

# What can happen when good wine goes bad?

## Winemaking process analysis

### Pre-fermentation



Adjust acidity and nutrients for the addition of tartaric acid, to maintain a low pH, and of diammonium phosphate as a nitrogen source for fermentation

**What can happen without relevant analysis of pH, titratable acidity (TA), and ammonia nitrogen?**



pH affects SO<sub>2</sub> antimicrobial action, growth of spoilage organisms, color and flavor. The lower the pH the lower the risk for microbial spoilage and sulfites prevent wine from spoiling.

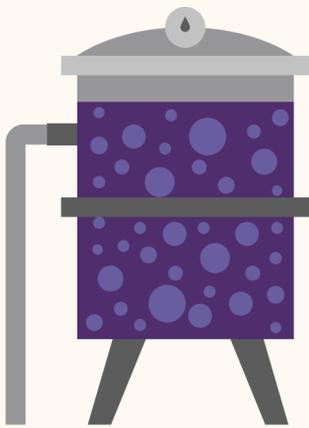


TA affects taste of wine and can adjust pH levels



Nitrogen affects how much nutrient is required to prevent stuck fermentation

### Fermentation - including maceration



During fermentation, yeast turns sugar into alcohol; contact time with skins, seeds, and stems influences tannins, flavors, and colors of wine

**What can happen without relevant analysis of pH, nitrogen, and SO<sub>2</sub>?**



pH affects colors, SO<sub>2</sub> additions, malolactic fermentation, and spoilage organisms



Nitrogen nutrients affect fermentation



SO<sub>2</sub> levels can be adjusted to inhibit any native yeast fermentation that could be on the grapes before primary fermentation

### Post fermentation

#### Clarification



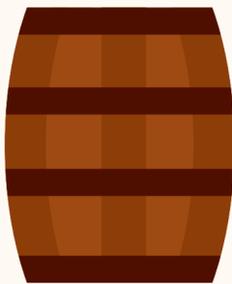
Filter systems are used to clarify wine and remove yeast after fermentation

**What can happen without relevant analysis of turbidity?**



Clarity is a feature of wine and microbial stability is important for long wine shelf-life

#### Racking



Wine is racked to aid in clarification of clean wine

SO<sub>2</sub> may be added in this step to suppress bacteria introduced in this process

**What can happen without relevant analysis of turbidity, clarity, sulfur dioxide, dissolved oxygen in tanks or barrels, titratable acidity, and pH?**



Excess air exposure will increase the O<sub>2</sub> in a barrel which can destroy the flavor of wine through oxidation, causing off flavors before wine maturation

#### Aging



Wine is put in barrels or tanks to age

**What can happen without frequent analysis of pH, sulfur dioxide, dissolved oxygen in tanks or barrels, titratable acidity (TA)?**



pH is adjusted for microbial stability, as it's the molecular form of SO<sub>2</sub> that will inhibit microbial stability. Some grapes typically have lower pH than others.



SO<sub>2</sub> affects microbiological growth and provides antioxidant protection.



O<sub>2</sub> exposure, in barrels and tanks, needs to be monitored to prevent oxidation



TA influences taste balance between sour or flat

#### Bottling and further aging



Wine may be sterile filtered and is packaged in bottles

**What can happen without frequent analysis of pH, sulfur dioxide, dissolved oxygen in bottles, titratable acidity (TA), turbidity/clarity measurement?**



pH, TA, and SO<sub>2</sub> levels are important and should be periodically checked to ensure they are within specification



Measure DO in the tank during bottling to ensure that the head space gassing is adequate to not allow O<sub>2</sub> pickup as the tank is emptied. Confirm by measuring DO in the wine right after it has been bottled.



Turbidity is important for making sure filters do not clog and ensuring a clear wine without any haze

## Without proper and accurate analysis



#### pH

potential growth of spoilage organisms; colors, SO<sub>2</sub> additions



#### TA

taste and spoilage, malolactic fermentation, balance between sour and flat



#### Dissolved oxygen

too much can lead to flavor degradation and wine spoilage



#### Sulfur dioxide

affects microbiological growth and malolactic fermentation; helps prevent oxidation



#### Nitrogen

affects how much nutrient is required to prevent stuck fermentation



Using the right tools and analyses can remedy complications and are the foundation of good winemaking.

Thermo Scientific™ Orion™ Versa Star Pro™ Multiparameter Benchtop Meter

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