PALL

Food and Beverage

Pall® Oenofine XL Filtration Systems

Single Step Protein Stabilization and Clarification

*Filtration. Separation. Solution.*SM

FBOENOFINEN

Pall Oenofine XL Filtration Systems

Single Step Protein Stabilization and Clarification

Protein stabilization and clarification are two critical steps to satisfying consumer expectations for a bright wine. While both steps prevent haze formation, one to remove heat sensitive proteins, the other suspended solids, the traditional commercial processes are typically carried out in consecutive phases adding labor, time and waste to the winemaking process. With Pall's new Oenofine XL Filtration System, wineries can now combine these operations into a single cost saving process step.

Traditional Protein Stabilization

Bentonite fining is the current industry standard for protein stabilization of white wine. While the traditional method is effective, the settling time, labor and handling, and waste associated with the existing process can add significant costs and limit a winery's overall capacity.

Bentonite, being negatively charged, can bind positively charged proteins in wine to prevent precipitation in the bottle. Although bentonite reaction time occurs almost instantaneously, wineries will typically allow days of settling prior to downstream processing. Long settling time generally improves filterability and is even a requirement for some membrane filtration systems, however, on the other hand, it can also be viewed as unfavorable due to protein discharging from bentonite platelets.

Additionally depending on the type of bentonite, the lees volume after treatment can range from 2 to 10 % leading to high waste disposal volumes or the necessity to implement further labor intensive and quality reducing steps to recover more wine.

Wine Clarification

After protein stabilization, filtration is typically carried out to remove suspended solids and further prepare the wine for additional steps prior to bottling. Various methods of filtration may be employed. Diatomaceous Earth (DE) and sheet filters are the more classical filtration technologies and may be combined or used in multiple stages to achieve the filtrate quality requirement.

In recent years, crossflow filtration systems have become a widespread cost saving alternative to the traditional filtration techniques. Crossflow filtration eliminates the use and disposal of filter aids, has low water and energy consumption and provides consistent wine quality with minimal preparation and labor.

With many modern crossflow systems bentonite can cause irreversible fouling or abrasive action on the membrane surface which can ultimately jeopardize membrane integrity.

Pall's newest development, the Oenofine XL system, overcomes these obstacles. Proprietary activated bentonite is dosed upstream of the hollow fiber membranes resulting in single step protein stabilization and clarification. The Pall Oenofine XL system enables wineries to reduce bentonite consumption, eliminate settling time after bentonite fining, and reduce wine waste and lees volumes. Additionally by reducing the turn around time for fining and filtration, wineries can even increase their total production capacity.

Figure 1: Oenofine XL Dosing Skid

Figure 2: Oenofine XL Base System

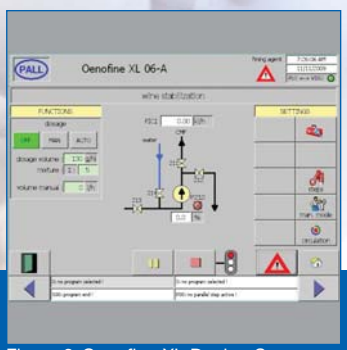

Figure 3: Oenofine XL Dosing Screen

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Unique Bentonite

Pall's calcium-sodium bentonite, the BXF range, is designed specifically for protein stabilization of wine in conjunction with the Oenofine XL system. The BXF products have a well-defined particle size distribution enabling wear-resistant and gentle application with membrane systems. The bentonite particles are below 100 microns and less than 0.5 % greater than 45 microns. See Figure 4 for BXF series bentonites under the microscope.

BXF-FINE ACTIVE has a purity and composition that results in a highly reactive product which can reduce bentonite consumption by up to 30 %. The bentonite is in conformance with the European Directive (EC) 96/77, E558 Bentonite, and the Oenological Codex (OIV) Resolution 11/2003. To meet stricter regulations on sodium level, BXF-FINE provides an option that also conforms to the German wine legislation.

For selection of the appropriate BXF series and information on specific national legislation or regulations, please consult your local Pall representative.

Proven Membrane

At the heart of the Oenofine XL system, is a Pall hollow fiber membrane that has been proven in wine clarification applications for over 10 years. Developed specifically for wine use, the membranes have negligible impact on wine characteristics and the capacity to handle high solids. Constructed from robust polyvinylidene fluoride (PVDF), the symmetric membrane permits high flow performance and long filtration runs without irreversible plugging.

The Oenofine XL membranes' high mechanical strength ensures wear-resistance when exposed to typical wine contaminants like fining agents, crystals or solids left over from upstream processing which other hollow fibers cannot tolerate. When coupled with the capability to backflush, the Oenofine XL modules demonstrate high solids operation and long service life making them ideal for the combined stabilization and clarification task.

Additionally at 21.5 m^2 of filter area, the PVDF modules have more than twice the filter area of competitive hollow fiber clarification modules. The high flow modules enable compact and economical systems.

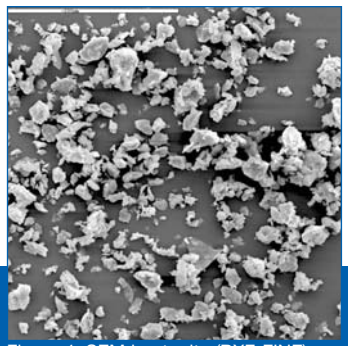

Figure 4: SEM bentonite (BXF-FINE)

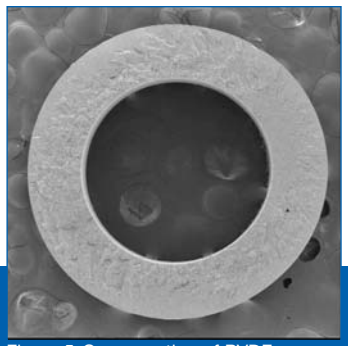

Figure 5: Cross section of PVDF membrane x40

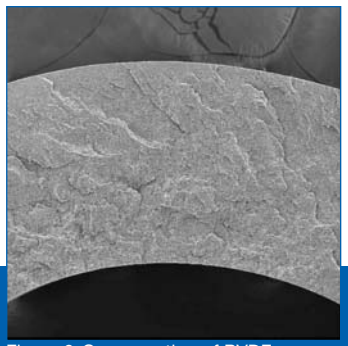

Figure 6: Cross section of PVDF membrane x150

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Single Step Protein Stabilization and Clarification

Flexible System Design

The Oenofine XL system is a fully automated crossflow hollow fiber system available from 6 to 18 modules. A small dosing skid allows automatic control of the bentonite addition for stabilization. As an option, Pall can provide a dosing tank and supplementary skid for solids evacuation and system storage in the case of a power failure. Additionally, the flexible software enables wine clarification without stabilization, similar to Pall's Oenoflow XL systems.

The typical average performance over 4 to 6 hours of operation is as follows:

Oenofine System	Flow Rate	
	Wine Stabilization	Wine Clarification
XL-6A	65 hl/hr	50 - 105 hl/hr
XL-8A	86 hl/hr	65 - 140 hl/hr
XL-10A	108 hl/hr	85 - 172 hl/hr
XL-12A	130 hl/hr	105 - 205 hl/hr
XL-14A	150 hl/hr	120 - 240 hl/hr
XL-16A	172 hl/hr	135 - 275 hl/hr
XL-18A	195 hl/hr	155 - 310 hl/hr

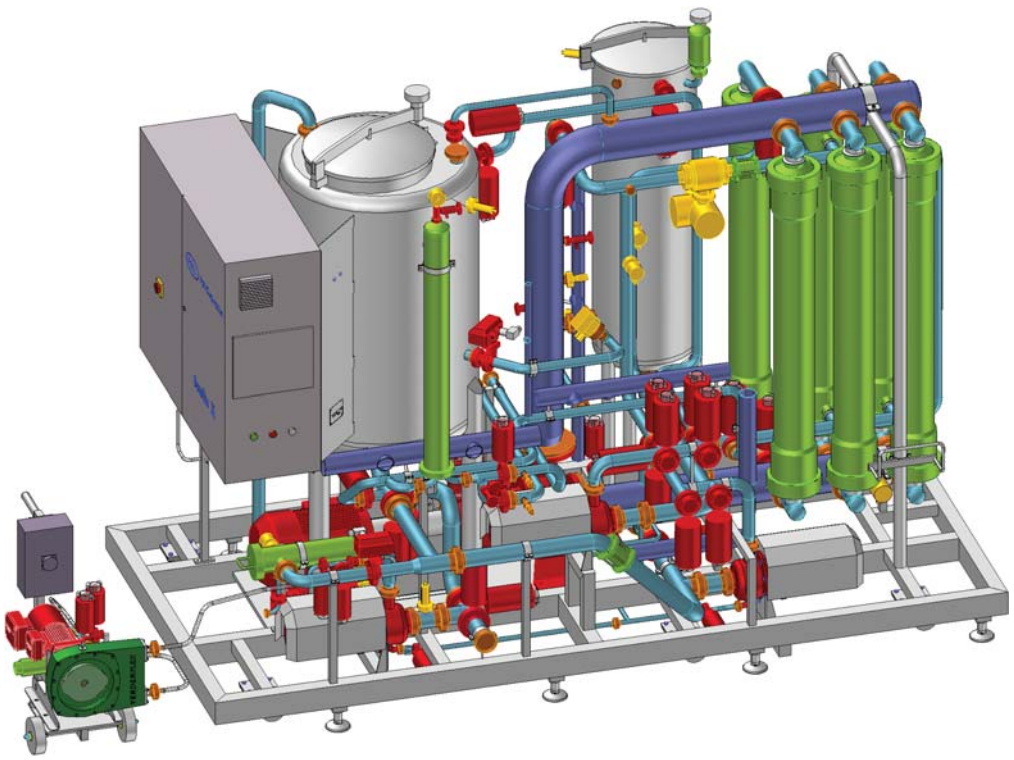
Pall offers a wide range of customizable options including but not limited to:

- A dosing tank
- A supplemental support system (for power loss)
- Low Concentrate Volume (LCV) (for Clarification only)
- Dual Pre-filter screens
- Nitrogen purge and blanketing
- Tank Distribution System
- An on-line turbidity meter

Our wine system specialists are available to assist in selection of the appropriate system and options.

Quality and Maintenance

The Oenofine XL system utilizes components with proven reliability from well-known, industry-accepted manufacturers. This allows for convenient supply of spare parts anywhere in the world.



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Providing Sustainable Value

By increasing yields, reducing waste volumes and combining process steps, the Oenofine XL systems provide wineries with a cost saving sustainable alternative to traditional wine stabilization and clarification methods.

Oenofine XL System Benefits

Cost Savings

- Combined stabilization and clarification steps
- Reduced waste and wine lees volumes
- Reduced labor and handling

Sustainability

- Reduction in solid waste for landfill
  - Up to 30 % less bentonite consumption
  - No filter aid (DE) requirement
- Up to 50 % reduction in energy and water consumption
- Higher yields, lower product loss
- Eliminates exposure or inhalation of potential carcinogen (DE)

Brand Protection

- Consistent filtrate quality with Pall's proven PVDF membranes
- Data monitoring and process trend recording
- Food contact compliance

Creating Value

- Eliminates settling time after traditional protein stabilization
- Increases winery turn-over or tank space capacity
- Flexibility to use for clarification only

ENABLING A GREENER FUTURE

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Pall Corporation has offices and plants throughout the world. For Pall representatives in your area, please go to www.pall.com/contact

Please contact Pall Corporation to verify that the product conforms to your national legislation and/or regional regulatory requirements for water and food contact use.

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