FIXING COMMON WINEMAKING PROBLEMS
New York State Home Wine Seminar
AUGUST 9, 2008

	COLOR	**CLARITY**	**CRYSTALS**	**CRISPNESS**	**CLEANLINESS**
Also Known As…	Oxidation Browning	Hazes Sediments	Tartrate	Flavor Balance	Aroma and Bouquet Absence of Off Odors
What Affects it Most?	pH Sulfur Dioxide Temp. & Air	pH Pectin Protein	pH Alcohol Temperature	pH Alcohol Residual Sugar	pH and SO_2 Temperature & Air Microbiology
How is It Affected?	Low: SO_2 High: all above	Low: none High: all above	Low: Temp. High: Alc. & pH	Low: all above High: all above	Low: SO_2 High: all above
What Don't we Want?	Brown Colors	Poor Clarity	Crystals	Unbalanced Tastes	Off odors
What Do we Want?	Superb Colors	Brilliant Clarity	Freedom from Grit	User Friendly Flavors	Clean aromas
How Can we Fix it?	Refer to: SO_2 Chart	Refer to: Fining Agents	Refer to: Tartrate Stabilization	Refer to: Juice Deacidification	Refer to: Wine Microbiology & Correcting Spoilage

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SO_2 CHART

There is a direct relationship between pH and SO_2 levels. The lower the pH is, the greater the level of molecular free SO_2 in the wine and vice-versa. It is the molecular SO_2 that is the active portion of SO_2.

I rely on the following chart, from Enology Briefs I (#1), Feb/March 1982 UC Cooperative Extension to make all my SO_2 adjustments.

pH Range	White Wines	Red Wines
2.9-3.10	10-16 ppm free SO_2	7-10 ppm free SO_2
3.2-3.4	21-32 ppm fSO_2	13-20 ppm fSO_2
3.5-3.7	40-63 ppm fSO_2	25-39 ppm fSO_2

You need a pH meter and some way to measure fSO_2 in wines. Titrettes are a good indicator of the amount of free SO_2 in wines containing 10-100 ppm of free SO_2.

0.45 grams of potassium metabisulfite for every gallon of wine equals 60 ppm SO_2

If your wine is over a pH level of 3.5 (my absolute tops for any wine), adjust it downward with tartaric acid for grape wines prior to tartrate stabilization or with citric acid prior to bottling.

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FINING AGENTS

There are six fining agents I use in my winemaking. They are the only ones you need that will cover nearly every winemaking problem regarding clarity or other situations.

1. Bentonite
2. Liquid gelatin
3. Silica dioxide
4. Polyclar VT
5. Egg whites
6. Tannin

1. Bentonite (for white and rose wines only):
   - mined clay also known as Montmorillonite clay, from Wyoming
   - Carries a negative charge and reacts with positive charged proteins
   - Removes all reactive protein from wine
   - creates the most lees of all the fining agents but can compact lees by adding a topping agent like Sparkolloid, Klearmor, or silica dioxide
   - strips color and flavor in excessive amounts but can also clean up off aromas and flavors
   - Made up as a 5% slurry in water (not wine) = 5 grams bentonite/100 mls water. Allow to sit (hydrate) for 48 hours minimum. A slurry will form. Mix well until slurry is smooth with no lumps. Suggested additions for grape categories:
     - Native grapes = 25 mls slurry for every gallon of wine to be treated
     - Hybrids = 20 mls slurry for every gallon of wine to be treated
     - Vinifera = 10 mls slurry for every gallon of wine to be treated

Not recommended for use in juice. The exception is a material called "Argilact" a combination of bentonite and casein (milk protein) used to remove moldy components from juice prior to fermentation that works very well.

2. Liquid Gelatin:
   - prepared from collagen, the major structural protein in skin and bones
   - Carries a positive charge
   - Reacts primarily with tannin
   - Liquid form is easy to use
   - can be used to reduce oxidation or browning in wines
   - needs silica dioxide or bentonite to pull it out of solution
   - excellent for fruit wines at a rate of 0.40 mls 50% liquid gelatin for every gallon of wine to be treated

3. Silica dioxide:
   - also know as keiselsol
   - used as a replacement for tannin during gelatin fining
   - helps to compact lees
   - used in liquid form
   - not effective when used alone
   - settles immediately
   - rate is 6 mls Kieselsol for every gallon of wine to be treated immediately after adding gelatin or bentonite to the wine

4. Polyclar VT:
   - synthetic material
   - reacts with precursors to browning in all wines
   - use sparingly in rose and red wines to remove brown color tones and bring back fruitiness
   - use in white wines to extend shelf life of bottled wines, remove browning and oxidative compounds, and enhance fruit aroma
   - normal rate is 1 gram Polyclar for every gallon of white wine to be treated. For rose and red wines to remove browning and restore color I recommend 0.20 grams Polyclar/gallon of wine

5. Egg Whites:
   - also called albumen
   - commonly used only in red wines to remove tannin
   - more effective than gelatin for tannin removal in reds
   - usage rate is one small egg white for every 5 gallons of wine. Beat until slightly frothy with a pinch of salt. Add some of the wine to be treated to the froth and mix then add back to wine to be treated. Pour over top of carboy-no need to mix; will form a net on its own and settle naturally.
   - significantly improves middle palate structure in red wines

6. Tannin:
   - negatively charged and reacts primarily with gelatin to enhance clarification
   - can add to red juices on the skins to "fix" or stabilize color during fermentation (Tancor Grand Cru)
   - can use "white" tannin to remove color of light red juices to render them into white wines (Batonnage Blanc)
   - when used with gelatin and bentonite, will definitely soften harsh wines like sherries and ports
   - Refer to manufacturer's suggested usage rates and do bench scale trials

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TARTRATE STABILIZATION

Here is a process for fast tartrate stabilization without chilling. I also use it if I have access to chilling as a method when chilling alone just doesn't cut it.

The process involves the addition of a calcium tartrate seed to unstable wine. The seed is added at a rate of 14 grams of seed for every gallon of wine treated. The seed is made up as a slurry as follows:

1. Add 8 grams of calcium carbonate to a stainless mixing pot containing enough tap water to dissolve the calcium carbonate.
2. To the water and $CaCO_3$ mix slowly add 6 grams of tartaric acid. The mixture will foam. Add enough water to prevent the mix from solidifying and keep stirring until all is dissolved. Add as much water as you need to mix everything well.
3. Allow the mixture to settle. The water will form a clear supernatant.
4. Decant any water off the top of the mixture and discard it.
5. Add water again to cover the top of the mixture and mix again. Allow the water to settle out for 24 hours.
6. After 24 hours, decant the water off the sediment as best you can. The seed is ready to use.
7. Transfer some of the wine to be treated into the mixing pot containing the seed slurry. Make sure it is well mixed then transfer the slurry/wine mixture back to the untreated wine. Mix well then let the wine settle for at least 48 hours. Filter or rack the wine off the sediment to a clean carboy using adjust free SO_2 using the SO_2 chart.

The calcium tartrate seed will react immediately with the wine. It will generate additional seed after being added. I usually make up separate seed material for white and red wines and treat wines from most neutral to most flavorful by racking my next wine into the seed remaining from the last wine to be treated.

An added benefit of seeding in this manner is a 10% drop in total acid content.

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JUICE DEACIDIFICATION

There is a quick and easy way to deacidify high acid juices, using calcium carbonate, prior to fermentation. The process does not lead to calcium tartrate instability in the wine and retains varietal aroma and flavor.

I prefer calcium carbonate for juice deacidification and potassium carbonate/bicarbonate for raising the pH, and not deacidifying, wine. Using calcium carbonate to deacidify wine post fermentation runs a high risk of developing calcium tartrate instability which may take months after bottling to manifest itself.

If you learn nothing else today, learn this:

Do everything you can to adjust juice chemistry prior to fermentation, not after it. You will reap benefit after benefit doing is this way. When adjustments are made after fermentation, wine quality always suffers to some degree, especially if you are inexperienced in winemaking.

To deacidify juice with calcium carbonate prior to fermentation:

- Calculate your starting acid level
- Subtract from this value your desired acid level in the juice
- Multiply this number by 0.057 which will give you pounds of $CaCO_3$ for every gallon of juice to be deacidified
- Transfer 1/3 of the total juice volume to be treated to a separate container and add all the calcium carbonate to that 1/3 amount. Let the calcium carbonate settle out naturally.
- Transfer the 1/3 treated portion back into the 2/3 untreated juice portion and mix. The juice is now ready to ferment.
- Do not add water to the used calcium carbonate from the 1/3 portion. It will turn to cement. Use some other method to dispose it.

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WINE MICROBIOLOGY

ORGANISM	RATING	WHY?	GROW IT	KILL IT
Wild Yeast	Good	Creates complex flavors	35 ppm SO_2 to juice Leave in solids	50 ppm SO_2 to juice Clarify Juice
Pure Yeast	Excellent	Predictable + Create the flavor you want	50 ppm SO_2 + Go-ferm + Fermaid before fermentation	50 ppm SO_2 during ferm. or adding brandy
Brettanomyces or Dekkara (yeast)	Very bad	Spoilage Yeast Barnyard Odor + Mouse Urine	Contaminated Juice or Equipment	50 ppm SO_2 to juice Good Sanitation
Mold	Very bad	Creates moldy or musty odor in wine	Poor sanitation High humidity	Good sanitation Low humidity
Candida (yeast)	Very bad	Forms white film on wine to make vinegar	Headspace in containers + low free SO_2	Keep containers full and free SO_2 minimum 20 ppm
Acetobacter (bacteria)	Very bad	Produces vinegar	Headspace in containers + low free SO_2 + warm temp.	Keep containers full and free SO_2 minimum 20 ppm
Malo-Lactic Bacteria	Good	Reduces acid and stabilizes wine	Inoculate Keep free SO_2 low Do not rack wine	High free SO_2 Rack wine Add Lysozyme

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CORRECTING SPOILAGE

Wine spoilage is a winemaker's bane. Good winemaking practices will anticipate spoilage problems and prevent them before they occur but we do not live in a perfect world. There are always circumstances beyond our control.

Here are six common spoilage problems I've experienced over 33 years as a professional winemaker and my recommendations for eliminating each problem:

1. **Hydrogen sulfide (H_2S):**

To prevent H_2S during the fermentation process, add a good yeast food like Fermaid at a rate of 1.5 grams Fermaid/gallon of wine at the first sign of a reduced odor. If you don't eliminate it at that point, rack the wine immediately after fermentation and add 60 ppm SO_2. The SO_2 will bind the H_2S and settle out as a precipitate. Rack the wine 48 hours after adding the SO_2, if the odor still persists, purchase Desulfin or Copper Sulfate solution from Presque Isle, or other source, and follow instructions.

2. **Mercaptan:**

If H_2S is not treated, it will form mercaptan. To remove mercaptan, first make sure that the wine contains at least 30 ppm free SO_2 then add ascorbic acid at a rate of 0.60 grams/gallon of wine. Allow the wine to sit for at least 24 hours then rack and treat for H_2S removal using Desulfin or copper sulfate. This is a slow reaction so it may take a few weeks for the odor to dissipate.

3. **ATA (Atypical Aging):**

Wines may exhibit excellent colors and aromas but the flavor will taste dirty, musty, or oxidized. To remove this flavor defect, make sure that the wine contains at least 30 ppm free SO_2 then add 200 ppm ascorbic acid (0.70 grams ascorbic acid/gallon wine) and rack after a minimum of 24 hours.

4. **Brettanomyces/Dekkara:**

Don't be fooled by people that say that "Brett" odors and flavors are desirable in wine in small amounts. This barnyard, dirt, or band-aid odor is very objectionable in wines. It is easily detected by taking a small amount of the wine in your hands and rubbing your palms together to volatilize the odor. If it smells like mouse urine, you have Brettanomyces spoilage. There is no way to remove the odor. Do not try to blend off the wine into other wines. It will contaminate anything into which you blend it. Destroy the wine.

5. **Geranium odor/flavor**:

Geranium odor/flavor is formed in bottled sweet wines containing sorbate that undergo a malo-lactic fermentation. The odor is the same as the geranium flower. This odor is also not something you can blend off into other wines and must be treated in a same manner as Brett odors.

6. **Film/surface yeast**:

Film or surface yeast forms on the surface of wines in containers with headspace. The yeast, Candida, if left untreated, will eventually form a thick, white surface layer. Candida metabolizes alcohol to form amyl alcohol, an offensive aroma and flavor.

At the first sign of surface yeast, rack the wine to a clean carboy. Make sure that your hose is below the surface of the yeast so as not to disturb the surface. Add SO_2 to the racked wine using the handy pH SO_2 chart and make sure that the racked wine is in a full carboy.