DRYDEN AQUA

Independently verified by the Institut de La Filtration et des Techniques Séparatives (IFTS), October 2019*

INTRODUCTION

The following report summarises the performance test results of Dryden Aqua AFM®, quartz sand, and other glass filter media commonly available on the market. All work was conducted by IFTS (Institut de la Filtration et des Techniques Séparatives – www.ifts-sls.com) in France. IFTS is recognised as the leading independent accredited laboratory in Europe for the water industry, specialising in water filtration media. All tests were conducted under strict ISO procedures.

AFM® is a highly engineered soda-lime-silica glass-based filtration media. Its production process is highly efficient in water and energy use, incorporating rainwater and solar power. Wherever possible, by-products are recycled or reused in other industries, setting a new standard for responsible waste management and sustainability.

FILTER MEDIA TESTED:

Products tested were as follows:

- AFM® Dryden Aqua, Scotland
- Quartz Sand from the Leighton Buzzard deposit, England
- Garofiltre crushed glass media, France
- EGFM by DMS crushed glass media, England
- Bioma crushed glass media, Spain
- Vitrosphere spherical glass balls, Germany
- Astral crushed glass media, Spain
- Nature Works glass media, Spain

REVIEW OF DATA

Three factors are important in media bed filtration:

1. Mechanical filtration

2. Adsorption reactions

3. Performance with coagulation and flocculation

The following report relates only to mechanical filtration performance. The tests were conducted on clean media. It is known that sand and non-activated crushed glass media become biofilters over a few months. Bacterial growth adversely affects mechanical filtration performance and promotes wormhole channeling. Biofouling, and therefore channeling, does not occur with AFM®.

***Tests conducted by IFTS: www.ifts-sls.com**

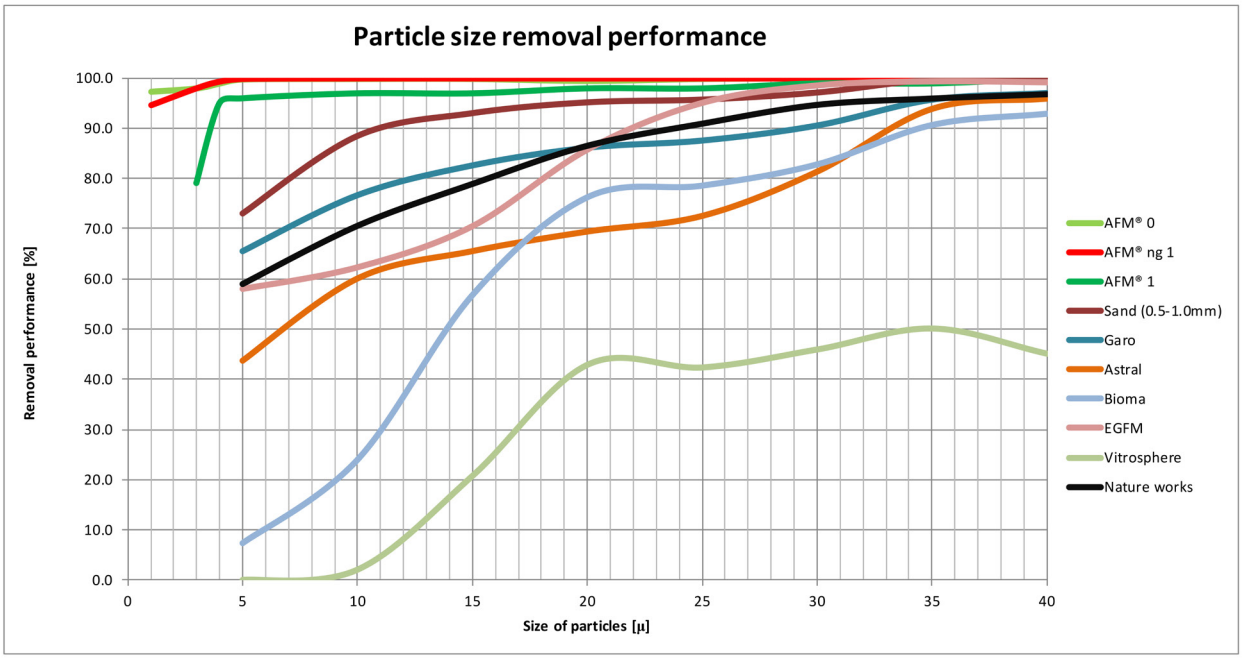
TEST 1: PARTICLE SIZE REMOVAL EFFICIENCY

AFM®ng Grade 1 removes 95% of all particles down to 1 micron. By comparison, even the best high-quality sand or glass sand achieves only 20 microns at an efficiency of 95%.

AFM® 0 removes particles down to 1 micron with over 95% efficiency and was developed for optimum filtration where flocculation cannot be applied.

These results were obtained from filters operating at a velocity of 20m/hr (8gpm/ft²) without flocculation, providing a direct comparison between filtration media. At slower water flowrates the results for AFM® improve exponentially.

Graph 1: Particle size removal efficiency @ 20m/h (8gpm/ft²) velocity, without flocculation



Source: IFTS test data, France

Summary of filter media performance at 1 and 5 microns, water flow = 20m/h

		AFM® 0	AFM® ng 1	AFM® 1	Sand 16 x 30	Garo	Astral	Bioma	EGFM	Vitro-sphere	Nature Works
Efficiency at 1 micron removals (%)	Average (%)	97.28	94.6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Efficiency at 5 microns removals (%)	Average (%)	99.79	99.6	96.02	72.97	65.61	49.35	7.45	58.03	0.05	59.07

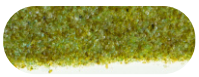
n/a = not applicable for filtration at the stated micron size

Source: IFTS test data, France

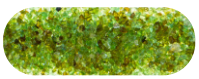
Comments

AFM® was the most effective filter media, AFM® ng 1 achieved 94.6 % at 1 micron at 20m/hr (8gpm/ft²).
The data also confirms AFM® ng 1 removed 99.6 % of all particles down to 5 microns, and the equivalent grade of sand only achieved 72.97 %.

AFM® Grade 0
(0.25 - 0.5mm)
Extra fine filtration

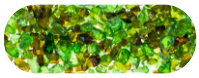


AFM® Grade 1
(0.4 - 0.8mm)
Main filtration



AFM® Grade DIN
(0.7 - 1.2mm)
Special media for waste - & highly polluted water

AFM® Grade 2
(0.7 - 2.0mm
Filtration & support



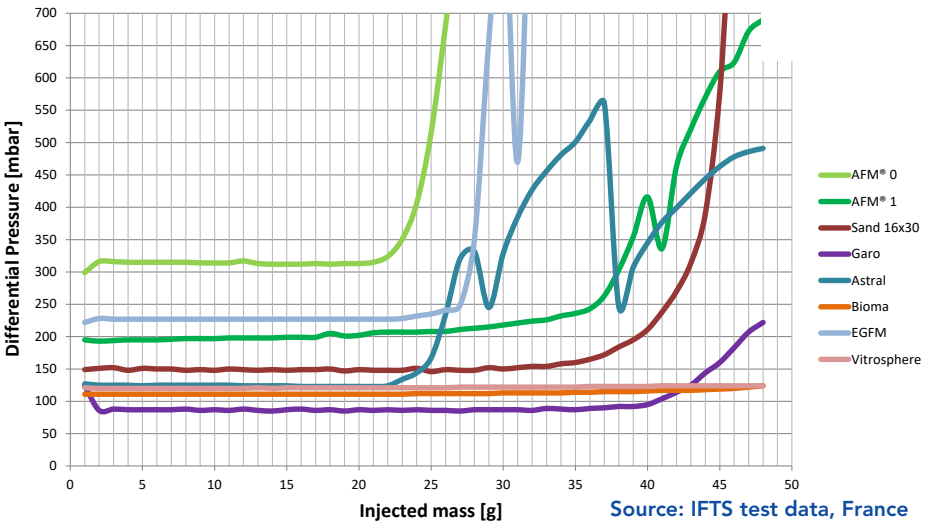
AFM® Grade 3
(2.0 - 4.0mm)
Support layer

TEST 2: DIFFERENTIAL PRESSURE VS. INJECTED MASS

ISO CTD particles were injected into the process water to test the media's capacity to remove suspended particles. As particles are captured, pressure should gradually build up in the filter. Media such as the spherical Vitrospheres remained flat because most particles passed through the bed, while media such as Astral were unstable and released retained solids back into the water.

The ability to retain particles is critical in any filtration system. In drinking water and swimming pools, where cryptosporidiosis poses a significant health risk, filters must be stable and capable of retaining parasites. Sand and AFM® were the only products that provided a stable filtration barrier.

Graph 2: Differential pressure vs injected mass



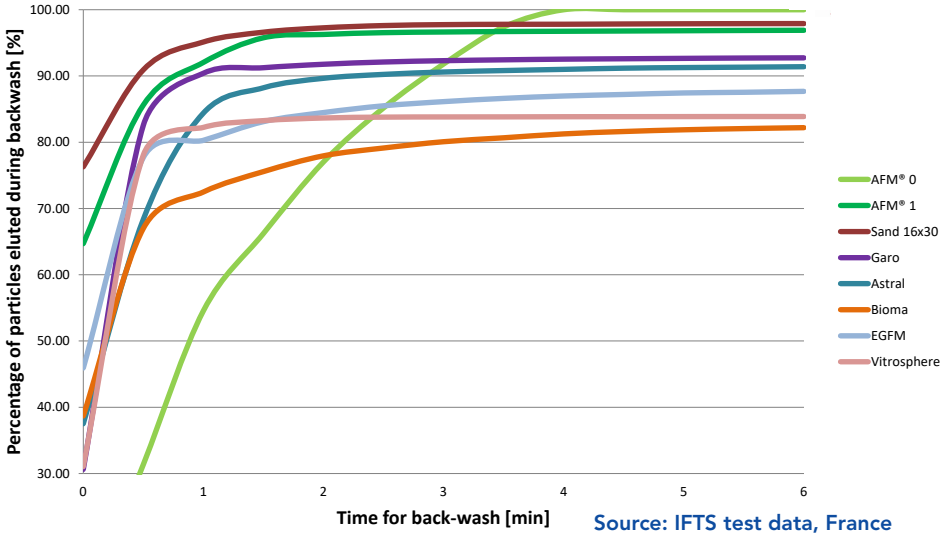
Source: IFTS test data, France

TEST 3: BACKWASH EFFICIENCY

The quantity of material released over time was measured for each media type. Graphical data for backwash efficiency shows that both sand and AFM®1 achieved 97%, while AFM®0 achieved 100%. The closest glass media was Garofiltre at 93%, followed by Astral at 92% and EGFM at 88%.

What goes into a filter must also come out. If not, retained organic matter is metabolized by bacteria, and the media will eventually bio-coagulate due to an accumulation of alginates secreted by bacteria and mineralized biofilm layer.

Graph 3: Backwash efficiency



Source: IFTS test data, France

ADDITIONAL INFORMATION: WHAT IS AFM® ACTIVATION?

AFM® activation is a patent protected 3-stage process during which the surface structure of the glass is changed at a molecular level. Glass is an aluminosilicate, the activation process uses the existing properties of the glass which is why Dryden Aqua only uses green and brown soda-lime-silica glass. In addition the production process enhances the glass' properties by:

1. **Increasing its catalytic properties**
2. **Controlling its surface charge density**
3. **Increasing its surface area**

Find out how AFM® is manufactured

DISCUSSION

1. **AFM® performed best in tests — more than twice as effective as sand or any crushed glass product.**
   While removing large particles is easy, it is the sub-5 micron particles that are most difficult to capture, and in this size range AFM® excelled (see Graph 1 & Table, page 2).
2. **None of the glass products tested backwashed effectively within 6 minutes.**
   The best retained 8% of solids, while the worst retained 20%. This results in significantly higher water demand for backwashing and increased chlorine consumption due to retained organic matter (see Graph 3).
3. **The chemistry, particle shape, and especially the activation process give AFM® properties that clearly outperform sand and glass media.**
   The large surface of AFM®s carries a strong negative charge to adsorb heavy metals and fine particles. AFM®ng has a neutral, hydrophobic surface that adsorbs organics and microplastics. Through these surface modifications, AFM®s/ng prevent bacteria from settling, making it a unique, bio-resistant filter material.

APPLICATION

- **Drinking water:** ferric, manganese, arsenic, chromium, TBT and a range of heavy metals and priority chemicals.
- **Filtration prior to membranes and desalination:** Filtration performance at least twice as good as sand, in most cases the SDI (Silt Density index) will be reduced to under three.
- **Tertiary treatment of wastewater:** municipal as well as industrial wastewater, AFM® does not biofoul so it is perfect for these applications.
- **Intake water filtration**: AFM® ensures superior particulate filtration for seawater, surface, and groundwater, handling TSS fluctuations and removing heavy metals like iron, manganese, and arsenic.
- **Aquarium/Zoo/Aquaculture Life Support systems:** marine and freshwater system, as well as marine mammal and bird systems.
- **Swimming pool water:** private, public, water parks and large scale lido systems.

AFM® CERTIFICATIONS

- AFM® complies with **EN17978**, glass granulates, **for treatment of water for human consumption**
- AFM® complies with the **Directive (EU) 2020/2184** on the quality of **water intended for human consumption**
- AFM® is **approved in UK** under regulation 31 of the **Water Supply (Water Quality)** regulations 2016 (as amended)
- AFM® is **certified** by WQA to **NSF/ANSI/CAN 61 & 372 Drinking Water Systems Components**
- AFM® is **certified** by IAPMO to **NSF/ANSI/CAN 50** for use in **swimming pools and recreational water applications**
- AFM® is **approved in Switzerland** according to **drinking water** ordinace (TBDV) Annex 4, paragraph 4
- AFM® is approved by the **polish national institute of public health (NIH)** for the use in drinking water & public pools treatment
- AFM® (as GreenFil™) is approved by the **Public Health Institute of the Czech republic** for the use in drinking water application
- AFM® is produced under **certified HACCP** principles **for use in food and beverage production**
- Dryden Aqua is certified to integrated management control systems **ISO-9001, ISO-14001, ISO-45001**

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