

# Winery Wastewater Odour Management

CSIRO Land and Water



Odour is an intrinsic management aspect of all activities associated with winery waste management. The treatment and storage of wastewater and solid waste by-products from the winemaking process must be undertaken in a manner that minimises nuisance. Objectionable and offensive odours can cause significant adverse effect on people's lives and well-being. In fact, complaints about odours are arguably one of the most frequent environmental pollution incidents reported to regulatory authorities.

Odour problems are more frequent in the vintage season when wineries are producing high volumes of wastewater with high organic load (COD: 5000-15,000 mg/L).

This pamphlet provides general information on odour management. Winery managers should be aware of the various local and State government regulations that apply in their region.

## Sources of Odour

Odour problems occur mainly as a result of wastewater or solids/sludge becoming anaerobic. Examples of this are ponding of winery wastewater; inadequate solids removal, allowing soils where wastewater has been applied to become anaerobic by excessive application and/or not allowing soils to dry between applications and inadequate solids drying periods.

There are three main groups of volatile compounds in winery wastewater which have low perception thresholds, high concentrations and unpleasant odour:

### 1) Sulphur compounds

The formation of very smelly sulphur compounds such as mercaptans (rotten vegetable smell) and hydrogen sulphide (rotten egg smell) occurs from winery wastewater when sulphur dioxide (SO<sub>2</sub>), which is used in fermentation and wine stabilisation processes is reduced anaerobically.

### 2) Oxygenated compounds

Oxygenated compounds come from the anaerobic fermentation degradation of the organic constituents of winery wastewater. The volatile fatty acids produced create a range of odours from vinegar; rancid butter and sweat.

### 3) Chlorination by-products

Chlorinated compounds are formed following the chlorination of cleaning waters and generally occur in fresh effluent rather than that which has been stored for a period of time.



Algae, as well as some bacteria, may also produce odour; however these occur infrequently and need specialist treatment.

## Odour Management

Outlined below are aspects of wine-making and wastewater management that should be considered when developing an odour management plan.

### 1. Reduce wastewater volume and strength

Undertaking management steps in the winery to reduce wastewater volume and load will reduce the overall problem. Steps that can be taken are:

- Avoid spillage/leakage of product and wine juice into wastewater streams.
- Use pigging to avoid cleaning water coming in contact with residue wine.
- Improve the mechanical removal of solids from surfaces and equipment

before beginning the cleaning processes.

- Segregate high strength streams in order to reduce the impact of chemicals on the wastewater quality.
- Recover organic solids as much as possible by using screens and sedimentation processes.
- Recycle caustic cleaning solutions until they are fully spent, e.g. pH is <10.



## 2. Wastewater and solids management

- Separate solids from the waste stream to reduce organic load .
- Wastewater stored in pits, tanks, ponds or on the soil surface in disposal area for periods exceeding 48 hours is likely to become anaerobic and start to smell offensively.
- Any storage of solids such as sludge and grape marc that becomes anaerobic will start to smell. As such the siting and management of these wastes is important; it should be well away from residences, cellar buildings and anywhere the public may venture.



Storage lagoon

## 3. Pond Management

Stagnant wastewater will become anaerobic and will start to smell. Steps that can be taken to avoid this are:

### a) Time and depth of storage

- Store wastewater for as short a time as possible and at as shallow depth as possible. Shallow evaporative areas (<100 mm) have been used successfully.
- Use closed tanks for small volumes to minimise release of odours. However the odours will be released when the stored water is moved to a treatment facility or disposed onto land unless it is quickly aerated. A practice for small wineries of storing wastewater during the day and then sprinkling onto land every night is likely to minimise odours as it minimises storage times
- Use covered anaerobic lagoons (CAL) for large volumes. Having a CAL means that large volumes of wastewater can be stored without odour issues. Other benefits are that



Aeration of wastewater

a large storage at the beginning of a wastewater treatment provides controlled flows into the main treatment system for optimum treatment. Also settling of solids and anaerobic digestion of some organic load will occur in the CAL which will reduce the organic load for the treatment system/disposal area.

### b) Aeration

Keep open ponds well aerated (>3.0 mg/L dissolved oxygen) thus avoiding anaerobic conditions. Many types of aerators are available. Their efficiency and cost of operation are dependent on hydraulic detention time and sizing and type of aerators. Aerators also allow aerobic digestion to occur and so reduce the organic load, so typically they are used after a CAL or as the first step in a treatment process after solid settling.

### c) pH/alkalinity control

Controlling wastewater pH (between 6 and no greater than 9) is important to control hydrogen sulphide emissions. pH

control to around 7 also assists organic load digestion and is important when applying wastewater to land.



Lime dosing

## 4. Land application

For odour management, and good site management, when applying wastewater to land the aim is to apply wastewater at the right volume and interval that matches the soil's capacity to adsorb the wastewater and breakdown the organic load. Some tips for maintaining a healthy wastewater application site and so avoiding odour problems are provided here:



Settling ponds

1. Wastewater should be screened to remove coarse solids prior to land treatment.
2. The wastewater should be applied immediately to land - storage time minimised.
3. The timing and volume of application should be such to achieve healthy crop growth. This requires a matching of crop water use with water applied. During periods of low evapotranspiration (winter) or rainfall then the amount of wastewater that can safely be applied is much reduced.
4. The rate of application should not cause soil to be saturated for prolonged periods or wastewater to be ponded on the surface. Runoff due to wastewater irrigation must be avoided, a sure sign of over-application.
5. The organic load should be managed so as not to clog the soil or cause waterlogging or anaerobic conditions
6. For long term application of winery wastewater without odours soil structure should be maintained. The sodium adsorption ratio (SAR) of the wastewater applied to clay soils should not exceed 8 unless gypsum or lime is applied routinely to the soil

## 5. Odour Monitoring

Odour management is complicated by a number of factors – the range of adverse effects it can cause, and people's varying sensitivity to odours. Such factors cause conflicts between neighbours and industry about the severity of the effects. These conflicts need to be resolved by assessing the effect on neighbours and deciding what action needs to be taken to remedy any unacceptable effects. Some methods of achieving this are outlined below:

1. **Community Consultation** – Community meetings for nearby residents can be held to gauge the extent of dissatisfaction being experienced. Depending on the prevailing circumstances these meetings may be replaced and/or complemented by a newsletter:

- Either medium will serve as a tool to negotiate solutions as well as provide direction or ongoing community input on existing odour issues.
2. **Annoyance Survey** – Surveys have been developed to assess the local community's level of annoyance with odour, taking into account frequency, intensity, duration, offensiveness and location. The odour annoyance survey can quantify the extent to which the local community, as well as winery employees, are adversely affected by odour emissions. If undertaken on a regular basis, it will also track changes in attitudes and therefore progress in mitigating the problem.
  3. **Diaries** - A comprehensive diary programme can collate data on the frequency and strength of odour impacts over a given period of time. The data can be used to calculate the percentage of time (hours/year) that residents and workers are exposed to odours, as well as the typical strength and character of the impacts. This information will also be useful in the assessment of operating procedures implemented to minimise odour problems.





### More information

To be advised.....

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