



Ariosos™

High Performance Air Filtration Composite Media
Engineered with Solupor® Membrane Technology

Benchmark Testing of Air Filtration Media in Cartridges for Pulse Clean Applications (US Summary)

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Overview

(Note: This is a summary version of Benchmark Testing of Air Filtration Media in Cartridges for Pulse Clean Applications. For full test details, please refer to that paper.)

Lydall recently undertook a cartridge benchmark testing program, constructing identical cartridges using *Arioso*™ High Performance Air Filtration Composite Media, grade M7001-11 (*Arioso* M7001), an industry leading ePTFE media (ePTFE), and a spunbond polyester media (Spunbond). We compared these in testing to industry standard 80/20 polyester/cellulose (80/20) and cellulose (Cellulose) cartridges*.

For the testing, we looked at 5 factors for comparison:

1. MERV Rating (Flatsheet) at 2.6 cm/s Velocity
2. Initial Pressure Drop
3. Final Pressure Drop (after dust loading and cleaning regimens)
4. Dust Loading
5. Water Repellency

Arioso M7001 cartridges were the only cartridges with MERV 16 Efficiency, had the lowest initial and final pressure drop, had the highest water repellency, and were less than 30% lower in dust loading capacity than the much lower efficiency media.

It is our belief that the combination of improved efficiency, lowest energy consumption, and best water repellency are of great value to users of pulsed cartridges, such as in Gas Turbine applications and APC/Dust Collection applications.

Gas Turbine Benefits

The performance of *Arioso* media in these tests would seem to indicate certain benefits for gas turbine operators, such as: increased machine availability and reliability, improved output performance, reduced fuel consumption, and reduced compressor cleaning costs.

APC/Dust Collection Benefits

The performance of *Arioso* media in these tests would seem to indicate certain benefits for dust collection users, such as: high efficiency, low power consumption, better suction, excellent dust release, and cartridge durability.

*Cartridge Construction Notes

These tests were designed to compare similar results of *Arioso* media, ePTFE, and Spunbond in similar cartridge configurations, versus industry standard versions of cellulose and 80/20 polyester/cellulose cartridges.

For this reason, the cellulose and 80/20 polyester/cellulose cartridges were designed with 320 pleats and 220 ft² (20.4 m²) of media, with corrugation and pleat locks. These were meant to represent the most typical cartridges sold in the market today, as a benchmark.

It was our belief that we could get similar performance with synthetic materials using much less surface area, so we constructed the *Arioso*, ePTFE, and Spunbond cartridges with 142 pleats and 98 ft² (9.1 m²) of media.

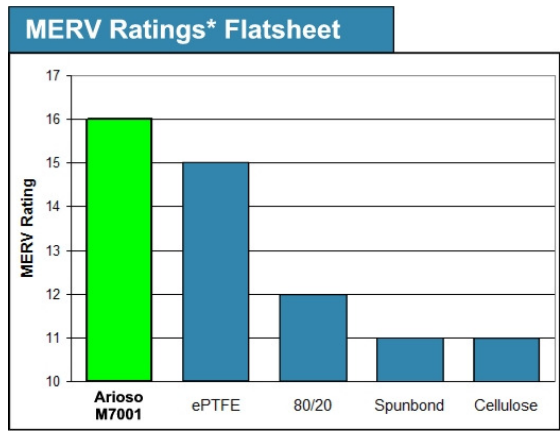
As you review these results, bear in mind that the performance of the *Arioso* M7001, ePTFE, and Spunbond cartridges reflects the use of 45% of the media of the traditional cartridges.



Sample 2. Arioso M7001-11 Cartridge Pair
142 Pleats, 98 ft² (9.1 m²) of media.

MERV Ratings, Flatsheet

Arioso M7001 was the only media to achieve MERV 16 efficiency* (flatsheet), removing 96.2% of particles 0.3 micron or larger. This should put a filter of this construction into a MERV 16 rating by ASHRAE 52.2. By comparison, the Cellulose, 80/20, and Spunbond cartridges would be in the range of MERV 11 or MERV 12 efficiency.



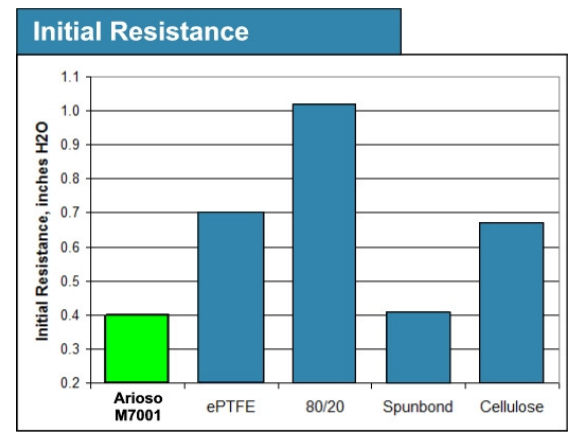
Gas Turbine Benefits. As gas turbine compressors are loaded with more particles, they become fouled, lose power, and require cleaning. Gas turbines outfitted with Arioso MERV 16 filters would have higher power output, require much less cleaning, and potentially have longer service life, thereby generating more income for their operators.

APC/Dust Collection Benefits. As OSHA and other regulatory bodies enact stricter regulations on air quality, more efficient cartridges are required in the marketplace, and Arioso cartridges are well positioned for these changes. Process reliability and worker safety can also be positively impacted by more efficient filtration.

* The efficiency ratings for this test used 0.3 micron DOP particles at 2.6 cm/s velocity on a TSI Model 8160 automated test stand on flat sheet media samples.

Initial Resistance, Cartridges

Initial resistance across the filters was measured at 500 cfm (850 m³/hr) for all filters. Arioso M7001 had 43% less pressure drop than the ePTFE competitor, and 60% less than the typical MERV 12 80/20 polyester/cellulose cartridges.



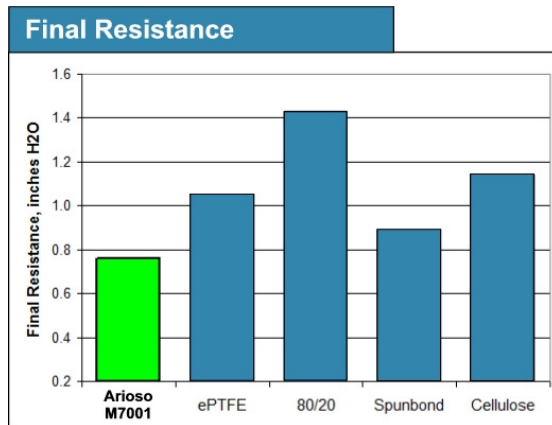
Gas Turbine Benefits. That correlates directly to less energy consumption, and direct energy output increase for a gas turbine operator, which means more income.

APC/Dust Collection Benefits. This results in less energy use for APC/Dust Collection applications upon startup, and better suction in applications that require it.

Final Resistance, Cartridges

Final resistance was measured to compare the increase in filter resistance caused by dust loading* during the tests. This is the resistance of the cartridges after they have been loaded with dust to a terminal pressure drop of 4" H₂O (1000 Pa), have undergone an offline cleaning regimen, been loaded for 60 minutes with a fixed volume of dust with pulse-cleaning every 5 minutes, and then undergone a final offline cleaning regimen.

Arioso M7001 maintains its pressure drop advantage, still using 28% less energy than ePTFE, and 47% less energy than 80/20 polyester/cellulose. It should be noted that the final resistance of the *Arioso M7001* cartridges was slightly higher than the initial resistance of the clean ePTFE cartridges.

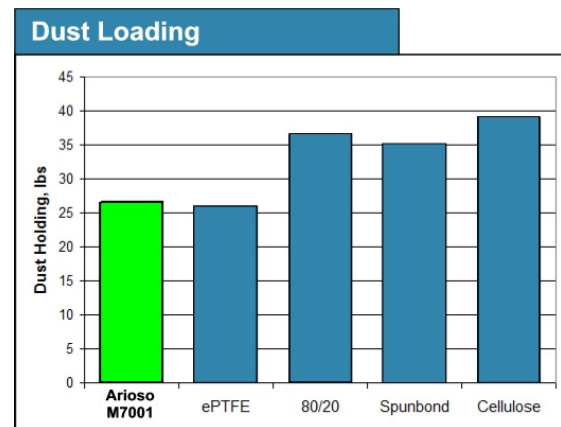


Gas Turbine Benefits. *Arioso* media maintains its pressure drop advantage over the life of the filter, showing excellent dust release, translating to continued lower energy use, and potentially longer filter life.

APC/Dust Collection Benefits. *Arioso* media maintains its pressure drop advantage over the life of the filter, showing excellent dust release, translating to continued lower energy use, better suction in applications that require it, and potentially longer filter life.

Dust Loading

Dust loading is an area where the less efficient media types have an advantage. However, *Arioso M7001* is many times more efficient, and has only lost roughly 27% of this capacity by comparison. And in a pulse-cleanable cartridge, is dust loading really that critical a factor?



Arioso M7001 cartridges had approximately the same dust loading as the cartridges constructed with ePTFE.

The *Arioso* cartridges for this test were designed specifically for dust release in a pulse-cleanable configuration. The final pressure drop tests seem to show that it performs exceptionally well in terms of dust release as compared to the competitive media.

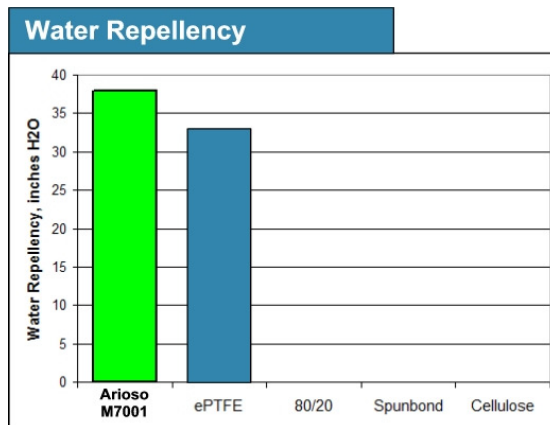
If the design were for a static cartridge, or required higher dust loading, Lydall would recommend a different media configuration and design.

* The dust selected for these tests was Calcium Carbonate 325 mesh (HuberCarb Q325). The median particle size is 13 micron, with 100% of the particles below 55 micron. The typical chemical analysis is as follows: Calcium Carbonate 96.5%, Magnesium Carbonate 2.0%, Silica and Silicates 1.0%, Other 0.5%.

Water Repellency

Arioso M7001-11 is fully synthetic, with its *Solupor*® UPE membrane being naturally hydrophobic. It had the highest water repellency out of any of the media tested, and three of the media had no water repellency at all.

Water repellency is measured by MIL STD 282, which measures the height of a water column required before water passes through a media. Water repellency was measured with the membrane (if applicable) facing the water column.



Gas Turbine Benefits. Humid environments and the effects of humidity on gas turbine compressors have long been challenges for gas turbine operators. High water repellency should help protect the downstream components from these challenges.

APC/Dust Collection Benefits. In humid environments, water repellency could mean better dust release from the surface of the filters, and could translate to longer filter life and lower pressure drop.

Additional *Arioso* Benefits

- *Arioso* media is fully synthetic and fully incinerable*.
- *Arioso* media has outstanding chemical resistance.
- *Arioso* media is environmentally friendly, containing no fluoropolymers/halogens*.
- *Arioso* media is available from MERV 15/16 up to MIL-SPEC HEPA efficiencies.

*Some features are dependent upon the functional support layer chosen.

Conclusion

Using less than half the media typically used in traditional pulse-clean cartridges, *Arioso* cartridges had 40-60% less pressure drop when clean versus traditional media, while delivering MERV 16 performance.

When compared with ePTFE cartridges of equivalent efficiency, the *Arioso* cartridges delivered 43% less pressure drop when clean.

The *Arioso* cartridges maintained their pressure drop advantage throughout the tests, showing excellent dust release, potentially pointing to longer filter life.

The use of *Arioso* media in pulse-clean cartridges should provide a combination of high efficiency, very low energy consumption, excellent dust release and excellent water repellency. These benefits are of great value to users of pulsed cartridges in applications such as Gas Turbine and APC/Dust Collection.



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