

Protecting the Quality of Beer – Filters that Remove Spoilage Organisms

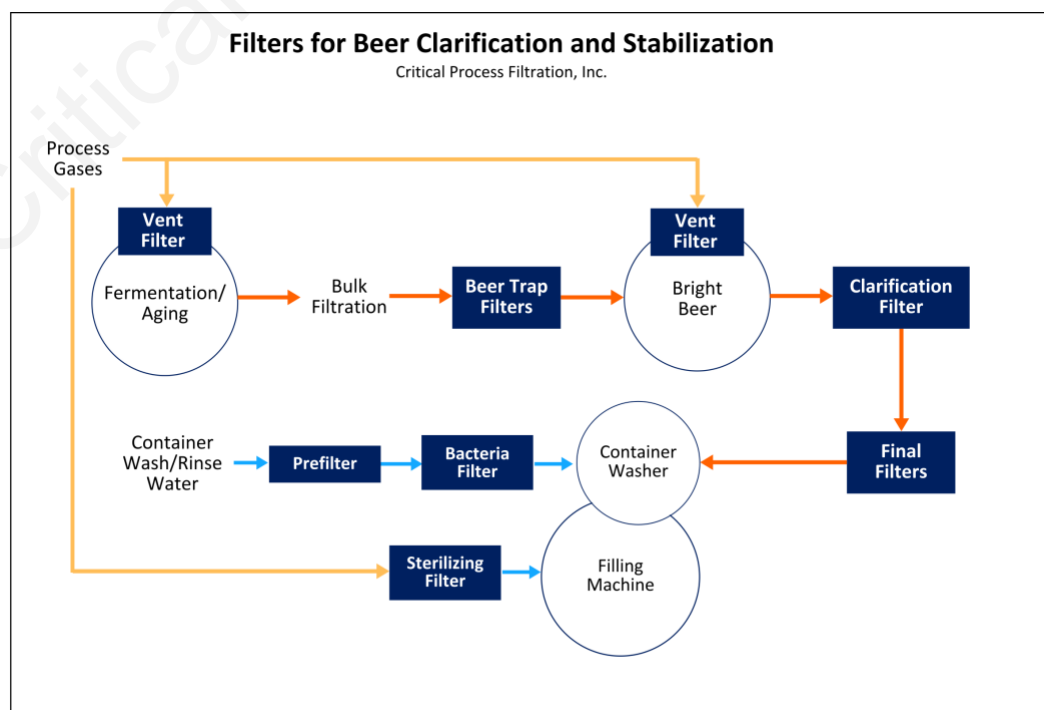
The beer brewing process with its ancient techniques and today's modern technology continually faces the challenge of eliminating microorganisms ranging from bacteria and yeasts, to molds and spore formers that cause quality issues. Whether a commercial or micro-brewery protecting the uniqueness of each beer will involve a level of filtration to efficiently stabilize and clarify the product after fermentation and before filling.

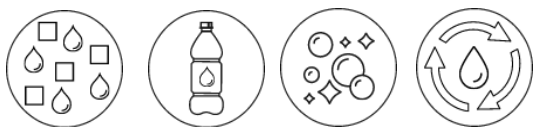
Although brewmasters and plant operators work diligently to prevent organisms from entering the brewing process, these unwanted contaminants find ways to enter through equipment, ingredients or the environment.

This summary focuses on using normal flow filtration to remove destructive contaminants during production, in order to protect beer flavor, quality and shelf life.

It includes:

- Filtering the remnants of bulk filtration with beer trap filters
- Tank vent filters and their role in protecting beer from environmental contaminants
- Filtration of process gases to eliminate a source of contamination
- Clarification filters for particle removal and protection of the stabilization filters
- Stabilization filters that remove bacteria and yeasts
- Sterilizing filtration of water and gas used during the wash/filling stages





Filtration of Ingredient & Process Water

As with every consumable beverage, water is a critical ingredient of the final product and vital element used in equipment cleaning. Filtration will remove particulate prior to steam generation, mashing, sparging and boiling of wort, as well as sterilize the water used in keg washing and canning/bottling.

For more information on water filtration, refer to the [Application Summary: Water Filtration in Food & Beverage Processing](#).

Beer Trap Filters

After beer has been fermented, various techniques (bulk filtration) are incorporated to filter the lees left in the bottom of the fermentation tank, such as additives and centrifugation. One such technique, diatomaceous earth (DE), a powder additive, leaves residue behind that could create off flavors, colors and aromas. Retention of the residue is the role of the beer trap filter before reaching the bright beer tank.

Critical Process Filtration depth media filters made from polypropylene or fiberglass media vary in the degree of holding capacity and particle load being filtered. They are made from pleated flat sheets of media which provide a greater surface area than melt blown and nano spun filters for this purpose.

FPD filters for particle removal and to protect taste (Polypropylene)

FGD filters for high contaminant holding (Fiberglass)

The size and number of particles in the beer determines what filter pore sizes to use and how many filters will be needed. The trap filter may be used to remove a large number of particles with sizes over 5 microns. This is often the size of DE particles and organic content that remains after DE filtration. Though individual particles smaller than about 20 microns are not visible to most people, a large number creates turbidity and haze. Using a 5-micron rated filter for trap filtration reduces the number of particles and creates visibly clearer beer – bright beer.

Clarification Filters

The clarification filter can serve solely as a particle filter or can remove both small particles and microorganisms such as yeast and bacteria.

Either way, the clarification filter should be chosen with the aim of extending the life of the final stabilization filter – the more expensive filter. Doing so reduces your costs by reducing the number of final filters and minimizing changeouts that open your system to further contamination.

Most facilities use filters that remove particles and large organisms, like yeast, to begin the biological stabilization process. If the master brewer chooses to use this filter only to remove particles and reduce haze, then a 3- or 5-micron pore size rating is sufficient. If the clarification filter should also begin the biological stabilization of the beer, then a 1 micron or 2 micron rated filter will remove yeasts and some larger bacteria that may have entered the process. 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.

Critical Process Filtration depth media filters and membrane filters are chosen based on the requirements of your clarification filters.

Removal of particles and organisms:

FCWPS filters high capacity membrane (PES)

FHLP filters for high particle loads and low extractables to protect taste (PES)

Removal of particles:

FPD filters for particle removal and to protect taste (Polypropylene)

FGD filters for high contaminant holding (Fiberglass)

The figure on the previous page shows a single filtration step, though some bottlers may choose to use a 2-stage filtration process if their beer has high levels of particulate 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.

Stabilization Filters

The most critical filter in this process is the final Stabilization filter. These filters remove the bacteria and yeasts that cause spoilage and reduce shelf life after bottling/canning.

The most commonly used filter for beer stabilization is a Polyethersulfone (PES) membrane based with either a 0.45 or 0.65-micron pore size. 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, however there

is a risk that some flavor or color elements of the brew will also be captured. For that reason, 0.65-micron membranes may be used for darker or heavier beers. CPF recommends testing filters to assure that target organisms are retained while also preserving beer flavor and color.

VPS Filters

FPS filters

Process Gas Filtration

Process Gas filters are also critical to the quality of the packaged beer. These hydrophobic membrane filters keep particles and bacteria that might be carried by process gas from entering tanks as they are emptied or from being deposited in bottles/cans as they are filled.

Tank Vent Filtration

Protecting the contents of fermentation and bright beer tanks is done by preventing any atmospheric contamination brought into the tank upon filling.

Tank Vent & Gas Filters (hydrophobic):

PTR Filters – for sterilizing (PTFE)

BTM Filters – for bacteria reduction (PTFE)



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