

### INTRODUCTION TO EFFLUENT MANAGEMENT

With the ever-growing demand for dairy products worldwide, efficient effluent management plays an important role in maintaining both environmental sustainability and agricultural productivity. Managing waste by-products such as manure and wastewater have become more crucial for dairy farm operations. By implementing strategic methods for handling effluent, dairy farms have more capacity to mitigate environmental pollution risks, enhance soil fertility, and contribute to the overall sustainability of food production systems.

Instead of viewing effluent management as a waste product to dispose of, effective effluent management is a resource that can be utilized for better outcomes on dairy farms. Finding effective strategies to manage effluent ensures maximisation of crop response by applying effluent when a crop absorbs nutrients the best for ideal outcomes. By understanding the approaches your farm operations can take, you can ensure sustainable systems that are compliant with local regulations and create positive returns for your dairy farm.

Effective effluent management involves a well-designed system paired with good processes that help the farm staff ensure the collected effluent is applied to pasture in the correct amount and at the appropriate time.

The on-farm benefits of effective effluent management include:

- Savings on fertiliser
- Improved soil conditions
- Prevention of animal health issues
- Compliance with council regulations or resource consent.





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# TRENDS

#### **Trends in New Zealand**

Current trends in New Zealand for dairy effluent management are focused on initiatives surrounding sustainability and environmental stewardship. The initiatives include best management practices to minimise runoff into waterways, improve infrastructure for effluent storage and treatment, and increase technology for efficient monitoring and streamlined tasks. With regulatory frameworks evolving to improve dairy farming practices and provide a balance of agricultural productivity with environmental conservation efforts, we are seeing an increased interest in finding effluent management approaches that reduce waste product and pollution. This includes less use of rain guns and more focus on effluent application methods that can target areas effectively.

#### **Trends Overseas**

The trends overseas are focused on sustainability and environmental responsibility. These initiatives include the adoption of advanced technologies for efficient treatment and reuse of effluent alongside the implementation of best management practices to minimise nutrient runoff and protect water quality. Many countries are strengthening regulatory frameworks to ensure compliance with environmental standards and promote continuous improvement in dairy farm practices. Globally there is a recognition of the importance of knowledge sharing to address common concerns and challenges. With more cross-sector collaboration, the dairy sector is able to drive innovation and develop more efficient effluent management systems that can benefit global efforts.





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### COMPLIANCE RULES

New Zealand compliance rules often require farms to adjust effluent application rates and methods to efficiently monitor high and low risk soil types, rainfall levels, irrigation methods, and catchment types to minimise environmental impact. For low-risk soils such as volcanic soil where infiltration is high, effluent application can be more lenient. With high-risk soils such as peat soil that has poor drainage, it requires stricter management practices to ensure minimal risk. Similarly, areas with high rainfall or close proximity to bodies of water require enhanced containment methods and setbacks to prevent runoff. Typically, if a tractor is able to be driven on a farm 24 hours after a heavy rainfall event without issues, then the soil is low-risk.

Different irrigation types, such as spray or heavy application methods, influence compliance requirements. Measures aimed at optimising nutrient uptake and minimising leaching have assisted dairy farmers in being able to meet these requirements with updated equipment. When it comes to catchment types, like sensitive or protected areas, there may be additional regulations to safeguard water quality.

Utilising the **DESC Calculator** can help you determine the volume of storage required depending on rainfall levels, soil type, irrigation method, and catchment approach. Input the measurements of your farm as well as farm management style and milking practices to determine the best method for your location.

Rainfall patterns influence timing and frequency of effluent spreading. Areas that experience high precipitation are often subject to stricter containment measures to prevent runoff into waterways. Impact on compliance requirements can be determined by irrigation methods such as spray, heavy application or drip approaches. Regulations are aimed at maximising nutrient uptake and minimise leaching, which is why further innovation is required to continually comply with the global standard for effluent management. Catchment characteristics including sensitivity and protection status may necessitate additional precautions to safeguard water quality, often requiring buffer zones or specialised management practices.

#### ALWAYS CHECK WITH YOUR REGIONAL COUNCIL

In regards to compliance rules and requirements. For further information call us on 0800 464 393 or email info@nevadagroup.co.nz

#### **Setbacks**

When looking at compliance rules for an efficient effluent management strategy, dairy farmers should be aware of setbacks required by regulations that ensure protection of bodies of water and sensitive areas that are at risk of contamination. Setbacks typically involve maintaining specified distances between effluent application areas and avoiding landscape elements such as streams, rivers, lakes, wells, and property boundaries. The exact setback distances can vary depending on factors of soil type, slope, and local regulations. Dairy farmers should consider setbacks that include methods to minimise odour concerns and ensure effluent management facilities are not directly near other dwellings or public roads. Adhering to setback requirements is crucial for compliance with environmental regulations and minimising overall risk of pollution.



Image above shows an example of an effluent irrigation zone setbacks around a river and cowshed, along with an irrigation line.



### MAINTENANCE COSTS

When planning a dairy effluent management system it is important to consider the operational costs and maintenance required. The type of maintenance needed and the cost to keep systems running depends on the size of operation, the type of infrastructure involved, and the compliance requirements for the area. In general, maintenance costs can include equipment maintenance, then maintenance for pumps, pipes, storage and treatment facilities, as well as associated power costs.

Regular inspections require labour and monitoring of facilities, which can contribute to expenses. If an inspection does not meet compliance, then expanding infrastructure or upgrading the facility will be required in order to meet regulations. Initial investment costs can be significant, but with innovative effluent management methods, you can avoid ongoing maintenance costs and utilise less labour for daily operations. Proven or accredited systems are highly recommended in order to keep costs low and to run dairy effluent management practices more efficiently.



#### YES, WE'RE ACCREDITED!

Nevada is Farm Dairy Effluent System Design Accredited by Irrigation NZ to ensure compliance with regulations and to provide advice on the latest in innovation for dairy farm practices. Contact us to learn more.

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### EFFLUENT STORAGE



There are a variety of popular effluent storage types that have evolved to meet compliance and ensure streamlined operations for dairy farmers. The best practice is to consider the effluent flow that can be utilised with gravity from the yard to the pond. If a pond is not possible or another method is preferred, then effluent can be caught in a sump or pumped to a storage facility. Infrastructure from the shed should include a storm water diverter to maximise the space for effluent storage by diverting rainwater away from the effluent system when the shed is not in use.

For effluent storage methods it is also recommended to have a stone trap that is suitable to the size of your farm. One stone trap is typically adequate, but when implementing a bladder tank as a storage facility, it is advised to have two stone traps involved in the infrastructure. There has been a trend towards utilising weeping walls, but keep in mind that a weeping wall creates a second product that has to be managed. Without many benefits involved and a huge cost in infrastructure, it is not an ideal approach for an effluent management system. When looking at the amount of storage you need for your dairy farm, it is recommended to go larger in size to future proof operations. If there is a plan for growth in the future, or if operations change hands, it creates long-term value on the property for dairy effluent management. It also can ensure that compliance is met if the requirements change due to the evolving rules based on environmental impacts and agricultural productivity. Extra storage also provides a way to mitigate issues with extreme weather events that have been occurring more frequently. By reducing concern of overflow or not having enough storage during the rainy season when effluent cannot be spread, your dairy farm can reduce overall issues with storage and meet compliance without concern. The current trends for effluent storage methods include synthetic lined ponds, effluent bladder tanks, and above ground storage tanks.

#### **Synthetic Lined Ponds**

Synthetic lined ponds are popular due to the ability to visually see what is happening in the pond and the opportunity for easy maintenance of the facility. It is an effective approach to manage effluent stirrer methods and to pump out effluent through pipes or to a slurry tanker without hassle. Synthetic lined ponds cost less than above ground options and can be accommodating to the shape of a farm as needed. Keep in mind if you are upgrading a pond, the pond will need to be cleaned out and lined before it can be utilised for operations, which can be disruptive to some farms.

#### **Effluent Bladder Tanks**

Effluent bladder tanks are one of the most effective approaches on the market today with a storage method that offers reduced issues with rainwater, which creates more capacity for effluent to be stored. Bladder tanks provide an advantage of safety if there are children present on the farm, as well as create less odour than other storage facilities. If your dairy farm experiences high yearly rainfall it is recommended to use a bladder tank before considering an above ground tank or pond, as bladder tanks are fully covered and do not collect additional rain water.



#### **Above Ground Storage Tanks**

Above ground storage tanks can be steel, plastic, or concrete. Concrete has been considered a good building material, but can be brittle over time and needs to be placed on solid ground. Plastic above ground tanks have a thin plastic liner and often feature a wall that is only two and half metres high, which does not offer the volume needed for larger operations. If there is high rainfall, there is an option to put a cover on the above ground tank to reduce the amount of rainwater the tank catches, but there are few situations where an above ground tank would be suitable over a bladder tank.



## EFFLUENT PUMPS

Effluent pumps on the market today offer lower running costs and deliver more efficient effluent management methods than previous approaches. Dairy farmers are choosing not to have floating pumps on a pontoon out on effluent ponds due to the safety issues and lack of efficient energy use. Instead of focusing on inefficient practices that are costly and unsafe, dairy farmers are opting for progressive cavity (PC) pumps that are shore mounted. This lowers the power requirements and increases output pressure. PC pumps are self priming and have consistent output regardless of the length of the discharge irrigation hose or the change in elevation of the farm. An irrigator can function with the same amount of volume of water with a progressive cavity pump and is optimised for performance, while a centrifugal pump requires more controls and a larger motor in order to achieve similar results.

#### **Progressive Cavity (PC) Pump**

A PC pump is a shore mounted option that is safer, service efficient, and longer lasting. The optimal performance ensures a consistent flow rate and greater efficiency for lower running costs.

#### **PTO Effluent Pump**

A PTO Pump system works efficiently, but operates at a fixed position. The setup is reliant on the amount and length of pipe laid out and still requires regular monitoring while it is running.





If you are utilising an in-ground irrigation system with a progressive cavity effluent pump, then it is also recommended to add a submersible transfer pump when moving effluent by gravity from a cowshed or yard. For large scale irrigation systems or drag hose systems, a PTO or diesel powered pump is ideal for operations due to the increased output when compared to electric pumps. Some effluent pumps available include a chopper near the impellor to cut up fibres, which can be a valuable resource if there are feed pads or underground storage bunkers.

When considering the right pump for your dairy effluent operation, consider the type of storage facility and application methods you want to implement before deciding on the best pump.

#### **Diesel Effluent Pump**

Diesel Effluent Pumps are ideal for contractors and feature a shredder on the intake port, in-built engine protection, a lockable canopy, and working lights to ensure safety and practicality.



#### Floating Centrifugal Effluent Pump

Floating Centrifugal Pumps are a traditional kind of pump that are reliable for the right situation. Rather than being shore mounted, it is submerged in effluent and operates at a lower pressure. Due to the low pressure, it is often limited in its ability to manage most effluent systems, but can be managed with a Variable Speed Drive (VSD).



## EFFLUENT STIRRERS

Effective mixing of dairy effluent is key to maintaining a good effluent system.

Vertical thrusting stirrers on a floating pontoon were the traditional method for stirring effluent, but due to the concept being unsafe and the stirring method being very inefficient, farmers have moved away from floating stirrers to choose more effective and safer methods. Shore mounted horizontal thrusting stirrers are a safer and more effective choice for operations today. The other part of an effective stirrer is the design of the propellor.

#### Shore Mounted Effluent Stirrers

To effectively stir an effluent pond with a shore mounted stirrer, it has to create a horizontal thrust for optimal results. The stirrer can easily be adjusted for depth level from one position at the side of the pond. With the ability to rotate the stirrer from side to side, it can be brought safely to shore for any needed maintenance.

#### **Bladder Tank Effluent Stirrers**

To stir an effluent bladder tank, it is recommended to use a PTO pump or large capacity trash pump. To adequately stir the tank, the ports around the bladder are used by sucking effluent out through one port and pumping it back into the bladder through another port with a high-volume effluent pump. This creates a swirling motion that brings the effluent into suspension. This method is repeated on the other side to adequately stir the effluent before irrigating. Regular stirring is recommended to avoid heavy solids falling out of suspension.



#### **PTO Effluent Stirrer**

PTO effluent stirrers range in size. Confirm capacity of the tractor available and how accessible the pond is. PTO pond stirrers can be cost effective and very efficient with the ability to easily move it around a pond or to different farm locations. However, there is a labour component to be mindful of, along with the availability of a tractor to operate the PTO pond stirrer.

#### **Electric Pond Effluent Stirrer**

An electric stirrer is often the recommended method with the ability to be automated to stir regularly to avoid heavy sludge and clusters of solids in the pond. For above ground tanks, an above ground electric stirrer is suitable for the task instead of a PTO stirrer. An above ground tank stirrer can be automated and provides a way to keep electric motors up and out of a synthetic lined tank. It is similar to a pond stirrer, but is placed on a pedestal or pole to reach up and over into the tank.

An often overlooked aspect of effluent stirrers is how often the pond may look nice on the surface, but it is the bottom of the pond that is more of a concern. If a pond is not taken care of properly, it can cause issues with storage capacity and become a much harder task to manage. Regular stirring ensures there is less to manage when it comes time to spreading the effluent.





## SLURRY TANKERS

Slurry tankers are a comprehensive system that operates as one machine. In essence a slurry tanker sucks the effluent, carries it and then spreads it. The all-in-one irrigation system gives more flexibility for farmers and contractors or to move between multiple farms, or to virtually spread on any paddock. If you are planning to upsize or downsize, it retains its value more than other effluent management approaches.

Slurry tankers are efficient for labour with only one driver needed and provide an excellent approach to get a higher return for crops. It can serve as an additional resource to an in-ground irrigation effluent system by reaching further away crop paddocks and other missed areas. If you decide in the future to switch to an electrical effluent system, there is also the option of selling the tanker or using it for far away or odd shaped paddocks. With the ability to use slurry tankers on regular and irregular shaped paddocks, it offers more control where effluent is being applied. This can reduce issues with higher risk soils by careful consideration where effluent is placed. It also can assist with sucking out sumps, HerdHomes®, covered cow barns, and other areas that may have heavier slurries that block irrigator nozzles or regular effluent pumps can not handle.

Unlimited reach and effective application of nutrients make slurry tankers an investment that benefits dairy effluent management methods and can streamline operations without extra infrastructure.

### DRAG HOSE SYSTEM

Drag hose systems are a great option if you have a big pond and good sized paddocks around 3 hectares or more or the farm is located in a high-rainfall area. The advantage is the ability to spread large volumes of effluent quickly, which creates an efficient approach to apply effluent from the storage facility. With the ability to run a large capacity PTO pump or diesel powered effluent pump, it does not require another tractor to be used and can be managed with a designated drag hose system or umbilical system.

Effluent PTO pumps, hose reelers, and lay flat hose all have applicators like a RainWave<sup>™</sup> or trailing shoe. RainWave<sup>™</sup> applicators provide the best value. Greater volumes and larger droplets can be applied quicker to decrease issues with wind drift for a more consistent spread width. A RainWave<sup>™</sup> also offers more nutrients reaching the base of crops, which not all applicators can offer.

Similar to slurry tankers, an operator is able to apply effluent with full control on where and how much is spread, including on irregular shaped paddocks. In Spring when you are not able to move heavy equipment around on the farm,



drag hoses are still able to be used with little issue. The downside is it does require the use of a PTO pump, stirrer, and applicator, which means multiple tractors are being used at once. With more labour involved, it is an effluent management approach that takes more time and resources but only has to be put in place every few months for one or two days. A drag hose system is also easy to re-sell.



### EFFLUENT IRRIGATION SYSTEM

Effluent irrigation system design is an important aspect when considering the type of equipment your farm needs to run efficiently. When drafting a design, take careful consideration of the current capacity of the farm, where expansion could happen, and how far the effluent system will need to go. Getting your farm properly assessed can help you get the maximum return on your investment.

Irrigation mainline can be in or above the ground. Irrigation mainlines are normally buried in-ground with hydrants positioned at every second paddock along the longest length of the paddocks in order to reach both of the paddocks. It is recommended to keep drag hose lengths to a maximum of 200 metres, which is adequate for most paddocks. This reduces drag on travelling irrigators to ensure less wear and tear over time.

The majority of the cost in an irrigation system typically comes from the infrastructure around a pond. It is recommended to extend the mainline further and to get more paddocks into the irrigation platform. Nevada recommends more than 4 hecares per 100 cows. A simple approach for an effective effluent irrigation system is to include an irrigator auto shut-off valve with an intelligent pump controller that can easily recognise the pressure of the pump and will automatically shutdown if it detects an increase or decrease of pressure. With failsafe devices in place, it reduces any potential issues with runoff or unwanted spread of effluent to areas on the farm.

All irrigators are recommended to have an automated shut off valve that includes the option for automatic alerts to leakage, blockage, or loss of flow with the ability to manually shut it off as needed. Ther maybe a trending movement towards safety geonets and GPS tracking on effluent irrigation systems, but be aware that some are more hassle than they're worth.

If you are looking to upgrade your dairy farm effluent management system or need an assessment on a design, Nevada is fully accredited to ensure your system of choice meets compliance and is the most efficient system for your farm.

To get a customised effluent system design for your farm, call us at **0800 464 393** or email **sales@nevadagroup.co.nz** 





### FINDING THE RIGHT SOLUTION FOR A SUCCESSFUL EFFLUENT SYSTEM

With an increase of focus on the balance around environmental sustainability and agricultural productivity, dairy farmers are looking at how to invest in efficient operations to benefit their dairy farm long-term.

An effective and efficient effluent system varies in approach from farm to farm, but with the latest in innovation for dairy effluent systems, Nevada is leading solutions to benefit New Zealand dairy farm operations and contribute to more efficient processes for the industry as a whole.

For more information about dairy effluent management systems and designs, contact our team to learn more.





# CONTACT

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