Test volume (V_2) = $10 \cdot Q_1 + V_1$ (L) = 20 m/h **(corresponding to 5,86 L/min)**
 - Q_1 : Flow rate of the filter pump module (m^3/h)
 - V_1 : Volume of the filter (L)
- End of test criteria : DP increase of 0,7 bar

- Height/diameter of filtration sand : 70 cm / 15 cm
- Height/diameter of support sand* : 15 cm / 15 cm

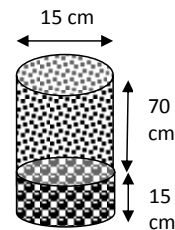
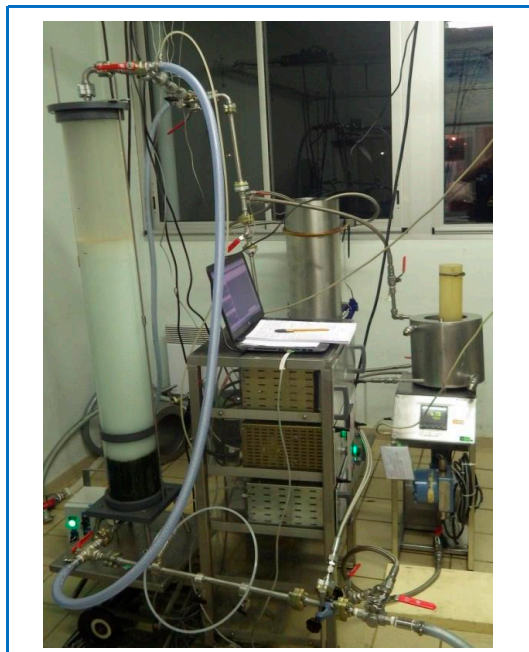


Fig.2: Picture for test rig according to EN 16713-1 §7.2.4

4- TEST RESULTS

4.1 End of test criteria

	Initial	Final	End of test condition	Actual value	End of test criteria
Flow rate (m/h)	20	20	-	20	NO
DP (mbar)	142	856	$\geq +700$	714.00	YES
Test duration (min)			≤ 360	24	NO

4.2 Filtration performances

Customer Ref.	IFTS Ref.	retention capacity (g)	Filtration rating at 80% (μm)	Filtration Efficiency at 45 μm (%)	Comments
			Global	Final	
20kg Hi -tech glass filter media n°1	984	7	< 20	88%	-

Note 1 :

The global filtration rating and the global filtration efficiency are calculated from total counting data collected during all periods at 50 mg/L.

4.3 Detailed test results

Detailed test results are presented in appendix.

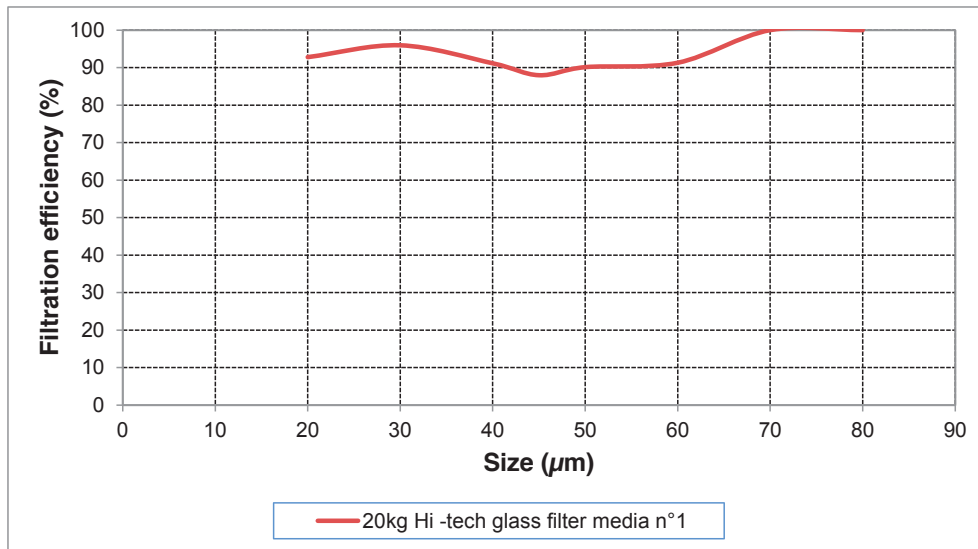


Fig. 2 : Filtration efficiency vs. particle size

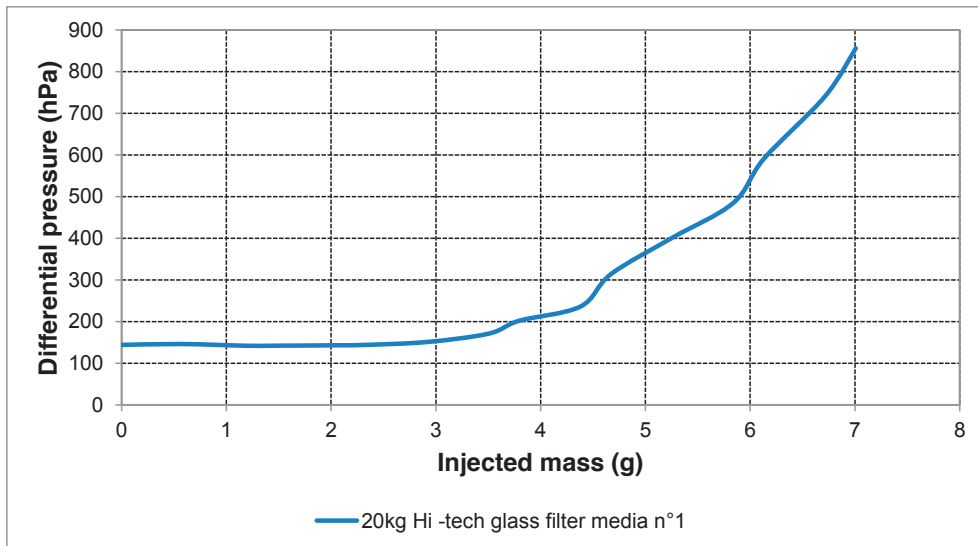


Fig. 3 : Clogging curve

APPENDIX

TEST REPORT N° 160309-A
DETERMINATION OF FILTRATION EFFICIENCY AND RETENTION CAPACITY
According to EN 16713-1 §7.3

TEST IDENTIFICATION

Test date : 02/04/2016	Operator : ml	IFTS sample number : 984
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FILTER IDENTIFICATION

Housing ref. : IFTS column	Filter element ref. : 20kg Hi -tech glass filter media n°1
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OPERATING CONDITIONS

Test fluid		Type : Microfiltered water	Temperature (°C): 21							
Initial cleanliness level		Upstream : 6,4 part > 20 µm/mL	Downstream : 1,4 part > 20 µm/mL							
Test contaminant		Type : ISO CTD	Batch number : 12299C							
Fluid circuit										
Phase	Filter test		Contaminant injection			Particle counting				
	Test flow rate (L/min)	5.86	Flow rate (L/h)	Concentration (mg/L)			Counter	Sensor	Flow rate (mL/min)	Volume (mL)
	Volume (L)	28		Initial	Final	Average				
Counting	Concentration (mg/L)	49.8	10	1752	1752	1752	HIAC 8000	HRLD400	20	20

Test parameters evolution (see figure 5)

TEST RESULTS

Differential pressure at test flow rate		Housing (hPa) : 50		Clean assy (hPa) : 142.0						
		Filter cartridge (hPa) : 92.0		Final ΔP filter cartridge (hPa) : 806						
Table 1 : Clogging curve (see figure 4)										
Period n.		1	2	3	4	5	6	7	8	9
Concentration (mg/L)	-	49.8								
Test time (min)	0.0	24.0								
Differential pressure (hPa)	142	856								
Injected mass (g)	0.0	7.0								
Retention capacity :		C_R = 7.0 g								

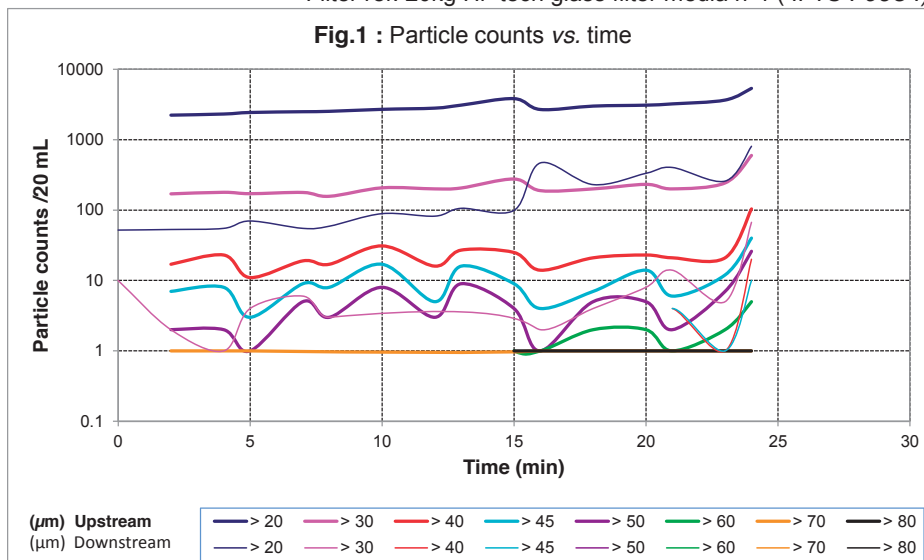
TEST RESULTS

Filter ref. 20kg Hi -tech glass filter media n°1 (IFTS : 0984)

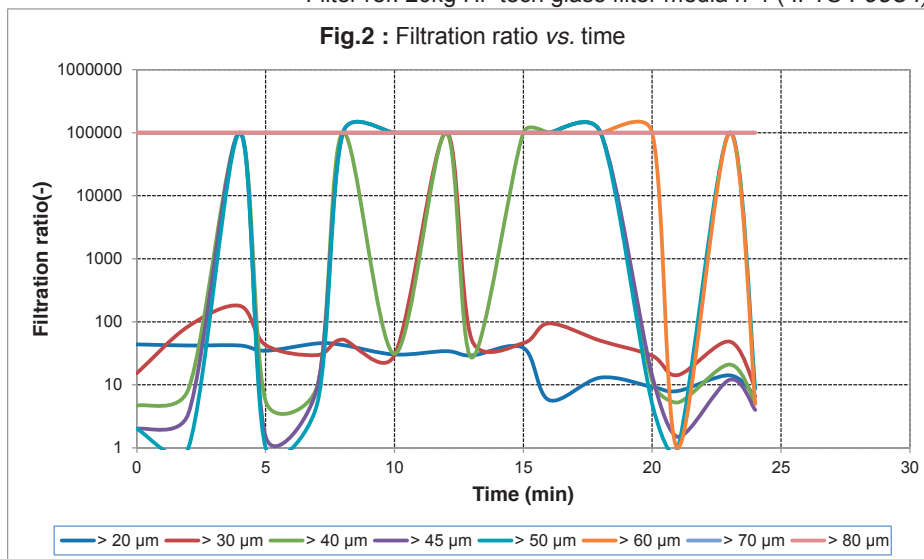
Raw counting data (see figure 1-2-3)																			
Table 2 : Filtration ratio and efficiency* vs. test period																			
Cumulative counts (N/20 mL)																			
	Particle size (µm)	>20	R ₁	>30	R ₂	>40	R ₃	>45	R ₄	>50	R ₅	>60	R ₆	>70	R ₇	>80	R ₈		R ₉
Counting period	µm	E%	µm	E%	µm	E%	µm	E%	µm	E%	µm	E%	µm	E%	µm	E%	µm	E%	
Upstream initial counts	6		1		0		0		0		0		0		0				
Average	Up	3087	14	231	25	27	11	11	8	6	10	2	12	1.0	∞	0.8	∞		
	Down	222	92.80	9.36	95.95	2.36	91.15	1.36	87.97	0.57	90.12	0.14	91.30	0.00	100.00	0.00	100.00		

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

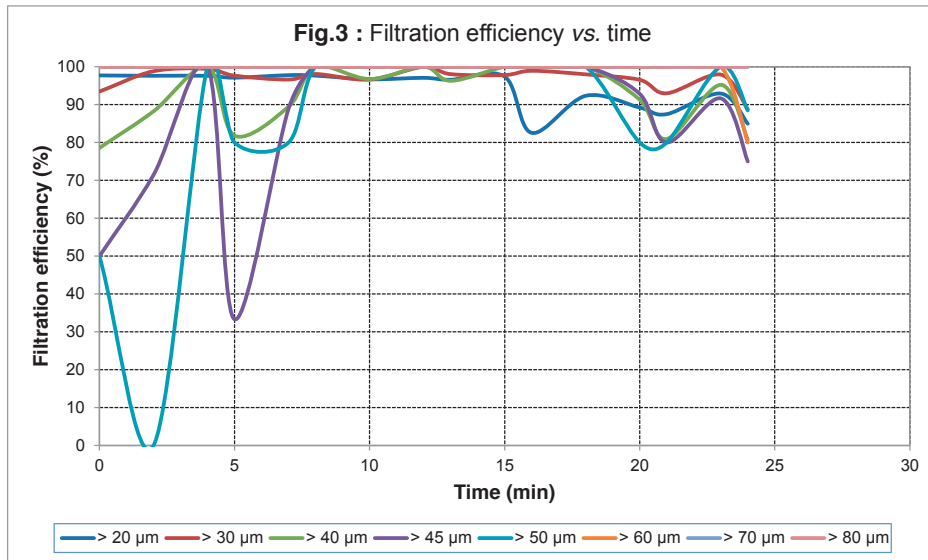
Filter ref. 20kg Hi-tech glass filter media n°1 (IFTS : 0984)



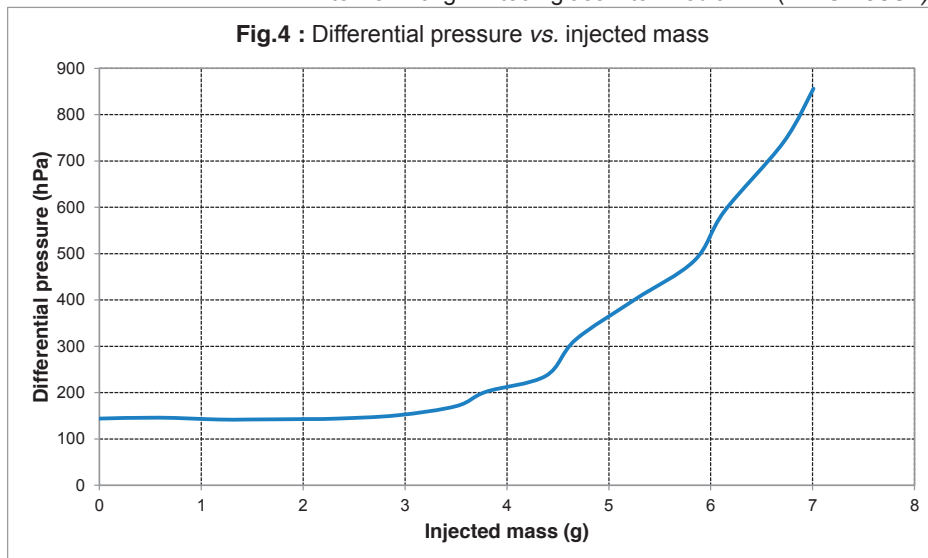
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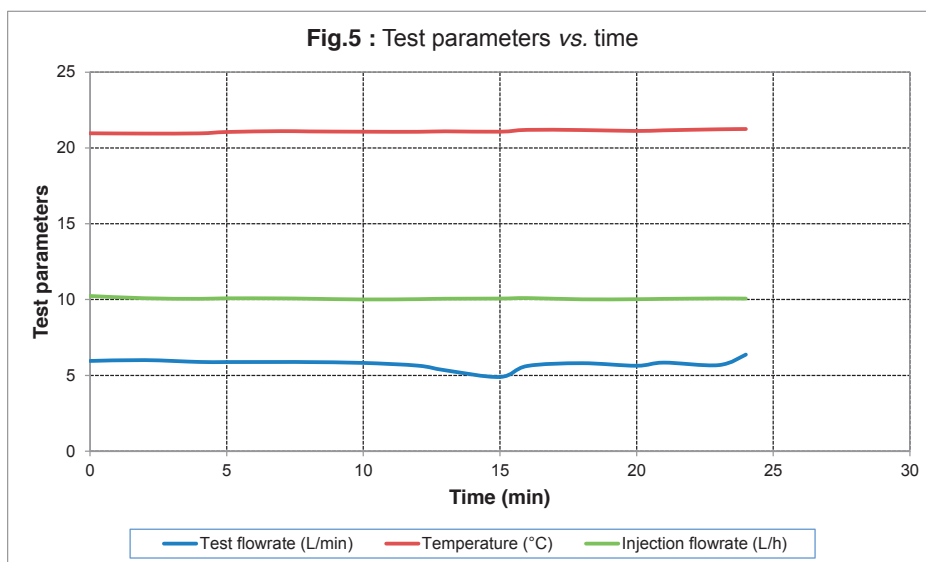
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