Winemaking Chronicle

Number 1 - September 2019

Lower the level of SO2 in white wines: good practices during ageing process

Example of a Sauvignon Blanc, Popular Premium segment for international markets

Author: Jonathan Delteil, DIWC senior consultant

Our vision

Market demands vary widely in space and time and our job as consultants is to help the wineries answer and adapt to these demands from the markets through technique and the application of winemaking good practices.

Lower levels of SO2 in wines is one of today's challenge, particularly in fresh fruity wines where it participates in the sensory style but in which consumers are most likely to remark its presence.

Our definition of good practices: A set of techniques applied to the winemaking process in order to reach planned objectives of price x sensory profile x target market.

As many fermentations are now going on in many wineries in Northern Hemisphere, in this harvest chronicle we start the process at the beginning of ageing. Pre-fermentation and fermentation phases will be the core of a chronicle in June 2020.

In order to keep this chronicle brief, we will only review the reduction of SO2 level in wines containing sulfites. We will not talk of « wines without sulfites ». We plan a future chronicle on the subject.

A practical example

This chronicle is based on a practical protocol for a popular premium Sauvignon blanc (2.5-4€ F.O.B.). This protocol is a recommendation for one of our consulting clients. They have applied it for several years obtaining conforming performances on their markets.

Key figures for a good SO2 efficiency

SO2 efficiency for a Sauvignon Blanc is quite simple to be defined with a few figures. Of course reaching stable and consistent results is more complex and this is what this chronicle describes through our good practices.

A reminder: the juice and wine pH is an absolute key-point for the balance between the different forms of SO2 and their stability.

In this chronicle we recommend a pH of 3.2 in the juice and the wine, a pH adapted for fruit expression and longevity and to manage the SO2 efficiency when kept at moderate levels.

The 4 key moments and 4 key levels for SO2 (at pH 3.2) :

- **Key-moment #1: in the clear juice just before inoculating the yeast.**

Key level: between 30 and 40 mg/L Total SO2. If respected, enzymatic oxidation chains are blocked, protecting the Sauvignon varietal aromas. At this stage Free SO2 is not an operational indicator.

- **Key-moment # 2: the end of alcoholic fermentation.**

Note: When sugars are finished, Total SO2 should be below 30 mg/L (when key level #1 was conforming). As soon as the sugars are finished, add SO2 in the wine for an immediate and intense anti-microbial action on the yeast and an anti-oxidation/anti-oxidase protection at the very beginning of aging. For a fresh style Sauvignon Blanc, at pH 3.2 we recommend to add 3 g/hL (or 30 mg/L) SO2 at once in an homogenized way before the first wine racking. Sulfite-reductase from the yeast could be still active but our recommended protocol is more efficient than leaving the wine without SO2 during one week or two after fermentation and it represents less risks of alteration of the aromas and less risk of spontaneous malo-lactic fermentation. When pH has not been adjusted or when there is a heavy contamination of the winery risking unwanted MLF, adding 5g/hL of chitin-glucan (Bactiless) during Racking #2 can prevent the development of spoilage bacterias.

- **Key-moment # 3: from day 1 of ageing to the day before bottling.**

Keep 1 mg/L **Molecular** SO2. Right after key moment #2, analyse frequently (every month for example) the FREE SO2, the pH and the alcool level and calculate the Molecular SO2. If below 0.9 mg/L, add SO2 to go back to 1.1 mg/L.

- **Key-moment # 4: the day of bottling.**

A few days before bottling analyze FREE and TOTAL SO2, pH and alcohol. Check that **molecular** SO2 is conforming.

Then calculate how much SO2 you need to add on the day of bottling (or the day before) to reach the following FREE SO2 levels according to the closure used:

screw-cap	36/38 mg/L
technical cork (examples: Nomacork, Diam)	38/40 mg/L
natural cork	40/42 mg/L

With the proposed complete protocol, TOTAL SO2 should be below 100-120 mg/L after bottling, allowing to respect organic wines maximum legal limits.

Of course there are many factors influencing the stability and consumption of the different SO2 during ageing and the shelf-life in bottle. They are key factors to reach the key levels of SO2 at the 4 key moments.

Key points influencing a good SO2 efficiency

Brief reminder of pre-fermentation and fermentation key factors:

Filling of the press: adjustment of pH (below 3.2), addition of SO2 (2 g/hL) (as SO2 solution or metabisulfite), addition of inactivated yeast concentrated in reduced glutathione (example: Glutastar), addition of CO2 (dry ice) on the grapes before crushing and destemming.

Pressing and settling: low-pressure pressing (below 0.4 bar) ; addition of SO2 (1 g/hL) right after the press ; protection under CO2 ; low turbidity (below 100 NTU by static sedimentation or nitrogen flotation) .

Alcoholic fermentation: low-SO2-and-acetaldehyde-producing yeast (e.g. ICV-Opale 2.0 or Sensy) ; rehydration with inactivated yeast concentrated in sterols (e.g. GoFerm Protect Evolution) ; immediate addition of organic nutrient (e.g. Stimula Sauvignon) ; fermentation between 17 and 18°C.

Reminder: along with the winemaker, the yeast is the potential main source of too-high TOTAL SO2 in wines. It can produce high amount of additional SO2 and also high amount of acetaldehyde that then combine SO2 very strongly. That is why the choice of yeast strain, the rehydration, the early nutrition are key points to limit as much as possible yeast-produced SO2 and acetaldehyde production.

Note: In the following protocol we recommend some enological products and oaks types. Through our experimentations and field experiences on many vintages and in many different countries we have deemed them the most apt to reach planned objectives of style and cost.

To calculate molecular SO2:
http://www.delteil-consultant.com/pdf/RD/molecularSO2_Changins_english.xls

END OF A.F.

11. End of A.F.
Immediately adjust pH to 3,2 if necessary
Add 3g/hL of SO2 and 3g/hL of ascorbic acid
Add 2g/hL of special inactivated yeast with chelated copper (Reduless)
Homogenize
Rack after 24 hours under protection of CO2. **Racking #1**.
Transfer the staves used during fermentation in the reception tank after washing them.

Note: - Steps 1 to 10 of the protocol are pre-fermentation and fermentation stages. Not detailed in this chronicle.
-Addition of SO2 right as soon as sugars are finished is here to protect the wine from oxidation and control the microbial population, particularly any spoilage that could start an unwanted and uncontrolled malolactic fermentation.
-pH often naturally rises during A.F. To ensure the efficiency of SO2 and hence the lowest possible addition, pH must be checked and adjusted if higher than 3,20.

Note: -Possible aggressive/negative aromas in the wine at this stage generally result from an over concentrated and unstable pool of sulfur compounds. A balanced pool of sulfur compounds participate to fruity and fresh aromas. Regular additions of Reduless allow to eliminate the excess amount of sulfur compounds and progressively stabilize the sulfur pool with a stable colloidal matrix : building step by step the wine longevity (see introduction). Reduless additions in this protocol do not transfer detectable amounts of copper to wine preventing the negative oxidative effects of solved copper.
-When pH has not been adjusted or when there is a heavy contamination of the winery risking unwanted MLF, adding 5g/hL of chitin-glucan (Bactiless) during **Racking #2** can prevent spontaneous malo-lactic fermentation.

12.First steps of ageing
•Maintain molecular SO2 at 1mg/L
•Adjust temperature to 8°C. Tank at full capacity.
•Mix the wine 3 days after the racking. Add 1g/hL of Reduless
•3-4 days after mixing, rack under CO2 protection. **Racking #2.** Transfer the staves to the reception tank after washing them with clean water.

Note: -Heavy compacted lees are a big consumer of SO2 and have a potentially harmful influence on the aromatic profile of the wine. This is why it is important to follow a strict program of lees segmentation to remove frequently the most harmful part of lees while keeping what is potentially interesting.
-Starting at step 13, each time we remove heavy lees with a racking, we partly replace them with an addition of an inactivated yeast (Pure Lees Longevity). This inactivated yeast has a sponge effect on oxidized elements of the wine. It also protects the wine by absorbing potentially dissolved oxygen. Regular addition of such inactivated yeast in important to bring freshness to the style

13. Build the colloidal matrix and adsorb possible elements oxidized during A.F.
•Microbial control
•Add 10g/hL of inactivated yeast (Pure Lees Longevity),
•Maintain pH under 3,20 and molecular SO2 at 1 mg/L. Temperature <10°C. Tank full. Add another 50g/hL of staves same oak (TN Coopers Ambrosia Complex, French oak).
•One mixing per week for a month
•3 days before racking, add 1g/hL of Reduless and mix.
•Rack after 3 days under CO2 protection. **Racking #3**. Transfer the staves in the reception tank after washing them

Note: -When our whole protocol is respected, at bottling, the wine has a balanced colloidal matrix and the right roundness. That is why we recommend addition of a rather low dosage of soluble mannoprotein. Such a dosage brings a last touch of mouthfeel to the wine while also acting as a buffer to protect the colloidal matrix from the shocks induced by the various pumping actions during bottling. This protection helps the wine return faster to its original profile after bottling and allows for a more stable matrix hence a wine more stable in time = longevity.
-Large French medium toasted oak segments (like staves) allow for a balanced and slow interaction with the wine and a good stabilisation of compounds of interest inside the colloidal matrix of the wine. That is why the same staves that were put during the A.F. remain until the first half of ageing to keep on doing their double job of giving light oak aromas that push the Sauvignon varietal aromas AND adsorbing unstable compound into their porous structure. Oak as recommended has no negative impact on SO2 stability.

14. Build the colloidal matrix, adsorb oxidized elements
•Add 10g/hL of inactivated yeast (Pure Lees Longevity). Maintain pH under 3,20. Temperature <10°C. One mixing per week until December 20th
•Around December 20th: add 1g/hL of Reduless + 10g/hL of Longevity. Let the lees settle until January 10th
•Around January 10th rack under CO2 protection. Racking #4. Remove the staves.
•Add 1g/hL of Reduless + 10g/hL of Longevity. One mixing per month. Keep molecular S02 at 1 mg/L.
•Bentonite complementary fining if necessary, cold tartaric stabilisation (or CMC addition).
•Just before bottling, adjust FREE SO2 between 36 and 44 mg/L according to the closure. See page 1
•Bottling with 3-4 g/hL of soluble mannoproteins (Mannolees) added the day of bottling.

Delteil International Wine Consulting
delteil-consultant.com