

PRESQUE ISLE WINE CELLARS

"Serving the Winemaker Since 1964"

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Use and Measurement of Sulfur Dioxide In Wine

Sulfur dioxide (SO₂) is a gas under normal conditions. It is very soluble in water. (wine is mostly water)

It has been used in wine making since early Egyptian and Roman times.

Reasons for its use include:

- It is an antioxidant (prevents many undesirable bonds of chemicals with oxygen).
- Keeps wine fresher.
- Helps prevent browning.
- Can inhibit some yeast (esp. wild ones).
- Inhibits acetic bacteria (the vinegar culprit).
- Inhibits lactic bacteria (if this is not desired then should hold off on use of sulfur dioxide).
- It helps stabilize color in red wines.
- It allows longer storage of wine.
- Not only used directly in wine but also in disinfecting equipment
- Nitrogen levels may be better preserved for wine yeast that otherwise would be competed for with wild yeast strains.

Some General Points to Consider:

- Because of the above information, it is our belief that by using sulfur dioxide, better wine will be made.
- Levels of SO₂ are measured in milligrams per liter (mg/l) which is the same as saying parts per million (ppm). Example: 45 mg/l = 45 ppm.
- Use is somewhat more important in white wines as they have less of other antioxidants than do red wines.

- The Food and Drug Administration cautions that there may be potential health problems for people with asthma. TTB regulations say any wine with a level greater than 10 mg/l must say “contains sulfites” on the label. The maximum level allowed is 350 mg/l. That is way above a level needed. Keep in mind that many yeast strains produce levels that exceed 10 ppm.
- There are considerable differences amongst people as to their threshold for detection of sulfur dioxide.
- Two forms of SO₂ will develop when added to wine. The two forms add up to “Total” SO₂.
 1. Bound (fixed).
 - a. Doesn’t do as much to protect the wine but subtracts from the “helpful” amount. How much binds up is not the same from situation to situation.
 2. Free SO₂ (yes, you do have to pay for the “free” SO₂ kit).
 - a. It also divides into parts with the major ones being the molecular form and the bisulfite form.
 1. The molecular form is the most important to the winemaker. It is the real microbe fighter.
 - a. 0.8 mg/l of molecular SO₂ is considered the needed amount for white wine and 0.5 mg/l for red wine.
 - b. Certain “free” SO₂ levels are needed to insure the target amounts of molecular SO₂ are maintained.
 1. It’s important to note that the amount of “free SO₂ to add to maintain the proper molecular level is dependent on the wine’s pH.
 2. Another thing to note is that what is determined to be an appropriate amount of “free” SO₂ added one day to maintain the desired molecular level may have that level go below the desired amount due to some of the SO₂ becoming bound.

Specifics of Usage:

Ways To Get Sulfur Dioxide Into Wine:

- Inject as a pure gas (most likely only a commercial winery would do this).
- Use campden tablets (are about 48% sulfur dioxide and must be crushed. Many recipes call for their use).
- Use sodium metabisulfite powder (cheaper but less common and adds salt to the diet).
- Use potassium metabisulfite powder commonly referred to as “meta” (about 57% SO₂ and easy to use. This is the most common method).

How Much Sulfur Dioxide Needs To Be Added?

To answer that a decision needs to be made on which method to use:

1. Use a rule of thumb method?
2. Use a more precise measurement method?
3. Use a combination of the two?
 - a. This might arise from testing for SO₂ but not pH (therefore an assumption is made that pH falls in an acceptable range. Kits to test “free” SO₂ are fairly affordable while a good pH meter will be more expensive.

The Rule of Thumb Method:

- Calls for the use of 1.5 grams (1/4 tsp.) per five (5) gallons each time the wine is racked. It is recommended that only two or three rackings be done. The 1/4 tsp. equals about 45 ppm (mg/l). Because most grapes/juices fall in a favorable pH range, and since some SO₂ becomes bound, and some is lost due to racking, this method really is quite workable and certainly is better than not using any “meta” at all.

Ways To Test More Specifically for “Free” and “Total” SO₂.

1. Aeration Oxidation.
 - a. Needs a distillation type apparatus.
 - b. A fairly costly piece of equipment.
2. Ripper Test
 - a. Said to be somewhat inaccurate especially in red wines and in white wines that were made from fruit infected by *Botrytis cinerea*.
3. Commercial Titret Kit (ampules).
 - a. A form of the Ripper Test but easier.

To calculate how much “meta” to add in grams to a known batch size use the following formula.

- Assume a 5 gallon batch of wine is measured to have a “free” SO₂ level of 10 ppm (10 mg/l). The pH is either measured or guessed to be 3.4 which requires a “free” SO₂ level of 32 ppm. Therefore the level of “free” SO₂ needs to be raised by 22 ppm (22 mg/l).

Since grams are more easily measured or more charts exist that change grams to teaspoon equivalents let us change the 22 mg/l to grams per liter by dividing by 1000 since there are 1000 milligrams in a gram. This amount then is .022 g/l (still = 22 ppm).

Also since a liter = 3.785 gallons we can change liters to gallons by multiplying 3.785 x the total gallons of wine.

One final point to remember is that potassium metabisulfite is only about 57% active SO₂ so that fraction needs to be calculated.

ppm needed as grams per liter x liters per gallon x gallons of wine
% of active SO₂ in “meta”

or

$$\frac{.022 \text{ g/l (ppm)} \times 3.785 \text{ l/gal} \times 5 \text{ gal carboy of wine}}{0.57} = 0.73 \text{ grams of “meta”}$$

A few final points concerning the use of potassium metabisulfite or other sources of SO₂:

- Be very sure to get it completely mixed into the wine batch. It might be advisable to dissolve it in some water and then add that to the wine.
- Avoid using potassium metabisulfite after having cold stabilized as the addition of potassium salt can bring about tartrate instability.
- If a sweet wine is bottled and potassium sorbate is used be sure to use SO₂ because sorbate will not inhibit malo lactic bacteria. If an M/L fermentation starts in the presence of sorbate a geranium off odor likely will develop. SO₂ does inhibit an M/L fermentation.
- Avoid introducing SO₂ during yeast fermentation as most will bind up so as not to be of any help and in the meantime more acetaldehyde will be produced which could affect the wine's flavor.