

EFFLUENT MANAGEMENT – Evaporation systems for effluent disposal

Production of intensive livestock in the Condamine catchment results in the production of large volumes of high strength effluent which need to be disposed of in a sustainable way. In particular, pork production (in conventional systems) and abattoirs produce relatively large volumes of effluent.

While land disposal is the most common method for utilising effluent, this option is not always available to producers. If nutrient levels in reuse areas increase to excessive levels restrictions may be applied to application rates, and this can affect the production of the whole facility. Inadequate areas for land disposal of effluent can also become a problem when a facility is expanded but the land area remains the same. In these cases, an alternative method for effluent disposal is to evaporate the water, leaving solids for reuse at a later stage.

The main requirements of an evaporation system are:

- High evaporation rates (high temperature, wind and sunlight conditions).
- Low annual rainfall.
- Adequate land area to site an evaporation basin.

There are a few points to note when sizing an evaporation basin:

- Class 'A' pan evaporation generally overestimates open water storage evaporation. As such a factor of 0.8 is used to relate the two.
- Regulatory authorities generally require that the basin achieves a maximum 1 in 10 year overtopping frequency (i.e. no more than one overtopping event every 10 years).
- The concept of net evaporation (i.e. rainfall onto the surface of the pond will *reduce* the net evaporation).

Net Evaporation

High net evaporation requires the combination of high (Class 'A') pan evaporation and low rainfall conditions. However it has been shown that Class 'A' pan evaporation overestimates the annual evaporation rate, so a 'pan factor' of 0.8 is necessary to relate to open water surfaces. For example, if the annual Class 'A' pan evaporation

is 1700 mm and the annual rainfall is 500 mm, the annual net evaporation would be 860 mm (0.8 x 1700 mm – 500 mm).

It is a regulatory requirement that effluent storages be designed such that 1 in 10 year rainfall events are captured. As such, historical modelling is required to ensure that the designed basin does not overtop at a frequency greater than this.

Basin Sizing

Sizing an evaporation basin requires the knowledge of the amount of effluent to be disposed of (on a monthly basis) and the net evaporation rate (also on a monthly basis) for the region. Basin sizing and design is best carried out by an engineer as detailed modelling is required to ensure that the design achieves a maximum 1 in 10 year overtopping frequency.

At sites where high volumes of effluent are produced, or at sites where the annual evaporation is relatively low, it is not likely that an evaporation system will be the best management option. This is because as net evaporation decreases, the basin area required increases to dispose of the same quantity of effluent. For this reason evaporation systems are not often used on the eastern downs. It is suggested that options are discussed with an engineer if an evaporation system is being considered.

Some other fact sheets in this series:

Effluent management – Sustainable land reuse

Effluent management – Co-composting for effluent reuse

Produced by FSA Consulting as part of the "Implementation of Sustainable Management Practices for Recycled Organic Reuse for High-Risk Industries and End-use Farmers" project, Funded by the Condamine Alliance. Condamine Alliance is the regional body with lead responsibility for enabling the community to achieve sustainable natural resource management in the Condamine River catchment, at the head of Australia's largest river system, the Murray-Darling Basin.

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