

Filter Options for Wine Clarification and Stabilization

Winemakers use the alcohol levels, oxygen content, and pH in wine to promote the growth of bacteria and yeast that create a great wine – and inhibit the growth of organisms that can ruin the wine. This delicate balancing act takes place from the grape harvest through the fermentation and aging of the wine. When the aging process is complete, and the bacteria and yeast have done their work, it is time to remove them and stabilize the wine. The stabilization process is critical to the shelf life and long term quality of the wine.

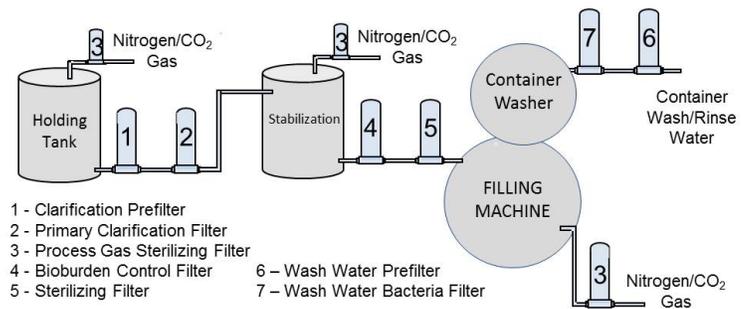
The winemaker uses several bacteria, especially lactic acid bacteria (LAB) like *Oenococcus oeni*, to provide desirable flavor and aroma characteristics to the wine during fermentation and aging. But other LAB like *Lactobacillus*, *Leuconostoc* and *Pediococcus* can produce undesirable aroma and flavor compounds. Acetic acid bacteria (AAB) such as *Acetobacter* and *Gluconobacter* can also cause spoilage issues.

Wine may also be spoiled by yeasts like *Saccharomyces cerevisiae* and *Candida* species as well as *Debaryomyces* or *Kloeckera* or *Zygosaccharomyces*. All can find their way into the wine during any stage of production prior to bottling.

Figure 1 shows a simplified wine clarification, stabilization and packaging process. The fermentation and aging processes have been completed in this example, and the wine has been bulk filtered before being moved to a holding tank.



Figure 1 - Filtration in Wine Clarification/Stabilization



Clarification

The first step in clarification is the removal of sediment and other suspended particles. The housings marked 1 and 2 in the figure are those performing this task. Clarification is more than just reducing haze or making the wine visually clear. The particles removed range from small diatomaceous earth particles to yeast and other large microorganisms that can affect wine flavor and character.

The 2-stage filtration process shown in the figure is designed to be efficient and allow the most throughput. The first filter may have a depth media filter with a pore size rating of 3 or 5 microns to capture larger particles and sediment. It protects a second depth filter, which may have a pore size rating of 1 micron, from becoming overloaded with particles and prematurely clogging. The combination allows more wine to be processed and can reduce overall clarification filter costs.

Some winemakers may use only 1 filter, depending on the particle and organism content at this stage of the process. Critical Process Filtration will work with winemakers to determine if a single stage or multi-stage system will produce the best, most cost-effective results.

Stabilization - Bacteria Reduction/Removal

The most critical filters in Figure 1 are the final stabilization filters (housings 4 and 5). Those filters remove the microorganisms discussed above, with the first filter removing most of the bacteria and the second the remaining organisms. The most commonly used filters are membrane-based. The first filter may have a pore size of 0.65 microns to 1.2 microns to protect the final filter with its 0.65 or 0.45 micron pores. Using the 0.45 micron filters will assure capture of all bacteria, but there is a risk that some flavor or color elements will also be captured by the smaller pores. For that reason, 0.65 micron membranes are often used for final filtration of red wines.

Container wash and rinse water is also filtered to prevent bacteria from entering the containers. Almost all bacteria removal filters for water are 0.22 micron membrane filters.

The winemaker should test filters before choosing a micron rating or material to assure the filters will remove the target organisms and also preserve wine flavor and color.

Process Gas Filtration

Process gas filters (housing marked 3) are also critical to the quality of the wine. These keep particles and bacteria that may be carried by process gas from being deposited in containers as they are filled. Holding and stabilization tanks may also use a process gas blanket to prevent oxygen from contacting the wine. The gas is usually filtered to prevent potential contaminants from reaching the tank. Almost all process gas filters and tank vent filters are hydrophobic membrane with 0.22 micron pore size ratings.

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Process Area	Filter Application	Filtration Function	Grade*	Media**
Clarification	Sediment/Particle Removal	Protect downstream processes and filters from fouling by DE or other particles	G	MB, NS, PD or GD
			F	PD or GD
	Clarification	Improve visual clarity of product by removing fine particles and sediment	G	MB or NS
			F	PD or GD
Final Filtration and Filling/Packaging	Bacteria/Bioburden Reduction	Remove most bacteria, yeasts and molds	F	CWPS, PS or PVWL
	Bacteria Removal/Product Stabilization	Remove all bacteria, yeasts and molds	F	PS
Product Storage and Filling/Packaging	Process Gas Filtration	Prevent particles or bacteria from gases like CO ₂ and Nitrogen from entering product or containers during filling	G, F	PVWB or TM

***Grade Codes**

F = Food & Beverage grade G = General Service Grade

****Media Codes**

MB = Melt Blown Polypropylene Depth Media

NS = Nano-Spun Polypropylene Depth Media

GD = Pleated Fiberglass Depth Media

PD = Pleated Polypropylene Depth Media

CWPS = High Capacity PES Membrane

PS = Polyethersulfone Membrane

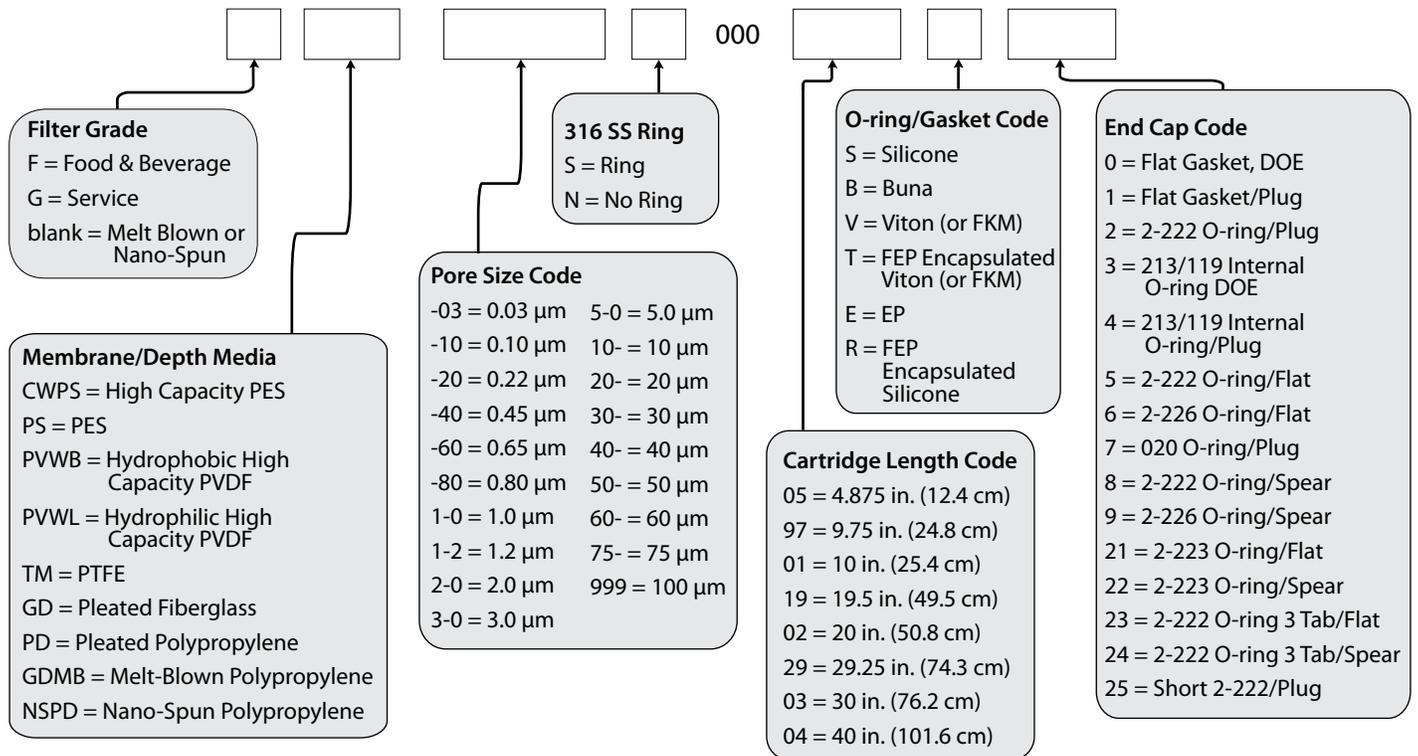
PVWL = High Capacity Hydrophilic PVDF Membrane

PVWB = High Capacity Hydrophobic PVDF Membrane

TM = PTFE Membrane

Contact [Critical Process Filtration](#) for help determining the best filter options for you.

Cartridge order numbers have several variables from grade to media and pore size to end cap type. For example, Food & Beverage Grade, Polyethersulfone Membrane, 0.22 Micron Rating, with SS Support Ring, 20" Length, Silicone O-Rings, 2-226 O-Ring/Spear End Cap Configuration = FPS-20S00002S9.



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