RELEASE Santa Rosa, November 30th 2023

Smart Bungs by Onafis granted by the Wine Industry Network

2023 WINNOVATION AWARD WINNER

The Onafis team is proud to receive the Wine Industry Network Innovation Award at the Santa Rosa exhibition on November 30th, 2023.

Automation as a trend, oenological expertise as a constant

The wine industry, whether European or American, faces common challenges: overcome the shortage of skilled labor, implement sustainable development strategies, control energy consumption, meet consumer demand for fewer chemical inputs... while preserving the financial profitability of the winegrowing business.

Automation and data science are one of the responses to this new paradigm. But we are convinced that automation must serve oenology intelligence … not replace it. Artificial Intelligence is just providing a tool to predict and anticipate. The winemaker remains at the heart of wine-making and quality control. Thanks to the connected tools, the winemaker can concentrate on the essentials.

What has Onafis done?

Onafis is a French Wine Tech company created in 2018 by Alexandre Ermenault, an engineer coming from the world of banking information systems. Thanks to his friendship with a winemaker in the Loire Valley region searching a solution to monitor his low sulfated wines during oak barrels aging, Alexandre plunged into the world of wine and put all his passion for data science to work to improve wine quality and process efficiency. His innovative idea 7 years ago, was to equip barrel bungs with specific sensors able to measure key parameter into the wine as dissolved oxygen, microbiological activity, temperature but also external temperature, humidity and atmospheric pressure. From the collected data and thanks to Artificial Intelligence, Alexandre built up an algorithm learning continuously and predicting wine evolution.

It took more than 3 years of R&D to create Onafis Smart Bungs that help winemakers control and monitor remotely the evolution of wines from fermentation to the end of aging. A real alarm for wineries, enabling them to adapt their actions and inputs accordingly. Onafis paves the way for efficiency in the winery, significantly reducing energy consumption, as well as the investment in time, money and materials needed for the usual controls.

Alexandre Ermenault : “Our ambition is to intelligently automate actions that today have no added value, and to respond to requests throughout all wine producing countries. I want Onafis to be the leader in intelligent solutions for sustainable wineries and wines of controlled quality”.

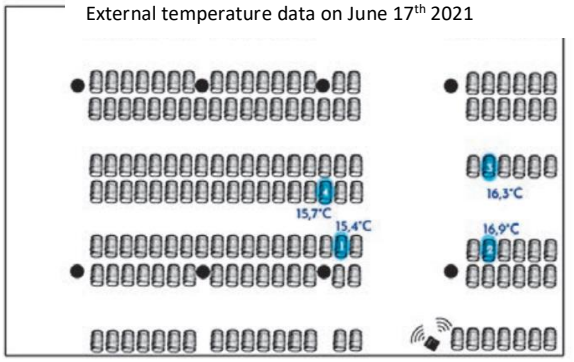
Report of project results

A project was conducted in 2021 consisting in following the barrel aging period of wines from 20 Bordeaux wineries (between February and September). Each month, more than 28,000 measurement points were taken in these 20 companies, which opens the door, from a scientific point of view, to precise and multiple analyses and interpretations.

a) Evidence of the existence of several microclimates in the wineries

The presence of doors or windows can create air currents that cause heterogeneity in the climate of the cellar. Placing probes in different strategic points of the cellar allows to highlight areas with different temperature and humidity conditions.

Graph 2. Plan of a winery with a microclimate on the right side



A statistical analysis (ANOVA) of all the data collected from March to June reveals the existence of two distinct groups: probes 1 and 4 on the one hand, and probes 2 and 3 on the other. The map clearly shows that the area on the right has higher temperatures (Figure 2).

b) The effect of temperature and humidity variations on evaporation losses

The collection of temperature and humidity data allowed to evaluate the evolution of wine evaporation. The correlation between wine loss and temperature and humidity conditions has been well established by a research institute in France. The margin is wide, between 2% and 12%, of wine loss. If you consider the monetary value of the wine, the financial loss can be enormous.

It was observed that, as we approach the warmer months, temperature and humidity increase in case of south-west of Franc. The losses are more important in summer. The data allowed to correct the cellar conditions as regards the microclimate and the annual trends highlighted. Some of the wineries achieved to reduce until 2 points of wine losses.

c) Additional analysis of oxygen consumption and its dissolution

Continuous data acquisition allows us to see the dynamics of oxygen consumption and its dissolution as a function of the actions performed with the barrel. Thus, the analysis of the influence of the filler on the oxygen concentration in the wine (Figure 4) reveals that the amount of oxygen introduced is important. Precisely, the saturation point of wine in oxygen is 8.4 mg/L (Singleton, 1987), which shows that a level of 3.415 mg/L is very high. It is consumed very quickly in wine, which can lead to undesirable

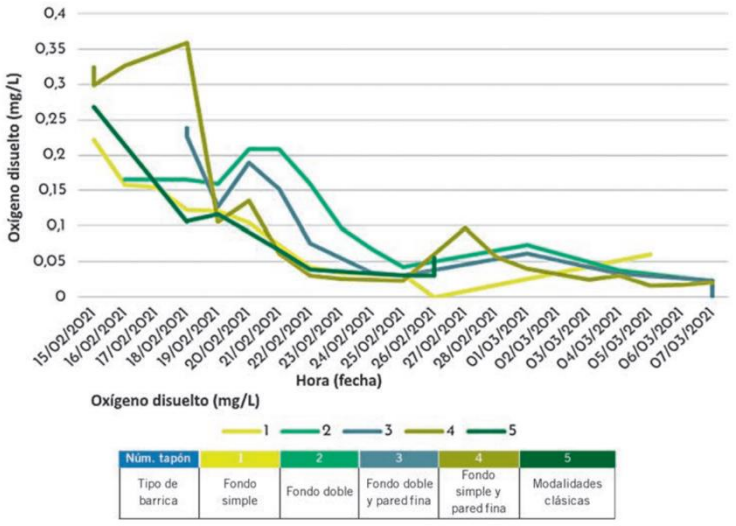
oxidation of wine compounds. **The same** work can be done in other operations such as racking, where the dose of oxygen introduced is much higher and more aggressive.

Graph 4. Dissolved oxygen levels measured before and after filling a barrel

d) Comparison of different types of containers and the amount of oxygen provided

Continuous data collection also makes it possible to compare wine aging in different containers. In a winery where stoppers are placed in classic barrels and others in ceramic barrels (Clayver©), the dynamics of oxygen consumption were compared. A slower consumption was observed in the ceramic barrels than in the classic barrels. This is due to the fact that the pores of conventional barrels cause a greater gas exchange and, therefore, oxygen consumption is faster. In another winery, different types of JABB© barrels have been compared. We can see that the consumption is more or less important depending on the type of barrel and, therefore, we can draw conclusions about the profile of the wine created from these barrels. The corks were positioned in the barrels as shown in Graph 5. In the associated graph, we can see the dissolved oxygen curves during consumption. Some differences are observed, with bungs 2 and 3 showing higher dissolution. The barrel with a simple bottom is the one that is closer to the classical mode.

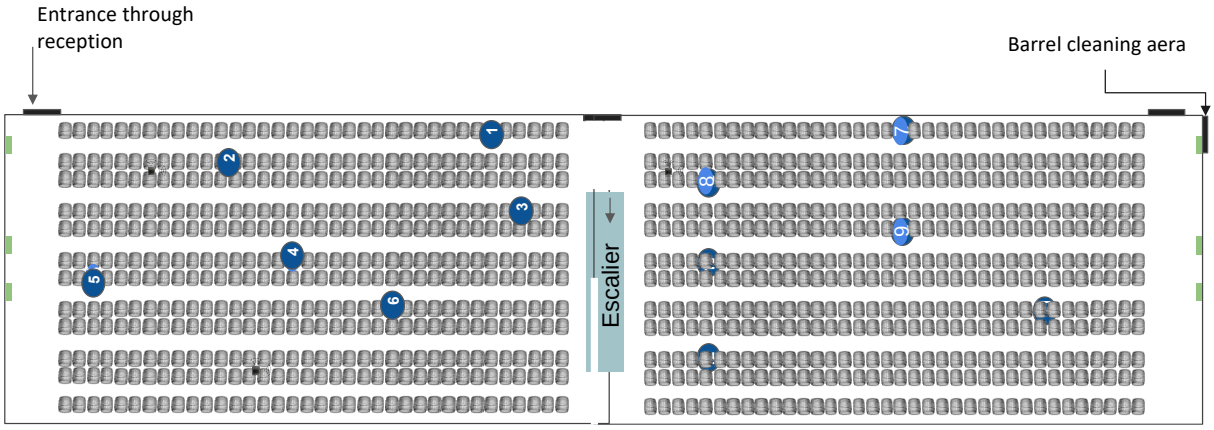
Graph 5. Presentation of the different compared modalities of barrels JABB and associated results of dissolved oxygen results



For wines with a more advanced evolution, the barrel with a single bottom and thin wall can be chosen.

e) Identification of microclimates and energy savings

The test was conducted in a famous Bordeaux Château, with the objective of identifying temperature and humidity conditions in the cellar, as well as the associated energy costs. We installed 12 Atmos sensors to monitor the aging of red wine in barrels in a subway cellar (total capacity of 1,000 barrels). The test was conducted between March 15 and April 16, 2023. The sensors were installed as follows, to completely cover the entire building (see map 1).



We also installed two ampere metric clamps that allowed us to accurately monitor all energy consumption. Depending on the client's needs, we have adapted and created the ideal conditions for wine aging. The objective is that the wine controls the conditions of its environment. The installed Atmos sensors allow us to measure the physical characteristics of the wine, continuously, without human intervention. They measure hygrometry, atmospheric pressure, and temperatures (internal and external).

What we have highlighted?

Hygrometry level: we identified heterogeneous humidity levels depending on the position in the building. The values have a maximum difference of 12.7%.

Temperatures: they remained stable and do not depend on external meteorological variations. In fact, the building is subway. However, we identified heterogeneous temperatures depending on the position in the vessel (maximum difference of 1.8°C). These discrepancies can be explained by the presence of cold air currents or broth. The average temperature in the building is 11°C, which shows that the air-conditioning system is effective but not very efficient and therefore generates significant energy costs.

Our objective is to pilot the cooling system using Weenat weather data (external data) on the one hand, and temperature and humidity data collected by our Atmos sensors on the other.
Considering the inertia of the wine and thanks to the identification of microclimates, we could allow an overall financial saving of €6,000/year, 30% of the current annual expenditure, and an energy saving of 10 tons of CO2 eq. Thanks to a more efficient management, making cuts in the cooling system, the savings are brutal.

b) Identification of microbiological deviation risk

On the other hand, Evolution ageing type sensors allow us to measure dissolved oxygen and the risk of microbiological deviations (in addition to measuring hygrometry, atmospheric pressure, and temperatures). We use a luminescence sensor and a combination of collected data and IOT to extract

consistent data. By installing this solution, the winemaker can continuously follow the microbiological growth in his barrels.
We had several experiences where the level of risk increased in the application. After laboratory analysis, we were able to confirm the presence of Bretts or any other species of yeasts or bacteria. The main advantage is that the sensor detects the proliferation before the human and allows to act quickly, before negative permanent consequences.

2023 learnings in California

The first Onafis smart bung in the USA was installed in March 2023, in Napa Valley. Since then, 4 leading wineries experimented the two types of Onafis smart Bungs: B-Evolution and B-Atmos.

The first outstanding results are:

Atmos: 19 bungs installed on 2 cellars.
- we were able to identify a faulty air conditioning system.
- the microclimate of the cellar showed great variability in humidity in the absence of humidifiers.
- the microclimate of the cellar showed insulation defects, causing significant temperature variations.
- the diagnosis of conditions in an ageing cellar highlighted the potential for reducing wine losses through evaporation.

Evolution: 12 bungs installed on 2 cellars.
- while the Californian cellars seem to be little subject to organoleptic deviations and contamination by *Brettanomyces bruxellensis*, the B-Evolution sensors have been able to alert us to the growth of microorganisms during ageing.
- the application of dissolved oxygen measurement for the evaluation and selection of barrels according to wine type was particularly appreciated.

To date, data collection continues, opening up new fields of study for Californian wineries in their specific oenological conditions. Nearly 15,000 data points were collected over this period. This data coupled with artificial intellingence allow us to learn continuously. We are now able to accurately identify different types of contamination.

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