Oak barrel selection and use at Nepenthe Wines

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Introduction
Nepenthe Wines Pty Ltd is a small producer of premium wines based at Lenswood, in the Adelaide Hills, South Australia. The winery was established in time for the 1997 vintage, and while initially designed for a maximum crush of 500 tonnes, plans have been developed that would see the facility process substantially more, subject to approval from the relevant authorities.

The plant and equipment used in the winery were chosen to allow flexibility in winemaking processes, and easy expansion of processing capacity. Small batches of wine may be made if required (as low as 0.5 t in the case of red wines, which yields approximately one barrel of wine). The winery’s design also facilitates the relatively efficient production of larger, commercial batches.

The winery was designed specifically for the production of premium red and white table wines, many of which incorporate the benefits of small oak vessels in the winemaking process; i.e. the contribution of oak flavour, aroma and tannins; controlled aeration; retention and manipulation of microbiological lees and controlled maturation.

The wines made with oak influence are listed in Table 1. The cost of oak barrels is the most significant annual capital expense in the winery’s budget, even in the period of heavy investment in long-term items such as stainless steel tanks and barrel sheds which are required to increase the working capacity of the winery in its early years.

Why spend a significant sum of money on oak barrels?
Quite simply, the money is well spent if the influence of the oak and maturation period is perceived positively in the finished wines. We seek wines that show their regional and varietal integrity, with intensity, length and structure, and the capacity to age in the medium- to long-term. They should also show complexity and subtlety; to that end the oak influence should always be a contributing, not dominant, component of the wine.

A large proportion of the independent reviews of our wines, white and red, confirm that oak is perceived to be present but not dominant; comments from a large number of critics have focused on the ‘classy’, ‘stylish’, ‘subtle’, ‘delicately nutty’, ‘well-balanced and integrated’ and ‘sensitively handled’ oak characters present. We see such descriptions as evidence of the merit of investing in high quality oak, as this investment translates into a positive perception of our wines and winemaking techniques by the trade and consumers (which should translate into steady sales at premium prices).

What specific characters are we seeking in our barrels?
Our focus is on gaining an oak influence that is perceived as much or more on the palate, than on the nose. Effects of increasing length, structure, richness and tannin are as important as the characters that can be detected and described as part of the flavour and aroma of the wine. However, the overt flavours and aromas associated with new oak barrels are also important, and those sought from individual barrel types are listed below:

- French/Russian oak: toast, grilled nuts, char, coffee, mint, sweet vanilla, mid- to late-palate tannin;
- German oak: intense spice (clove, cinnamon), coffee, toast, length of oak flavour, and
- American oak: caramel, butter, nuts, vanilla, sweetness, subtle coconut.

We perceive some aromas and flavours negatively, and select cooper who we believe deliver a minimum number of barrels with the following characters (note that this is not an exhaustive list):

- overt woodiness (as distinct from oakiness); often described as sawn or plank-like;
- pencil shavings;
- hessian;
- resinous;
- dusty;
- sappy or green;
- overtly smoky; and
- overtly astringent.

Table 1. Wine styles made at Nepenthe with oak influence

<table>
<thead>
<tr>
<th>Variety</th>
<th>Proportion in oak and treatment regime (approximate, %)</th>
<th>Period in oak (approximate; months)</th>
<th>Recommended retail price ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sauvignon blanc</td>
<td>10: fermented &amp; matured</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Semillon</td>
<td>70: fermented &amp; matured</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>Chardonnay</td>
<td>100: fermented &amp; matured</td>
<td>11</td>
<td>27</td>
</tr>
<tr>
<td>Pinot noir</td>
<td>100: matured</td>
<td>11</td>
<td>27</td>
</tr>
<tr>
<td>Bordeaux family red</td>
<td>100: matured</td>
<td>18</td>
<td>30</td>
</tr>
<tr>
<td>Zinfandel</td>
<td>100: matured</td>
<td>15</td>
<td>40</td>
</tr>
</tbody>
</table>
What do we have in 1999?

Our oak purchases over the past three vintages have been made from several cooper, and include a diverse range of products from these suppliers. The variation in cooper and oak origin reflects the early stage of our process of evaluation of the suitability of barrel types to our wines, and the perceived high variability in style and quality of products from all suppliers.

Our current policy is to purchase approximately 70% of all of our needs from one principal supplier, with varying quantities from other cooper making up the balance. Current suppliers include Seguin Moreau, Sirugue, Schahinger, Remond, Taransaud, Nudalié, François Freres and Cadus. The list of suppliers is subject to change as we evaluate their barrels. We have purchased barrels from several other cooper and not made follow-up orders.

The choice of purchasing a large proportion from one major supplier reflects the conclusion of several research projects, including the ‘The Oak Project’, conducted by The Australian Wine Research Institute (Sefton et al. 1993; Sefton 1991; Spillman et al. 1996; Spillman 1994). These studies showed that the characters of any set of barrels is significantly affected by the cooperage and seasoning practices, rather than the origin of the oak. Accordingly, it is logical to buy from one supplier who provides barrels with desirable characters. We buy from other cooper in the pursuit of complexity (to have barrels with a range of styles and flavours), and to protect our supply base. This is important in the current environment where several suppliers have limited production capacity and have ‘closed their books’ to new customers.

We use only 225 or 228 L barriques or pièces. Most are ordered as ‘medium toast’ or the individual cooper’s variation thereof; a small proportion are ‘medium plus’ or ‘heavy’ toast. Few have toasted heads, although we may choose to purchase more barrels with this extra toasting in future. Inspection of the degree of colouration and blistering of the inside of the new barrels shows that there is significant (and, we believe, undesirable) variation in the visible extent of toasting between cooper and within several barrels from individual cooper.

The proportions of barrels used are as follows:

- French oak 76%,
- Russian oak 10%,
- American oak 8% (of which, approximately 80% used for red wine); and
- German oak 6% (of which, approximately 80% used for white wine).

At this stage the policy is to keep the barrels up to a maximum age of 6 years, although some are sold before this time, and others are kept for a longer period. There is no policy regarding regular shaving or re-firing; generally only those barrels which have detectable volatility after a period of being stored empty are subjected to this process. A relatively large proportion (~20%) of new barrels are used for white wine for one or two fills (usually including fermentation of the wine) before being converted to use for red wine. We have also been purchasers of used, red French oak barrels from selected sources in an attempt to maintain a balance between new and used oak, as we have not yet grown to the extent that we generate enough old oak of our own.

Most French oak is ordered according to designation of origin, e.g. Voges, Tronçais and Allier; and a smaller proportion is comprised of cooper-specific style or varietal blends such as ‘Burgundy’, ‘Chardonnay’, ‘Pinot Noir’ and so on. The focus on region reflects our uncertainty regarding the suitability of specific oak styles to individual wines. We are also cynical that artisan cooper based many thousands of kilometres away, (who certainly have never tasted, for example, our two vintages of Pinot Noir), have any concept of which staves are best suited to it. We believe that we will have to undertake extensive tasting over many vintages to determine which oaks or blends are the ‘best’ for our individual wines—if such a thing actually exists. To assume that this selection process can be carried out by the cooper’s staff is unrealistic.

This cynicism is in part due to the observation of significant variation between oak types, whether designated as a regional or blended product. We attribute this variation to:

- the character and quality of individual staves;
- the cooperage practices (such as degree and extent of toasting);
- the character and quality of fruit from block to block and vintage to vintage;
- wine composition (especially the concentration of sensory components such as aldehyde, volatile acidity, alcohol, tannin, acidity, H₂S, CO₂);
- cellar practices (e.g. a move to greater use of grape solids in fermentation and maturation); and
- tasters’ expectations, experience and performance (our own subjectivity).

Barrel use

Pre-use preparation

AII new barrels are cursorily inspected when unwrapped, and any external damage noted. A ny with critical defects (such as broken staves) are rejected. This is extremely rare. Each barrel is then subjected to a rinse/pressure test regime that involves placing approximately 10 L of hot water (~50°C) in the barrel, sealing with a silicon bung and rolling/agitating through one full circle. The pent-up pressure quickly reveals most major leaks such as worm holes, porous staves and porous joints. These are then addressed before the barrel is filled, by the use of a hammer and hoop driver, spiles, pegs or wedges. The rinse water is left in the barrel for no more than two to three minutes before being drained: at this point a sample is taken from every barrel, for evaluation by the winemaking staff. This serves to reveal any taints, such as mouldiness, and provide insights into the character of the barrel: dusty and smoky characters are particularly evident in the warm water, which is also frequently quite tannic.

A proportion of the barrels is inspected using a small-diameter safety light that can pass through the bung hole. The aim of this inspection is to observe the extent and variability of toasting. While of very limited value in discussing toasting with cooper, it is nevertheless considered a useful adjunct to tasting in monitoring the evenness of this important cooperage practice. Barrels are rinsed and inspected on the day of filling. It is considered important that damp barrels are filled within a period of several hours.

A ccess and storage

AII barrels are kept on ‘high-profile’ racks that provide a gap of approximately 300 mm between bilge and bung. This facilitates fork-lift movement of barrels from warm to cool controlled temperature storage (for example, to assist malolactic fermentation), and allows access for tasting, topping, stirring or additions. Climbing on barrel stacks is inherently dangerous, and to avoid the practice we use A-frame step-ladders with a stable platform at 2.4 m from floor-height. The ladders are equipped with castors for mobility. The
stacks are up to four racks high. All barrels are sealed with silicon bungs; inverted empty bottles or silicon 'breather bungs' are used to close the bung hole of barrels containing actively fermenting wine.

Topping and stirring
Topping is undertaken with a pressurised 20 L stainless steel beer keg, beer line and tap, or small jugs for small quantities. The frequency of topping varies from 14 to 28 days, depending on the composition and nature of the wine (e.g. with respect to progress of MLF, concentration of SO₂), and the temperature at which it is being stored.

Stirring of wines on yeast and bacteria lees is undertaken using a 90° configuration pneumatic drill, that gives relatively easy access to the bung hole while the barrel is in place on the rack. A stainless-steel pivoting propeller-style mixer allows thorough mixing of the barrel's contents in approximately 30 seconds. The use of the pneumatic drill gives the added benefit of better safety when compared to using 240 V electric cables in proximity to metal racks with relatively sharp corners.

Washing after use
Due to the requirement that we remove all waste-water from the winery site and pay for its transport and treatment, it is important that an efficient washing technique is used at Nepenthe.

We use a diesel-fired high-pressure cleaner capable of providing water at 100°C, with a Gammajet Barrel blaster cleaning head. The blaster has three nozzles, which ensure that it completes a 360° cycle more quickly than if it had two; and uses approximately 15 L water/minute at 700 psi. It is mounted on two small legs that allow it to be placed in the bung hole of an inverted barrel while still on the rack; our system is to take the washer to the barrel, rather than the opposite, which requires constant use of a fork-lift. If the barrel stack has been broken down to individual racks, one person can easily empty and wash barrels continuously. Racking from barrel to barrel requires two people.

The washing system results in visually clean water running from an average barrel that has been racked off yeast lees in approximately 60 seconds. This time of washing does not remove all tartrate deposits. The normal wash cycle used is two minutes at 60°C, which removes all traces of lees and a significant proportion of any tartrate present. Full tartrate removal is achieved with 80–90°C for three to four minutes.

Storage when empty
Empty barrels are generally washed thoroughly as described above, allowed to drain for several hours, and then approximately 5 L of an acidified SO₂ solution is added. The solution consists of (per barrel) approximately 20 g potassium metabisulphite and 20 g tartaric acid, dissolved and added separately for safety reasons. The barrels are stored on their heads, so that the water keeps the chime joint wet, and rolled from one head to the other intermittently, as often as possible. The period between being rolled varies from one to, at a maximum, four weeks, and at each occasion the bung is removed from several barrels and the interior gas sniffed carefully. If no SO₂ is evident, the solution is drained, the barrel re-washed, and the solution replaced.

While this system has been used to keep barrels sound for as long as six months, we do not think having barrels empty of wine for more than a month is a desirable practice. We rarely 'lose' a barrel to volatile spoilage, but poor discipline in regularly rolling and checking the barrels would certainly result in a proportion developing volatility.

Record keeping
The Nepenthe record system assigns each barrel an individual number, and logs the use of that barrel since its first fill. The record is kept on an in-house spreadsheet that allows easy searching of barrels by many criteria, including cooper, oak origin, toast level, current and past contents, etc. Its most powerful feature is the ability to enter results of tastings and then sort barrels by wine quality grade, which instantly reveals trends in oak source and type—a valuable tool in determining if a particular oak 'treatment' (such as toast level or oak origin) is correlated to quality. The ability to see at a glance the history of a barrel is also useful, and allows lesser quality barrels to be filled with appropriate wine—or disposed of by sale or destruction.

Conclusions
Quality oak barrels are an expensive but essential input to our wines—an input that can yield large dividends in the marketplace through positive enhancement of the wine. They must be managed in such a way as to maximise their benefits and longevity. Their use is labour-intensive and thus inherently inefficient, and to some extent efficient use is inconsistent with quality winemaking practices. Careful winery design and cellar practices can improve efficiency of use while preserving the flexibility required to maximise quality. While the practices described in this paper represent our preferred techniques at present, we would change all or any for a demonstrably better one.

The choice of barrels is almost as important as determining the harvest date in small-scale winemaking, where blending and culling options are often limited by practicality or cost considerations. While individual winemakers' preferences are critical in the selection process, it is important that the inherent subjectivity of selection is reduced by the use of repeated blind tastings, and several individual opinions.

Finally, the basic principle of our selection and use policies is dictated by the finished wine: the identity of the cooper, source of oak, toast level, winemaking treatments employed etc. are of no relevance when the wine is assessed. The best barrels must be selected on merit, not bias, price or sentimentality.

References