

Filter Options for Beer Clarification and Stabilization

Particles and microorganisms that are a natural part of the brewing process might create off flavors, colors and aromas if they remain in the beer after fermentation and aging.

Figure 1 below shows the filtration steps that help remove unwanted particles and organisms and safeguard the quality of the beer.

The alcohol, low oxygen content, relatively low pH, hops extracts (alpha-acids) and dissolved carbon dioxide in beer inhibit the growth of pathogenic bacteria. That is why beer has been a safe drinking alternative for so many centuries. However, there are microorganisms that can survive and even thrive in beer and spoil the flavor and aroma of any good brew.

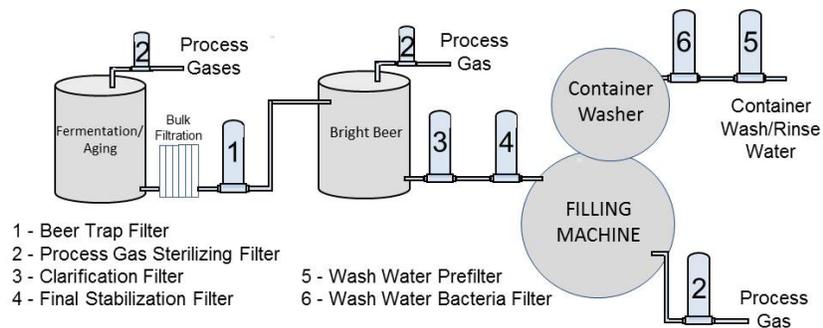
Beer can be spoiled by bacteria or wild yeasts ranging from *Lactobacilli* and *Pediococci* to *Pectinatus* and *Megasphaera* species. If *Saccharomyces cerevisiae* or *Candida pelliculosa* find their way into the brewing process they can also cause off flavors.

Lactic acid bacteria (LAB) can provide some benefits to the brewer. They can create desirable compounds and even inhibit the growth of molds during the brewing process. However, if left in the beer, they can cause shorter shelf life or spoilage.

The brewmaster and plant operators work diligently to prevent most undesirable particles and organisms from entering the process, yet they still enter through equipment, ingredients or the environment. This guide briefly explains the filter options available from Critical Process Filtration to remove the particles and organisms that find their way into the beer.



Figure 1 - Filtration in Beer Clarification/Stabilization



Beer Trap Filters & Clarification

Immediately after fermentation and aging, beer is bulk filtered. The bulk filtration step is usually done using a diatomaceous earth (DE) filter. DE filters are known to release particles that can affect beer quality. The beer trap filter (housing 1) removes these particles to protect the beer quality as it enters the final clarification and stabilization process and is bottled. This step is almost always performed using depth filters rated at 3 to 5 microns.

Clarification is more than just reducing haze or making the beer visually clear. The particles removed range from small particles that may remain after bulk and even trap filtration, to yeast and other microorganisms that might adversely affect flavor, color and aroma.

Housing 3 in the figure is the location for clarifying filtration. The figure shows a single filtration step, though some bottlers may choose to use a 2-stage filtration process if their beer has high levels of particles or microorganisms. Using multiple filtration steps often makes removing large quantities of particles more efficient and may avoid premature clogging of filters before batches are completed. Depth media is often preferred for clarification, with a filter pore size ratings of 1 to 3 microns used in this step.

Bacteria Reduction/Removal

The most critical filter in Figure 1 is the Final Stabilization Filter (housing 4) – the one that removes the microorganisms discussed above. The most commonly used filter is membrane based with either a 0.65 or 0.45 micron pore size. These will remove both bacteria and yeasts. Brewers may choose the smaller pore size to assure capture of all bacteria, including the vegetative forms of some species that may survive in the beer, but there is a risk that flavor or color elements of the brew will also be captured by membranes with 0.45 micron pores. For that reason, 0.65 micron membranes are often used for darker or heavier beers. The brewer should test filters in their beer before choosing a micron rating or material to be sure that the filters will remove the target organisms and preserve beer flavor and color.

Process Gas Filtration

Process gas filters (housing marked 2) are also critical to the quality of the beer. These keep particles and bacteria that may be carried by process gas from being deposited in containers as they are filled. Storage tanks may also use process gas blanket to prevent oxygen from contacting the beer. The gas will also be 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	Beer Trap	Protect downstream processes and filters from fouling by DE or other particles	G	MB or NS
			F	PD or GF
	Clarification	Improve visual clarity of product by removing fine particles and sediment from bright beer	G	MB or NS
			F	PD or GF
Final Filtration and Filling/Packaging	Bacteria/Bioburden Reduction	Remove most bacteria and molds	F	CWPS, PS or PVWL
	Bacteria Removal/Product Stabilization	Remove all bacteria 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**

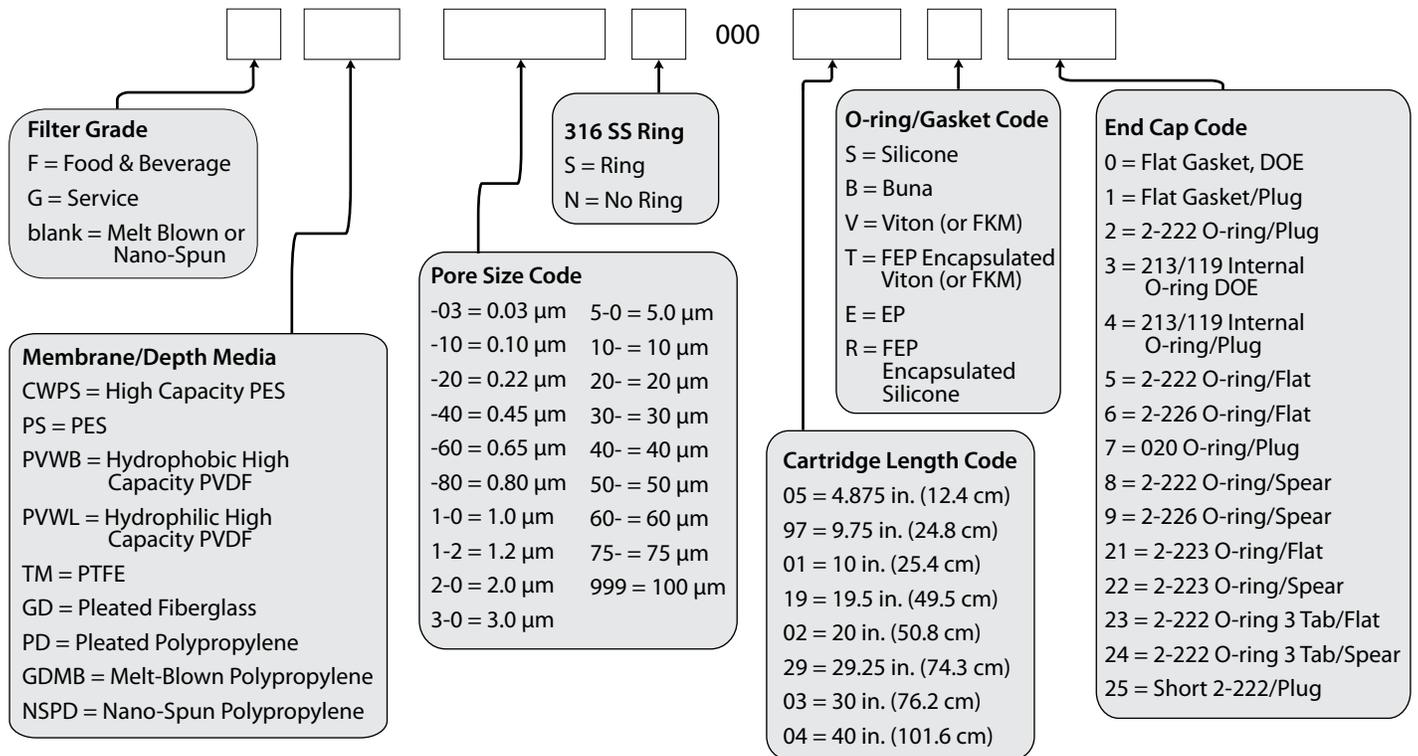
F = Food & Beverage grade G = General Service Grade

****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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