

A staff guide to operating your effluent irrigation system

Low rate system





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Version 1 – Nov - 2012

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DNZ40-134

Operating your effluent irrigation system

Understanding how to operate your effluent irrigation system properly is an essential task on farm. This booklet helps take farm staff through the important parts of operating and maintaining a low rate effluent system. The book can be used as a training guide for those who are new to low rate pod systems, or for staff who are new to the farm to introduce them to the farm's effluent practices and policies.

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Symbols



This symbol means STOP IMMEDIATELY – throughout the book there are examples of problems that will arise on your farm related to effluent. In most cases if you see any of these issues you must STOP IMMEDIATELY and inform your manager or farm owner.



This symbol means WARNING – throughout the book there are examples of problems that will arise on your farm related to effluent. In most cases if you see any of these issues you must fix the immediate problem if you have permission or have been shown what is required to fix the problem. And then inform your manager or farm owner.

Our farm policy for effluent

We must ensure that:

1.	No effluent gets into waterways
2.	No effluent puddles in any paddocks
3.	The effluent system is checked daily (minimum)
4.	If there are problems with effluent, talk to the manager/farm owner
5.	Effluent irrigation events are checked and recorded against the Effluent Management Plan
6.	The Resource Consent / Permitted Activity rules are displayed in the shed
7.	The maximum application depth is not exceeded
8.	The maximum application rate is not exceeded
9.	Effluent is not applied if the soils are too wet

Potential hazards of effluent irrigation



Why is effluent important?

Well managed and maintained effluent systems:

- Grow more grass for less cost
- Grow better tasting grass, therefore cows eat more
- Have fewer messy breakdowns
- Have cleaner water for the community
- Ensure regional council rules are met – no fines
- Obtain greater public acceptance.

What is effluent made up of?

- Wash down water
- Rain
- Faeces and urine
- Spilt milk
- Detergent
- Soil from feet.



What nutrients are in effluent?

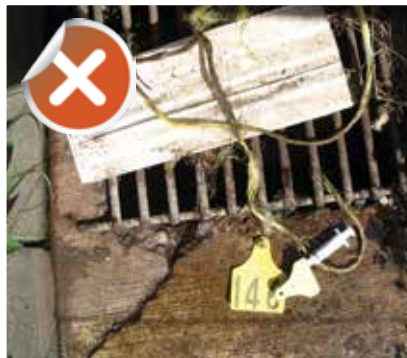
- Nitrogen (N)
- Phosphorus (P)
- Potassium (K)
- Sulphur (S).

The value of the nutrients in effluent from 100 cows in an average New Zealand herd is **\$3000 PA**

What shouldn't be in effluent?



Chemicals



Rubbish/afterbirth

Before every milking: checklist



1. Stormwater

Is the stormwater or wash water diversion in the correct position?



2. Stone trap

Is the sump/stone trap clear of rubbish/afterbirth?



3. Storage

Is there enough room in the storage pond or tank for another milking? (Refer to pg 7)



4. Solids separator

Is the solids separator or weeping wall set up correctly?



5. Pump/stirrer

Do you need to turn the stirrer or pump on?



6. Yard

Wet the yard before cows come in



7. Be gentle

Reduce noise and be gentle with cows during milking



8. Turn hoses off

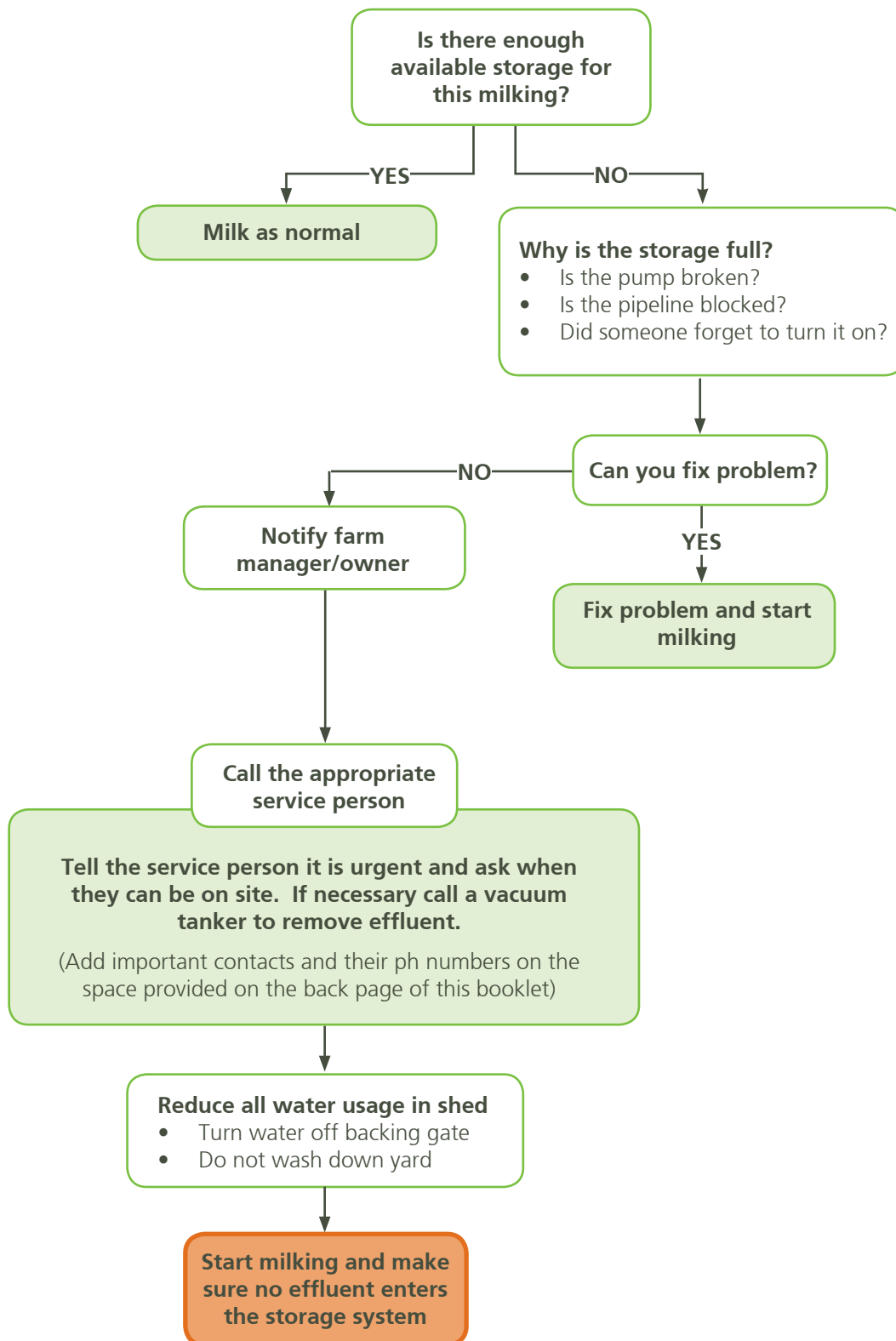
Use less water and turn off the hoses



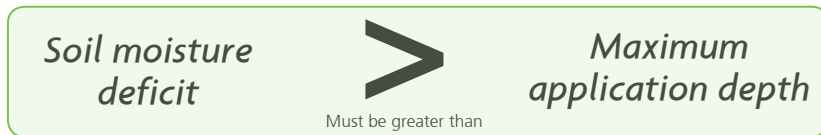
9. Scrape the yard

After milking scrape yard with scraper before you hose down

Before every milking: check effluent storage



Before irrigating: check soil moisture



Check electronic monitoring equipment

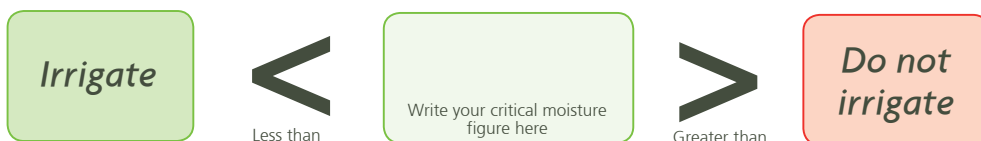
Check the soil moisture data logger or use a soil probe to get the soil moisture figure for the paddock being irrigated

Check website

Some regions / regional councils have up to date information available online providing the soil moisture levels of the area.

Then...

Compare today's soil moisture figure against the farm's critical soil moisture figure. The critical soil moisture figure will determine whether you can irrigate and your irrigation timing.



Check paddocks manually - look and listen. Do not irrigate if:



There is already water puddling on the ground/worms on surface.



You can hear/see water or wet mud under foot when you walk.



It has been raining a lot, snowing or the ground is frozen.



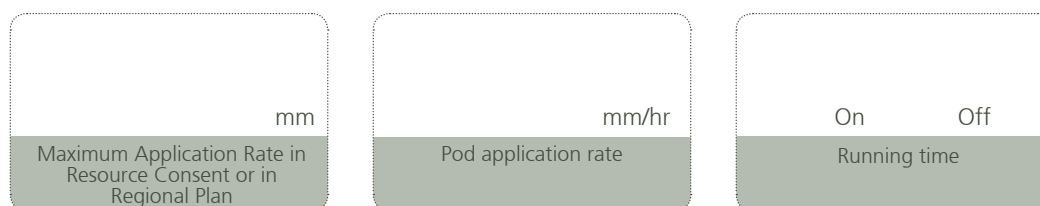
The soil makes a 'worm' when rolled, sticks to your thumb when rolled or free water appears when squeezed.

Cow and pasture considerations

- Apply effluent onto short pasture. If possible, graze the area 2-3 days before application
- Avoid grazing pasture within 10 days of spraying effluent, to reduce animal health risks and maximise pasture intake
- Avoid grazing springing or just calved cows on the effluent block – this will help avoid metabolic problems
- Avoid or cover water troughs
- Avoid tiles, swales and low lying areas when soils are wet
- Keep drier and higher areas for spring/autumn application.

Irrigation timing

How often you need to move pods depends on your systems. When conditions are most suitable, irrigate as much of the time as possible. Move pods multiple times a day and get your pond right down.



Once you know the above three numbers use the tables below to work out how long your pods can stay in one place before moving. Use 4 ml application rate if you have not had your system tested and do not know your system's specific application rate.

Before irrigating

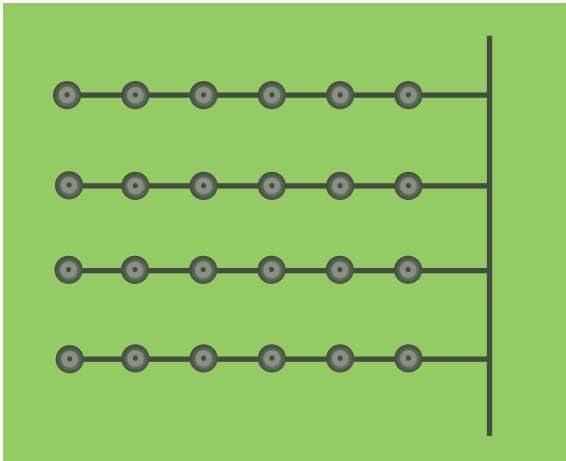
Time between moving pods to apply 15mm depth										
Minutes Operating		Your systems average application rate per hour (mm/hr)								
		2 ml	2.5 ml	3 ml	3.5 ml	4 ml	4.5 ml	5 ml	5.5 ml	6 ml
On	Off	Period of time between moves (hrs)								
15	15	15.00	12.00	10.00	8.50	7.50	6.50	6.00	5.50	5.00
15	30	22.50	18.00	15.00	13.00	11.25	10.00	9.00	8.25	7.50
15	45	30.00	24.00	17.25	20.00	15.00	13.00	12.00	10.75	10.00
20	20	15.00	12.00	10.00	8.50	7.50	6.50	6.00	5.50	5.00
20	40	22.50	18.00	15.00	13.00	11.25	10.00	9.00	8.25	7.50
30	30	15.00	12.00	10.00	8.50	7.50	6.50	6.00	5.50	5.00
60	60	15.00	12.00	10.00	8.50	7.50	6.50	6.00	5.50	5.00
On continuously		7.50	6.00	5.00	4.25	3.75	3.25	3.00	2.75	2.5

Time between moving pods to apply 20mm depth										
Minutes Operating		Your systems average application rate per hour (mm/hr)								
		2 ml	2.5 ml	3 ml	3.5 ml	4 ml	4.5 ml	5 ml	5.5 ml	6 ml
On	Off	Period of time between moves (hrs)								
15	15	20.00	16.00	13.50	11.50	10.00	9.00	8.00	7.25	6.50
15	30	30.00	24.00	20.00	17.00	15.00	13.50	12.00	11.00	10.00
15	45	40.00	32.00	26.50	22.75	20.00	17.75	16.00	14.50	13.50
20	20	20.00	16.00	13.50	11.50	10.00	9.00	8.00	7.25	6.50
20	40	30.00	24.00	20.00	17.00	15.00	13.50	12.00	11.00	10.00
30	30	20.00	16.00	13.50	11.50	10.00	9.00	8.00	7.25	6.50
60	60	20.00	16.00	13.50	11.50	10.00	9.00	8.00	7.25	6.50
On continuously		10.00	8.00	6.50	5.75	5.00	4.50	4.00	3.50	3.25

How to move a pod system

Typical standard pod system setup

Setup will vary on different farms but typically pods are set up with about 3-4 lines with about 6 pods on each line



Typical large pod system setup

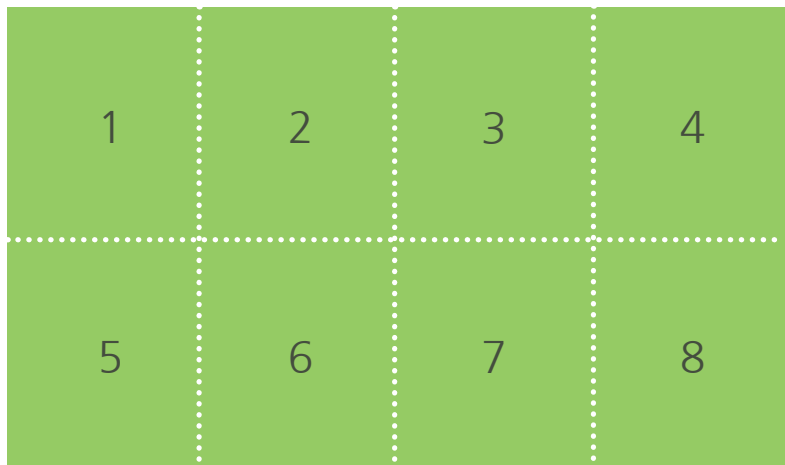
Setup will vary on different farms but typically pods are set up with a single pod line with about 4-6 pods connected to the feed line



Before irrigating

Pod layout in paddock

Divide each paddock into separate zones. Mark on fence posts the correct spacings that can be easily seen when on the bike. This will help line up lines so you get the right spacing and identify each area.



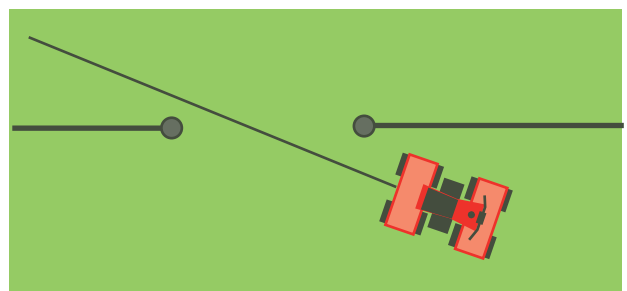
Moving pods

There are two different movement types. Moving pods:

- between paddocks
- within the same paddock.

Moving pods between paddocks

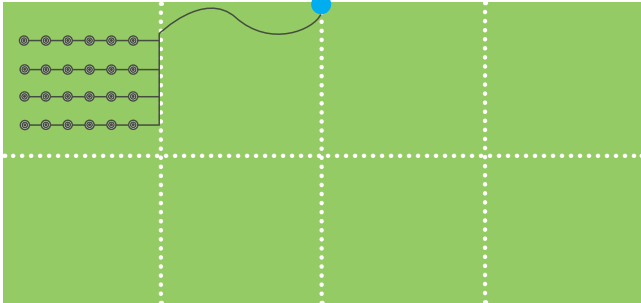
Moving lines between paddocks can be tricky. When going through gates it is very important to have the right angle so lines do not hit or bend around fence post. If lines hit or bend around fence posts this will cause the pipes to weaken and they will split, it will also cause damage to pods /sprinklers.



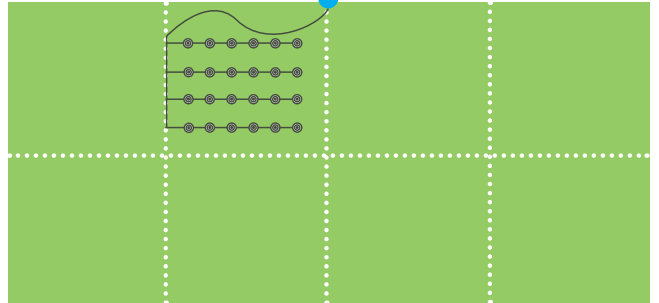
Moving pods within the same paddock

Split the paddock up into zones and move the lines to new zone each time. This will mean nutrients are more evenly applied.

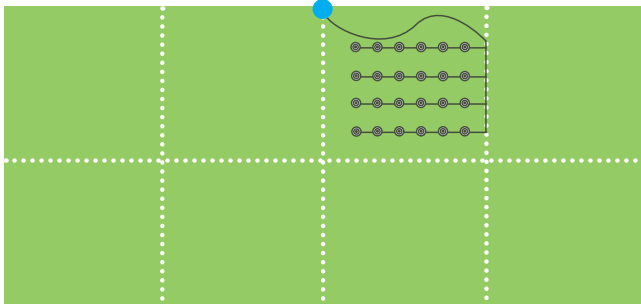
Position 1



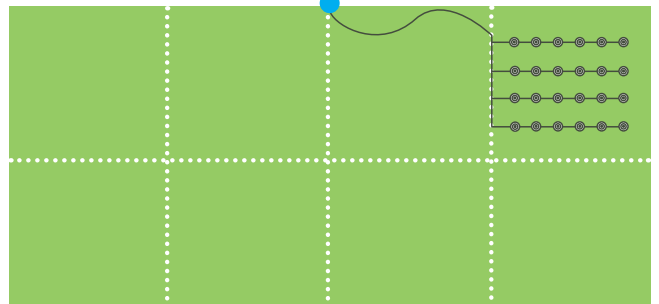
Position 2



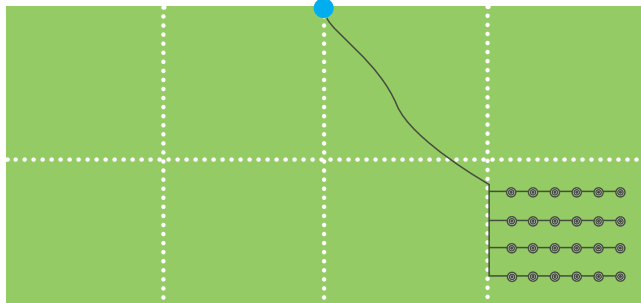
Position 3



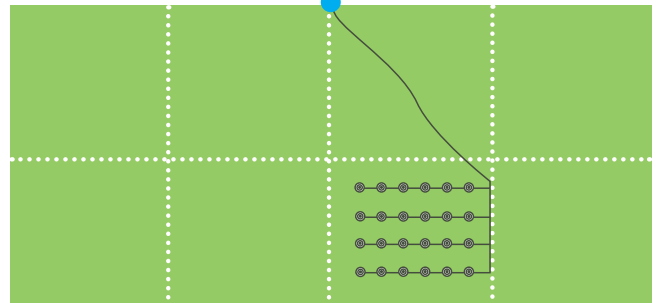
Position 4



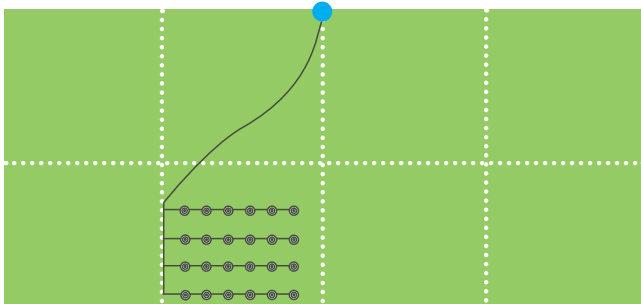
Position 5



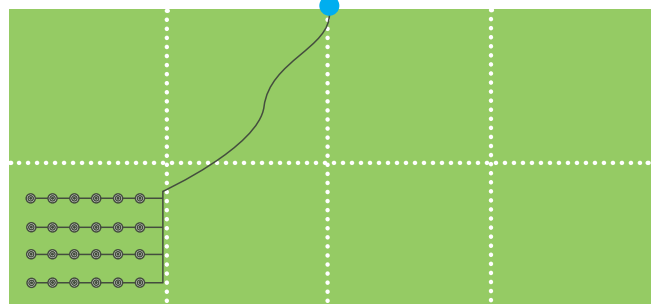
Position 6



Position 7



Position 8



Before irrigating

Moving standard pods: step by step

Before irrigating



1. Soil

Check the soil moisture. Is it too wet to irrigate? Never use pods in the rain



2. Location suitable for conditions

Check irrigation record sheet, are pods are in the right location. Make sure pods not near waterways, tiles, gullies.



3. Pump - OFF

Turn off pump



4. Hydrant - OFF

Turn off or disconnect hydrant at paddock



5. Open Valves

Open all valves at end of each pod line, allow lines to empty before moving. Disconnect tow fittings (if attached) and take tow fitting to other end of pod line



6. Undo cam

Disconnect all cam locks connecting pod lines to feed line



7. Close valves

Close all end valves when empty



8. Cap

Close valve or put on cap on line at the drag end so dirt and stones do not enter pipes while towing



9. Vehicle direction

Face the tow vehicle the direction the line is to be towed.



10. Connect tow

Attach tow hook to tow vehicle



11. Drive smoothly

Drive smoothly to new location, use wide U shaped turns not V



12. Line up

Line up pod line with markers on the fence. If no markers avoid cross over spray approx. 25m



13. Tow hose

Once line is in place unhook and go to next line. Move all lines. Repeat until lines have been moved



14. Connect cam

Connect cam locks and move caps and towing systems to end of each line if at wrong end.



15. Open valves

Open all valves that are connected to the feed line



16. End of line valves

Check all end of line valves and/or caps are closed before turning pump on



17. Turn on

Turn system on



18. Check valves

Check valves all shut again after system is on



19. Check pods

Check each pod is spraying properly. Spray should be fan shape not a solid jet. Look for blocked nozzles and leaks in the line. Have spare nozzles on hand and repair as required.

Moving large pods: within a paddock

When moving large pods within a paddock, use the same step by step method as for standard pods, BUT only drag 2 pods at a time not the whole pod line as it will be too heavy.

Moving large pods between paddocks – step by step

Before irrigating



1. Soil

Check the soil moisture. Is it too wet to irrigate? Never use pods in the rain.



2. Location suitable for conditions

Check irrigation record sheet, are pods are in the right location. Make sure pods not near waterways, tiles, gullies.



3. Pump - OFF

Turn off pump



4. Hydrant - OFF

Turn off hydrant at paddock



5. Open valves

Open all valves at end of each pod line, allow lines to empty before moving.



6. Undo cams

Disconnect all cam locks connecting pod lines to feed line



7. Cap

Put cap on hoses at the drag end so dirt and stones, do not enter pipes while towing



8. Load pods

Load pods onto to vehicle or trailer



9. Attach hoses

Attach hoses to vehicle



10. Drive smoothly

Drive smoothly to new location



11. Line up

Line up pod line with marker on the fence. If no markers avoid cross over spray approx. 25m



12. Unload

Unload pods and hoses



13. Connect cams

Remove caps and connect cam locks



14. Close valves

Check end of line valve and/or caps are closed before turning pump on



15. Turn on

Turn pump and hydrant back on



16. Check

Check each pod is spraying properly. Spray should be fan shaped not in on solid jet. Look for blocked nozzles and leaks in the line. Have spare nozzles on hand and repair as required.

Can you see a problem?

The following section illustrates the possible problems that may arise. Make yourself aware of these and the required actions of each problem.



STOP irrigating immediately. Inform your manager or farm owner of the issue. It is important to stop irrigating as the problems arising will have adverse affects on the farm and farm environment.



WARNING. If you have had prior experience or approval to fix the problem then do so. Inform your manager or farm owner of the issue or phone the appropriate service person.

With the pods?

Can I see a problem?		What should I do?
<p>Not enough pressure</p> <p>Spray too thick and not throwing far enough</p> <p>Expected throw distances:</p> <ul style="list-style-type: none"> • Small black pods – 12m • Small white and purple -14m • Big black pods -20m 		<p>STOP irrigating and tell your manager / farm owner</p> 
<p>Blockage in pod</p> <p>Effluent dribbling out of pod</p>		<p>STOP irrigating and tell your manager / farm owner.</p> <p>Clear blocked pod, and check solid separator for problems</p> 
<p>Broken knocker arm/counter balance.</p> <p>Spray coming out as solid jet not fan shape</p>		<p>STOP irrigating and tell your manager / farm owner.</p> <p>Replace broken parts</p> 

Can I see a problem?

What should I do?

Top broken

Spray going in two directions, out nozzle and straight up



STOP irrigating and tell your manager / farm owner.

Replace broken parts



Saddle leaking

Spray will be leaking and puddling around pod



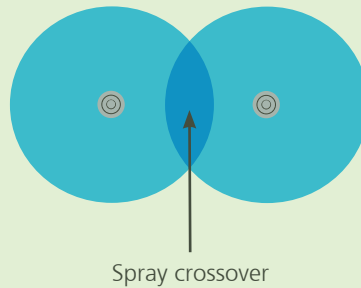
STOP irrigating and tell your manager / farm owner.

Tighten, replace or repair



Pods too close together

Spray crossing over



Tell your manager / farm owner.

Make sure pod lines are lined up correctly with markers

Note: Can be ok if application depth test has been done with this set up but higher risk in challenging conditions




In the paddock?

Can I see a problem?		What should I do?
<p>Effluent running into waterways or drains</p>		<p>STOP irrigating and tell you manager/farm owner. Move pod line further away.</p> 
<p>Connection leaking</p> <p>Effluent may spray out or there may be a puddle or foam near the connection. Pods may have smaller spray than normal as less pressure</p>		<p>STOP irrigating and tell you manager/farm owner.</p> <p>Check connection and replace any broken parts.</p> 
<p>Leak in pipe</p> <p>Effluent spraying out or puddling under pipe. Pods may have smaller spray than normal as less pressure</p>		<p>STOP irrigating and tell your manager / farm owner.</p> <p>Fix the leak</p> 

Can you see a problem?

With ponding in the paddock?

Can I see a problem?		What should I do?
<p>Puddles</p> <p>Small puddles after irrigation that don't disappear for a few hours</p>		<p>STOP irrigating and tell your manager/farm owner. Check your irrigation timing and application rates</p>

Can you see a problem?

With the storage pond?

The following section shows the possible problems that may arise with the effluent storage pond. Make yourself aware of these and the required actions of each problem.

Keep the level of effluent in the storage pond as low as possible:

- To have storage space if you have a breakdown, bad weather or if you are too busy to irrigate
- Irrigate whenever the conditions are right, don't wait until the pond is full
- Check you have enough storage before every milking.

<i>Can I see a problem?</i>		<i>What should I do?</i>
Wet areas or greener areas around the pond may mean that the pond has a leak		Tell your manager/ farm owner and show them the wet/ greener area 
Grass or solid crust on the top of the pond means too many solids in the pond		Tell your manager/ farm owner 
Cracks in pond walls or the sides of the pond falling in		Tell your manager/ farm owner and show them where the problem is. Make sure there are no safety issues 

Can you see a problem?

<i>Can I see a problem?</i>		<i>What should I do?</i>
<p>Pond level too high or high level alarm goes off</p>		<p>DO NOT PUT ANY MORE EFFLUENT INTO THE POND. Tell your manager/farm owner or call the appropriate service person</p> 
<p>The pond never fills up. This may indicate that there is a leak</p>		<p>Tell your manager/farm owner</p> 
<p>Pond smells bad</p>		<p>Tell your manager/farm owner</p> <p>Try to keep the pond low, avoid spraying near boundaries or upwind of neighbours</p> 

Troubleshooting

Problem: Effluent ponding/puddles or runoff	
Possible causes	Fixes
Pods have not been moved	Move pods to new zone
Soils too wet to irrigate	Stop irrigating and wait until soils conditions are better
Pods applying on already irrigated land	Mark correct position for lines on fence
Pods spray crossing over and applying too much effluent in one place	Space pod lines and/or pods further apart so there is no cross over Small black pods – 12 m radius Small white/purple – 14m radius Big black pods – 20m radius
Leaking pod saddle	Check pod, tighten replace or repair
Application rate greater than infiltration rate of soil	Apply effluent at the correct rate.

Problem: Effluent not spraying out of pod properly	
Possible causes	Fixes
Not enough pressure from pump to operate pods properly	Call for pump service. Have you got the right pump for the job?
Pod or line blocked	Clear out blocked pod and check solid separator for problems
Pod broken	Check knocker arm, counter balance and nozzle. Replace any broken parts
Blockage at pump	Remove blockage Put grate over sump and put rubbish bucket in shed Put in high/low pressure switch to protect pump
Silting up of mainline	Keep stone trap clean. Flush line with water
Leak in pipe or bad connection	Check pipes and connection for leaks as these will reduce pressure at the pods

Problem: Hose /pipe blowout

Possible causes	Fixes
Poor or worn couplings	Replace couplings
Pipe kinked – can be from bending lines around posts	Replace kinked section of pipe and move lines using wide turns and travel straight where possible
Couplings installed wrong way around	Put couplings the right way around

Problem: Artificial drainage tiles run green

Possible causes	Fixes
Too much effluent applied for the conditions and effluent is draining through the soil profile	Stop irrigating until soil conditions are more suitable

Problem: Effluent siphoning /draining of mainline when pump is off

Possible causes	Fixes
Pods downhill from pump	Install an anti-siphon valve and/or anti-drain valve

Can you see a problem?

Keep spare parts, nozzles, joiners in shed at all times

Maintenance – monthly

At the shed



1. Empty weekly

Clean out the effluent sump and stone trap. Place solids on a sealed or contained area



2. Level switch

Check the level switches are clear and working and are set correctly



3. Storage

Check level of storage ponds and for any damage



4. Solids separator

Check solids separator system or weeping wall is working properly and deal with solids if needed. Store solids on sealed or contained area or spread thinly to paddock.

At the pods



1. Nozzles

Make sure nozzles are not cracked or blocked



2. Pod body

Make sure there are no cracks and the tapping saddle is secure



3. Hose in pod

Make sure hose has not twisted in the pods, this stops the pods sitting flat. New hoses may take a while to settle flat, lay out flat for a few days before installing



4. Knocker arms

Check knocker arms are not broken



5. Connections

Clean connections and make sure they are not loose or leaking. Check hose clamps and pipe pushed tight up to fitting



6. Hoses

Check hoses have no cuts, splits or bulges. If hoses have kinked while being moved, replace as they will split. Use joiners to fix splits not tape

At the storage pond



1. Pipes

Check pipes are running in and out are not blocked



2. Walls

Check pond walls are stable



3. Leaks

No signs of leaks



4. Fence

Check fence is safe and secure



5. Smell

Does the pond smell bad?

Maintenance – 6 monthly

At the shed



1. Pump

Have a qualified service agent check and service pump as required



2. Pressure

Have a qualified service agent check pump pressure and flow rate to compare against system design



3. Flush

Flush clean water through the delivery lines

At the irrigator



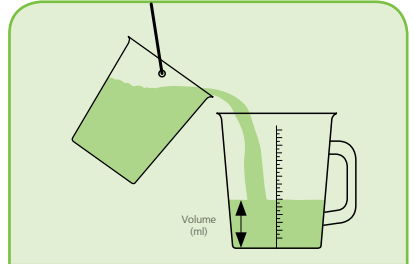
1. Nozzle wear

Check nozzles for wear. Find out what size nozzle is installed and compare to a new nozzle to see how much they have worn



2. Pressure

Check pressure in the paddock, and compare against ideal operating pressure



3. Rate & depth

Measure application rate and depth (see page 30)



4. Hydrants

Check the condition of the hydrants



5. Couplings

Check condition of couplings. Check coupling has not pulled from hose due to towing. Check hose clamps and pipe pushed tight up to fitting



6. Hoses

Check for splits and cuts and buldges.

Sump/stone trap



1. Rubbish

Collect any rubbish out of the sump and/or the stone trap



2. Prepare

If sump/stone trap is wide enough use front end loader, otherwise use a shovel and wheel barrow



3. Scoop

Slowly scoop out the contents taking care not to spill it. Use the low ratio on the tractor to avoid ripping up the entry

Maintenance – annually

At the storage pond



1. Desludge pond *(Recommendations do not apply to synthetically lined ponds, call a professional to desludge synthetically lined ponds)*

1. Remove the crust with excavation machinery – warning: gases may be released when crust is first broken so keep clear and away from pond edge
2. Stir the pond to mix the solids before emptying
3. Never empty the pond completely
4. Be careful to not damage the sides/bottom or the liner of the pond when emptying
5. Pond sludge has more nutrient value than normal effluent, so apply to bigger area at lower rate
6. Repair any damage to the pond before putting any effluent back in.



2. Grass edges

Control/spray the grass and the weeds around edge of the pond. However be aware that bare ground has a higher chance of eroding pond edges

Maintenance – spreading effluent solids

Spreading direct to pasture



Muck spreader/slurry tanker

1. Transfer sludge to a muck spreader or slurry tanker
2. Check effluent nutrient plan for disposal location and application rates
3. Add water to the sludge to make it easier to spread if you are using a slurry tanker
4. Avoid danger zones e.g. waterways, bores, boundaries, creeks etc.



Tractor

1. Check the effluent plan for disposal location
2. Spread the load lightly across as large an area as possible. Check your nutrient management plan for application rates
3. Do not dump in one spot.



Stockpiling/composting

1. Check sealed storage area is ready and that the liquid will drain safely into the effluent system or be collected
2. Carefully transport sludge to the storage area
3. Empty sludge onto pile
4. Check that there is no run off
5. Scrape up any fallen / dropped sludge that is not on the sealed area.

Monitoring

Understanding application depth

Application depth is how much volume is going on to your soil – usually referred to as depth (mm) – similar to the rainfall you collect in a rain gauge e.g. 20mm.



Understanding application rate

Application rate is how fast it is going on – usually referred to as (mm/hr) similar to the intensity of rainfall e.g. 10mm in 1 hr.



Maximum application rate and depth for different soil types?

Maximum application rate and depth may be set by regional councils. Ask your manager/farm owner for this farm's maximum. It is not to be exceeded. If there are no figures from the council then the amount of effluent you can apply at one time, and the speed you can apply it at, is dependent on the soil type. Using the table below and having a discussion with your manager or farm owner, fill in the appropriate areas of the worksheet.

Soil type	Maximum application depth	Maximum application rate
Sand	15mm	32mm/hr
Loamy sand	18mm	32mm/hr
Sandy loam	22mm	20mm/hr
Fine sandy loam	24mm	17mm/hr
Silt loam	24mm	10mm/hr
Clay loam	18mm	13mm/hr

How to test application depth and rate

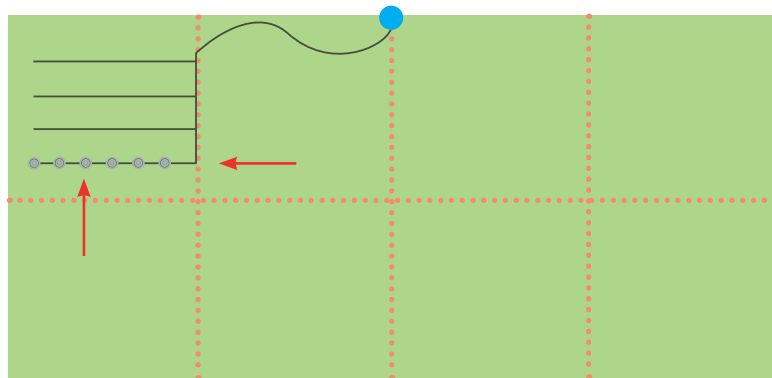
Collection containers

When testing you can use either rectangle trays with straight sides, rectangle trays with sloped sides or standard round buckets. You will need about 20 of these. You must use a different calculation depending on the type of collection container.



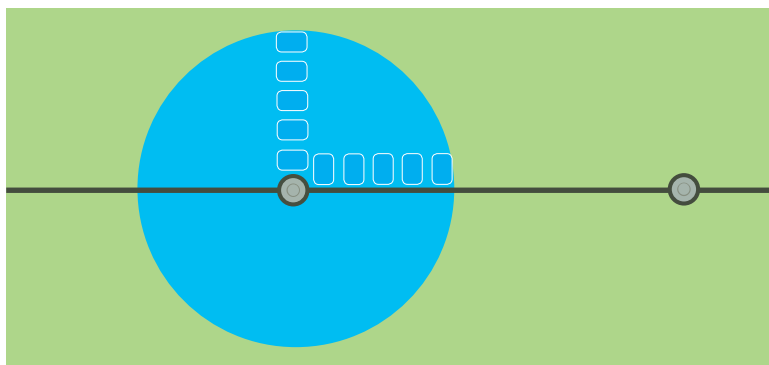
Step 1: Location

Go to the middle pod on the last pod line in the series (furthest away from the pump)



Step 2: Layup containers

Lay out collection containers out in an "L" shape from the middle pod. Containers should be spaced at 1m intervals and cover right to the edge of the spray area of the pod. Put a stone in each container to stop it blowing over if needed.



Step 3: Turn on

Turn the system on. Run the pods for 1 hour. Record the start and finish time.

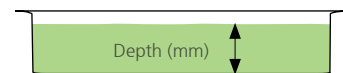


Step 4: Measure how much

For RECTANGLE TRAYS WITH STRAIGHT SIDES:

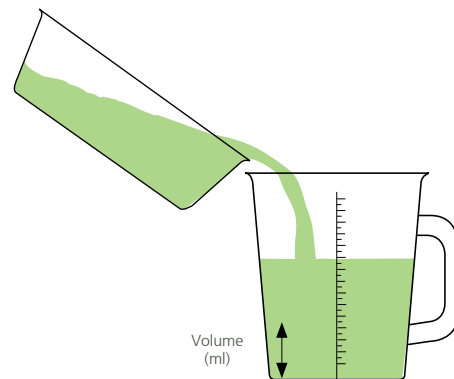
Use a tape measure

1. Remove the stone
2. Measure how deep the effluent is in each container (mm)
3. Write down depth for each container



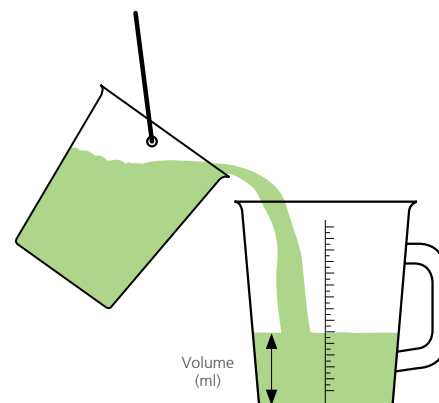
For RECTANGLE TRAYS WITH SLOPING SIDES:

1. Remove stone
2. Tip effluent into measuring jug record the volume (ml)
3. Write down volume for each container



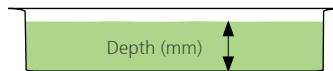
For ROUND BUCKETS WITH SLOPING SIDES:

1. Remove stone
2. Tip effluent into measuring jug record the volume (ml)
3. Write down volume for each container

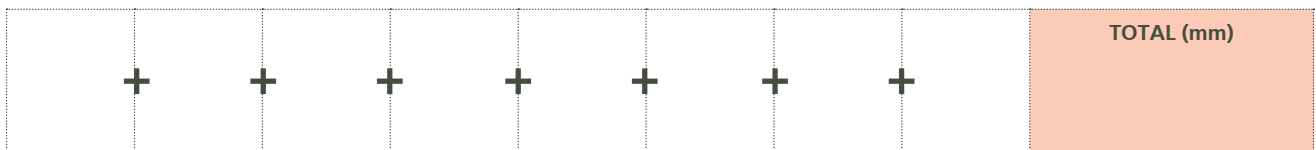


How to calculate application and depth rates

Rectangle trays with STRAIGHT sides



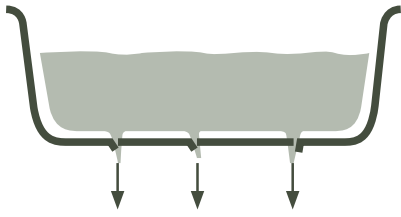
Container 1 Container 2 etc ...



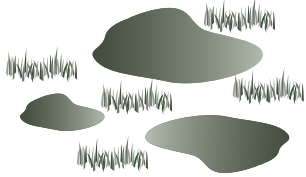
TOTAL (mm)	÷	=	AVERAGE APPLICATION DEPTH (mm)
	NUMBER OF CONTAINERS		

AVERAGE APPLICATION DEPTH (mm)	÷	=	AVERAGE APPLICATION RATE (mm/hr)
	TIME (hrs)		

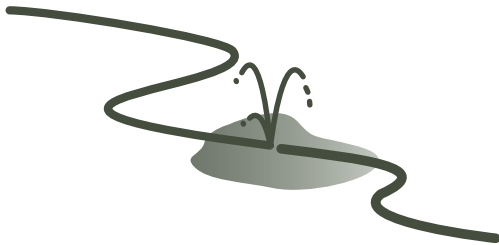
Emergency



The pond is leaking



Puddles on grass



Burst pipes



Overflowing



Blockage

Emergency Numbers:

Farm manager/owner

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Regional council

.....

Effluent systems repairs

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