

Gavin Water-saving initiatives to reduce water use in wineries and getting smarter with water sourcing in the face of climate change.

A knowledge exchange to the Great Wine Capital of Adelaide, South Australia

Executive Summary

The wineries visited in the Great Wine Capital of Adelaide provided a number of ways to help save water use in a winery context. Refinement to cleaning practices and chemical reuse was one area where significant amounts of water can be saved. New technologies and automation auto allow for smaller quantities of water to be saved as variabilities in water use can be eliminated.

With the effects of climate change becoming more pronounced, methods of ensuring the security of our water supply must be investigate to safeguard the wine industry and the region as a whole. Investigating water sourcing solutions which wineries in the wine regions surrounding Adelaide are using, notably rain water harvesting and storage, it was found that there could be great potential to come away from Hawke's Bays current dependence on ground water. Although not directly linked to winery water, securing a more diverse set of water sources for irrigation and other vineyard water needs is required in the future. The water recycling program used in Adelaide to supply irrigation water to McLaren Vale is one way that we could look to increase water availability in a vineyard setting, thus taking pressure of sources needed for potable winery process water.

Context

The world is a constantly changing place and the Great wine capital of Hawke's Bay is no different. Climate change is here and with it comes some big changes to our climate. Sourcing of water from our rivers and our ground water is set to become more difficult as the effects of climate change cause more erratic and severe rainfall events which are separated with periods of very low rainfall.

On top of this our ground water is currently over consented, so regulation is already being introduced in Hawke's Bay to bring consents back into line with capacity. The issue with this is that as our population grows our suburban areas will require more and more water, which currently is predominantly drawn from the same ground water that is also being used more rurally for our wineries and vineyards.

To combat the issues posed by climate change as well as the increase in population on our already overburdened ground water, the sources of water for wineries and vineyards must be diversified and what water we do have must be utilised in the most effective way possible.

The Visit

The trip consisted of a 7-day visit to the wine regions surrounding Adalaide in South Australia. The regions that were focused on were McLaren Vale and the Barossa Valley as these were seen as being the most arid areas with the greatest water availability challenges. Other informal visits were conducted to get the overall feel of the various regions and subregions. The aim of the trip was to conduct a high level, practical examination of a range of South Australian wineries to see if learnings could be obtained from either their infrastructure, technology or processes and procedures.

The wineries visited were:

- Mollydooker, McLaren Vale
- Yangarra, McLaren Vale
- Oliver and Press, McLaren Vale
- Treasury Wine Estates (TWE), Barossa Valley
- Yalumba Angaston (not visited but one of their senior winemakers provided me with their relevant information.)

Table 1 Water use figures of each visited winery (where specified). Average NZ water uses taken from NZ Wine Growers National Water Use Report 2023

| Winery | Tonnage Processed (2024) | Bottling plant onsite | Water use efficiency (L water/L wine) | Average NZ water use for similar winery (2023) |
|------------------------------|--------------------------|-----------------------|---------------------------------------|--|
| Mollydooker | 1400 | No | 5.6 | 2.8 |
| Yangarra | 500 | No | 4 | 2.7 |
| Oliver and Press | 2000 | No | 2.4 | 2.8 |
| Treasury Wine Estate Barossa | 59100 | Yes | 4.28 | 2.1 |
| Yalumba Angaston | 11000 | Yes | 6 | 2.1 |

Learnings

For starters when you contrast the water usage averages for New Zealand wineries and those of the wineries that were visited in South Australia it was found that the Australian wineries are using either the same or greater quantities of water in wine production to New Zealand, or in some cases quite a lot more. This is not entirely surprising as winemaking techniques, especially when you contrast two similar new world winemaking regions, are reasonable similar. In the cases where larger uses were seen this is likely due to South Australia producing a much higher proportion of red wines with large barrel programmes. In other cases, wineries had extensive bottling facilities onsite such as TWE and Yalumba causing higher apparent water uses. As with wineries in New Zealand the overwhelming majority of water use occurs during harvest time. Main water use activities are tied to barrel cleaning and management as well as tank and equipment cleaning.

Chemical Use

One major area that the wineries visited in Adelaide excelled in was in cleaning chemical reuse. Cleaning of tanks and other equipment makes up a majority of water use in a winery setting. By reusing chemicals as much as possible not only does it save water, as your wash water from cleaning can be reutilised, but it decreases the chemical loading of the wastewater generated by the winery. Oliver and Press used a simple system of storing used caustic solution in IBUs where the solution could be used a number of times, checking pH regularly to ensure it remains effective. They also utilised float switches inside reused blue 200L drums so that the drum would only fill to 100L, reducing the default quantity of water being used at each wash stage of the tank cleaning (Fig. 1).



Figure 1 200L reused chemical drums reused for winery cleaning. A float switch has been installed at 100L level to reduce the amount of water used at each wash cycle.

Yalumba's Angaston winery took this system a step further installing a caustic storage tank and reticulation system around their winery so a 2% caustic solution can be easily accessed anywhere in the winery. The chemicals used in cleaning the xflow filters onsite feed into this system helping it maintain its concentration. The system is checked weekly via titration to ensure the correct concentration of caustic is maintained. The system cuts water use as there is always caustic available for any job without constantly mixing new batches of chemical solution.

At TWE in Barossa they were investigating reducing the amount of rinse and neutralisation required after caustic washes of tanks. As tank cleaning is such a large part of winery water use a up to 50% reduction in water needed to clean each tank could represent a significant saving in overall water used.

It was noted that number of wineries visited including the larger wineries (TWE and Yalumba) had stopped using sodium based caustic products which were causing issues in waste water and onflow effects in ground water sodium accumulation. Instead, Potassium based chemicals such as potash were being used as a replacement.

Rain water use

Another major area that a number of wineries visited excelled at was the collection and storage of rainwater as their primary process water source. In most cases this was due to the unavailability of mains water in the area and the unsuitability of ground water due to its high salt content. In some cases, ground water was used as an inferior source of water used for vintage processing gear cleaning, but there was always the requirement to rinse this water off of equipment with rainwater to avoid a salt deposit forming. Yangarra and Oliver and Press used rainwater for 100% of their main winery process water, only using ground water for tasks such as floor cleaning. Large water storage tanks were housed onsite to store collected rainwater off winery building roofs (Fig. 2). Prior to use the water was filtered and UV treated to avoid any microbial contamination.

Rain water is also collected and stored widely either in open storage pools or tanks for uses such as fire protection and other non-winery purposes.



Figure 2 Rainwater storage tanks at Yangarra in McLaren Vale. Yangarra has 500kL of storage capacity.

Technology

At larger wineries new technologies such as automated barrel fill and wash units take variations in water use out of the equation by automating the exact amount of water to use to wash every barrel (Fig. 3). Other tech advancements include improving pigging of must lines during vintage and fixed lines for wine transfers. Eliminating water push throughs of must and wine particularly over large distances can represent a large saving to winery water use, particularly over vintage time.

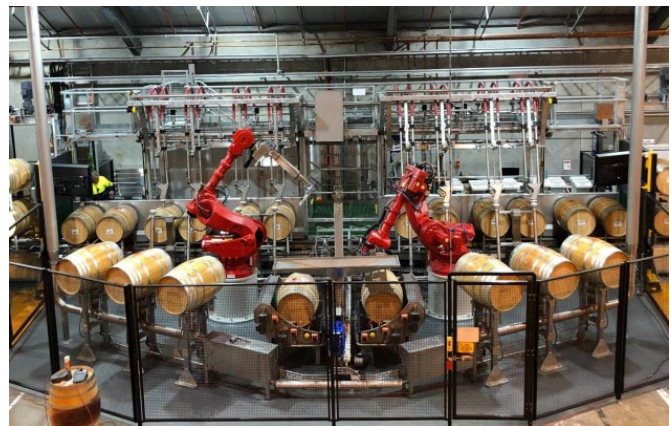


Figure 3 An automated barrel line at Treasury Wine Estates Barossa which is capable of emptying, washing and filling 46 barrels every hour.

At Yalumba water use is reduced at the crusher as water used for wash down is collected, sieved for grape solids and then fermented and distilled ready to be reused. Initiatives such as this, while representing a large capital expenditure can hugely reduce the peak water consumption during vintage time.

Ideas for the future

Climate change is already having a great effect on the climate of Hawke's Bay. As precipitation becomes less predictable and severe weather events more common, steps must be taken to diversify our water sources so that there is enough to go around. Hawke's Bay has an over reliance on ground water as current stocks are over consented and municipal water supply is also drawn from the same source. This over reliance threatens to hold back the wine industry in Hawke's Bay as it makes it difficult for new wineries to establish and existing ones are either unable to expand or must become better at using the water they have.

Becoming more efficient with water use through initiatives such as chemical reuse and optimised rinsing procedures as well as new technologies and smarter winery design can save the amount of water we use to make our wines.

Simply using less water in our wineries may not be enough however. The real gains in winery water source security will come from diversifying our water sourcing and reducing our reliance on ground water take. To achieve this, regulation could be introduced in the future requiring rainwater harvesting and storage to compliment ground water use and reduce our reliance on this water source. While rainwater collection may not satisfy the full water requirement of a winery, especially during the busy vintage months, it will compliment setups where ground water is already used to help reduce ground water take.

Future infrastructure investment is needed in the longer term to alleviate pressures on ground water. Hawkes Bay could benefit from a project similar to the McLaren Vale irrigation pipe lines where treated suburban waste water from Adelaide is piped out to McLaren Vale to be used for irrigation. The recycled water pipeline is capable of providing over 25 million litres a day at a cost of around \$1.47/kL. This initiative has numerous benefits as it both provides a reuse for a waste product while also alleviating the shortage of suitable irrigation water in the region. If in future we were able to provide a similar service to areas such as the Gimblett Gravels this would further reduce pressure on our over used ground water stocks and reduce the requirements for river water use which can be unpredictable and have other environmental effects. The other main benefit of infrastructure of this type is that users pay for used water to help offset the cost of construction. This is unlike current Hawke's Bay waste water systems which pump our treated waste water into the sea.