Amine Filtration
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Amine Filters & Filtration Media

There are several different types of filters elements (internals) available in the market place for amine units. These filter elements can be: a) metal-based filters, b) disposable filters and c) filter-aid systems that use a solid material such as diatomaceous earth coated over a filter support. Most amine units however use disposable filters because of the high fouling tendency of amine solvents contaminates and the difficulty of properly washing any media saturated with solids. Disposable filters, also known as cartridge filters, often have an out-to-in flow (with a few exceptions).

Figure 1 shows some of the most common types amine filters elements. Each type has its cost/benefit properties and is evaluated in a case-by-case basis with respect to the most appropriate type for each specific amine unit.

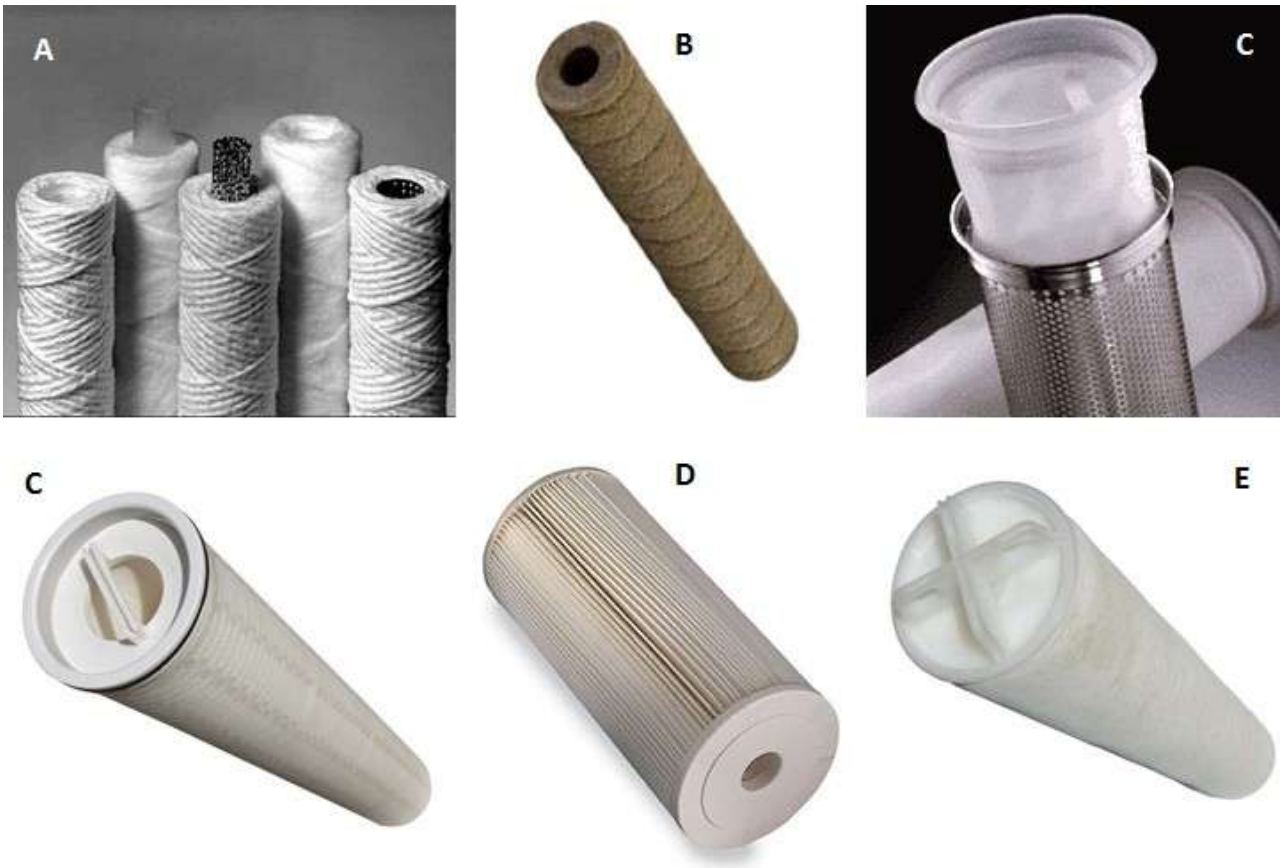

Figure 1. Common disposable cartridge amine unit filter types: A) String Wound (out-to-in flow); B) Resin Bonded (out-to-in flow); C) Bag (in-to-out flow); D) High Flow (in-to-out flow); E) Pleated Filters (out-to-in flow) and E) Axial or Radial Pleat 740 Design (out-to-in flow)

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Table 1 displays key details on most disposable cartridge filters used in amine units. In general, melt blown and resin bonded filters are inexpensive, but have low solids retention capacity and low to marginal efficiency. Bag filters are very similar, but with higher solids retention capacity. These filters have only one layer of filter material and display low efficiency and medium solids retention capacity. Some of the most advanced bags filters have more than one layer of filter material and can retain an enhanced amount of solids. High flow elements are normally offered where high flows can be processed. This is generally the case. However, the in-to-out flow requires larger vessels and at high flows this usually decreases element lifetime exponentially. Pleated filters offer perhaps the most flexibility because they combine the high capacity of bag filters with high efficiency media. These elements require small vessels and the option of coreless fabrication. Finally, the high capacity radial pleat is also a good candidate because of its enhanced surface area and good efficiency. The only potential drawback is the limited media types with which this radial pleat configuration can be fabricated.

Table 1. Details of common disposable cartridge filters used in amine units

Filter Type/Details	Cost	Loading Capacity	Flow	Sealing	Common Sizes	Type
Bag Filter	Low	Low	In-Out	Deficient	6” x 30”	Surface
Melt Blown	Low-medium	Low	Out-In	Marginal	2.5” x 40”	Depth
Resin Bonded	Low-Medium	Low	Out-In	Marginal	2.5” x 40”	Depth
String Would	Low	Low	Out-In	Marginal	2.5” x 40”	Depth
Hi Flow	High	High	In-Out	Good	6.0” x 60”	Surface
Pleated Cartridge	Medium-High	High	Out-In	Good	2.5” x 40” 6.5” x 40”	Surface

For cartridge filtration, numerous filter medium have been utilized in amine service: wound cotton (with either plastic or metal cores), pleated cellulose, pleated and non-pleated polypropylene, fiber glass, melt-blown and resin bonded. Field tests confirm that the best filter media are pleated cellulose, pleated propylene or fiber glass. Care has to be taken to utilize media that will not produce foam due to components on the media matrix or cause foaming by material incompatibilities with contaminants in the amine solution.

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Amine Unit Filtration Media

Media grade and efficiency is a controversial theme in current discussions about the proper type of filtration for amine service. Gathering experiences from a wide array of sources have shown that a 50-micron Beta 5000 filter (determined by media porometry) is an adequate "starting point" for most amine filtration applications. This is applicable for "starting point" only and optimization of the media grade and efficiency should be monitored and optimized periodically to adjust for particle size distribution. Some MDEA applications as well as many refinery amine applications, which are known to be loaded by a black, shoe polish-like material consisting of iron sulfide and heat stable salts bound with traces of hydrocarbons and polymerized amine, require more stringent filtration. The shoe polish-like material is very finely divided amorphous solid, with FeS particles being between predominantly between 1 and 5 microns in size along with water soluble salts and hydrocarbons.

Table 2 displays the most common media used in amine units. By far polypropylene, glass fiber (borosilicate), cellulose and cotton are the most common materials utilized. From our perspective all the media in the table below has weaknesses independent of their cost. For example, glass fiber if the most expensive media, however, it has the higher capacity for solids retention. Hence, the filter will have longer on-line life reducing waste volumes and maintenance costs (and effort). Although polypropylene is a good media for many applications, it is a risky media to use in amine units because of the low softening point temperature. This can cause the media too melt and dissolve if the amine unit losses temperature control. Cellulose is inexpensive, but has to be ensured that the material has proper mechanical strength (imparted by a binder) that will not cause problems to the amine solvent. Cotton filters in general do not have the design for proper amine unit filtration, not the fixed structure of the material to endure high differential pressures.

Table 2. Common disposable media used in cartridge filters for amine units

Material Type	Common Name	Temperature Limit (°F/°C)	Resistance to Caustic	Resistance to Hydrolysis	Resistance to Oxidation	Use in Amune Units
Cotton	Cotton	300/150	Good	Good	Good	Yes
PVC	Rhovyl	150/65	Excellent	Excellent	Excellent	No
Polypropylene	Polypropylene	190/90	Excellent	Excellent	Poor	Yes/No
Nylon	Cerex	230/110	Excellent	Good	Good	Yes
Polyacrylate	Donalit	255/125	Good	Good	Fair	No
Polyester	Darcon	300/150	Poor	Poor	Poor	No
Aramid	Nomex	400/205	Excellent	Poor	Fair	Yes
PTFE	Teflon	500/260	Excellent	Excellent	Excellent	Yes
Borosilicate	Fiberglass	550/285	Fair	Excellent	Excellent	Yes
Cellulose	Paper	170/80	Excellent	Excellent	Good	Yes/No

For more information, please contact **Amine Filtration** at Help@AmineFiltration.com