

Vacuum during bottling



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[Basic Wine](#)

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During winemaking, **oxygen exposure is usually avoided** as far as possible especially during vinification of Sauvignon blanc wines. Not only can oxidation modify key aroma compounds, such as the fruity varietal thiols, but it can also result in the development of oxidation aroma and browning.

Of all the winemaking processes, **bottling is one of the most critical phases of oxygen pickup**. Factors such as the dissolved oxygen content in the wine at the time of bottling, the headspace volume and composition and the type of closure (oxygen permeability) will all affect the oxygen concentration in the sealed bottle which could adversely affect the wine's quality over time.

A study¹ was conducted to investigate the **impact of operating conditions during bottling on the oxygen content** and evolution of a bottled Sauvignon blanc wine. In this blog post the main findings from the use of vacuum during bottling will be reported.

Materials and Methods

A Sauvignon blanc wine was bottled under varying conditions. One batch was bottled with a high dissolved oxygen content of 2.64 mg/L while a second batch was bottled at low dissolved oxygen content (0.23 g/L). Each of these batches were then bottled and sealed with a cork either **with or without the use of vacuum technology**.

	Initial dissolved oxygen concentration mg/L	Vacuum / No vacuum
1	2.64	Vacuum
2	2.64	No Vacuum
3	0.23	Vacuum
4	0.23	No Vacuum

The bottles were stored upright at an average temperature and relative humidity of 17.1°C and 76 % for 18 months. Measurements of dissolved oxygen, headspace oxygen, dissolved carbon dioxide, sulphur dioxide, colour and sensory evaluation were performed during storage period.

Results

Vacuum vs no vacuum – Oxygen concentration after bottling

Starting with a relatively **high dissolved oxygen** content (2.64 mg/L), bottling the wines **under vacuum** resulted in a total oxygen concentration of around **5.9 mg/L** directly after bottling. When **no vacuum** was applied, the total oxygen concentration was significantly higher at **> 8.00 mg/L**.

Starting with a relatively **low dissolved oxygen** content (0.23 mg/L), bottling the wines **under vacuum** resulted in a total oxygen concentration of around **2.0 mg/L** directly after bottling. When **no vacuum** was applied, the total oxygen concentration was significantly higher at around **4.5 mg/L**.

The gaseous headspace contained **16.93% v/v oxygen when vacuum was applied during bottling compared to 19.63% v/v without vacuum.**

When **using vacuum, the total oxygen content increased with about 1.8 to 3.3 mg/L** (from the dissolved oxygen content in the tank to the total oxygen content in the sealed bottle). This is significantly lower than when no vacuum was applied during bottling. In the **absence of vacuum the increase of the total oxygen content was about 4.3 to 5.7 mg/L.**

Irrespective if the initial dissolved oxygen in the wine was high or low, the **oxygen pickup was approximately 2.4 mg/L lower when bottled under vacuum** compared to when the wines were not bottled under vacuum.

Vacuum vs no vacuum – internal pressure

Applying vacuum at the time of bottling reduced the aphyrometric pressure (the difference in pressure between the inside of the bottle and atmospheric pressure) in the bottle. The average aphyrometric pressure was **25 kPa with vacuum compared to 137 kPa without vacuum.** This led to considerable variation in the amount of oxygen trapped in the headspace and consequently the total package oxygen. The **absence of vacuum** results in a **positive internal pressure** which could **accelerate the dissolution of the headspace oxygen** into the wine.

Vacuum vs no vacuum – Sulphur dioxide and colour

The wines bottled **without vacuum had lower free and total sulphur dioxide concentrations and higher colour saturation values** compared to wines sealed under vacuum.

Sensorial Analyses

After 18 months storage the wines bottled under **vacuum had significantly lower scores of “visual shade” and “oxidation”** compared to wines bottled without vacuum.

Conclusion

The amount of oxygen in a sealed bottle mainly depends on the **dissolved oxygen content of the wine prior to bottling (in the tank) and the quality of the bottling line and operating conditions.**

The use of vacuum (or the absence thereof) can significantly affect

- 1) the amount of oxygen in the bottle after sealing and**
- 2) the rate at which the headspace oxygen is dissolved into the wine**

An advantage of evacuating the bottle of air after filling is the removal of oxygen from the headspace and preventing the creation of pressure in the bottle due to the “piston” effect by inserting the closure. The **absence of vacuum** during bottling without the use of blanketing gas can cause an **increase in the amount of oxygen trapped in the headspace. An increase in internal pressure is also evident without the use of vacuum technology and will consequently increase the rate of dissolution of oxygen via the headspace/wine interface.** A bottling line supplied with vacuum filler is effective in reducing the amount of oxygen in the headspace.

References

(1) Vidal, JC; Moutonet, M. Impact of Operating Conditions During Bottling and of Technical Cork Permeability on the Oxygen Content and Evolution of Bottled. Internet Journal of Viticulture and Enology 2011, 4/3.
