STABILIZATION OPTIONS

For Sweet Wines before Bottling

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Sugar-Sugar

- Top source of carbon
- Excellent seller of wine
- Brings balance to wine with high acidity/astringency
- Promotes peace, comfort and wellbeing…
- to all creatures great and small.
- Including yeast and bacteria.

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Game plan to stabilize/prevent refermentation in the bottle?

- Filtration
- SO_2
- Dissolved oxygen
- Sorbate
- Pasteurization
- Velcorin®
- Bottling conditions

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Filtration

- Absolute 0.45 micron membrane.
- $10^7/cm^2$ or $10^9/10”$ retention rating as well as 99.9%. Ask for the validation guide.
- Integrity testable.
- 30k-80k gallons per 30” throughput if your prefiltration is done properly.
- Cons: The bottling line between the filter and the filler can still be a source of contamination.

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SO_2

- Potassium metabisulfite (KMBS)
- Excellent anti-microbial and anti-oxidant agent
- Molecular SO_2? 0.5mg/l (ppm) for red, 0.8mg/l (ppm) for white, up to 1.5mg/l for dessert.
- pH dependent
- Tablets, granules, liquid, powder
- Timing.

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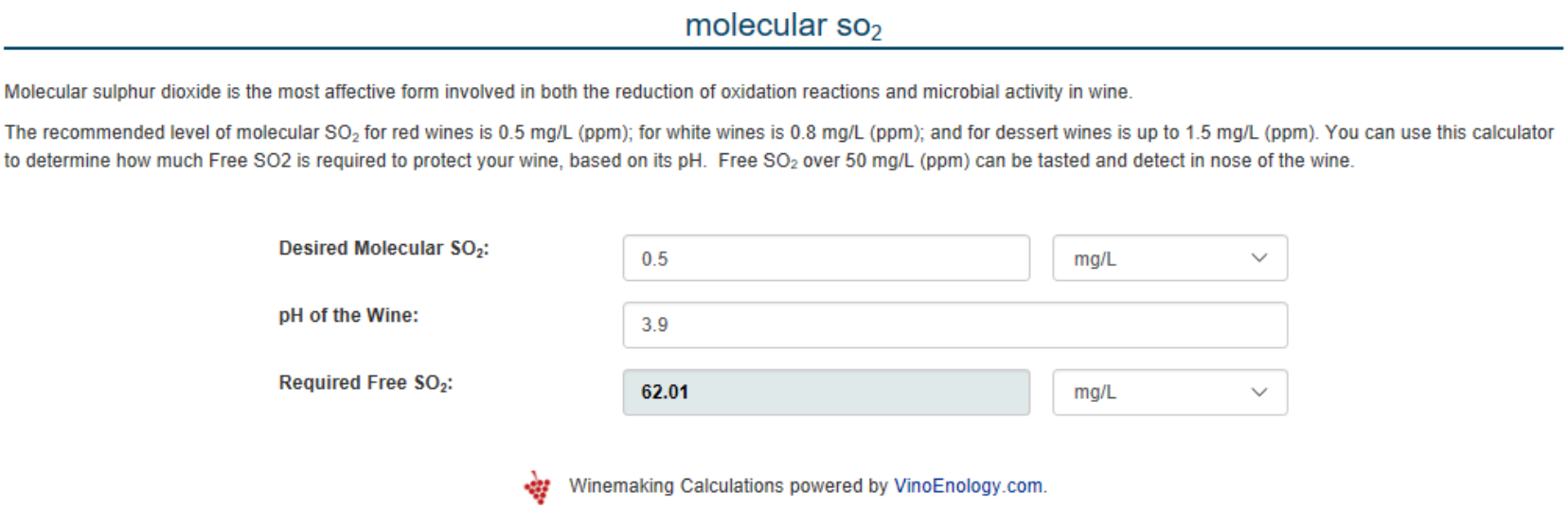
Winemaking calculators



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Dissolved oxygen

- By itself not enough to deter refermentation but as part of a game plan, it makes SO_2 more effective.
- <0.5ppm O_2 at bottling.
- Scrub DO with high purity food grade N_2 through a sinter.
  No DO meter? Scrub with 5 times the volume of N2.
- What you get?
  Fresher wine, less chance of oxidative spoilage microbes getting going, more stable and effective SO_2 levels/adds, and should see less incidence of post packaging reduction if you maintain low levels of DO. Also less browning.

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Sorbic Acid

- A. W. Van Hoffman was the first to isolate Sorbic acid from the berries of the mountain ash tree in the year 1859.
- Legalized for use in wine in France in 1958 and in Germany in 1971.
- Potassium Sorbate is the most soluble salt of Sorbic acid. Salt form is preferred due to solubility.
- In the United States, the TTB permits the use of sorbic acid and potassium sorbate to preserve wine. The maximum concentration of sorbic acid allowed in finished wine is 300 mg/L, (300 ppm).
- https://www.extension.iastate.edu/wine/sorbic-acid

Table 1. Sorbic acid and potassium sorbate solubilities

Solvent	% Solubility Sorbic Acid	% Solubility Potassium Sorbate
Water		
20°C (68°F)	0.16	58.20
50°C (112°F)	0.55	61.00
100°C (212°F)	4.00	64.00
Ethanol		
5%	0.16	57.40
100%	12.90	2.00
Sucrose		
10%	0.15	58.00
40%	0.10	45.00
60%	0.08	28.00

Source: Gooding et.al. (1955), Pfizer (1974), Monsanto (1978), and Sofos and Busta (1981), Cited by Sofos and Busta (1983).

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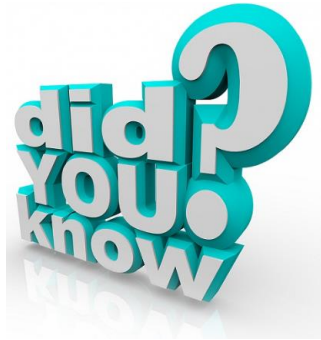
Potassium Sorbate in wine



- Inhibitory effect against yeast *
- Selectively inhibitory against some bacteria
- *Not inhibitory against *Zygosaccharomyces bailii* at 0.06% Sorbic acid in 10% glucose solution.
- If you use contaminated concentrate with Zygo in it, you will get refermentation even if you used the correct level of molecular SO_2.
- Max dose is 300ppm of Sorbic acid but the taste threshold is much lower at about 130ppm.
- Potassium Sorbate is not effective against *Lactobacillus* or *Acetobacter. Lactobacillus* can metabolize and produce geranium type off flavors from it.
- Addition of sorbic acid often results in the formation of ethyl sorbate, which is said to impart an unpleasant odor when present at a significant level.
- To prevent off-flavors from Potassium Sorbate metabolism, you have to make sure you have sufficient molecular SO2 levels based on your pH.

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Potassium Sorbate… S'more

- The higher the alcohol content of your wine, the better the solubility of Sorbic acid and the less Potassium Sorbate you need to add:
-

% Alcohol in wine	Sorbic acid mg/L
10	150
11	125
12	100
13	75
14	50

- A wine must be filtered/clarified to less than 100 cells/ml for Sorbate to be effective.
- The solubility of Potassium Sorbate is affected by temperature – don't add to cold wine.
- Mix wine very well after a Sorbate addition.
- Potassium sorbate contains 73.97% sorbic acid.

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Sorbate addition calculation

- Potassium sorbate contains 73.97% sorbic acid.
- Ppm = mg/l
  mg/l of Sorbic acid x 1.35 = mg/l of Potassium Sorbate.

*ppm of sorbic acid desired	Grams of Potassium Sorbate Required	Grams of Potassium Sorbate Required	Grams of Potassium Sorbate Required	Grams of Potassium Sorbate Required
	gm/gal	gm/10 gal	gm/100 gal	gm/1000 gal
50	0.225	2.55	25.5	255
75	0.383	3.83	38.3	383
100	0.511	5.11	51.1	511
125	0.639	6.39	63.9	639
150	0.767	7.67	76.7	767
175	0.894	8.94	89.4	894
200	1.022	10.22	102.2	1022
225	1.150	11.50	115.0	1150
250	1.278	12.78	127.8	1278
275	1.405	14.05	140.5	1405
300	1.533	15.33	153.3	1533
325	1.661	16.61	166.1	1661
350	1.789	17.89	178.9	1789

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Pasteurization

- Batch, tunnel, flash
- Cider
- Beer
- Juice & dairy
- Kosher Wine
- Best practice is to filter the product to at least submicron before pasteurization.
- Protein stable before.
- Possible change in structure/mouthfeel/balance.
- Packaging?
- Solubility changes.

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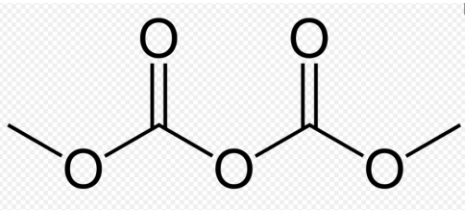
Velcorin®



- Dimethyl Dicarbonate (DMDC)
- Beverage Sterilant
- Max dose is 16ml/hl or 200ppm.
- Breaks down into equal parts CO2 and Methanol.
- Freezes at 63F. Needs special dosing machine for application/atomizing.
- Not a preservative so you don’t need to put it on the label.
- Action is temperature sensitive. The colder the wine, the slower the reaction.

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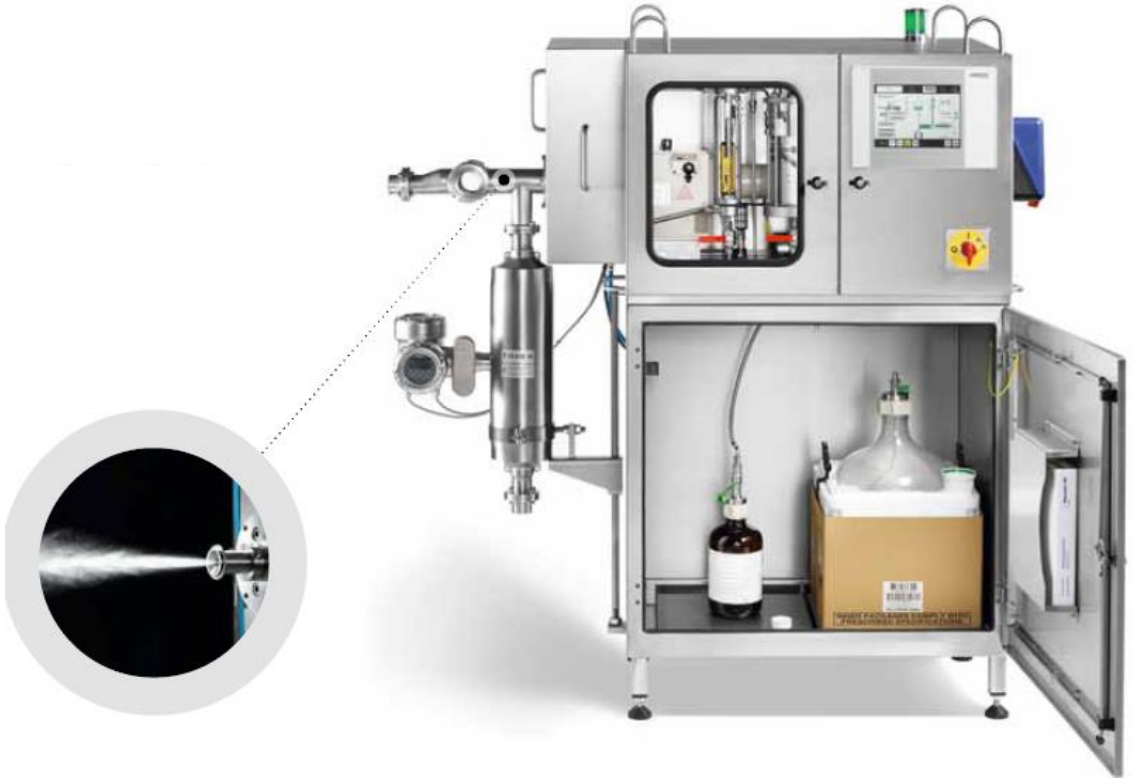
Velcorin is dosed with a specialized dosing machine

- Dosing Machine Features:
  - Flowmeter to register the flow of beverage to the filler bowl
  - Intricate spritzing nozzle
  - Temperature control system
  - Dosing chamber that holds two cases of 3 kg bottles



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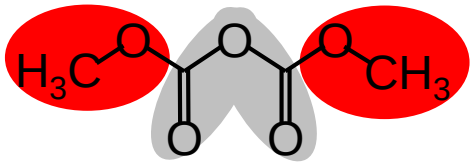
Velcorin has a unique operating principle

Wine | **Cell interior**

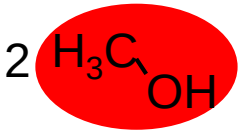
200 mg dimethyl dicarbonate

(lipophile)



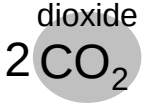
+

96 mg methanol



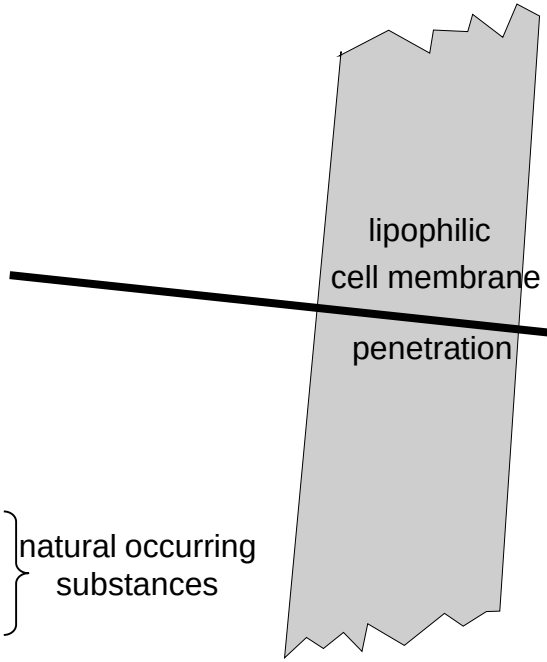
+

131 mg carbon dioxide

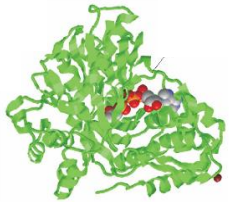


natural occurring substances

[pH : 2 - 4 (acidic)]



effect on



inactivated enzyme with carbo-methoxylated imidazole group

[pH : 7 (neutral)]

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Microbial Effectiveness of Velcorin

- Most effective against yeast
  - *Saccharomyces*
  - *Brettanomyces*
  - *Zygosaccharomyces*
- Moderately effective against some bacteria
  - *Acetobacter*
  - *Pseudomonas*
  - *Lactobacillus*
- Least effective against mold

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Velcorin Applications in Winemaking

- To help stabilize unfiltered premium wines:
  - as a substitute for membrane filtration
  - as an insurance against undesirable yeast like *Brettanomyces*
- To decrease the amount of SO_2 used in early-to-market wines
- To prevent re-fermentation in wines containing residual sugar
- Bulk Wine stabilization

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Velcorin is NOT a Silver Bullet!

- Velcorin is not a band-aid for sloppy sanitation
- Bench-Top studies are REQUIRED!

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Other tools:

- Bactiless
- No Brett Inside
- Lysozyme

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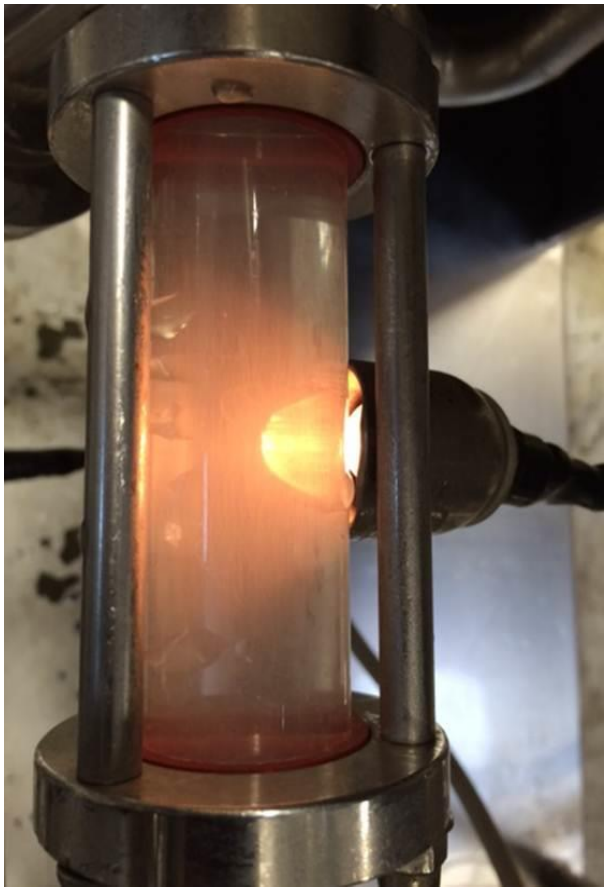
Bottling Conditions

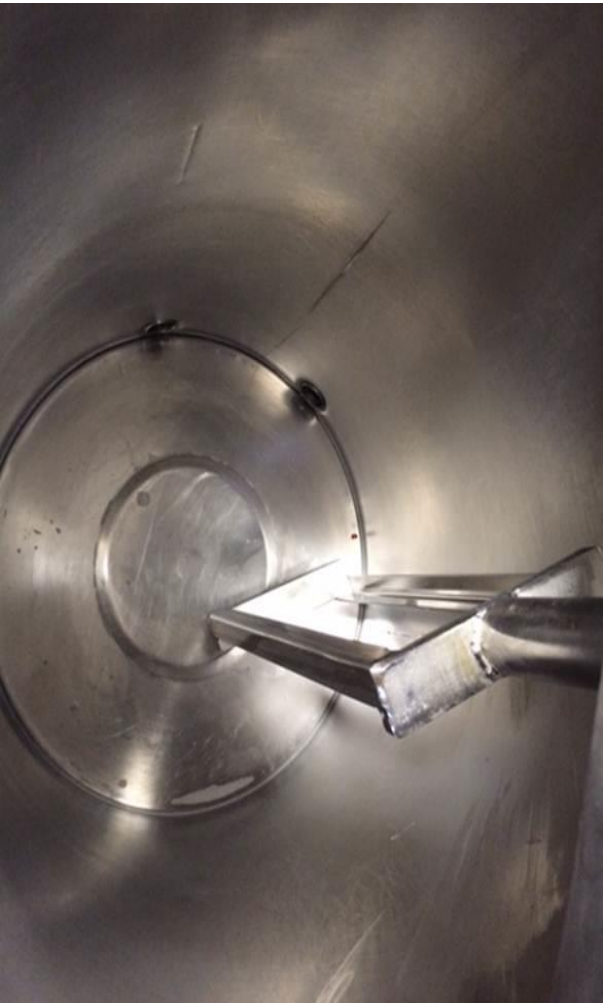
- The last frontier.
- Where do you bottle? Automatic bottling line? Next to ferm tank? Did you know yeast and bacteria float around in the air?
- Sanitation = cleaning followed by sanitizing
- Biofilm buildup? Sugar acts like a magnet.
- Periodic filler head inspection/rebuild.
- ATP swabs – Charm science or Hygiena
- Sterile filtering into a tank and then hand bottling, is not sterile bottling.
- Cleaning your bottling line:
- http://www.scottlab.com/uploads/documents/technical-documents/1191/Bottling%20Line%20Cleaning%20Protocol.pdf

BEFORE…



SCOTT LABORATORIES

…AFTER



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BEFORE

SCOTT LABORATORIES

AFTER

SCOTT LABORATORIES

Thank you!

SCOTT LABORATORIES