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This extract is taken from an article published in the Wine & Viticulture Journal – November / December 2012

Humidification – keeping more of the angels' share in the barrel

By Cathy Howard

Winery humidification technology could help Australian wineries to keep more wine in the barrel and, in turn, profits up.

Any wine lost during the production process is a loss in profit. At various points in the winemaking process we lose wine volume, and at each of these points we strive to minimise those losses. Apart from the occasional and unforeseen human error in the cellar leading to a wine loss, we lose wine through carrying out routine operations such as transfers, filtration and bottling. We also lose wine through evaporation during storage in oak barrels, sometimes referred to as 'the angels' share'. **This loss can be as high as 9 percent** depending on the conditions in the cellar (temperature and humidity), and the length of time the wine is stored in the barrel.

To manage this evaporation loss and to maintain wine quality by minimising the ullage in the barrel, we replace or top up this lost volume regularly with wine of similar quality. This is a significant added cost to production, not only because of the wine volume that has been lost, but also due to the cost per litre of the replacement topping wine, as well as the labour costs incurred when carrying out the barrel topping operations.

So, what can we do to reduce this volume lost to evaporation, and minimise its effects on our production costs, while still retaining the wine quality benefits of maturing our wines in oak barrels?

Temperature control in the barrel hall is important, particularly in Australia with our relatively mild winters and warm summers. Many wineries use insulated, air conditioned areas to store their barrels. At Whicher Ridge, we store our barrels stacked three cradles high in an insulated, air conditioned, high roofed, corrugated iron building, with a floor area of 7 metres by 9 metres. The air conditioner runs as required during summer and into autumn, to keep the ambient temperature in our barrel room down to around 18°C.

Our Cabernet Sauvignon and Shiraz stay in barrel for up to 24 months, and our Sauvignon Blanc and Chardonnay stay in barrel for 12 months. We have a total of 40 barrels, which we routinely top up every six to eight weeks. On average, during the cooler months, we have an average topping volume per 225-litre barrel of 1-1.5L. In the warmer months this is closer to 2-2.5L/barrel. This equates to a loss in volume per barrel of 5% per year. For our reds, this is 10% over the two-year period that the wines are maturing in barrel.

What about controlling the humidity in the barrel room? High humidity minimises the evaporation of wine through the wood because the moisture is available from both sides of the barrel wood, and a relative humidity of around 85% is considered ideal.

Misting uses the basic principle of flash evaporation. Water is pressurised to 1000PSI via a pump, then forced through specially designed brass and stainless steel nozzles, where it is atomised into millions of ultra-fine water droplets. The droplets of water flash evaporate when they come into contact with the air, absorbing the heat in the air without any wetting of floors or surfaces.

Water lines are generally run along the roof and spaced appropriately, with the nozzles spaced depending on the ambient humidity conditions in the room. The nozzles are angled at 90° to the floor, and mist across the barrels. A humidity sensor probe is positioned in the centre of the room. The relative humidity levels are controlled electronically by a programmable humidistat. The desired conditions are programmed into the humidistat, which controls the pump module operation. The controller is set for the minimum humidity required, and is generally programmed at 85% for barrel rooms. Based on this information, the humidifier will operate until the sensor reaches the humidity required. Humidity spikes are eliminated **and losses through evaporation can now be contained to approximately 2%.**

Air in the barrel hall must be circulated to get around every barrel to prevent mould growth, and the fans must run all of the time that there is moisture being put into the hall. The air conditioning system already in place in the barrel hall would be able to carry out this function. Mould generally grows where the wood is damp, and a relative humidity of 85-90% in a breezy atmosphere is not conducive to the formation of mould.

Another requirement is that the barrel room is as well sealed as it can be, to prevent the loss of a chilled, humidified atmosphere. How much will a humidification system cost? For larger barrel halls, the compressed air and water humidification systems would be \$15-20,000 for the equipment, plus installation costs. Smaller systems running with a high pressure pump would start at \$3000, plus installation.

Once installed, the running costs include electricity and water use charges. Winery operators would have a feel for the costs of running the refrigeration system, while the humidifier system costs are the water, and the electricity to run either the air compressor or the high pressure pump. System maintenance is fairly standard, as nozzles do not usually block unless the pre-filtered water being used has high calcium levels.

As part of my research for this article, I did some quick calculations for Whicher Ridge Wines. The total volume of topping wine that we used over the past year in our 40 barrels was 490L, and this equates to a rate of loss per barrel of 5% per year. If I work on our topping wine being valued at \$4/L, this loss equates to \$1950 per year.

If I then look at our labour costs, we would spend around six hours every six to eight weeks carrying out barrel topping operations, including set-up and cleaning. If I conservatively value our time at \$30/hour, this is equivalent to \$300 per topping operation, which equates to labour costs of \$1800 per year. If we can reduce the volume of wine we are losing from evaporation down to 2% per year, we would be saving \$1150 in topping wine costs per year, and if we carried out four topping operations a year instead of six this would save us \$600 a year. A total saving in the first year of \$1750, and on a system that would potentially cost us \$3000 plus installation, **would pay for itself in two years.**

We are only a small operation, and currently we do all the cellar work ourselves. **In medium to larger wineries, a reduction of 50% in the wine volume losses through evaporation combined with the substantial savings in labour costs due to carrying out less barrel topping operations, could lead to a humidification system paying for itself within the first year.**

Conclusions

Any wine lost during production is a loss in profit, and losses due to evaporation during barrel maturation are no exception. Humidification of the air in the barrel hall can significantly reduce this loss. **There will be significant savings in production costs, which will pay for the humidification system in a short period of time, and these savings continue over time, every year after installation.**

Humidification systems do not lead to the pooling of water on the floor and mouldy damp barrel surfaces. The ultra-fine mist droplets totally evaporate when they come into contact with the air, absorbing the heat in the air. The humidification of barrel halls complements the existing refrigerated cooling systems, as they replace moisture removed by the refrigeration process. The air movement provided by the cooling system fans further assist the barrel surfaces to remain dry. Another benefit that has not been discussed in this article is the improvement in storage conditions for empty barrels, both new and used.

Cathy Howard is winemaker and, together with husband Neil, proprietor of Whicher Ridge Wines, near Busselton, in Western Australia, and has been making wine for the past 18 years. She also consults part time to some wineries in the Geopraphe region.

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