Winemakers are practical microbiologists. They 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 some lactic acid bacteria (LAB), especially 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. The most common spoilage yeasts are Saccharomyces cerevisiae and Candida species, though other yeasts such as Debaryomyces or Kloekera or Zygosaccharomyces can also find their way into the wine and act as spoilage organisms.

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

The housings marked 1 and 2 in the figure are the clarifying filters. As described in a separate Application Summary, “Choosing the Right Filters for Wine Clarification”, the filters chosen may be used as initial stabilization filters. The choice is based on the type and number of microorganisms present in the wine at this stage.

The final microbial stabilization is accomplished by passing the wine through the bioburden reduction filter (housing 4) and then the sterilizing filter (housing 5). Similar filters are also used for water to wash and rinse containers (housings 6 and 7), thus preventing the introduction of organisms from the wash water.

Process gas (most often nitrogen, CO₂ or a combination) is used to limit the oxygen in contact with the wine at various stages of the process. It is filtered (housings marked 3) to prevent particles and organisms from entering the process by being carried in the gas.

Some of the factors to consider when choosing final stabilization filters used for wine, gas and wash water functions are reviewed briefly below.

Choosing the Sterilization Filter
The most critical filter in Figure 1 is the final stabilization filter (housing 5) - the one that removes the microorganisms discussed above. The most commonly used filter is membrane based with either 0.65 or 0.45 micron pore size rating. These will remove both bacteria and yeasts. Winemakers may choose the smaller pore size to assure capture of all bacteria, including the vegetative forms of some species that may survive in wine, but there is a risk that some flavor or color elements will also be captured by membranes with 0.45 micron pores. For that reason, 0.65 micron membranes may be used for red wines. The winemaker should test filters before choosing a micron rating or material to be sure that the filters will remove the target organisms and also preserve wine flavor and color.
The filters chosen must be designed to function after whatever disinfection or sterilization process will be used. The organisms targeted for removal also need to be considered. Critical Process Filtration has several filter options, as shown in the table below. These filters are available as cartridge filters and disposable capsule filters as well as in flat disc form for laboratory scale testing.

Contact Critical Process Filtration for help determining the best filter options for you.

**Filter Options for Wine Stabilization and Packaging**

<table>
<thead>
<tr>
<th>Process Area</th>
<th>Filter Application</th>
<th>Filtration Function</th>
<th>Critical Process Media*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioburden Control and Sterilizing</td>
<td>Bioburden Reduction</td>
<td>Remove most bacteria and yeasts</td>
<td>CWPS, PS, PVWL</td>
</tr>
<tr>
<td></td>
<td>Bacteria Removal (Sterilizing)</td>
<td>Remove all bacteria and yeasts</td>
<td>PS</td>
</tr>
<tr>
<td></td>
<td>Process Gas Filtration</td>
<td>Prevent bacteria from entering tanks when liquid is drawn from them and from entering bottles during filling</td>
<td>PVWB, TM</td>
</tr>
</tbody>
</table>

*Media Codes
CWPS = High Capacity PES Membrane
PS = Polyethersulfone Membrane
PVWL = High Capacity Hydrophilic PVDF Membrane
PVWB = High Capacity Hydrophobic PVDF Membrane
TM = PTFE Membrane

Visit our website or contact us for more information and to access data sheets on all of our products.