Low SO_2 – a two-pronged concept

By Michael Sobe and Sebastian Bausinger

Sulphur is omnipresent in wine, but its presence is very much a bone of contention. Most wines would be inconceivable without SO2. Viewed with persistent mistrust by consumers, limits are clearly defined by law and often set even lower by producers' retail partners. At the same time, high sulphur content is also detrimental to wine's sensory qualities, but inadequate protection is even more harmful.
The concept outlined in the following pages highlights the production stages which provide opportunities to conserve SO2 levels. It is possible to distinguish two possible complimenting approaches (Fig. 1).

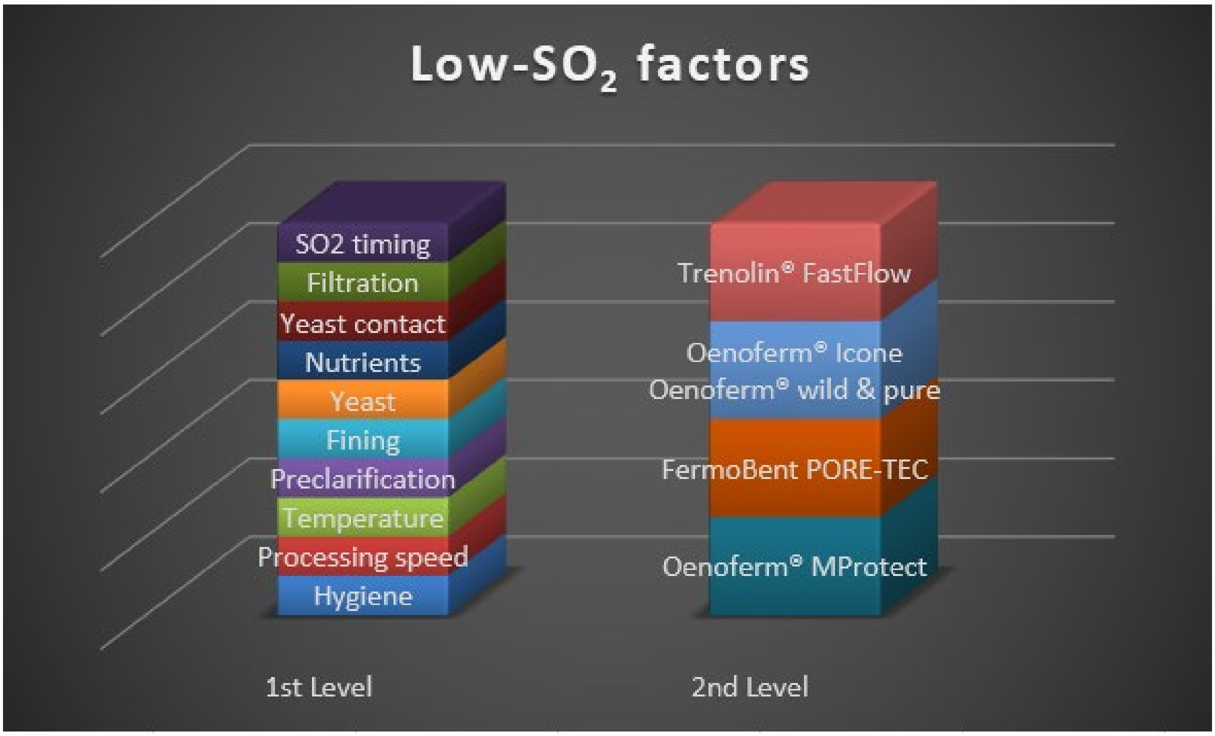

Fig. 1: Diagrammatic overview of categorial opportunities to reduce a wine's SO_2 balance

The first is optimisation of the essential production processes to keep the wines' need of SO_2 as low as possible. The other is targeted use of active SO_2-reducing processes and products.

Good professional practice
An exhaustive list for the first approach would take up the whole of this article and more. Essentially, it is a question of reducing bonding partners and microorganisms. Important touchpoints here are plant hygiene, cool and rapid grape processing, appropriate protection during mash and juice contact times, appropriate preclarification, creation of ideal fermentation conditions, actively

supervised maturation and correct addition of sulphur. It is therefore a much more complicated question than just reductive conditions.
The aim of the first approach is mainly to minimise and control any risk factors. The fewer negative bonding partners are present in the wine, the more effective the action of the SO_2 dosage used will be. Appreciable quantities of SO_2 can therefore be saved by wine making optimised in this way. The research at DLR RNH in Oppenheim estimated potential savings as a result of wine-making adaptations at about "30 mg/l" (J. Weiand, Winter Conference).

pH value controls efficacy
The wine's pH value is key here. The efficacy of added SO_2 is heavily dependent on the pH value, which can also render it virtually ineffective **(Fig. 2)**. For instance, to achieve the similar efficacy of 50 mg/l free SO_2 at a pH value of 3.2 at the higher pH value of 3,6 a stunning 120 mg/l of free SO_2 would be needed.

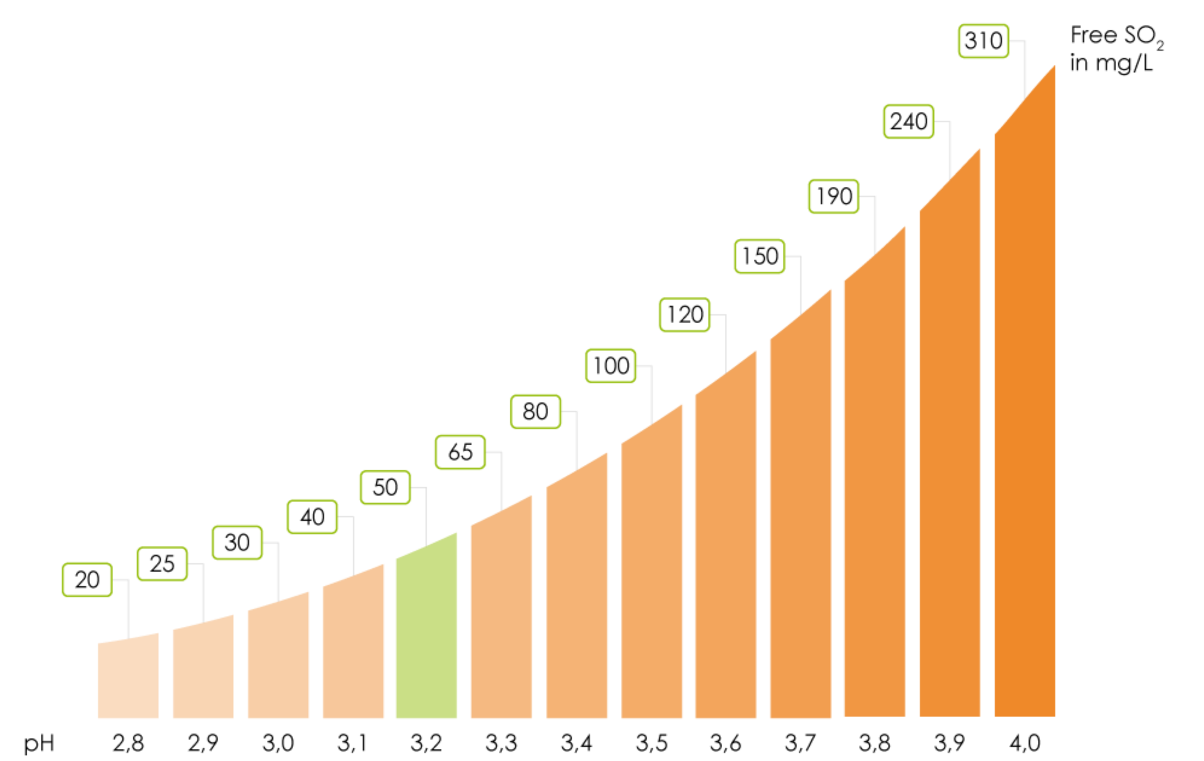

Fig. 2: The relationship between pH value and free SO_2 is shown by the quantity of free SO_2 required, depending on the pH value, to achieve a comparable effect to that achieved by 50 mg/l free SO_2 at a pH value of 3.2 (green).

When the losses of free SO_2 as a result of ligated fermentation by-products, undesirable contact with oxygen and bottling are taken into consideration, one might reach astonishing dosages. Even small savings quickly add up on the other hand, and provide new freedom to act again. Considering problematic vintages, rot-prone varieties and rising pH values caused by climate change, a valuable reservoir of useful SO_2 can be created. Even partial optimisation of processes helps to conserve the wine's overall balance and to employ the actually used SO_2 in as targeted a manner as possible. Potential acidification reduces the pH value and can decisively increase SO_2's efficacy.

Correct product choice offers potential

In addition to producing wine this way, the second stage focusses on specifically targeted processes and products. These actively replace the addition of sulphur, selectively assume protective functions and ensure stable wines. Each of the following applications reduces the treatments required and checks oxygen contact, thereby conserving the SO_2 balance. This results in another potential saving, which further increases the potential reservoir of available SO_2.
Special bioprotectors can be used instead of a classic mash sulphurisation, such as Oenoferm® MProtect, starting with the harvest and subsequent transportation. These bioprotectors work on the basis of specially selected wild yeast strains, whose aim is to rapidly multiply and therefore suppress the existing grape flora. When these yeasts are used correctly, basically no alcoholic fermentation will take place during the protection period in question. Metschnikowia pulcherrima in particular proliferates strongly in cold conditions, thus ensuring a natural protection when combined with cooling measures.
Fast processing of grapes, mash and juice plays a major role in the production of negative bonding partners and with regard to microbiological effects. The use of an effective enzyme to improve pressability and preclarification can be decisive herein. Trenolin® FastFlow is a highly active specialised enzyme. It reliably degrades pectins even under cool conditions and improves pressability, clarification and even the subsequent filtration of the resulting wines. Rapid processing is facilitated and wine filtration optimised in a single step.
Fermentation together with bentonite not only reduces the need for bentonite, but also eliminates the need for further subsequent treatments. The bentonite used must be extremely low in iron, such as FermoBent® PORE-TEC. The wines are cleaner in their expression and in terms of less by-products, ferment more reliably and the deposit can be removed with the lees in one step, without additional filtration.
Choice of the right yeast can significantly influence the production of SO_2 through fermentation. In addition to the familiar Oenoferm® wild&pure **(Fig. 3)**, Oenoferm® Icone is a red wine yeast that forms particularly low quantities of SO_2 - less than 10 mg/l. Despite a low nitrogen requirement, supplementation with nutrient VitaFerm® Ultra F3 optimises the fermentation process and minimises the formation of by-products.

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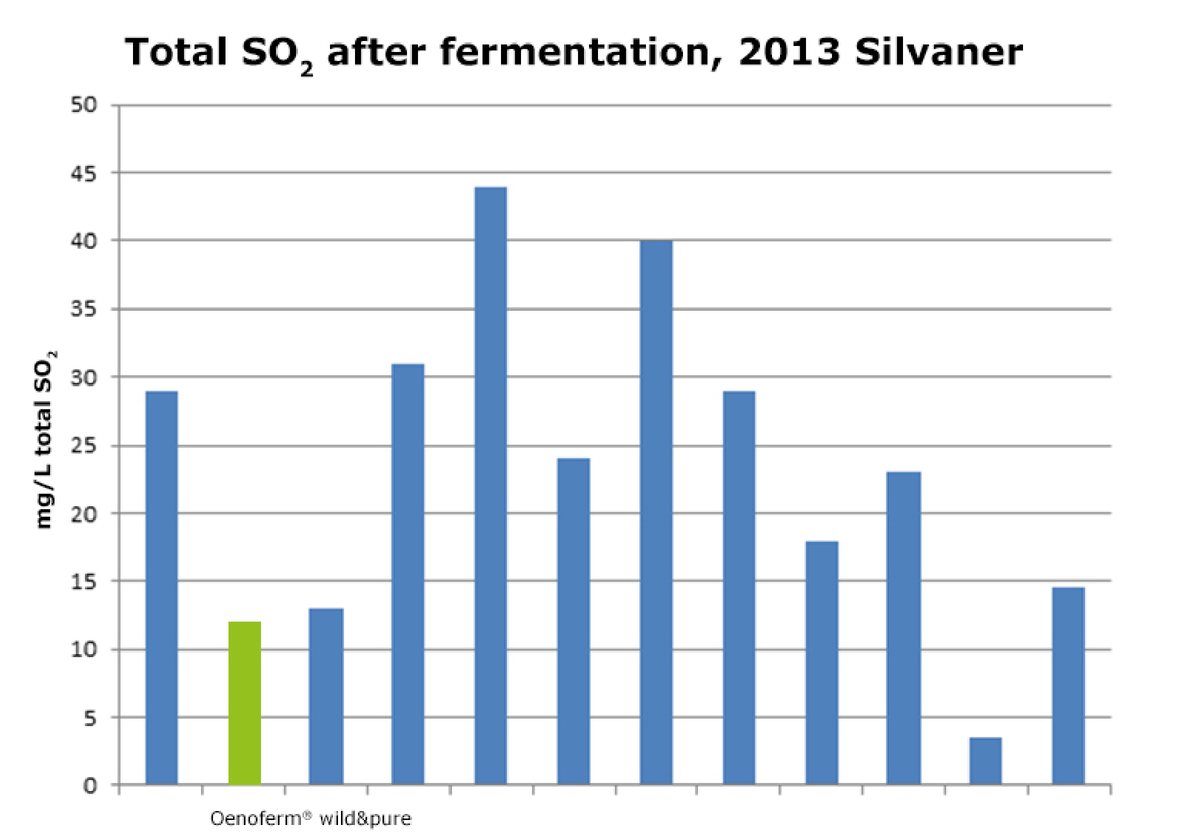

Fig. 3: Oenoferm® wild&pure produces much less SO_2 during fermentation than other cultured yeasts. (Source: LWG Veitshöchheim)

Targeted use of sulphur

The timing and method of SO_2 addition are particularly decisive. Addition of SO_2 shortly before the end of fermentation fixes fermentation by-products that are still present in the wine and directly increases the volume of bonded SO_2, without fulfilling any protective function. Several small, staggered additions tend to fizzle out, often producing "sulphur-eaters", which also consume further additions of SO_2 without producing any free SO_2 of note to protect the wines in future. Aroma is lost, oxidation takes place despite high total SO_2, and wines do not keep as well.

Ideally the wine's pH value is first determined, either by a laboratory or with a professional pH meter. A precise value is necessary to determine the free SO_2 required. The SO_2 should be added in a single dose. This should be followed up by consistently maintained reductive conditions until the bottling.

Summary

Sulphur is an irreplaceable treatment agent to maintain wines' quality (microbiological protection, antioxidant, removal of fermentation by-products harmful to health). The specified limits are governed by WHO and OIV values and preclude harm to the health of consumers. A SO2-saving concept should not, therefore, replace its use, or promote even lower limits. Instead it is meant to

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highlight safe corridors, scope and valuable reserves for wine making in problematic vintages. By adapting working methods and the correct products, it is possible to save significant quantities of SO_2 in a wine's overall balance.

Bibliography:

Jörg Weiand, Potentiale zur Reduktion des Schwefelbedarfs, 57th Winter Conference proceedings, Rheinhessen-Nahe-Hunsrück Rural Service Centre