



PRESQUE ISLE  
WINE CELLARS

## PIWC FILTER UNITS

Time is the winemaker's ally and given enough time, most wines will become very clear through natural settling. Filtration, when done correctly, can yield a very clear wine in a shorter timeframe, and can help to ensure wine stability by removing spoilage organisms. Filtration does have limits, though, and attempting to filter a wine too early can be very frustrating—the filters clog up quickly from the suspended solids, costing money and taking a lot of time. It is therefore recommended that wines should be racked off the yeast lees before trying to filter. A second racking may be needed if more sediment settles out over time.

Most filter media will not effectively remove pectin or protein hazes. These hazes are the result of pectin or protein molecules forming matrices in the wine, distorting light rays as they pass through, and creating a hazy appearance. Since they are molecular in nature (and not particulate) they will pass through a filter and reorient into the haze-forming matrix on the other side. Pectic enzymes are used in the initial processing of grapes to break down the pectins. However, if you suspect that a haze is the result of pectins, additional pectic enzyme can be added at any point in the winemaking process without negative effects; follow manufacturer recommendations for the rate of addition.

Protein hazes are formed when proteins in the wine denature, forming a haze. In some cases, the proteins will clump together to form little blobs of fluffy-looking sediment (as opposed to hard tartrate crystals). Protein hazes often occur later in the process, especially if the wine has been exposed to warmer temperatures. Bentonite fining is the most effective way of removing excess proteins. As with all fining agents, a bench test is best practice to determine the appropriate rate of addition for that particular wine. Do not attempt to filter a wine off the bentonite lees—they are notoriously light and easily disturbed and will blind a filter almost immediately. At least one careful racking is required before filtering.

Filtration should not be considered as a substitute for proper sanitation. While filtration may remove spoilage organisms and particulates, maintaining sanitary conditions whenever wine is handled will prevent a population from getting out of control. Proper cleaning, appropriate levels of sulfur dioxide (potassium metabisulfite) and potassium sorbate are invaluable to retaining flavor quality and protecting against refermentation in sweet wines. Remember, spoilage organisms may be airborne so maintaining appropriate chemical control and sanitation is an ongoing part of winemaking.

### **Filter Cartridges**

Filter cartridges are made with a filter medium that works by trapping particulates in the wine as it passes through the filter unit. Filter media can be divided into three basic types: depth, surface and membrane based on the configuration and material. Each filter is also made to trap certain sized particles, indicated by their micron ( $\mu$ ) rating. A higher number (referred to as coarser filtration) allows larger particles to pass through; a smaller number (finer filtration) traps smaller particles. Ratings for wine filtration vary between  $10\mu$  (very coarse) and  $0.2\mu$  (very fine). Filtration can be done in steps, starting with a coarse filter and ending with fine or even sterile filtration (absolute  $0.45\mu$ ) filtration. Filter cartridges are available in 10" and 20" lengths and are only used in housings designed for the specific length.

Because of the nature of depth and surface filter media, there is considerable variation in the size of particles that are actually trapped. These cartridges bear a *nominal* rating, at which 95-98% of particles will be stopped; 2-5% of particles larger than the rating are able to pass through. Depth and surface media are always nominally rated. A selection of different ratings are available for depth and surface cartridges to allow for progressively tighter filtrations.

*Absolute* ratings are used with membrane cartridges since this filter medium can be manufactured to provide a very consistent and uniform pore structure throughout. These cartridges are expensive but are the only type of media that can be trusted to completely remove spoilage organisms using a 0.45 $\mu$  absolute cartridge.

*Throughput* is a term that is used to identify the number of gallons that can be expected to pass through the filter before it plugs. It is always an approximation and should only be used for comparison since the actual gallonage that can be filtered is not guaranteed and is dependent on the size and quantity of particles in the wine. A 20" cartridge will have double the throughput of a 10" cartridge, and this should be considered when determining batch size.

1. **Depth type (PRS) nominally-rated cartridges** look like paint rollers and are made of polypropylene, are inexpensive, and are at their best when particles in the wine are of varying sizes. The filtration media is quite thick and the pore size gets tighter towards the central core. This creates a tortuous path, a maze that eventually stops unwanted particles. The PRS cartridges are available in medium (1.0 $\mu$ ) or fine (0.5  $\mu$ ). Throughput for a 10" cartridge is 30-40 gallons.
2. **Surface type (TC) cartridges** are technically a form of depth media, but are much thinner sheets that are pleated before forming into a cylinder to increase the surface area and throughput. They are available in three nominal ratings: 1.0 $\mu$ , adequate as first prefilter; 0.45 $\mu$  suitable for polishing a dry white or red wine; and 0.2 $\mu$  suitable as a final filter for all wines, or as a prefilter to a 0.45  $\mu$  membrane cartridge for sterile filtration. A TC cartridge is more expensive than for a comparable PRS filter, but the throughput is generally much greater.
3. **Absolute membrane (Watertec or Graver PES) cartridges** are offered with an absolute 0.45 $\mu$  rating, removing any particle that is greater than 0.45 $\mu$ , which includes any spoilage organisms, allowing for sterile filtration. The cartridges are expensive and should only be used after filtering with a nominal 0.2 $\mu$  TC cartridge. An ideal setup is to use a dual-cartridge system with the TC and membrane cartridges joined in direct succession—filtering through both in one pass. This will increase the throughput to several hundred gallons, spreading the high cost over more gallons.

## PIWC Filter Unit

The PIWC Filter unit can be configured with single or double housings for 10" or 20" cartridges. Double housing units allow you to filter through 2 cartridges in one pass, saving time and eliminating extra handling of the wine. The first cartridge should always be a coarser filter than the second. This is an ideal setup for a sterile 0.45 $\mu$  membrane filtration, using a 0.2 $\mu$  (nominal) TC cartridge in the first housing as the prefilter.

The units are equipped with a pump that is matched to the size of the housing—100 gph for 10" housings or 240 gph for 20" housings. It is not recommended to use a larger (higher flow rate) pump to avoid premature clogging of the filter or rupturing the filter media.

Cartridges require minimal treatment before use by flushing with several gallons of hot water followed by circulating an acidic sulfite (citric acid and potassium metabisulfite) solution for 5 minutes.

## Using the Filter Unit

1. **Inserting a cartridge**

- a. **Plastic housing** - Unscrew the bottom of the housing from the top and insert the cartridge making sure that it is centered in the housing bowl. Be certain that the O-ring is in place and seated in the groove at the top of the housing bowl and tighten onto the housing head as much as you can by hand.
  - b. **Stainless-steel** - Unscrew the hex nut located on the top of the housing to remove the housing bowl. Insert the cartridge, centering it on the cup at the bottom of the housing bowl. Make sure the O-ring is in the groove at the top of the bowl and reconnect the bottom bowl to the housing lid. Tighten the bolt enough to prevent the housing from leaking.
2. **Connecting hoses**
- PIWC Filter Units come with two 5' lengths of polyvinyl tubing, 5/8" for 100 gph pumps/10" housings or 3/4" for 240 gph pumps/20" housings. Other lengths of tubing can be used as needed to go further distances. In general, it is better to push wine than to pull it, so keep the inlet hose short and the outlet long, if possible. Connect the (shorter) hose to the inlet fitting on the pump by sliding it over the fitting. Connect the (longer) outlet hose to the outlet side of the filter housing in a similar fashion. It is not necessary to use hose clamps on these fittings as there should be no pressure buildup in these hoses.
3. **Flush the system** with a couple of gallons of hot water and then circulate a citric/sulfite solution (2 tsp citric acid and 2 Tbsp potassium metabisulfite per 5 gallon of cold water) for several minutes. Switch the inlet to the wine to be filtered and flush out the water. **Do not run the pump dry** to push out the water—it will damage the pump! When wine starts coming out of the outlet hose, place it in the receiving container.
  4. **If leakage occurs** with the plastic housing, shut off the pump and tighten the bottom of the housing further. If it is still leaking, disconnect the bowl and check the O-ring. If leakage occurs on a stainless-steel housing, make sure the O-ring is seated in place and the top and bottom of the housing are in alignment and tightly connected.
  5. While the wine is filtering, **monitor the pressure** on the gauge on the inlet side.
    - a. Under normal conditions, it will slowly increase as particles are retained by the cartridge. The pressure on the outlet side should be zero, or if the receiving container is higher than the pump, slightly above zero (increasing approx. 4 psi for every 10' difference in height). Continue filtering until you have either filtered all of the wine or the pressure differential (the difference between the outlet and inlet gauges) exceeds 25 psi.
    - b. Avoid introducing air into the filter during filtration as the turbulence can reduce the life of the cartridge. When moving between source containers, stop the pump before it starts to suck air.
    - c. It is best to keep the inlet tube off the bottom of the container to avoid picking up sediment early in the filtration. Gradually drop the inlet hose as you empty the container.
    - d. If the **pressure differential reaches 25 psi**, the cartridge is clogged and will need to be replaced before continuing to filter. Pump out the remaining wine in the system, remove the cartridge and rinse out the bowl before replacing with a new cartridge. Repeat step #3 above to prepare the cartridge.
    - e. On double cartridge filter units, pressure gauges are fitted on the inlet of each housing. This helps to determine which cartridge is plugged based on the pressure differential for each housing. An increase on the first gauge indicates the first cartridge is plugged (and the second may be plugged but the flow rate is low enough to not build up pressure on the gauge); pressure buildup on the second gauge or both gauges indicates the second housing is plugged.
  6. **When doing several batches**, start with the best or most delicate flavored white wines and progress to lesser or more intensely flavored white wines followed by reds in the same order.

## Very Important Precautions

1. **Do not run the pump dry.** The pump is self-priming and will easily pump against a 10' head. If it doesn't, stop and check the following:

- a. Check the strainer screen. On the 10" unit brass pump, remove the lower of the two nuts on the side of the pump and pull out the small cylindrical screen. Clean off any crud and return to the pump. On SS pumps and larger brass pumps the screen is in a separate "y" fitting threaded into the inlet of the pump. It is a good practice to clean the strainer screen at the end of the day whenever you use it. Never run any pump without the strainer screen in place as abrasive particles like tartrate crystals can destroy the impeller.
- b. If the screen isn't clogged, make sure all hose and fitting connections are tight, and any inline valves are open.
2. The pumps supplied with the PIWC Filter Unit are positive displacement pumps that are able to pump to high pressure. For safety reasons, they are equipped with a **pressure relief valve** that is factory preset to 50 psi. It is located behind the horizontal cover nut at the top of the pump but **do not change the pressure setting**. If for any reason you choose to remove this cover nut, note the number of threads exposed outside the pump body on the screw located under the nut. Changing this preset pressure setting voids the unit's warranty.
3. **Protect yourself against electrical shock** when working in damp areas. The motor is grounded and should only be used with grounded receptacles. We further recommend that you use a ground fault interrupter (GFI) receptacle when working in damp areas.
4. **Never run the pump without the strainer screen in place.** The pumps have very close tolerances and need protection from abrasive materials which might otherwise be pumped through them.
5. **Pressure can build up** in the unit if a cartridge becomes completely plugged, a hose gets kinked, or a valve is closed. If the pressure is great enough, it can blow back through the system making a mess or rupturing a cartridge. If pressure shows on a gauge after the unit is shut off, carefully open a closed valve or housing to allow the pressure to slowly bleed off.
6. **Filter cartridges are not designed to be back flushed.** The filter media is not supported against backwards flow and will be ruptured if this is attempted. Surface and depth cartridges should be discarded when they become plugged. Membrane filters may be cleaned by soaking in a 3% caustic solution; follow manufacturer recommendations.

## Cartridge Storage

**The TC, Watertec & Graver PES** cartridges can be stored for later use if the cartridge hasn't clogged. To store a cartridge, immerse it in a citric/sulfite solution (½ tsp citric acid and ½ Tbsp potassium metabisulfite per gallon of cold water) or 40% alcohol solution, removing the O-rings or gasket seals before storing. It is possible to hold cartridges in this manner for a year or more, but you may need to replace the solution every few months to ensure that it is still effective at maintaining sterility. Storage tubes are available from PIWC in which to store cartridges.

### To use as a transfer pump

The filter pump can be used as a transfer pump without having a cartridge in the housing, or by disconnecting the pump outlet hose from the housing. Transferring should be limited to clear wines only—juice or cloudy wines will plug the inline filter screen very quickly. Never operate the pump without the strainer screen in place as damage to the impeller may occur.

*\*Allow the filter unit to dry before storage; see the separate info sheet for filter storage.*

**Contact us for replacement cartridges, parts and questions:**

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