

# Effluent Pond Systems

## Two pond systems

In two pond systems effluent enters the first (**anaerobic**) pond where solids settle and are broken down by bacteria which thrive in the absence of oxygen. This reduces the level of nutrients flowing into the second pond. Anaerobic ponds need to be *at least* 3 metres deep (4 m to 5 m being ideal).

The recommended minimum anaerobic pond sizes for different herd sizes in Waikato are shown in Table 3.

**Table 3:**  
Recommended sizes for anaerobic ponds in the Waikato

No. of Cows	Recommended Volume**	Examples of dimensions required.	
		Depth	Size
100	470 m <sup>3</sup>	3.0 m	15 m x 22 m
150	690 m <sup>3</sup>	3.0 m	16 m x 28 m
200	910 m <sup>3</sup>	3.0 m	17 m x 33 m
250	1130 m <sup>3</sup>	3.0 m	19 m x 35 m
300	1400 m <sup>3</sup>	4.0 m	21 m x 33 m
350	1620 m <sup>3</sup>	4.0 m	21 m x 37 m
400	1840 m <sup>3</sup>	4.0 m	21 m x 42 m
450	2050 m <sup>3</sup>	4.0 m	21 m x 46 m
500	2270 m <sup>3</sup>	4.0 m	21 m x 50 m

**\*\* Assumes storm water from the dairy shed and surrounding land is NOT entering the pond. All storm water should be diverted if possible!**

The second (**aerobic**) pond is shallower, enabling the penetration of sunlight and aeration of the water by wind to maintain higher oxygen levels. In some cases, second ponds have a bottom layer where there is no oxygen – these are more correctly called **facultative** ponds. Aerobic and facultative ponds are generally less than 2 metres deep.

The recommended minimum aerobic/facultative pond sizes for different herd sizes in the Waikato are shown in Table 4.

**Table 4:**  
Recommended sizes for aerobic/facultative ponds in the Waikato.

No. of Cows	Recommended Surface Area	Example of dimensions required.	
		Depth	Size
100	480 m <sup>2</sup>	1.2 m	15 m x 32 m
150	720 m <sup>2</sup>	1.2 m	19 m x 38 m
200	950 m <sup>2</sup>	1.2 m	22 m x 43 m
250	1190 m <sup>2</sup>	1.2 m	22 m x 53 m
300	1420 m <sup>2</sup>	1.2 m	Make up required surface area with 2 or more ponds.
350	1660 m <sup>2</sup>	1.2 m	
400	1900 m <sup>2</sup>	1.2 m	
450	2140 m <sup>2</sup>	1.2 m	
500	2370 m <sup>2</sup>	1.2 m	

## Sealing

It is crucial that any pond is sealed to ensure effluent is not leaching into groundwater. There are a number of options available for sealing ponds. Compacted clay is a good option if it is available and if constructed correctly. More costly options include plastic liners or concrete, these will ensure your ponds are sealed. Remember to inform anyone doing any work if a clay layer or plastic liner is present.

In areas of the Waikato there are high water tables. In these areas it is important to consider the type of ponds and the depth of construction.

For more information on pond construction guidelines refer to the “Dairy and the Environment – Managing Farm Dairy Effluent” Manual on the Dexcel website [www.dexcel.co.nz](http://www.dexcel.co.nz).

## How do I know if my pond system is big enough?

The effluent pond system will work well...

- If the ponds are the correct size for the number of cows plus any extra effluent from feed pads, stand-off areas etc.
- The bottom sludge is not allowed to build up
- If the retention and settling time is 60 –90 days
- If stormwater is diverted from entering ponds.

The following signs indicate a poorly operating pond system:

- Sludge build-up or excessive crusting
- Bubbling has stopped in the anaerobic (first) pond
- Discolouration of the receiving waterway
- Bad smells from the receiving waterway.

**The most common reason for poor performance of a pond system is *undersized ponds***



Use this worksheet as a guide for determining whether your pond system is big enough:

**YES** ← Is stormwater from your dairy shed and surrounding land diverted away from your pond treatment system? → **NO**

**Anaerobic Pond**

Measure your anaerobic (first) pond:

Length  m x Width  m x Depth  m =  m<sup>3</sup> x 0.5 =  m<sup>3</sup> Your Anaerobic Pond Volume

↑  
This figure accounts for a 2:1 batter slope

Compare your anaerobic pond volume with the recommended sizes below

Anaerobic (first) pond	
No. of Cows	Recommended Volume**
100	470 m <sup>3</sup>
150	690 m <sup>3</sup>
200	910 m <sup>3</sup>
250	1130 m <sup>3</sup>
300	1400 m <sup>3</sup>
350	1620 m <sup>3</sup>
400	1840 m <sup>3</sup>
450	2050 m <sup>3</sup>
500	2270 m <sup>3</sup>

\*\*Assumes stormwater from the dairy shed and surrounding land is NOT entering the pond. A larger volume will be required if this is not the case.

**YES** ← Does your anaerobic (first) pond meet the recommended volume for the size of your herd? → **NO**

**YES** ← Are the solids retained in your anaerobic (first) pond by an effective baffle or T-piece? → **NO**

### Aerobic Ponds

Measure your aerobic pond. If you have more than one aerobic pond, work out the surface area of each pond then add them:

	Length	x	Width	=	Surface Area
Aerobic Pond One	m		m		m <sup>2</sup>
+					+
Aerobic Pond Two (if relevant)	m		m		m <sup>2</sup>
+					+
Aerobic Pond Three (if relevant)	m		m		m <sup>2</sup>
Your Total Surface Area of Aerobic Ponds =					m <sup>2</sup>

Compare your aerobic pond size against the recommended sizes below

Aerobic (second) pond	
No. of Cows	Recommended Surface Area
100	480 m <sup>2</sup>
150	720 m <sup>2</sup>
200	950 m <sup>2</sup>
250	1190 m <sup>2</sup>
300	1420 m <sup>2</sup>
350	1660 m <sup>2</sup>
400	1900 m <sup>2</sup>
450	2140 m <sup>2</sup>
500	2370 m <sup>2</sup>

Does your aerobic (second) pond/s meet the recommended surface area for the size of your herd?

**YES**
←
→
 **NO**

Is your pond system designed to cater for effluent from your standoff/feed pad areas?

**YES**
←
→
 **NO**

If you have answered **YES** to all of these questions then you should have a pond treatment system that performs adequately.

If you have answered **NO** to any of these questions then refer to the table on the next page.

<p><b>Stormwater Diversion</b></p>	<p>Minimising the volume of your dairy shed effluent is very important. By installing and using an effective stormwater diversion you are decreasing the amount of rainwater entering your system. Consider an average combined yard and roof area of 250 m<sup>2</sup> – an annual rainfall of 1186 mm will add 297 m<sup>3</sup> (296,500 litres) of water to the pond system! If you choose not to use your stormwater diversion, you will need to increase the capacity of your anaerobic and aerobic ponds, or add on another treatment system such as land application from your aerobic pond.</p>
<p><b>Undersized Anaerobic pond</b></p>	<p>When your anaerobic pond is undersized it has the following effects:</p> <ul style="list-style-type: none"> <li>• Increases the solid content of your aerobic (second) pond, which decreases the pond's efficiency</li> <li>• Increases the solid content of the treated wastewater entering receiving waterways.</li> </ul> <p>To improve the situation of an undersized anaerobic pond:</p> <ul style="list-style-type: none"> <li>• Either increase the size of your existing pond, or add another anaerobic pond until your total anaerobic volume meets the recommended size for your herd plus any additional effluent inputs (e.g.: feed pads)</li> <li>• Contact Environment Waikato if considering adding on another treatment system, such as applying effluent to land. Use your effluent ponds as storage and irrigate from the aerobic (second) pond.</li> </ul>
<p><b>Ineffective Baffle or T-piece</b> (pipe joining 1st and 2nd pond)</p>	<p>By allowing solids to move from the anaerobic pond to the aerobic pond, you are overloading the capacity of these aerobic ponds. To ensure that this does not occur:</p> <ul style="list-style-type: none"> <li>• Make sure the baffle or Tee is set up correctly and does not block</li> <li>• The position of the inlet and outlet pipes is very important. The inlet should be at the top of your pond (off to one side) while the outlet should be at the other end (diagonally opposite the inlet pipe).</li> </ul>
<p><b>Undersized Aerobic pond/s</b></p>	<p>An undersized aerobic pond (assuming that the anaerobic pond capacity is adequate) results in elevated faecal bugs and ammonium nitrogen levels in your wastewater. To make improvements:</p> <ul style="list-style-type: none"> <li>• Increase the size of your existing aerobic pond</li> <li>• Two average-sized aerobic ponds are better than one large aerobic pond</li> <li>• Alternatively, contact Environment Waikato if considering adding another treatment system, such as application to land, and pump your effluent from the aerobic pond.</li> </ul>
<p><b>Pond system is not designed to cater for stand-off/feed pad effluent</b></p>	<p>By adding effluent from a stand-off or feed pad, you are overloading your pond system. Options for improvement include:</p> <ul style="list-style-type: none"> <li>• Scrape solids off the feed pad or stand-off area and stockpiling them in a safe way that will not contaminate waterways or groundwater</li> <li>• Install a separate solids retention pond that will take the effluent from your stand-off/feed pad area. Ensure that the size of this is adequate for your herd size and frequency of use. Install an effective baffle or T-piece to prevent solids entering the existing anaerobic treatment system</li> <li>• Increase the capacity of your pond system. You can do this by adding on extra ponds</li> <li>• Contact Environment Waikato if considering adding another system such as land application from your aerobic pond.</li> </ul>

## Pond System Maintenance

---

### Daily

- Before and after every milking, check that the stormwater or washwater diversion is in the correct position.

### Weekly to Monthly

- Clean and clear the effluent stone trap and gratings
- Check that the pipes running in and out of the ponds are not blocked
- Check the effect of the discharge on the receiving waterway
- Check that the pond walls are stable, and that there is no seepage. Visible wetness or pasture that is growing exceptionally well are indicators of seepage problems
- Control weed growth in and around ponds by spraying with a herbicide
- Check that the fencing remains stock proof.

### Six monthly to Annually

- When the area around the ponds and any seepage areas are dry, graze them
- Check that there is not excessive build-up of solids in the anaerobic pond
- Desludge ponds at least once every five years, or when the sludge level is over half the normal effluent depth - this can be checked with a long pole.

## Desludging effluent ponds

---

- Ponds should never be emptied out completely. A third of the sludge should be left behind, as it will contain bacterial populations necessary for the continuation of anaerobic processes
- When using contractors or hiring equipment make sure that the equipment used has been cleaned before use on your farm to avoid disease transfer
- Mix sludge with liquid effluent, before spreading directly on to pasture to prevent plant damage, due to higher N content of sludge
- Sludge and crusts are usually removed with excavation machinery
- If possible, the surface liquid effluent should be removed before desludging by suction drawing it into a vehicle spreader
- Alternatively, pond stirring to mix the various layers of the pond during tanker filling can remove the need for excavators to desludge ponds
- Use vehicle spreaders when soils are dry
- Do not allow grazing of pasture recently treated with effluent. Either wait for rain or allow at least a 10-day stock withholding period before grazing. This will ensure the pasture is sterilised by sunlight and air or washed by rainfall.

## Better management of effluent pond systems

---

- Divert stormwater from the farm dairy before it reaches the pond system. Also install a channel around the pond embankments to prevent water run-off from surrounding land entering the pond system
- Prevent chemicals from entering ponds (such as excessive amounts of copper sulphate or other foot treatment chemicals) Many chemicals can affect the breakdown of effluent
- Ensure that plastic waste products do not enter ponds (i.e.: AI gloves, syringes). These can block the inlet and outlet structures and reduce the effectiveness of the pond system
- Ensure that groundwater is not entering through the pond floor or walls
- Where ponds are lined with a plastic liner, ensure that the pumps or other machinery never interfere with the liner. For this reason, contractors should be made aware that a liner is present
- Ensure that your pipework is installed correctly. Inlet and outlet pipes placed in the wrong position can result in the short-circuiting of effluent through the system. Optimising retention time is critical
- Ensure that stock is kept fenced out to prevent damage to pipework and embankments
- Ponds must be maintained regularly and properly. Maintenance involves desludging, controlling weeds and repairing and maintaining pipes and structures.

