Agriculture Notes

Dairy Effluent: Minimising the Effluent Stream

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The first step in managing or developing any effluent system is "Minimisation". How can all the components contributing to the effluent stream be reduced practically and economically? This includes manure, wash down water, rainfall, fibrous material, sand, gravel and debris.

The amount of effluent generated at the dairy shed or intensive feeding facilities surprisingly is **not** related to the herd size or the size of the facility. Small herringbone dairies have been known to generate an effluent stream equivalent to large rotary operations.

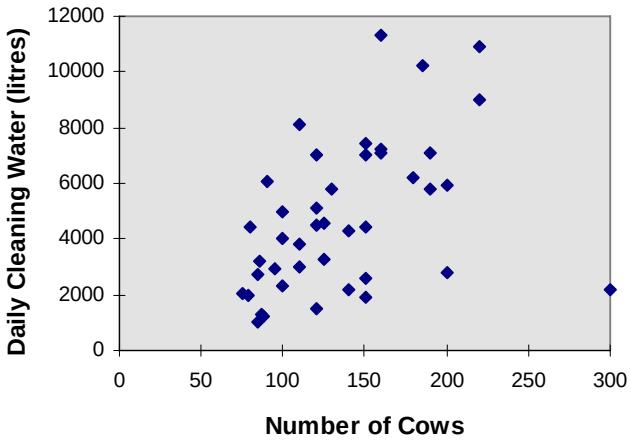

Figure 1. Dairy water use survey (cleaning water vs herd size)

The purpose of this note is to explore the various components that impact on a dairy effluent system and provide practical solutions and options to minimise their contribution to the total effluent volume.

Dairy Shed and Feedpad water use

Understanding the daily water use in dairies and on feedpads is very important because it has many implications in relation to developing and managing a dairy effluent system.

For example:

- Storage capacity. The amount of water utilised over the day for milk harvest or on herd feeding facilities multiplied by the recommended storage requirement will directly relate to pond size.
- Irrigation. The greater the water use, the greater volume that has to be irrigated back throughout the year. This has huge implications on the time spent irrigating and the scale of size in pump, pipes and irrigators.
- Total cost of effluent management. The more water and solids entering an effluent system the more money spent on building ponds, maintenance, labour and the irrigation system required to reapply the effluent water back to land.

Understanding where the water comes from (ie, plant rinses, wash-down systems, cup and platform sprays etc) is important as it provides an opportunity to review and reduce the source. It also ensures the farm water reserves is sufficient to maintain the dairy operation all year.

Water use in dairies alone can vary between 1,000 litres to over 100,000 litres per day. It is this overall volume accumulated over the storage period, which requires management.

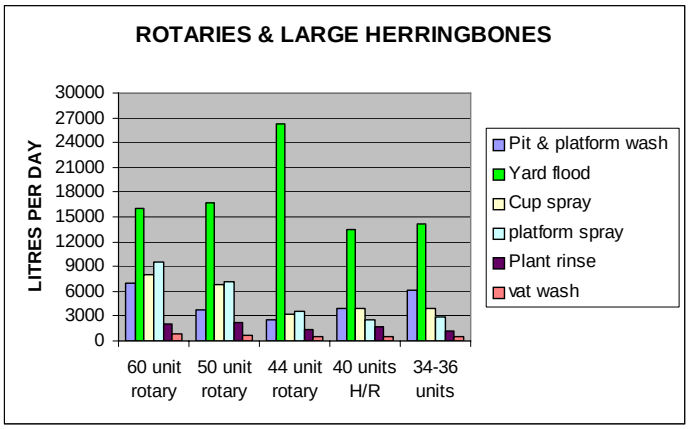

Figure 2. Daily water use sources (Large dairies) McDonald 2005.

Flood washing dairy shed holding yards and feedpad alleyways is now a common practice throughout the dairy industry, with the main driver being as a time saver.

Floodwash tanks however require a significant water supply, with the most common tank capacity being 17000 litres for the average sized dairy.

Unfortunately the mentality amongst farmers is to dump the tanks capacity, rather than the actual amount needed to successfully wash the yard.

A detailed water consumption survey of different dairies was conducted in 2005 by DPI. These averages (Table 3) should provide a general indication of total water volumes required to effectively operate dairy sheds.

Table 3. Daily water use averages for different shed types. (McDonald 2005)

60 unit rotary	50 unit rotary	44 unit rotary	32 unit H/bone	24 unit H/bone
35300L	34700L	28800L	16000L	16600L

20 unit H/bone	18 unit H/bone	16 unit H/bone	12 unit H/bone	10 unit H/bone
9300L	8900L	7800L	5100L	3900L

Maintaining plant and yard hygiene is essential, as water minimisation at the dairy should not compromise milk quality or herd health.

Practical options to reduce water use may include:

- Utilising recycled effluent from a multiple pond system to wash down holding yards.
- Mechanical breakdown of manure pats prior to hosing or floodwash dumping.
- Turning off cup and platform sprays immediate after cows have left the platform and reducing unnecessary volumes. These two components contribute nearly 40% of total daily water use in rotary sheds.
- Installing appropriate floodwash tanks to suit the yard washing requirement and positioned strategically to optimise performance.
- Repairing and replacing broken nozzles or leaking hoses.
- Strategically washing muddy udders and teats.

Recycling plate cooling water

Clearly the exclusion of plate cooling water from entering the effluent system directly will enable the size of any storage pond(s) to be reduced significantly. Diverting plate cooler water into wash down tanks for yard cleaning or returning to dam sources is a common and best management practice.

Groundwater

Minimising effluent on farms relying on bore water for yard washdown can reduce the demand placed on groundwater. By so doing, farmers may be extending the life of their groundwater supply. Reducing groundwater extraction can also protect spring-fed dams from drying up, as well as protecting streams relying on groundwater flow.

A water consumption survey in 2005indicated 49% of Southwest farmers and 36% of Gippsland farmers (surveyed) relied on bore water to supply the dairy. Poorer bore water quality is also an important issue to address as it may increase salts accumulation in the ponds affecting their performance.

Rainfall

Rainfall is another source of water that can enter the effluent system and unnecessarily fill storage ponds. Effluent storage ponds need to calculate 90th percentile rainfall contributions entering the system in order to prevent them from overflowing during heavy storm events.

Options to reduce rainfall entering the effluent system may include:

- Installing rainwater diversion off holding yards in high rainfall areas. Trap doors and diversion pipes installed on spoon drains or off yards prior to the solids trap or sump/pump is common. (Refer figure 4)
- Ensuring that the nib walls around the yard is high enough to prevent surface runoff from surrounding areas entering the yard.
- Rainwater tanks capturing roof runoff. This will reduce the contribution and at the same time provide a reliable quality water supply.
- Levy banks or drain diversion around the pond(s). This will eliminate rainfall from surrounding paddocks and laneways entering the storage unnecessarily.

Effluent solids & foreign material

Solids entering the effluent stream have the potential to cause problems whether it be with pumps, conveyance piping or within the ponds. Separation of the liquid and solid effluent stream will be necessary at some stage within the overall effluent system. Some farmers opting to utilise sumps and traps with weeping walls prior to pondage whilst others preferring to use settling ditches and ponds before conveying the liquid fraction into storage ponds.

The amount of these solids entering the effluent system can be reduced by:

- Keeping laneways well drained and in good condition. This will prevent cows transferring stones and gravel into the holding yard.
- Placing foot baths immediately before the entry point to the yard.
- Installing a debris trap or screen below the yard and prior to any pond or pumps to collect fibrous material and other debris such as hair, tail tape, horns, and string.
- Installing weeping walls or weir type structures to remove solids from the liquid stream.

Facility and yarding design

The actual design of dairy sheds, yarding areas, entry laneways and feedpad facilities is often underestimated on its impact to minimise effluent being generated.

Design criterion should take into account cow flow, comfort, operator ease and stock handling management.

Design principles to reduce the amount of effluent being generated at the facility may include:

- Appropriate yard spacing per animal.
- Appropriate yarding width, length and slope to promote effective yard washing.
- Yard surfacing and patterning.
- Wide gateways to prevent cow bullying.
- Sprinklers and yard sprays to reduce heat stress.
- Avoidance of sharp angles for cows existing the shed.
- Appropriate yard design and location of gates to enhance cow flow and effective drafting.

Operating environment

A dairy cow is capable of producing 7-8% of her body weight in manure and urine every day. Therefore a 500kg cow has the potential to produce 40kg per day. Depending on yarding time and shed design most dairy herd will spend 10-15% of their time each day at the dairy. Feedpads and intensive feeding areas depending on their purpose whether it being supplementary feeding or shelter can accommodate the herd for longer periods of the day.

A herd that is unsettled and stressed in their environment will more often than not deposit more manure than a herd that is content and comfortable.

Options to improve animal well being may include:

- Providing adequate shading and protective tree belts.
- Vector control (Flies).
- Establishing adequate drainage to keep the area dry.
- Maintaining sufficient water supplies.
- Ensuring manure and feed spoilage is removed from the area periodically.

Herd diet

Any strategy aimed at minimising nutrient losses from dairy farms should first examine the relationship between feed intake, milk production, and nutrient excretions in manure. Manure management should start at the front, rather than the back end of the animal. Excessive feeding of crude protein (CP) and phosphorus (P) to dairy cows increases nitrogen (N) and phosphorus loads in manure, which can exacerbate the potential nutrient loss.

Extensive research in dairy cow nutrition has shown strong correlation between supplementary feeding intakes and nutrient outputs in faeces and urine. The manipulation and adjustment of feed rations without compromising herd productivity or herd health has the potential to reduce both phosphorus and nitrogen levels being deposited in the effluent stream. This level of detail may be more applicable for the larger intensive herds operating on small acreages or on properties with extensive networks of watercourses and drainage lines.

Further information

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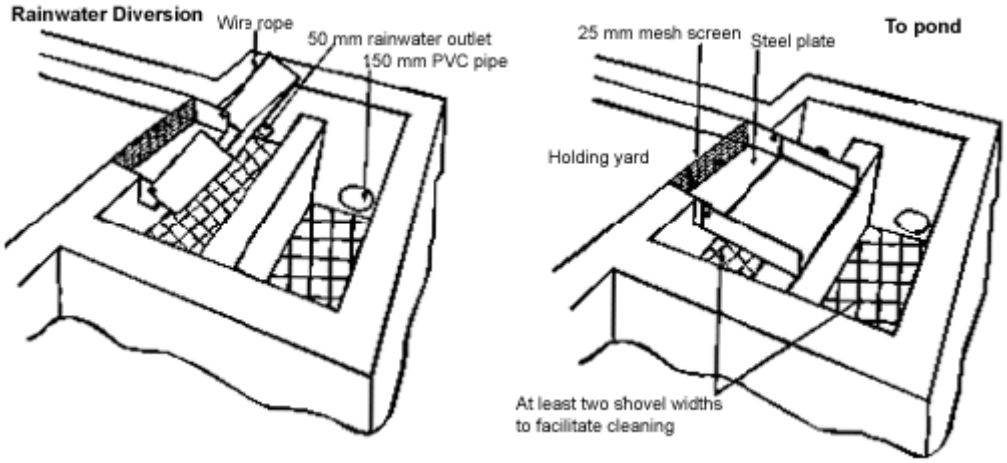

Figure 4. Rainwater diversion device