Types of Effluent Systems

Funded by Dairy Australia and your dairy service levy

There are two main categories of effluent systems - Storage Ponds and Direct Application.

To determine the best option for your farm you should consider;

- Herd size (current & future plans)
- Rainfall
- Water use & reuse in your dairy shed
- Soil types on your farm
- Managing the system - time, labour & making the most of the nutrients in the effluent
- Infrastructure maintenance - ponds, pumps, pipes

A comprehensive manual to assist in designing & managing an effluent system is available. Dairy Australia has published the *Effluent and Manure Management Database for the Australian Dairy Industry (2008)*. It is available from Dairy Australia or can be down loaded from the following web site **www.dairyingfortomorrow.com**

Storage Ponds

Effluent is collected after each milking and directed to a storage pond that allows irrigation to pasture at a time chosen by the farm manager. Storage ponds also allow for the accumulation of water to recycle for yard cleaning. Storage ponds are strongly recommended for high rainfall areas to prevent effluent application to waterlogged soil. Regular maintenance, including weed control is necessary to ensure the pond operates appropriately.

Two Pond Systems

A two pond effluent system consists of 2 ponds (sometimes more) usually situated adjacent to each other. The 1st pond catches and stores the solids and the 2nd pond is designed to hold the watery overflow from the 1st pond. Ponds are commonly used in higher rainfall areas. Pond sizes are designed according to cow numbers (1st pond), water use in the dairy shed and yard, yard size and rainfall (2nd pond). The second pond is typically designed to hold the effluent for the wetter months, not the whole year. The second pond needs to be empty prior to the wetter months to maximise storage capacity.

Advantages:

- Effluent can be stored and applied to pasture when runoff or leaching in the drier times is less likely to pollute waterways
- Stored effluent can be applied to summer crops to maximise returns
- Effluent can be strategically applied as nitrogen source
- Cleaner water in the second pond is available to recycle for yard washing, freeing up fresh quality water for other uses.

- A standard water pump for irrigating water from the second pond, greatly reducing the cost of the pump *(NB: effluent pumps are usually 3-4 more expensive than standard water pumps)*
- Effluent can be shandied with irrigation water during the irrigation season *(5 parts irrigation water to 1 part effluent water is recommended)*
- A wide range of management options for emptying both ponds is available eg. effluent pumps, water pumps, vacuum tankers, excavators and sludge pumps

Disadvantages:

- A suitable site is required to ensure that no effluent can seep into ground water, a clay or synthetic liner may be required. Soil testing prior to excavation should be conducted to ensure that this type of structure is appropriate for the proposed site
- A turkey nest pond may be required if ground water comes closer than 1.0m from the base of the planned effluent pond, or if in a floodplain area
- Ponds take up space therefore grazing area is lost

information sheet

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Single Pond Systems

In a single pond system all of the effluent is collected and stored in the same pond. This pond combines both processes of a two pond system into one. Its main function is to retain all effluent over the wetter months of the milking season.

Advantages:

- Less space is required than for a two pond system
- Lower capital cost than for a two pond system as you are only constructing a single pond
- Same advantages as a 2 pond system with effluent stored for strategic use

Disadvantages:

- An effluent pump is required to empty the pond reducing the options of managing the solids
- Single ponds are designed to be emptied twice yearly, requiring the solids component to be handled much more often than with a 2 pond system
- There is limited clean water to clean out the main line since the single ponds contains solids

Ditch System and Storage Pond

This system consists of a long narrow 1st pond or large solids trap and a pond. The ditch replaces the 1st pond in a two pond storage system. The ditch is far smaller than a pond and solids are not broken down to a sludge. Solids are removed regularly and dried on site, preferably so that liquid seepage runs back into the pond, ready for spreading on paddocks. Water in the pond is usable for reuse in the shed or irrigation to pastures.

Advantages:

- Little depth is required for the ditch (1-2m) therefore easy to construct and can be dug with a backhoe reducing construction costs
- The ditch is easy to clean with a small excavator

Disadvantages:

- To keep the trench shallow to allow easy maintenance there is a need to have a length of between 100 - 200m to satisfy the volume component
- Due to the relative low volume capacity and with no actual treatment taking place there is a need for frequent cleaning of the trench (12 months)
- A gentle slope (0.5%) is required to enable solids to fall out

Direct Application

Effluent is collected in a sump, usually located at the back of the cow yard. It is then pumped directly to the pasture immediately after each milking. No storage ponds are used. Direct application is only recommended when effluent can be safely applied to pasture all year round without losses from runoff or when storage ponds are not an option due to soil type or unsuitable topography.

Advantages:

- No land is lost to ponds
- Reduces the potential contamination of groundwater through leaking storage systems
- Suitable on well drained soils where runoff is not likely to occur

Disadvantages:

- High labour requirement - the system must be managed over the whole milking season
- A larger irrigation area is usually required in the wet season to reduce the risk of effluent running off farm
- A constructed storage may be required to contain waste in the wettest periods
- Due to limited storage capacity the pump needs to be reliable. It is advisable to have a backup pump on standby in case of a breakdown
- Paddock rotations may be difficult at times because of the need to spell waste treated paddocks before grazing
- As all waste, including water is removed daily, this system limits the ability to recycle wastewater for yard wash down
- Manure pumps are required to handle solids - a stone/gravel trap should be included to protect the pump

Solids Separation and Storage Pond

There are three commonly used forms of solid separation. These allow for the removal of solids from the effluent allowing for the water component to be managed separately.

1. Solids Trap

This is usually a concrete structure that allows the larger solids to settle prior to the water component draining to a pump well or storage pond. The addition of a weeping wall and regular cleanout of the solids trap minimises solids carryover to the pond, maximising storage capacity. These can be built by specialist contractors and are suitable for up to 400 - 500 cows. Larger herds need more elaborate systems.

2. Static Screen

The effluent from the dairy shed is pumped over a large sieve like structure where the solids are collected on an impervious area (area that resists leaching) and the water component is retained for reuse or recycling in a storage pond. The solids are between 35% - 50% dry matter.

3. Fan Separator - Screw Press *(or Extruder pump)*

This machine separates the solids in the effluent using an auger type system. The separated solids are collected, stored and reused when and as required. The liquid portion is stored in a storage pond and irrigated or reused as required. The solids are over 50% dry matter and easily handed mechanically.

Advantages of solids separators:

- An alternative to using a 1st pond if ground water is close to the surface
- Eliminates the need for a first pond
- The water quality in the pond is adequate for yard washing

Disadvantages of solids separators:

- High labour requirement & requires alternate storage facilities for the solids component
- Fibrous material (straw, hay or silage) may block inlets
- High initial infrastructure costs

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