

Managing pH & SO₂ in Winemaking is Crucial

**Presented by
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Managing pH & SO₂

- Since the 18th Century, SO₂ has been used to protect wine because of its antimicrobial and anti-oxidative properties
- Poor SO₂ Management is the #1 cause of winemaking issues and failed wines with home winemakers.
- Why pH matters in Winemaking
 - pH measures the strength of acidity in wine not just the amount of acid, but how active it is. Most wines fall between 3.0 and 4.0 and even small shifts can dramatically affect wine chemistry.
 - pH and TA are interrelated. You can't change one without affecting the other. But the changes are not 1:1

Clean & Sanitize with a two-step process

- Cleaning:
 - One Step, Cleanser: Environmentally Friendly, Non-Toxic, no-rinse cleanser,
 - Five Star PBW: Environmentally Friendly
- Sanitizing
 - Five Star: Star San Sanitizer: High Foaming, Flavorless, Odorless & Non-Toxic
 - Five Star: Saniclean Sanitizer: Low Foaming, Flavorless, Odorless, & Non-Toxic

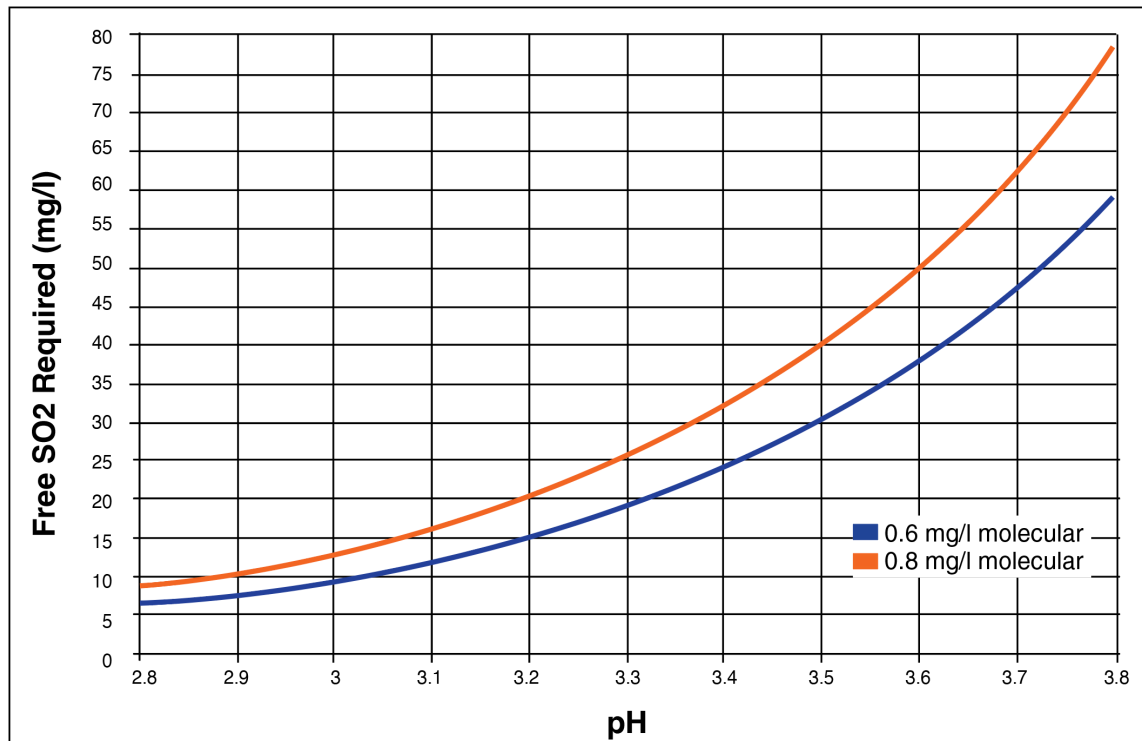
Protecting your wine

- Adding SO₂ to Grape Must is a Cornerstone of modern winemaking
 - **Microbial Control:** SO₂ inhibits wild yeast and spoilage bacteria that hitch a ride on the grapes from the vineyard.
 - **Oxidation Prevention:** SO₂ acts as an antioxidant from oxygen exposure, which preserves Color and Flavor.
 - Enzymatic Oxidation occurs at crush and fermentation
 - Non-Enzymatic Oxidation occurs post-fermentation
 - **Chemical Stability:** SO₂ keeps wine tasting fresh and looking good. It blocks off-flavors and helps red wines keep their color.

Four easy steps to adding SO₂ to your wine

- Crush: add 50 ppm to your must
- After MLF is complete add 50 ppm to your wine
- Monitor your wine with FSO₂ testing every 4-6 weeks to determine how much SO₂ you need to add to keep you FSO₂ at the recommended level to protect your wine.
- Two weeks before you bottle your wine, test your FSO₂ and add enough SO₂ to protect your wine in the bottle

The Required amount of FSO₂ to protect your wine increases as the pH increases



pH will determine how much SO₂ is required to protect your wine

pH	0.8 ppm	0.5 ppm
	White Wine	Red Wine
2.9	11 ppm	7 ppm
3.0	13	8
3.1	16	10
3.2	21	13
3.3	26	16
3.4	32	20
3.5	40	25
3.6	50	31
3.7	63	39
3.8	79	49

How to add SO₂ to your wine

- **The 10 % SO₂ Solution**

- 10% solution is a mixture of 10 grams of SO₂ (potassium metabisulfite) into 100 ML of water. First you add 10 grams of SO₂ to 50 ML of water then you top up to 100 ML of water. See the chart that shows how many ML of 10% solution to add an exact amount of ppm of SO₂ to your must of wine.
 - See the pH chart to determine how SO₂ is need to protect your wine
 - See the 10% Solution Chart

10% SO₂ Solution Chart

10% Solution of Metabisulfite							
(Add ppm SO ₂ to desired amount.)							
Must/Wine	10	20	25	30	40	50	75
(gallons)	(Add milliliters of 10% solution)						
1	.6	1.3	1.6	2.0	2.6	3.3	4.9
5	3.3	6.6	8.2	9.9	13.1	16.4	24.6
10	6.6	13.1	16.4	19.7	26.3	32.9	49.3
25	16.4	32.9	41.1	49.3	65.7	82.1	123.2
60	39.5	78.8	98.5	118.3	157.7	187.2	295.7

Other ways to add SO₂ to your wine

- Powder Potassium Metabisulfite: Measure your grams with an accurate scale
- Effervesence Granules or Tablet foil pouches
 - Efferbarique
 - Inodose
 - Campden Tablets

Adding SO₂ to your fresh grape must

- **Crush:** After you crush your grapes, you should add 50 ppm SO₂ to your grape must, to inhibit wild yeast and spoilage bacteria.
- **Red Wine:** When calculating the SO₂ dose, you will use the total estimated must volume which includes the skins, seeds and juice.
- **White Wine:** When calculating the SO₂ dose, you will use the estimated juice volume because you have already pressed off the skins and seeds.

Testing your grape must (juice)

- Waiting 24 hours after the crush to take a must sample for lab testing.
- A **Lab Juice Panel** will give you your Brix, pH, TA, ML, YAN, NH₃, K⁺.
- **Brix:** you may want to adjust your Brix (sugar level) depending on your grape.
- **YAN:** you may want to add more nutrients depending on your Brix and yeast nutrient requirements
- **pH:** you may want to adjust

Ideal pH Ranges & Flavor and Color

- Ideal pH Ranges:
 - White wines: 3.0 - 3.4 pH
 - Red wines: 3.3 - 3.6 pH
- Sensory & Structural Impact:
 - Flavor:
 - Lower pH wines are more acidic, which can make the flavors feel crisper and more vibrant
 - Higher pH wine usually tastes smoother and less acidic, highlighting fruit flavors
 - Color:
 - Lower pH in red wines can make the color more vibrant.
 - Higher pH in red wines can lead to a deeper more muted color.

pH levels will generally rise during fermentation

- pH: You may want to raise or lower your pH depending on the grape and the type of wine you are making.
 - Alcoholic Fermentation: (AF) pH typically increases 0.1 to 0.3 pH
 - Malolactic Fermentation: (MLF) pH typically increases slightly and softens acidity.
 - Low pH: Enhances microbial stability and SO₂ effectiveness.
 - High pH: >3.6 increases vulnerability spoilage

Adjusting pH incrementally (if necessary)

- Because the must components are in a state of flux from cold soak to post MLF, many winemakers prefer to make **incremental adjustments** rather than one big initial adjustment.
- Ideally you should adjust your pH (if necessary) before you start fermentation.
- Then if needed, make additional adjustments after fermentation and MLF is completed.

How to raise or lower pH

- To Lower pH (Increase Acidity)
 - Add 1 gram Tartaric acid per Liter, lowers pH by 0.1 - 0.2 unit (will vary)
 - Add incremental smaller amounts and retest to prevent lower pH to much
- To Raise pH (decrease Acidity)
 - Add Potassium Bicarbonate (KHCO_3) for smaller adjustments
 - Typical dose: .67 gram per Liter reduces TA by 1 gram/Liter and raises pH by 0.1 units
 - Below pH 3.65, Potassium Bicarbonate additions lowers pH and TA
 - Above pH 3.65, Potassium Bicarbonate additions raises pH and lowers TA
- Best Practices
 - Always measure pH and TA before and after additions
 - Use Calibrated pH meter with 0.01 accuracy
 - Make incremental additions, mix thoroughly, and taste along side & retest.

Adding yeast to your wine must

- Add Yeast 12-24 hours after you add your SO₂ to your must or after you are done with cold soak.
- After your wine is done with fermentation and MLF add 50ppm SO₂
- Some of SO₂ added to grape must or wine is bound up immediately after addition. The remainder is called FSO₂ with a small portion remaining as molecular SO₂. Molecular SO₂ levels should be maintained between 0.5 (red) and 0.8 (white) levels ppm for proper protection. Once SO₂ become bound it is no longer protective but still contributes to the wines total SO₂ level. The remaining free portion is available to protect the wine.

Managing SO₂ after fermentation is done

- Monitor Free SO₂ (FSO₂) by testing
 - As FSO₂ gets bound up and declines, you need to add more SO₂ as needed monthly to ensure the wine stays stable and safe.
 - Test your wine every 4 – 6 weeks to determine your FSO₂ in your wine
 - In early months of wine aging FSO₂ declines 10-15 ppm per month
 - In later months of wine aging FSO₂ declines less per month
 - Total SO₂ (TSO₂): is the sum of FSO₂ and bound SO₂.

Bottling

- Bottling
 - Two weeks before bottling you will need to test your wine for FSO₂
 - Determine how much FSO₂ should be in the bottle with the pH chart
 - During bottling, wine can lose 5-15 ppm FSO₂ with air contact
 - Add an additional 15 ppm on top of the required amount based on the pH chart
 - As an example, if the pH chart says you need 25 ppm based on your wine's pH, then add an additional 15 for a total 40 ppm at bottling.
 - Once you add the SO₂ to your wine mix up the wine with a drill spinner to blend in the SO₂ addition
 - Wait a week to let your wine settle and clear before bottling.

Testing your grape juice and wine

- Testing your wine for FSO₂
 - Professional Lab testing
 - Juice panel after crush
 - Wine panel after fermentation and MLF
 - Home testing
 - Vinmetric SC-100a FSO₂ test
 - Vinmetric SC-300 Complete test
 - Economy Aeration-Oxidation FSO₂ test
 - Expensive Hanna Mini Titrator HI84500
 - Titrets – not very accurate, we do not recommend

Sources

- The information in this report was compiled by Terry Feeney and Tom Jereb from many different AI internet sources and Bruce Hagens report entitled “ Ensuring wine stability-versatility of Sulfides (S)₂), Wyeast Laboratories, Inc. Website, ETS 2025 Harvest Guide and the Beverage People article on How to use and test for Free SO₂ in wine.