

When it all goes wrong: The treatment and disposal of juice, wine and lees waste material



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From time to time winemakers will encounter situations where juice, wine or lees cannot be sold or processed further and must be discarded. Such situations can arise both during the winemaking process (e.g. due to a wine fault, taint or contamination) and after a wine has been packaged (e.g. oxidation, heat damage, microbial contamination or lack of freshness). Following are options available to winemakers in these scenarios, including:

- Sorting damaged packaged stock
- Blending and processing options
- Distillation
- Processing juice or wine through winery wastewater systems
- Management of treated wastewater
- Wine disposal companies.

Sorting damaged packaged stock

When packaged wines are affected by a variable problem – such as leakage, oxidation, heat damage caused during storage or transport, microbiological spoilage, or variation in an analytical parameter such as gas levels in sparkling wine – sorting saleable from unsaleable stock can be attempted. In the past, this has most commonly been achieved by a combination of visual inspection of unopened stock and sensory assessment of selected opened bottles. This approach is subjective and unlikely to catch all stock affected by the variable problem. The BevScan, a near infrared (NIR) based instrument recently developed in a partnership between The Australian Wine

Research Institute and Jeffress Engineering, provides a new option for objective and non-destructive sorting of bottled wine. Users can identify a range of bottles they consider acceptable, build a profile based on this selection and then compare all samples against this profile, gaining a fast and objective classification. Classification capabilities of the BevScan have undergone initial testing on cases of variable oxidation, variable gas levels in sparkling wine and heat-damaged stock, but are likely to be applicable to other causes of variation. More information about the BevScan can be obtained by contacting Jeffress Engineering (admin@jeffress.com.au) or the AWRI's Commercial Services (commercialservices@awri.com.au).

When the variable problem affecting a wine is microbial in nature, for example refermentation of a packaged product, affected stock sometimes appears visually obvious due to leakage, protruding closures or expansion of bag-in-box packaging. However, sorting stock in these cases is not recommended because stock that does not display any obvious visual cues may still be affected and could present problems in the future.

Blending and processing options

In cases where older packaged stock has lost its freshness, it can be opened and reworked by blending with fresher, sometimes different vintage wine. In the latter case, the wine must be relabelled as a non-vintage wine. Reworking

is often done by hand and is therefore both laborious and time consuming. Blending is also an option for dealing with some wine faults, such as Brettanomyces spoilage, volatile acidity, or wine taints such as smoke taint and cork-type or musty taints. The addition of larger volumes of unaffected wine can reduce the concentration of the fault or taint to below the sensory threshold for that compound. Other wine faults and taints may not be treatable using these techniques, such as wines contaminated with substances not listed as legal additives in the relevant standard (such as the Australian and New Zealand Food Standards Code). Examples include contaminations of juice and wine with hydraulic oil from mechanical harvesters, brine from cooling systems, and tainted winemaking additives and processing aids (AWRI publication #1125). These wines should not be blended, and instead affected wines should be considered unsaleable and disposed of via an alternative technique. In some circumstances, the wine loss might be covered by the winery's insurance policy.

Many wine faults or taints can be removed or reduced using a range of fining, filtration or processing techniques. Reverse osmosis has been marketed as being successful for treating or reducing Brettanomyces and volatile acidity wine faults, as well as smoke taint. Removal of 2,4,6-trichloranisole (TCA) from wine has also been achieved by adding polyethylene sheets to tanks of affected wine, which scalp or adsorb the compound (AWRI publication #662). ▶

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Distillation

When a wine is considered unsaleable, some of its production costs may be recovered by sending it to a distillery to recover the alcohol content. Some distilleries might treat wine contaminated with substances not listed as legal additives, such as wine contaminated with brine from cooling systems. The alcohol produced from these treated wines is generally allocated for use in alcohol-based brine systems and should not be used for wine spirit. For some non-volatile contaminations however, the alcohol may be used for wine spirit, although this is at the discretion of the distillery. Appropriate testing of the spirit should be done as a duty of care to ensure no contamination of the spirit produced. If distillation is chosen to treat tainted wine, insurance coverage might also cover the cost of transporting the wine for treatment. Where applicable, this may be arranged between the winery, insurer and the distillation company. Note that 'blue lees' from potassium ferrocyanide finings should not be distilled due to the increased risk of distilling cyanide with the distillate.

The main costs for processing wine through distillation are in the transport of the wine to the distillery. Not all wineries are in close proximity to a distillery and therefore it might not be cost effective to treat the wine this way.

Processing juice or wine through winery wastewater treatment systems

Batches of wine might be able to be processed through winery wastewater systems. The composition of wastewater fluctuates with the activity of the winery but is predominantly a mixture of water from tank and equipment washing, sanitation, sodium hydroxide (caustic) and citric acid cleaning solutions, water from cooling towers, and small volumes of wine or juice from tank cleaning and transfers. Wastewater

is therefore often characterised by a low pH (of 3 to 4), variable organic loading (typically measured by biological oxygen demand [BOD] and chemical oxygen demand [COD]), and high sodium and/or potassium levels. Additions of greater than usual volumes of wine to this system may vary this composition.

Waste is generally passed through screens, pH adjusted to neutralise, aerated or anaerobically digested to reduce BOD and COD, and then settled to remove sludge to achieve the required wastewater discharge quality.

Grape juice and wine have a high organic loading (e.g. high BOD and COD content), which makes disposal of large volumes of wine through wastewater systems difficult. High organic loading (such as large additions of juice or wine) in wastewater systems causes problems in the functionality of their microbial action. This could lead to reduced treatment effectiveness and cause malodorous emissions of methane and hydrogen sulfide due to the development of anaerobic conditions. Some wine companies might have large enough systems to allow them to treat wine in this manner due to the large dilution of wine BOD with other winery wastewater, however, additional energy costs for pumping and aeration will be incurred. Small- to medium-sized wineries might not be able to tolerate large volumes of wine through their wastewater systems. Similarly, septic tanks would not be able to handle the high organic load and other potentially inhibiting substances that might be present in wine.

Management of treated wastewater

Each Australian state/territory has its own environmental legislation and industries must conform to the relevant legislation. For instance, the South Australian Environment Protection Authority (EPA) requires that waste generated

at winery premises not be discharged into any waters (Environmental Protection (Water Quality) Policy 2003 under the Environmental Protection Act 1993). Treated waste, specifically treated winery wastewater, is increasingly being viewed as a resource rather than waste, in line with environmental sustainability strategies (Frost et al. 2007). In a survey coordinated by the CSIRO, most treated wastewater is therefore destined for land-based disposal, such as irrigation of vines, woodlots, grazing pastures or other crops (Kumar et al. 2008). In cases where treated wastewater cannot be re-used on site, disposal of some treated winery wastewater to the sewer is allowed, but only with prior written approval from the respective state/territory or regional trade waste unit. Trade waste discharges from wineries have the potential to adversely affect the sewerage system, so appropriate management practices and waste quality standards of acceptance are required to be met.

Treated liquid waste to be discharged to the sewer needs to comply with specifications including chemical requirements and maximum contaminant concentrations. Additionally, substances such as chlorinated hydrocarbons, oils, and substances that could generate hazardous gases or block operation of the sewerage system are prohibited and need to be disposed of via alternative methods. An example of trade waste specifications can be found at trade waste guideline No. 35, Winery operation guideline, SA Water.

Note that trade waste winery operation guidelines vary between each state/ or territory. Some states/territories are operated and governed by more than 80 separate water companies which preside over certain regions. It is important to check the guidelines in your area. Country wastewater treatment plants are generally not able to cope with the same size loads as metropolitan treatment plants. ▶

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Disposal of treated wastewater to the sewer involves an industrial cost of application (often about A\$500) as well as base charges per flow (often about 5-10 cents per kilolitre), with different additional rates for other parameters such as BOD, COD, pH, soluble solids or salinity. Note that in some states/territories, treated wastewater from large metropolitan and regional treatment plants can also end up being re-used for irrigation of vines, parklands and horticultural crops.

Re-use of treated winery wastewater on site is the preferred management option for environmental sustainability. Utilisation of treated wastewater, such as for irrigation of woodlots, pastures, vineyards or company-owned land, does need to meet requirements set by relevant state/territory and local regulatory bodies. If dispersing and re-using wastewater in these ways, it is important to identify components such as COD, pH, salinity and sodicity. Analysis of soil and groundwater quality is also required to prevent contamination of the surrounding land or groundwater system.

Wine disposal companies

In cases where juice, wine or lees cannot be treated by the already mentioned processes, such as the disposal of blue fining lees, wine disposal companies can be employed. There are a variety of liquid waste disposal companies throughout Australia. Waste disposal companies deal with a wide range of solid and liquid waste, not only

wine-derived material but also oil waste, grease trap waste, hydrocarbon-based waste, cyanide waste, hazardous liquid spills, and laboratory materials. These companies come direct to your location and use their own pumps and hoses to remove the product. This is particularly useful when managing contaminated wine as it avoids any cross-contamination of wine through using your own hoses and equipment. Treatment companies must meet strict government regulatory requirements, are operated by trained personnel, and offer drum or tanker collection services.

Summary

Disposal of grape and wine products can be a costly exercise and should ultimately be avoided. Investment should be directed towards prevention of damaging stock to a point where it cannot be sold or processed further. This could include incorporation of winemaking quality system measures to prevent intake of contaminated or tainted batches of fruit or additives. Packaging quality measures could include: steps to prevent microbial contamination, measures to prevent exposure to extreme temperature during storage or transport, and to minimise the chance of packaged stock being held for long periods in warehouses. If disposal is necessary, then you should assess all of your options to make an informed decision of the best course of action. ■

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