Cork Closures and Quality Control at Rosemount Estate

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Introduction
Rosemount produces mid- to high-priced premium table wine in 750 mL bottles, all of which are sealed with natural cork stoppers. Five years ago, the exclusive use of natural cork led to concerns regarding the apparently high level of cork taint, although it was difficult to determine the extent of the problem. It was decided to significantly upgrade testing procedures and change direction to eliminate this problem.

Reliance on cork suppliers for most quality assessment procedures had been supported by spot checks at the winery, but inadequate resources were available to perform full testing. A complete checking procedure was introduced, based on guidelines developed by the Australian Wine Research Institute, in collaboration with others.

It was envisaged that utilisation of composite corks and, at a later stage, agglomerate corks fitted with discs of natural cork at each end (‘1+1’ corks), would result in more consistent quality and eliminate severe taint, rather than lower costs. The particular corks that were used did not reduce the problems, and the composite cork had its own peculiar objectionable character, possibly due to the glue utilised. This feature was not perceived as a traditional cork character.

Quality assessment
The initial test protocol involved the overnight incubation of 5 corks in 250 mL white wine, followed by sensory assessment of the wine. This regime was replicated 20 times for each batch of corks. The results of such tests did not reflect the level of taint observed in bottled wines.

In May 1993, a small shipment of rosé wine was sent to a supplier in the United Kingdom. Upon receipt, a high level of cork taint, with characters typical of 2,4,6-trichloroanisole (TCA), was reported. Samples returned to Australia were checked at both Rosemount Estate and the Australian Wine Research Institute. It was jointly concluded that in excess of 10% of the bottles of wine were affected by a moderate to severe taint. This had occurred despite the utilisation of the regime described above.

Corks from Sardinia and Spain were used in an effort to achieve a lower incidence of taint and greater consistency. Sardinian cork was very dense, with up to 20 growth rings per cork, and highly desirable physical characteristics. However, taint levels were still unsatisfactory.

During this period, other concerns regarding cork quality were examined. These were:

1. cork coatings;
2. insertion testing;
3. method of shipment from Portugal to Australia;
4. moisture level;
5. possible contamination at the winery; and
6. washing.

Cork coatings
Regular checks on corks showed variation in the chemical characters, attributed to different surface treatment compounds applied by suppliers. Samples of all external treatments showed enormous variation in these coatings, which were either silicone or a combination of silicone and paraffin. These treatments usually have strong, pungent chemical characters which are caused by carrier solvents. A cetic acid is one of the least offensive of these characters, while others have pungent, non-vinous chemical characters which were carried through into cork test procedures and, presumably, the final product.

Cork insertion testing
The silicone-based treatment led to problems with corks turning and being pushed into the bottle by the consumer. To overcome this, suppliers changed the amount applied, which resulted in the opposite problem. Corks became difficult to extract and seepage was observed between the neck of the bottle and the cork. A treatment employing a paraffin/silicone mix which has a neutral carrier is currently used.

Method of shipment from Europe
Several years ago, some oak staves were contaminated during shipping. The floor boards of the container had been treated with a chlorine-based sterilant, causing production of TCA which was transferred to the staves. Similar dangers were considered likely in corks shipped in bales. At present, all cork used at Rosemount Estate is shipped in high-density plastic bags with a moisture level in the cork which is sufficiently low to prevent growth of mould. Bags from one supplier are being evaluated that fit within a fold-up, pallet-size carton, itself sealed with a high-density polyethylene bag lined with aluminium foil. Suppliers must ship all cork to the winery in similar (non-PVC) bags, and the shipping container must have a non-wooden floor. No sulphur dioxide is added to the bags.

Moisture level
It is a concern that during shipment the moisture level in the cork can vary, and increase to a level which could allow growth of mould and subsequent formation of TCA. In production, the level of moisture is raised as high as possible without the risk of contamination. A moisture level of 7 ± 0.5% is acceptable to prevent the growth of mould while conferring good sealing characteristics.

Contamination at the winery
To be sure that these cork taint characters were not arising at the winery, an extensive examination was carried out, but no source was found.

Cork washing
During this period, alternative cork washing procedures became available, since the traditional chlorine wash was supposedly directly linked with TCA taint. Hydrogen peroxide and potassium metabisulphite (PMS) washes were investigated. Corks treated with hydrogen peroxide were tested on a limited basis, due to concerns regarding oxidation of wine. PMS treated corks were extensively evaluated and utilised, but it was concluded that the incidence of taint was not reduced by these alternatives. Currently, based on taint levels rather
than treatment concerns, chlorine or PMS washing is used to the exclusion of hydrogen peroxide.

Portuguese, Spanish and Sardinian cork suppliers were visited, together with many factories and the Portuguese and Sardinian Research Institutes. Generally, many possible sources of contamination, but very little effort on testing or the elimination of this problem, were found.

After this period, contact was initiated with other Australian wineries. Staff of respected American wineries were consulted and their methods for checking cork taint were examined, as a number were also greatly concerned about this problem. At most of these wineries, 1 cork was incubated in 100 mL wine, with a variable number of replicates. Comparisons of trials in which 1 cork was immersed in 100 mL wine (100 replicates) for 48 hours or overnight (approximately 18 hours) showed that the former gave strong background cork characters that masked any taint present. Currently, all samples are incubated overnight.

Summary
The following protocols have been adopted:

- prior to purchase of any cork, the supplier must submit a sample of treated corks, which must be representative of the whole shipment;
- on receipt, 100 corks are tested (1 cork in 100 mL wine, replicated 100 times).

The acceptance criteria are as follows:

- if one or less corks in 100 is affected by a TCA-type taint, the batch is accepted and physical checks of quality proceed;
- if 2 corks in 100 are affected, the test is repeated; and
- if 3 or more in 100 are affected, the batch is rejected.

Once accepted, the corks are printed. On arrival at the winery, the taint test is repeated and may be performed on 200 corks of a large batch. If the batch passes this secondary assessment, the grade and microbiological status is checked. The cork is then approved for use. By utilising these criteria, a marked reduction in the incidence of taint has been achieved.

1000 corks—a considerable amount.

The complicating factor is, however, the apparently high percentage of agglomerate corks that are considered to cause taint. Data on taint incidence were collected at the 1994 McLaren Vale Wine Show. Of the 356 bottles opened for tasting, 18 (5%) were considered to be tainted. Of the affected wines, 16 (89%) were sealed with agglomerate corks and 2 with natural corks. While this is an isolated sample, it shows a clear difference in the incidence of taint between natural and agglomerate corks, and is useful information for cork companies.

It is reasonable to state that there are differing views in relation to agglomerate corks within the Australian cork supply industry. Most, if not all, companies supply an agglomerate cork. Some promote them, some do not. The choice of whether or not to use them rests with the wine company.

It is proposed that the term 'cork taint' is too broad, and may be used too readily. It does not necessarily describe the taint. The use of the term appears to be entrenched, and the only effective way to alter this usage would be to totally eliminate cork-derived characters.

Quality issues
Quality issues cover many areas, with true quality coming from a positive attitude and flexibility. Most cork importers now deal with one main supplier. This is important, as it facilitates a clear understanding and discussion of the issues, and their subsequent resolution. The industry is committed to the implementation of the ISO/AS 9000-series (Standards Australia 1994) total quality management approach. J.B. Macmahon Pty Ltd is the first Australian cork supply company to achieve accreditation. A qualified person is required to manage cork quality, and most cork companies employ such personnel.

Conclusion
Many gradual changes have taken place over the past 25 years and the cork supply industry has made considerable improvements. All goals have not been achieved, and considerable work remains to be done. The goals can be achieved with the assistance and encouragement of the wine industry.

References