Study of the effectiveness of several industry-scale oxygen introduction techniques into red fermenters

Martin P. Day¹, Ben Thoman², Simon A. Schmidt¹

¹ The Australian Wine Research Institute, PO Box 197, Glen Osmond (Adelaide) SA 5064, Australia, ² Pernod Ricard Winemakers, PO Box 447, Para Road, Tanunda, SA 5352

Corresponding author's email: martin.day@awri.com.au

Benefits of adding O₂ – a decrease in ‘reductive’ aromas, decreased DAP requirement and softening of tannin – have been demonstrated by AWRI research. Numerous techniques can be employed to achieve this in industry. This study measured dissolved oxygen (DO) in several winery situations.

How effective is the splash pump-over?

Example at Cape Jaffa winery in 2018
- Standard pump-over with irrigator
- ‘Tub’ typically kept 50% open
- Mettler-Toledo DO meters placed before delivery and after tub (on pump suction)
- Six pump-overs measured

Observed readings
- Average DO before tub: 0.97 % air saturation (SD 0.23) or 0.066 mg/L (SD 0.17)
- Average DO after tub: 29.6 % air saturation (SD 3.0) or 2.67 mg/L (SD 1.29)

Conclusions
- 30% air saturation is probably sufficient when turning over the whole tank volume during a pump-over
- May only help improve ‘reductive’ aromas not modify tannin
- Increased turbulence (screen or inclined plane) in flow will increase DO (data not shown)

Is the vortex sparger effective in a closed pump-over?

Example at Cape Jaffa winery
- Standard pump-over with irrigator, vortex sparger (V/S) after pump
- Mettler-Toledo DO meters placed before pump and just before irrigator
- Five pump-overs measured

Observed readings
- Average DO before pump: 0.3% air saturation (SD 0.2) or 0.017 mg/L (SD 0.009)
- Average DO using V/S: 58.7 % air sat (SD 5.4) or 3.61 mg/L (SD 0.19)

Conclusions
- Device is twice as effective as splash tub
- Much easier cellar work
- Avoids potential contamination, is cleaner
- Requires one-off purchase (~A$900) and clean air supply

Does Pulsair® contribute any oxygen?

- Pulsair® and similar equipment is widely used for cap management in larger red fermenters.
- This ‘air mixing’ equipment introduces explosive bubbles of air in preset sequences through tubes around the lower tank perimeter to destabilise the cap, causing it to submerge.
- The large size of the bubbles should render ineffectual any oxygen exchange into the fermentation medium; however, anecdotal evidence indicates otherwise!
- In this study, submergible DO data loggers (miniDOT, Precision Measurement Eng., CA) were deployed in several 150 t closed jetter tanks at Richmond Grove in 2019.

Conclusions
- Measurable O₂ peak only lasted 10 minutes (duration at half-height = 5 mins)
- Most oxygenated area is below cap (5 m from bottom) to mid-point (3 m)
- Aeration in the upper half of the fermenter receives 30-50% of a splash pump-over
- Summed over the duration of the fermentation this may have a beneficial impact.

Thanks to:
- Richmond Grove cellar crew
- Anna and Des Hooper, Cape Jaffa wineries