Case study: Using BevScan to screen bottles of a white wine affected by variable oxidation

Introduction

This case study presents a step-by-step example of using BevScan's SIMCAL mode to sort bottles of a white wine affected by variable bottle oxidation.

More general information about BevScan and about variable oxidation can be found in the following two AWRI fact sheets, available from www.awri.com.au:

- **Introducing BevScan - a new tool for non-destructive wine analysis and classification**
- **In-bottle measurement of variable bottle oxidation**

Summary

Samples of a 2002 Semillon wine were submitted to the AWRI for investigation of a variable oxidation problem. An initial set of 24 bottles was scanned using BevScan to produce a preliminary SIMCAL (profile of the wines). These bottles were then opened and subjected to sensory assessment for taint and fault aromas. The sensory scores given by the panel for the attribute 'oxidised' were used to adjust the SIMCAL profile, ensuring it was based only on bottles with 'acceptable' levels of oxidation. This adjusted SIMCAL was then used to screen further unopened bottles of the same wine, allowing fast non-destructive identification of bottles suspected to be affected by oxidation. Chemical analysis was used to confirm the spectral results and validate the classification performed using the optimised SIMCAL.

Building the preliminary SIMCAL

Appropriate instrument conditions were initially identified for the type of wine and bottles under investigation. The first 24 bottles were then scanned with the BevScan instrument in SIMCAL mode using these settings. Spectra were taken at four different positions on each bottle (a,b,c,d) where the spectrum at each position was the average of 25 successive scans. The resulting SIMCAL (profile) is shown on the BevScan display as an ellipse containing 96 scattered dots (Figure 1). The dots represent the individual spectra of the scanned wines (24 bottles x four positions) and the ellipse represents the boundary of the profile.

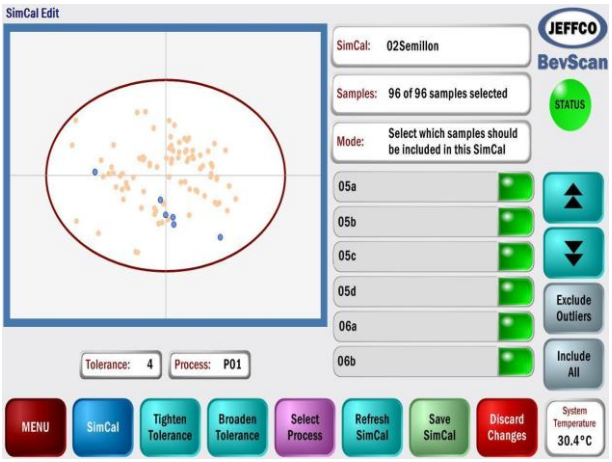

Figure 1: Initial SIMCAL plot generated by scanning 24 bottles at four positions (96 dots).

Optimising the SIMCAL

The 24 scanned bottles were then opened and subjected to sensory analysis by the AWRI's sensory panel. Two of the 24 samples received mean scores >1 for the attribute 'oxidised' indicating they were likely to be affected by oxidation. The spectra from these two samples were, therefore, removed from the SIMCAL, thus creating a profile based only on 'good' bottles.

This step does not necessarily require a formal tasting panel. It could also be carried out using conventional chemical measures of oxidation (e.g. Free SO_2 concentration or Optical Density at 420 nm).

The optimised SIMCAL (with oxidised bottles removed) is shown in Figure 2. The pale grey dots represent the spectra from the oxidised bottles that have been removed.

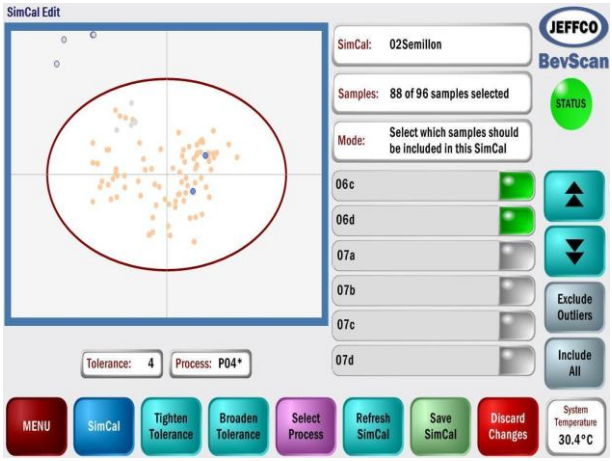

Figure 2: Optimised SIMCAL plot generated by removing oxidised samples.

Using the SIMCAL for non-destructive sorting

The optimised SIMCAL was then ready to be used to classify further bottles of the wine. Twenty-four additional bottles were scanned and automatically compared against the SIMCAL profile. Bottles were classified as 'good' if their spectra were found to lie inside the SIMCAL ellipse. This was also indicated by a green status light on the software screen and a SIMCAL score of less than 10 as shown in Figure 3.

'Good' sample

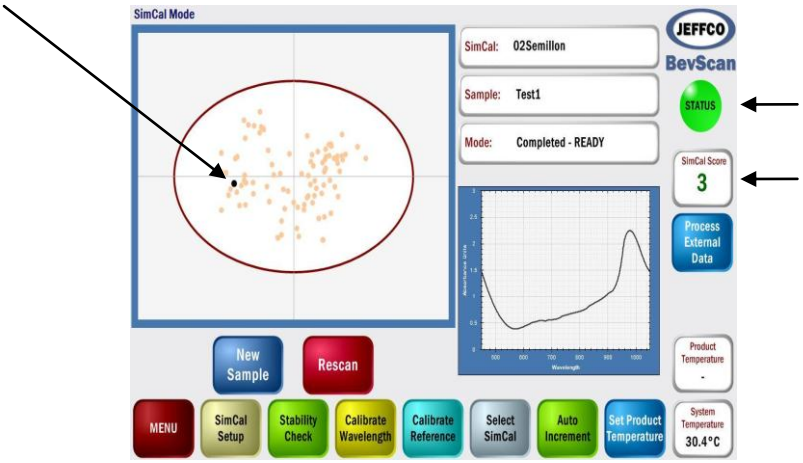

Figure 3: A 'good' sample indicated by SIMCAL.

Bottles were classified as 'suspect' (possibly oxidised) if their spectra were found to lie outside the ellipse of the SIMCAL. This was indicated by a red status light on the software screen and a SIMCAL score of greater than 10 as shown in Figure 4.

'Suspect' sample

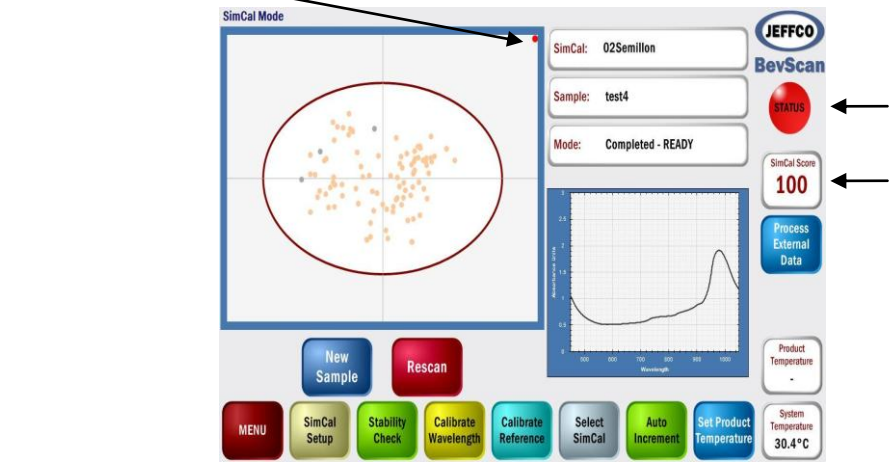

Figure 4: A 'suspect' sample indicated by SIMCAL.

Of the 24 bottles scanned at this point, two were found to have spectra outside the ellipse and were, therefore, suspected of being oxidised.

Validation

To check the BevScan's classification, the two bottles found to be outside the ellipse were subjected to sensory and chemical analysis. One of the bottles classified as 'good' by the SIMCAL model was also analysed for comparison. Both sensory and chemical analyses confirmed the classification obtained by the SIMCAL. The two bottles outside the ellipse were found by the sensory panel to be oxidised and the bottle from within the ellipse was found to be sensorially acceptable. Additionally, the free and total SO_2 levels in the 'suspect' bottles were significantly lower, and the OD420 significantly higher than in the 'good' sample.

Conclusion

Bottles of white wine affected by variable bottle oxidation were successfully sorted using the BevScan's SIMCAL mode.

A small number of destructive tests (sensory or chemical) were initially needed to build an appropriate profile of 'good' bottles of the wine, but after this initial step, large numbers of bottles could be assessed quickly and non-destructively.

This approach offers a reliable and simple way to deal with a variable oxidation problem, without the expense of opening, assessing and re-closing bottles required if a destructive testing approach is taken.

For additional information please contact us

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