Presque Isle Wine Cellars

"Serving the Winemaker Since 1964"

(814) 725-1314 www.piwine.com

Filter Media Explained

Filtration is used for two purposes: 1) clarification where the visual clarity and brilliance of your wine is improved by removing particles and impurities; and 2) microbial stabilization where microbial impurities such as bacteria and yeast are removed. Filter media is available as **pads** or as **cartridges**, with each having specific applications (generally related to production volume and filter batch sizes) that must be taken into account when purchasing the initial filter system. Filter media are also categorized by their construction and mode of particle removal – depth, surface, and absolute membrane - and by their porosity which reflects the minimum particle size that is captured by the filter. Depth and surface type media are considered to be appropriate only for clarification; only certain absolute membrane type media are effective as a final filter where microbial stabilization is desired. **An important note: while absolute membrane cartridges can provide microbial stabilization, in wine bottled with residual sugar we still recommend the use of chemical additives such as potassium sorbate to protect against the risk of secondary fermentation in the bottle** unless the filtering and bottling is done in a perfectly sterile environment (and we know of no winery where that ideal environment exists).

Do you need a **pad system** or **cartridge filter system**? Whether you need a pad filter unit or a cartridge unit is pretty much dependent on the quantities that you will be filtering at any given time. Cartridge Systems are generally good choices for production volumes up to 10,000 to 15,000 gallons annually with typical maximum batch sizes around 500 gallons. Commercial-sized pad systems, referred to as plate and frame filters, are generally better for higher production volumes. These are available in two common sizes: 20 x 20 cm or 40 x 40 cm, referring to the size of the pads that are used. Pad filters are almost always depth-type media, and are available in a wide range of porosities to cover filtration needs up to the time of bottling. Plate and frame filter units consist of a chassis that supports a series of plates, between which the filter pads are sandwiched. Units are usually sold in multiples of 20 plates, with most small wineries starting out with a 20 plate chassis that accepts 40 x 40 cm pads (pad sizes are not interchangeable.) A 20 plate unit can filter up to as much as 1000 gal. in one pass, depending on the particle load in the wine, and the tightness of the filter media. Plate and frame filters can also be used at bottling as a polish filter for dry wines, or as a pre-filter to a membrane cartridge.

Depth type media is usually considerably cheaper and at its best when particles in the wine are of varying sizes. The filter media is formed in such a way that the liquid being filtered passes through a tortuous path, a maze, which gets tighter as it progresses through the media, eventually capturing the unwanted particles. Older depth type cartridges were simply cotton yarn wrapped around a central core; new technology gives us a cartridge that is much better and very cost effective. Depth type pads and cartridges (see our **Filter Cartridge Selection Chart**) are available in coarse (nominal 5.0 micron), medium (nominal 0.75 micron) and fine (nominal 0.2 micron), and are only suitable for clarification, or as pre-filters to an absolute membrane cartridge.

Surface type media (see our **Filter Cartridge Selection Chart**) consist of a sheet with a single layer of filter media sandwiched between two supporting layers. The sheet is then accordion-folded to increase surface area and incorporated into a cartridge. We stock surface type cartridges with nominal 1.0 micron, 0.45 micron and 0.2 micron ratings.

The **absolute membrane** filter (see our **Filter Cartridge Selection Chart**) is the most expensive and is best only used as the final polishing filter. It is available only as a cartridge with an absolute micron rating of 0.45 micron. Because of their high cost, membrane cartridges should really only be used after the wine has been pre-filtered through a nominal 0.2 or 0.45 micron filter.

Porosity: A key thing to understand about filter media is that there are different porosity levels from which to choose. The porosity rating reflects the smallest particle sizes that will be stopped by the filter. It can be as simple as coarse, medium, fine or super-fine as is the case with certain depth type cartridges and with the small pad filters used in the Buon Vino Mini Jet. For commercial pads and cartridges we handle, the porosity is typically a numerical rating in microns. The smaller the micron rating, the finer the filter; for example a cartridge rated at 0.2 micron removes more and smaller particles than one rated at 5.0 microns. Common micron ratings in between those include 1.0, 0.75, and 0.45. Manufacturers specify whether the porosity rating is nominal or absolute. **Absolute ratings** indicate the smallest particle size that will be stopped in virtually every case—99.99% of the time. The **nominal rating** indicates the smallest particle that will be stopped most of the time, but with considerably less certainty than 99.99%; it won't stop every particle at or above the rating.

Throughput Capacity: Another key element to understand with filter media is its throughput capacity which is the number of gallons of wine that can be passed through before the filter clogs. Throughput is not a constant; it depends on the density and size distribution of particles in the wine being filtered and on how the filter is used. Figuring out how to use your filter media to maximize the throughput capacity is key to getting the most economy and benefit out of your investment.

Winemakers often wonder how many gallons can be put through a particular filter media. The answer is "it depends". As illustrated in our experiment described below, starting with a 0.2 micron cartridge got only five gallons through, but when that same filter cartridge was used further down the 'train', it got many gallons through. Ideally, you would want the final polishing filter, which is likely the most expensive, to get many, many gallons through it. If your 'filter train' is designed correctly, the

polishing filter should be like an insurance policy. It should not have to take much out, and therefore, be able to be used many times. This is the most cost effective filtration.

Configuration: If you are considering a cartridge filter system, another factor with which to be familiar is the difference between a DOE (double open end) and SOE (single open end) cartridge configuration. In the cartridge filter system, the cartridge is placed into the filter housing and the wine is pumped into the housing, surrounding the cartridge. With the proper seal, the wine must pass through the filter media to the center of the cartridge where it can then exit the housing. A DOE cartridge is open on both ends of the core, and the seal at each end is formed by a large rubber gasket that is pressed against a "knife-edge" fitting at each end of the housing. A SOE cartridge is open only on one end and the seal comes from two O-rings that fit into a finely machined socket. In either configuration, if the seals fail, then wine will bypass the filter media, rendering the filtration ineffective. Of the two designs, the SOE configuration is considered to be the more secure and fail-safe. DOE cartridges have very good seals but are not quite as reliable as SOE cartridges. When you remove a DOE cartridge you should be able to see the indentation marks left by the 'knife edge' of the housing as an indication that a proper seal was made.

The Filter Train

Filter media can be a significant investment and the tighter or finer the filter, the more expensive it generally is. Absolute membrane filters are also typically more expensive than depth and surface type filters. It is important to use the particular pad or cartridge best suited for the job you wish to accomplish. To make the most of your investment in filter media, it is necessary to develop a filtration strategy that achieves maximum benefit and capacity from the media you choose considering such things as the condition of the wine, the size of batch to be filtered, and the desired goals and degree of filtration. **Often, to best accomplish this, more than one porosity level of media must be used, starting with coarser, less expensive filters to provide initial clarification and finishing with tighter porosity level cartridges**. Starting with media that is too tight may result in its clogging very quickly, which can drastically reduce their throughput capacity and be costly and time consuming. Using a series of filters in decreasing porosity levels is often referred to as a 'filter train' with the coarser media acting as a **pre-filter** and the last media being the **finishing or polishing** filter. Deciding whether one porosity level of media will suffice or whether a 'train' is needed is a decision that must be made. The home winemaker often can get by with using only one size filter. This has mostly to do with batch sizes, economics, less concern with appearance for marketing, etc. The commercial winemaker will more than likely be best served by developing an appropriate 'filter train'.

As an example, if a home winemaker has 75 gallons he/she wants to filter, it may be possible to use a moderately tight pad or cartridge (say 0.5 micron) and get it all done in one pass with one filter. This might cost about $40.00 in filter media. In contrast, if the batch size is 100 or more gallons, the same 0.5 micron pad or cartridge may clog after 80 gallons. The winemaker is now faced with not only the hassle, but more importantly the expense, of having to use another cartridge or set of pads. To illustrate further, we did some in-house testing using a 100 gallon batch of wine that had not been filtered previously. First we tried a tight 0.2 micron cartridge that costs about $50. It clogged after five gallons. At that rate, if we stuck with the 0.2 micron cartridge it would have taken 20 of them at a cost of about $1,000.00. We switched to a coarser 0.45 micron cartridge and got all 100 gallons through, and could have done more. Then we went back to the 0.2 cartridge, and got all 100 gallons through. For these two filtrations, the cost was about $90.00. The question then arises: "How does one know/decide the right filter train and at which porosity level to start?" In an ideal world, a filterability test is done, but not everyone is able to easily do this. Learning from others certainly helps, and as time goes on your own experience will become invaluable.

Winemakers often wonder how many gallons can be put through a particular filter media. The answer is "it depends". As illustrated above in our experiment with the 0.2 micron cartridge, the first filtration with the 0.2 micron rated filter got only five gallons through, but when used further down the 'train', it got many gallons through. Ideally, you would want the final polishing filter, which is likely the most expensive, to get many, many gallons through it. If your 'filter train' was done correctly, the polishing filter should be like an insurance policy. It should not have to take much out, and therefore, be able to be used many times.

Deciding on the right combination and sequencing of filters is a decision for each winemaker that can be different depending on the winemaker's needs and objectives. Time, cost, volume and batch size of wine to be filtered, type of wine being filtered, degree of filtration needed, and objectives of filtration will affect the decision. A typical approach for us is to start with a coarse 1 micron depth type cartridge for initial filtration, followed by a 0.45 micron nominal cartridge and perhaps a 0.2 micron nominal cartridge for polishing, followed by a 0.45 absolute membrane cartridge if final filtration and microbial stabilization is needed. This has proven to be the most cost effective filtration approach for us but may or may not be right for you.

Reusing Filters

If the capacity of some cartridges is not used up during a day's filtering run, they can be stored for later use in a sanitary storage container with a 40% alcohol solution or acidified sulfite solution. Other options for storage include sanitizing in an autoclave or pressure cooker, or with hydrogen peroxide, chlorine or ozone. Be sure to remove all rubber gaskets and O-rings before putting the cartridge into the solution. We stock 12" and 24" storage tubes in which to store cartridges that have remaining capacity. Refer to our Cleaning and Storing Filter Cartridges for more information. **Pads and the depth type cartridges cannot be saved for reuse; only surface and membrane filter cartridges can be reused.**