Cold stability, testing for a moving target.

Dr Eric Wilkes
Group Manager Commercial Services
Cold Stability, what is it?

- **Cold stability** is essentially a wine's ability to resist the precipitation of tartrates.
- Components in wine (crystallization inhibitors) help prevent the tartrate from precipitating.
- As the wine matures or undergoes winemaking processes, the levels of these crystallization compounds can change, allowing tartrate to precipitate.
- This can happen even after traditional cold stabilization.
Potential vs current

This means there are essentially two types of tartrate stability!

**Current Stability**

*A measure to show if the wine will precipitate tartrates here and now if chilled.*

**Potential Instability**

*A measure of the wine’s potential to become unstable as the wine loses crystallization inhibitors (ages/changes), even if it does not precipitate crystals when chilled.*
There are nearly as many cold stability testing methods as there are wine varieties; and just as much debate about which is best.

- We will touch on the four most commonly used:
  - Freeze/thaw
  - Cold incubation / brine
  - Mini contact / conductivity
  - Saturation temp

- ✔
- ❓
- ❌
Freeze / thaw

✔ Quick cheap and dirty.
✖ Can pretty well get whatever result you need depending on the freezing time.

Results impacted by:
• Sample size
• Sample shape
• Location in the freezer
• Particulates
• The phase of the moon (really)
Brine or 3 day test

✔ Considered the reference method by many Australian wineries.
✔ Gives a good indication of current stability.
✖ But it does not give an indication of the wines future (potential) stability.
✖ Can be hard to interpret for reds.
➢ Best procedure is to bring it back to 20°C for a few hours to allow any colour compounds to go back in solution.
➢ Check the solids left for crystals.
Mini-contact or conductivity methods

Conductivity is a measure of ions in wine, mainly attributed to $K^+$. Essentially all these methods try to measure the change in conductivity after seeding a cold sample of the wine.

- **Principle:** Crystallisation causes a decrease in conductivity over time.
- A big change in conductivity reflects a large tartrate precipitation and hence a high degree of instability.
- More advanced methods determine rate of change of conductivity to give a more accurate determination.
- Constant agitation and monitoring of conductivity.
Mini-contact or conductivity methods

✔ Gives a reasonable indication of the wines potential stability.
✔ Very quick compared to the 4 day test.
✖ However the seeding can swamp the natural crystallization inhibitors giving false positives and resulting in over stabilization.
✖ Quite expensive to set up to do well.
✖ Can be difficult to interpret for some wines with either very high or very low conductivities.
✖ Often difficult to correlate with traditional results for reds.
**Saturation temperature (Tsat)**

- **Tsat** is defined as minimum temperature required to induce crystal formation; the lower the better.
- The method is based on increase in conductivity at room temperature; determined by calculating the temperature at which the wine will (theoretically) throw a deposit.

\[
Tsat = T - \frac{\mu S_2 - \mu S_1}{33}
\]

- ✔ Indication of potential stability
- ✖ Crystallisation inhibitors not accounted for
In summary

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<tbody>
<tr>
<td>Freeze /Thaw</td>
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<tr>
<td>3 day brine</td>
<td>✓</td>
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<td>Conductivity</td>
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No perfect method (at least yet).

What is the best option???
The best option!

A combination approach!

A combination of Brine (current stability) and Sat Temp (potential stability).

Brine ✗ Sat Temp ✗
➡ brutally unstable, probably chill and seed.

Brine ✔ Sat Temp ✗
➡ Currently stable but could throw a deposit with time. Think about a crystallization inhibitor.

Brine ✔ Sat Temp ✔
➡ Stable for the duration. No need to do anything else.