

Filter Bags vs Filter Cartridges

For applications requiring high particle retention efficiencies at less than 25 micron (>90% efficiency), the use of filter cartridges had for many years been the method of choice to achieve high performance in such critical applications with consumable filter elements.

However, innovative developments in both the media used to construct filter bags and the development of our manufacturing techniques has now enabled applications previously dominated by cartridge filtration to be replaced by bag filtration, giving numerous advantages.

This bulletin discusses some of these advantages, focusing particularly on performance and cost.

AFS Products

Allied Filter Systems Ltd is able to recommend and offer several products from our high efficiency range which have produced outstanding performance against absolute rated cartridge filtration. We also have our 0.5 micron extended life filter bags as another option.

High efficiency filter bags

Our **OA series, MBP series, 500 series and 300 series High Efficiency** filter bags give depth filtration and particle retention up to efficiencies of 99.98% between **1 and 25 microns**. They are constructed from a composite of polypropylene or polyester microfibre (**MBPE series**) media.

0.5 micron Extended life filter bags

The constituent extended life media is manufactured using a 50/50 blend of microdenier and fine denier polyester staple fibres to produce a uniform needlefelt web. The filter bag is rated at **0.5 micron** and is **70 - 80% efficient** at this rating.

Advantages of Bags vs Cartridges

1) Surface area and Differential Pressure

A standard size 2 filter bag has a 7" diameter and is 32" in length, providing a surface area of approximately 0.5m² of filter media.

A standard 10" length melt blown absolute rated filter cartridge has an outer diameter of approximately 2.5", providing a surface area of approximately 0.055m² of filter media.

Therefore, to achieve the same amount of surface area as **one size 2 filter bag** would need **nine 10" cartridges**.

The increased surface area of a filter bag also has the effect of **reducing the initial pressure drop** across the filter system compared with cartridge filters. This leads to bags having a longer service life.

2) Flow Rates

To achieve the same flow as rate as **one size 2 filter bag** would require **between 5 and 15 x 10" filter cartridges** depending on the filter bag series.

Maximum recommended flow rates:

MBP, OA series: 15m³/hr

500 series: 10m³/hr

300 series: 5m³/hr

Cartridges: Typically 1m³/hr per 10" length

The opening diameter of a filter bag is 7", whereas the core diameter of a cartridge is 1". Therefore there is a far greater flow restriction with cartridges which leads to higher pressure drops. This is coupled with the increased surface area of a filter bag as discussed above.

3) Cost

From the discussion on surface area and flow rates, it is clear that because a lower number of filter elements are required in a filter bag system, there is a significant cost saving to be gained by selecting a filter bag system compared with a cartridge system.

To illustrate the point, we have compared below the cost of either our high efficiency filter bag or our 0.5 micron extended life filter bag against a melt blown absolute rated filter cartridge in an application requiring equivalent flow rates.

	High efficiency Bag size 2	0.5 extended life bag size 2	0.5 or 1 micron absolute 10" melt blown cartridge
No of units required to achieve same performance	1	1	12
Approximate Cost per unit	£20.00 – £50.00	£10.00	£8.00
Total filter cost per changeout	£20.00 - £50.00	£10.00	£72.00

Even greater savings can be achieved when the required micron rating is greater than 25 micron, as standard needlefelt bags will achieve comparable particle retention performance to filter cartridges.

4) Storage and disposal

One box containing fifty size 2 filter bags is stored in 0.1m³ of storage space. In this same volume, the equivalent number of stored filter cartridges would be around one hundred 10" cartridges. As you would need around a minimum of 250 cartridges to achieve the same performance as 50 filter bags, several times less storage space would be required by choosing to use bags over cartridges. That also means much higher the shipping costs to receive the filters.

Furthermore, where consumable filters are disposed of by landfill, the lower volume taken up with filter bags leads to a significant reduction in waste disposal costs.

5) Downtime

Changeout of filter bags only takes far less time compared to changing out a cartridge filter handling a comparable flow rate. For example, the equivalent flow rate obtained through one size 1 filter bag would be achieved by six 10" cartridges i.e. 6 times the number of elements to change. Many cartridges also have end cap seals and require hold down devices, prolonging further the time of changeout compared to changing one filter bag. This consideration is even more significant as the filter housings increase in size.

6) Ease of changeout

With a filter bag, solids are collected on the inner surface of the media, so when removed from the filter housing after use, they are easy to dispose of without depositing any solids into the filter housing. With cartridges, the solids are collected on the outside of the filter element, making

removal more difficult, in many cases leaving unwanted residue on the inner surface of the filter housing, which leads to possible contamination when next used.

7) Sealing Points

A single, size 1 filter bag housing has **one sealing point** between the housing and the filter bag. To achieve the same flow rate performance from a filter cartridge system would need a six round, 10" cartridge arrangement. Each cartridge has 2 sealing points, giving a total of **12 sealing points**. This leads to a much higher possibility of bypass of unfiltered fluid, as well as the enhanced care that the operator must take to ensure a perfect seal at each point.

Conclusion

When selecting whether to purchase a bag filter system or cartridge filter system, many factors must be considered. Such factors have been discussed in this document, but we believe that given the advancement in technology of the media now being used to construct filter bags, coupled with innovative methods of construction, filter bags should always be strongly considered.

The cost savings can be significant, not just in the purchasing cost of bags compared with cartridges, but in storage space, disposal costs, and downtime. A bag filter system is capable of achieving the required high performance and reliability, whilst providing a practical and versatile solution to filtration in critical applications.

