

# Cross-flow lees filter experience delivers efficiency and economy at Yalumba

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Recovery of wine from lees represents one of the most challenging forms of filtration faced by wineries. The high concentration and variability of the suspended solids limit the suitable filtration technologies, while strict environmental regulations and sustainability programs are increasing pressure to reduce waste volumes.

Traditionally, lees filtration is performed with filter aid based systems like rotary vacuum drum (RVD) or chamber press filters. While these systems typically have good volumetric recovery of the wine from the solids, there are some inherent drawbacks that can affect wine quality. The open design allows for oxygen pick-up and the recovered wine often needs further processing. The wine is typically downgraded in value and used in blends instead of added back to the original batch.

The classical technologies also require large volumes of diatomaceous earth (DE) or perlite filter aids. This increases the winery waste, disposal, labour, and wine losses; all factors contributing to high operating costs.

To overcome the limitations of the existing filter aid-based lees systems, The Yalumba Wine Company was one of the first wineries to adopt the latest development in cross-flow filtration.

The new technology utilises the same hollow fibre membranes proven in wine clarification applications over the past decade, however, for lees processing the hollow fibres have a wider inner diameter so that they can process higher solids. With implementation of Pall's Oenoflow™ HS system, the Barossa Valley winery can recover higher quality wine from lees more efficiently and economically.

## Why change?

The Yalumba Wine Company has been exploring options to remove earth filtration from its winemaking processes. In the past six years, Yalumba has managed to remove all DE filtration and, now with the incorporation of Pall's Oenoflow HS system, it has been able to further reduce its reliance on perlite filtration for wine lees. In its strive for sustainability, Yalumba approached this objective holistically, ensuring that the move was advantageous for all areas of the business including wine quality, the environment, operational efficiency, occupational health and safety, as well as financially.

The change reflects Yalumba's winemaking philosophy, says head of winemaking Louisa Rose.

"Some years ago the Yalumba winemaking team set themselves a goal to eliminate diatomaceous earth, and similar media from the winery processes," Rose said.

The goal, she says, was important for a number of reasons:

- environmental issues are always at top of mind, and earth usage from both an input and waste point of view was never ideal
- the cost of earth and other filter media such as lenticular cartridges was a large part of the company's consumables' budget
- perhaps most importantly, Rose says they believed that using the associated filtration technologies significantly reduced the quality of its wines, stripping or absorbing flavour and texture into the media.

"At Yalumba we have a strong minimalist additive philosophy, and use almost no fining agents in our winemaking; earth just didn't fit this model," she said.

"Cross-flow filters have enabled this goal to be realised, and the high solids lees cross-flow filter has been the icing on the cake.

"No longer do premium quality lees and juice bottoms end up at the bottom of the quality chain. The quality in many cases is almost as good as the clear wine, and they are often recoverable back into the product they came from, or similar."



Figure 1. Pall Oenoflow™ HS 24-A in operation at the Yalumba Wine Company

## Project implementation

Yalumba operates two wineries in the Barossa Valley, The Yalumba Winery at Angaston, and the Oxford Landing Winery in Nuriootpa. Yalumba installed the Oenoflow HS system to process lees from both sites.

During vintage, the system is used at the Angaston winery, where it processes cold-settled white juice bottoms, as well as any lees that are available to be processed. Once the majority of white juice bottoms have been processed, the filter is then relocated to the Oxford Landing Winery, where it continues to process the lees from both sites. By relocating the unit, the transport volumes from each site are minimised while maximising the availability of the unit.

Between April and June 2010 as compared to the previous year with the RVD filter, with implementation of the new wide-bore hollow fibre system, Yalumba was able to eliminate the purchase of 30 tonne of perlite for lees processing and reduce their solid waste of "spent earth" volume by 175t.

Considerable improvements in filtrate quality and consistency have also been realised. In the past with the RVD, recovered white wine turbidity generally ranged from 10-50 nephelometric turbidity unit (NTU), while red wines had higher turbidity and frequent wine solids carry-over. Yalumba ►

had seen some red wines post-RVD filter with turbidity in excess of 800 NTU. With the Oenoflow HS system, recovered wine turbidity is consistently less than 1 NTU.

## Recovering wine at a higher value

Economically, the greatest benefit realised with the high solids cross-flow filter is the reclaiming of wine from the lees back into the original product. Instead of being downgraded, the recovered wine is at the bottling specification for turbidity and micro-organism level. This means that from a processing point of view, it will not have any negative effects when added back to the original batch. Oxford Landing winemaker Matt Pick described the addition of the lees recovered material as “adding complexity and texture from yeast derived characters back into the wine”.

Tables 1 and 2 show the results of white and red wine lees filtration trials at another winery, comparing the untreated lees to filtrate from both an RVD and the Oenoflow HS system.

Between April and August 2010, the Yalumba Angaston site recovered 108 kilolitres of wine from lees with a total value \$168,000 higher than would have been obtained by RVD filtration, because of the higher quality of the cross-flow filtered wine.

## Operational advantage

The Oenoflow HS system is fully automated, allowing the solids concentration within the system to be accurately controlled to achieve long run times. On some batches of white wine fermentation lees, by automatically controlling the bleed, the filter operated in a steady state condition, with no degradation to flow or change in the solids concentration, enabling run times of over 48 hours, limited only by the volume of material to process.

The combination of the cleaning system and flow-path on the filter removes the fear of irreversible blockage of the fibres. The flow through each module is from the bottom up facilitating an easy discharge of solids at the end of each batch. This enables the filter to handle wine solids and bentonite to high concentrations without difficulty.

The filter has also been used for standard post-fermentation and racking cellar filtration at the Oxford Landing Winery, expanding the filtration capacity of the site. The filter is able to operate unmanned over weekends as it is connected to the site's SCADA system for remote monitoring. This enables an additional 35% operation time

**Table 1: Trial with white wine lees**

Analytical Parameter	Untreated Lees	RVD Filtrate	Oenoflow HS Filtrate	Oenoflow HS Retentate
pH	3.26	3.3	3.31	-
Total acidity (g/l)	5.71	4.95	5.48	-
Volatile acidity (g/l)	0.23	0.18	0.21	-
Tartaric acid (g/l)	2.1	2.0	2.0	-
Malic acid (g/l)	2.1	1.7	1.8	-
Lactic acid (g/l)	0.5	0.3	0.4	-
OD 420 nm	0.05	0.051	0.05	-
Oxygen (ppm)	1.2	4.3	1.6	1.5
Turbidity (NTU)	-	19	0.5	-
Suspended solids (%)	32	0	0	80

Comparative figures must be validated on an individual application-specific basis. Variation will occur based on individual conditions.

**Table 2: Trial on red wine lees**

Analytical Parameter	Untreated Lees	RVD Filtrate	Oenoflow HS Filtrate	Oenoflow HS Retentate
pH	3.41	3.45	3.46	-
Total acidity (g/l)	5.11	4.86	5.02	-
Volatile acidity (g/l)	0.36	0.35	0.38	-
Tartaric acid (g/l)	2.0	2.0	2.0	-
Malic acid (g/l)	<0.2	<0.2	<0.2	-
Lactic acid (g/l)	1.5	1.5	1.6	-
Intensity	5.27	6.22	5.99	-
Tonality	0.76	0.68	0.69	-
Anthocyanins (ppm)	335	348	345	-
OD 420 nm	2.27	2.52	2.44	-
OD 520 nm	3.00	3.70	3.55	-
Oxygen (ppm)	1.2	4.9	1.3	1.5
Turbidity (NTU)	-	18.9	0.6	-
Suspended solids (%)	8	0	0	80

Comparative figures must be validated on an individual application-specific basis. Variation will occur based on individual conditions.

during the weeks when it is utilised. Additionally by using the system for filtration prior to the bottling membranes, Yalumba has reduced the number of lenticular housings and consumable cartridges required for pre-bottling filtration.

## Environment and safety

Environmental impact and employee safety are both vital considerations for The Yalumba Wine Company.

Rose says the complete removal of earth filtration from its

## Correction

Regarding an article published in the November 2010 issue of *Australian & New Zealand Grapegrower & Winemaker Journal* titled 'Industry accepts cross-flow filtration technology'. Della Toffola Pacific accepts that statements it provided relating to the 4000sqm of surface area were incorrectly completed. The article should read that Della Toffola have installed the most widely used 'ceramic' cross-flow filtration media in Australia, distinguishing that PALL Australia has significantly more than 4000sqm of cross-flow media when compared to Della Toffola in Australia.



winemaking process was a three-prong approach, as it supported quality, environmental and safety concerns simultaneously.

Yalumba had already shifted completely from DE use, eliminating it through use of cross-flow membrane technology for all general cellar clarification. The RDV filters, however, still used perlite, and while being less hazardous from a safety point of view, it must be controlled tightly through the HACCP and wine processing aids approval system. Respiratory protective equipment is required for operators handling the perlite. There is also a significant environmental impact, as the perlite must be mined and then appropriately disposed.

The Oenoflow HS system eliminates the need for personal protective equipment for the lees process. There is no dust, which upon inhalation can lead to respiratory issues. Also, when chemically cleaning with the automated cross-flow system, the operator can select the appropriate cleaning cycle and then leave the area. For chemically cleaning the RDV filter, the operator needs to be present.

## Summary

Yalumba cellar supervisor and lees cross-flow trainer Rob Bondfield says the new filter has delivered welcomed changes.

“After spending some time running the Oenoflow lees filter and learning what to look

out for regarding solids percentage, varying flow rates, pressure differentials, etc, I believe it’s made a huge difference to our quality and efficiency of lees filtration,” he said.

“We no longer have to downgrade our lees filtrate because what we are filtering is of the same quality as the free run. We also don’t have the problem of using perlite or DE on the rotary drum and having to dispose of the waste.

“The other advantage we have found is that the NTU coming out of the crossflow filter is 0.2-0.4 which has vastly improved our final filtration.

Bondfield also praised the user-friendly aspect of the units touch screen and navigation tools.

“Purchasing this filter has improved all areas of our lees recovery which, in turn, can only assist in making better wines for our company.”

While Yalumba will continue to work on increasing the proportion of solids in the retentate and the filtrate recovery, they are at the forefront of innovation with an application that has sustainable benefits for so many parts of the business, improving wine quality, reducing environmental impact, providing a safer work environment, all while improving the financial recovery of wine lees products.

## Special thanks to

### Yalumba

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