

Dominique Delteil Consultant

Good Practices For The Treatment of Sulfur Off-Odors

A discussion between a winemaker and Dominique Delteil (freelance enological consultant working for Lallemand)

Q. It appears most wineries have some degree of reduction. This can range from a huge amount of H₂S to other, more complex disulfides. In some instances it is 10% of the cellar. In others it can be half of the cellar that is effected. There appears to be no common thread.

DD: First I'd rather talk about "sulfur off-flavors" or "sulfur off-odors" rather than "reduction" because we smell and taste them. We are not measuring the redox potential. As reduction has a precise chemical meaning, I prefer leaving the word "reduction" for a true redox reaction. This is not a purist attitude. There are very bad sulfur off-flavors in oxidized wines and I've seen people continue to aerate over-aerated wines because they still had "reduction" aromas. So in an attempt to get rid of "reduction" they were oxygenating already oxidized wines. With more than 20 years of consultancy I've come to appreciate a precise use of technical terms.

Most of the time monitoring is only done through sensory analysis. Sulfur compounds are very varied. Sensory perception changes depending on their concentration, the interference with other aromas, interactions with macromolecules, etc. So, based upon my sensory experience and the difficulty (not to say impossibility) in monitoring the changes in wine chemistry full time, I am very, very careful when using a molecule name to describe a sulfur off-flavor that I smell. I just say "sulfur off-flavor" because it is what I measure with my nose and my mouth. I am never sure it is H₂S or disulfide or even a non-sulfur compound like amino-acetophenone or skatol.

Q. In my case, we have racked off stinky lees and actually used clean tank fermented primary lees to add back to those lots. In most cases the wine is improving but it still has an underlying burnt popcorn or toast. This is mostly obvious in newer barrels.

DD: Beware of using lees from other tanks. One risk is spreading Brett & Company (*Brettanomyces*, *Pediococcus*, *Lactobacillus* and *Oenococcus*). These microorganisms produce sulfur off-flavors and stinky compounds (like skatol) that create the perception of sulfur off-flavors, even if some are not chemically sulfur compounds. If someone has already spread used lees, I would strongly recommend monitoring all your lots for microbes. Many actions to diminish sulfur off-flavors can be positive for them (stirring, racking, etc.).

Another risk of using lees from another tank is that the yeast cells from your fermentation tanks are "used" cells. They have a less efficient "sponge" effect than new cells from inactivated yeast products like Opti-RED. Since the introduction of these products I have strongly recommended their use to diminish sulfur off-flavors.

For example, in December 2005, Opti-RED worked very well for a client in Italy. He had unusual sulfur off-flavor problems after a wet season. We didn't want to work with micro-oxygenation because the wine was a very light style red. (Similar situations might occur with Pinot Noir in the U.S.).

Procedure: Add Opti-RED at 300 ppm, stirring every other day for a week. Then rack without aeration. Sometimes you need a second treatment if you want to avoid copper treatment. See below for copper treatment comments.

Q. We have racked some lots out of new barrels into older wood to see if that helps. Malolactic fermentation (ML) is about halfway done. I have done lab trials of AA (Ascorbic Acid) and Copper and have found that around 50ppm AA and 1.0 ppm CU cleans up the wine up but really strips the mouthfeel.

DD: I understand. A 50 ppm AA addition is quite high. I have recently seen a similar situation in Italy, with rosé. I used Opti-RED plus 10 ppm AA. This provided good results without giving too thin of a mouthfeel. For the last 10 years when copper was needed, I always recommended a

Dominique Delteil Consultant

coupled treatment with yeast maceration. Over the past five years I have modified this to include Opti-RED and BoosterRouge.

Procedure: Perform a lab trial with 300ppm Opti-RED or BoosterRouge + 0.5 / 1.0 / 2.0 ppm copper. Stir. Taste the following day. Treat the tank with 50% of the best copper dosage. For example if 1.0 ppm copper was the best balance between diminishing sulfur off-flavors and respecting the fruit, treat the tank with 300ppm Opti-RED and 0.5 ppm copper. Because the wine in the tank or the barrel will be stirred and racked, the efficient dosage in the winery is often lower than the one in the lab. Once the tank or the barrel is treated, stir every other day for a week. Then rack without aeration if it is a fragile variety like Pinot Noir.

On occasion a second treatment with Opti-RED and 10 ppm AA will be necessary.

I have always seen a positive result in working like this, step by step, rather than a straight copper dosage that may strip everything.

The Opti-RED and BoosterRouge inactivated yeast have a complex role in such a treatment. The inactivated yeast adsorbs some compounds involved in the perception of sulfur off-flavors. Some wine molecules are protected through macromolecule interaction thereby diminishing the negative copper impact on varietal characters. The Opti-RED and BoosterRouge also add macromolecules (mannoprotein, nucleic acid, etc.) that compensates for the damage from the copper.

Note: A significant part of the copper precipitates as copper sulfur or is adsorbed on particles. It is not good practice to leave excess copper in the treated wine. It is strongly recommended to check the copper concentration in the wine after racking.

Q. The biggest question we all now face is the next step for treatment. Do we use AA and copper or would the copper impregnated pads help remove disulfides? Alternatively, should we use AA first and then use the pads? Could we treat with AA and a heavy copper addition then use the copper reducing pads?

Do we need to use Carbon too?

DD: I hope not! In extreme conditions before reaching the carbon solution, try adding copper and Opti-RED for one week (see the above treatment). Next add sawdust (toasted French oak at 1000 ppm) and Opti-RED (300 ppm) for one week with stirring. Opti-RED will prevent excessive oak aromas and tannin perception. Then go back to barrel and again add 300ppm Opti-RED to build a balanced colloidal system over the next three months. Keep up a regular stirring regime.

This is a lot of Opti-RED, isn't it? Yes! But you have a big problem and it is already very late in the season. With timely prevention, the wine should be clean before Christmas.

Q. Is it better to treat earlier and then go back to barrel with the treated wine or is it better to treat closer to bottling?

DD: I always recommend to work as early as possible, starting at the very beginning of fermentation. Prevention is the best remedy!

When prevention is not 100% efficient I recommend having clean wines before Christmas. The more you wait the more you have chemically stabilized compounds that will be very tough to touch later with copper or whatever. Then you won't have time to build the colloidal and aroma balance in the barrel with either active and microbiologically pure lees (Opti-RED) or yeast maceration of 1000ppm D254 active dry yeast.

Q. How do you know you've solved the problem and it won't reoccur in the bottle?

DD: Time and experience! More seriously, taste the wine to confirm that you have reached conformity. Then, avoid conditions that will produce sulfur off-flavors again (old wet oak barrel, Brett, etc.).

I recommend tasting the treated wines outside the winery itself (to avoid sulfur aromas saturation that can hide the problem). They should be tasted alongside clean wines (last year's wines, competitor's wines) and against the same wine treated with a copper penny. Sulfur off-odors are very versatile. The contrast with cleaner wines helps avoid sensory saturation. The human palate

Dominique Delteil Consultant

can become saturated with sulfur off-odors. It is difficult to identify them when they are below a certain intensity.

Q. What type of laboratory tests will help us make these decisions?

DD: Check for living *Brettanomyces*, *Pediococcus*, *Lactobacillus*, *Oenococcus*. Check for residual copper residues. Do organoleptic tasting.