

Scientific Paper:

Journal of Food Engineering (2021) 291, 110233

## **In-situ monitoring of wine volume, barrel mass, ullage pressure and dissolved oxygen for a better understanding of wine-barrel-cellar interactions**

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### **Abstract:**

The process of aging wine in oak barrels causes various mechanisms that modify wine quality. This study is devoted to understanding the gas and wine transfers that occur through the barrels depending on ambient conditions. Four barrels were instrumented in a cellar to monitor the liquid height and evaporation rates, the ullage space pressure, the content of dissolved oxygen in the wine and the environmental conditions. The liquid wine progressed slowly through the wood and reached a stabilized position after approximately 100 days. Evaporation was initially very limited and then achieved an average rate of 20 mL per day after linearization of the moisture content profile. The evaporation rate was directly impacted by the cellar conditions. The negative pressure inside the barrels, created following the loss of wine, was also affected by the cellar conditions. Above a certain negative pressure, an air percolation threshold was reached, implying the rapid entry of air into the barrel.

Keywords: wine aging, oak barrels, simultaneous transfer, wine transfer, air percolation, dissolved oxygen