Guide for operations and maintenance of a waste stabilisation pond system

Philip de Souza & Unathi Jack

WATER RESEARCH COMMISSION

TT 472/10

GUIDE FOR OPERATIONS AND MAINTENANCE OF A WASTE STABILISATION POND SYSTEM

Report to the
Water Research Commission

by

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on behalf of Emanti Management (Pty) Ltd

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EXECUTIVE SUMMARY

Operation and maintenance of a waste stabilisation pond system is relatively simple. Nevertheless, basic operation and maintenance needs to be performed to ensure proper functioning and a long system life and protection of the environment and communities.

PURPOSE OF GUIDE

This guide has been developed with the purpose of:

- providing practical guidelines for the persons responsible for the operation and maintenance of waste stabilisation pond systems,
- understanding typical failures experienced within waste stabilisation pond systems, and
- how to attend to and rectify such failures.

WHO SHOULD USE THE GUIDE?

The guide has been developed in such a way that it will assist the operations and maintenance personnel of waste stabilisation ponds sites to understand:

- how to effectively operate waste stabilisation ponds system
- how to effectively maintain the waste stabilisation ponds system
- how to determine if there is a problem with the waste stabilisation ponds system
- if there are issues that need urgent attention and should be reported to the supervisor

System or site supervisors could use the guide so that they have a common understanding with the operations and maintenance actions and requirements including:

- providing the correct record sheet for the personnel on-site to quickly identify issues of concern
- providing necessary equipment for the on-site personnel

This guide can be used with the following related Water Research Commission (WRC)/Department of Water Affairs and Forestry (DWAF) guides:

- DWAF (2004) General Authorisation
- Permissible Utilisation and Disposal of Treated Sewage Effluent, Department of Health under reference 11/2/5/3: 30 May 1976,
- “South African water quality guidelines – agricultural use” DWAF 1993
- “South African water quality guidelines – industrial use” DWAF 1993
- Handbook for the operation of wastewater treatment works
- All other references noted at the end of this document
- A guide for management of waste stabilisation pond systems also developed

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Water Research Commission

Members of the Reference Team

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Eastern Cape **:** Maletswai, Senqu, Buffalo City, Inkwanca, Great Kei,
Mpumalanga : Emalahleni
Free State **:** Dihlabeng, Kopanong, Letsemeng, Mantsopa, Mohokare, Naledi, Tokologo, Nketoane

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GLOSSARY

Aerobic : a biological process which occurs in the presence of oxygen

Anaerobic : a biological process which occurs in the absence of oxygen

Desludge : the process of removing sediment by draining and cleaning

Discharging : is a process where treated wastewater is discharged of

Effluent : treated wastewater flowing out of the wastewater treatment system

Grit : solid material contained in raw wastewater (e.g. sand, gravel, food waste, etc.)

Infiltration : the process of water entering soil

Influent : untreated wastewater – the wastewater that flows into a wastewater treatment system

Inlet : opening providing a means of entrance/intake of the untreated wastewater

Lining : a protective covering that protects an inside surface of the pond to avoid leaching

Nightsoil : human excreta collected intentionally

Organic load : amount of Chemical Oxygen Demand (COD) per unit volume or area per unit of time; usually expressed as [kg/m^3/day] or [kg/m^2/day]

Outlet : opening providing a means exit of the treated wastewater

Overflow : flows or runs over the top or banks

Overloaded : loaded past/exceeds capacity of the treatment system

Ponds : are described as relatively shallow bodies of wastewater contained in an earthen basin

Septage : material removed from any part of an individual sewage disposal system

Screenings : the fine or coarse material removed by the screens at the inlet of the wastewater treatment system

Screens : a device with openings, generally of uniform size, that is used to retain course solids found in wastewater

Scum : filmy layer of slimy matter that forms on or rises to the surface of a pond. Scum is known to be a form or type of algae

Sludge : semisolid material deposited during the treatment of wastewater

1. TYPES OF WASTE STABILISATION PONDS

Waste stabilisation pond systems comprise a series of ponds, all of which are relatively shallow bodies of wastewater contained in an earthen basin. The basis for the classifications are type of influent (i.e. wastewater entering) and type of biological activity (i.e. functioning in presence or absence of oxygen). Two types of biological activities are anaerobic (functions without presence of oxygen) and aerobic (functions with presence of oxygen. The primary pond is often an anaerobic pond, followed by a series of aerobic ponds.

1.1 Anaerobic ponds

Anaerobic ponds operate in the absence of oxygen. Anaerobic ponds main purpose is to provide pre-treatment as they remove organic loads and settled solids. Anaerobic ponds are normally characterised by:

- The influent received. Anaerobic ponds were mostly used for systems receiving nightsoil. Now that buckets have been eradicated, the influent received is mainly domestic.
- The colour of the wastewater contained within the pond is normally dark brown to black.
- Normally contain no significant algal population. Scum layer could be found on top of the pond.

1.2 Facultative ponds

Facultative ponds operate with both aerobic and anaerobic zone. Aerobic conditions are generally maintained in the upper layers while anaerobic conditions exist towards the bottom. Facultative ponds are normally characterised by:

- the effluent received: Facultative ponds are normally receiving ponds where only domestic influent is received.
- the colour of the wastewater contained within the pond is normally that of the influent received. Sometimes the colour is bluish to green depending on the algal population present.

1.3 Aerobic ponds

Aerobic ponds operate in the presence of oxygen. Oxygen supply is totally dependant on natural conditions, principally the wind and due to algal photosynthesis. An example of an aerobic pond is called a maturation pond. Maturation ponds are used for polishing the effluent quality. The primary function of maturation ponds is to remove pathogens. Aerobic ponds are similar in appearance to facultative but only differ in organic load. Maturation ponds are characterised by:

- normally follows a series of facultative ponds. Maturation ponds are the last ponds of the waste stabilisation ponds system.
- the colour of the wastewater contained within ponds is clear. Sometimes dark green in due to algae but appears red or pink when slightly overloaded. Final effluent (if applicable) can be used for irrigation (if meets standards for irrigation) or recycled to the receiving pond.

Waste stabilisation ponds are normally constructed in series (that is one follows the other) where the receiving pond is either anaerobic or facultative depending on the influent received. Influent received could be domestic, industrial, combination of domestic and industrial. Typical layout of the pond systems together with their network is shown in the figure below (Mara, 2005).

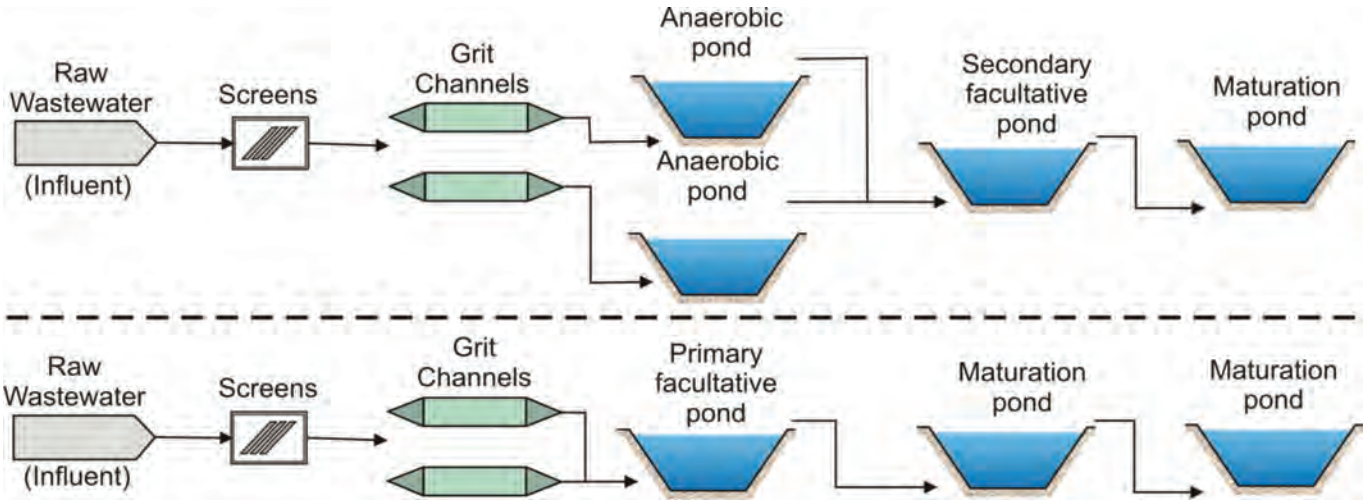


Figure 1: *Waste stabilisation ponds configurations*

An illustration of a waste stabilisation pond basin is shown below.

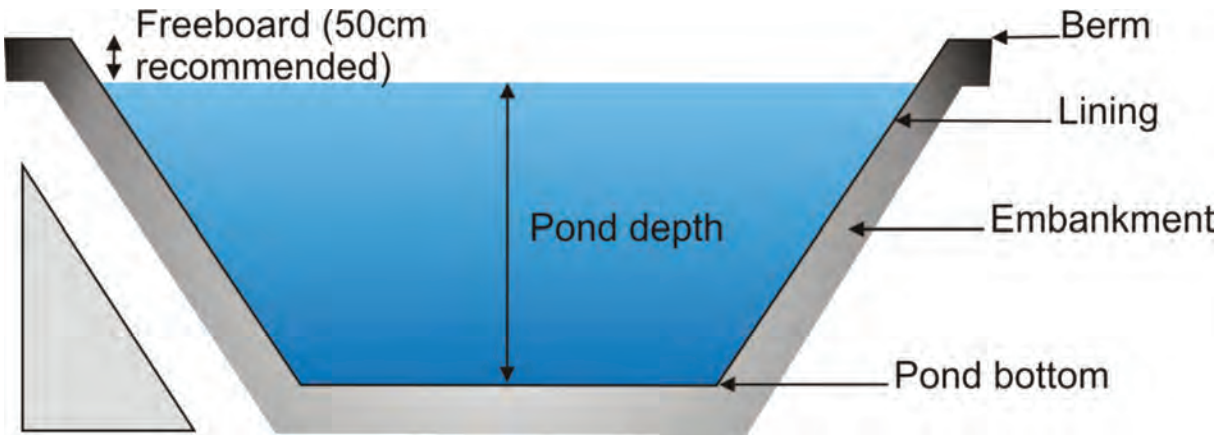


Figure 2: *Illustration of a pond basin*

2. OPERATION AND MAINTENANCE OF A WASTE STABILISATION POND SYSTEM

Operation and maintenance of a waste stabilisation pond system is relatively simple. Nevertheless, basic operations and maintenance needs to be performed to ensure proper functioning and a long system life. This includes consideration of:

- Pump station maintenance
- Disposal of septage
- Proper handling of screenings
- Lining protection
- Proper operation of the system
- Final effluent monitoring
- Sludge handling
- Leak detection
- Process controllers and public safety

2.1 Pump stations maintenance

Influent to the waste stabilisation ponds system could either be pumped or gravity fed. Raw wastewater entering the wastewater treatment system normally carries materials such as rags, plastics, etc. which can damage pumps if not removed. Such damage and blockages need to be avoided by installing screens at the pump station. It is necessary to always have a back-up pump in case of emergencies. Routine maintenance such as greasing, servicing, etc. should be carried out as indicated on the pump manual provided by the manufacturer. The figure below shows a pump station.

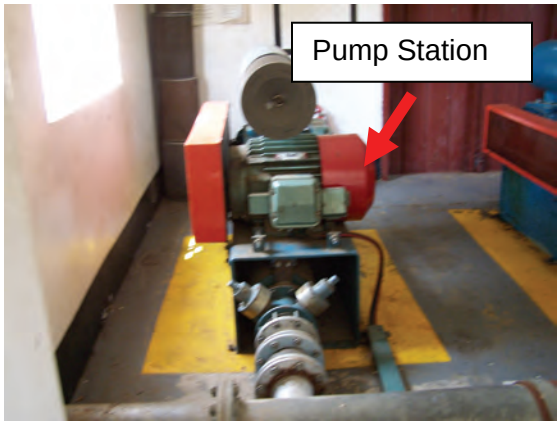


Figure 3: ***Pump Station***

2.2 Disposal of septage

Influent to the waste stabilisation ponds may be transported by tankers. Inlet works should always be used in receiving wastewater to be treated. Whether a pipe, a channel or tankers are used to transport influent into the waste stabilisation ponds, it must be made sure that the influent is directed to the inlet works. Where tankers are used, the tanker discharge pipe should be directed at the inlet screens as shown in the following pictures.

Figure 4: *Septage disposal*

- Every waste stabilisation ponds system should have an inlet works.
- Never discharge septage directly into the ponds. The amount of influent received within a pond should be measured, according to legislation.
  - Tankers that stop on the bank of a pond when discharging could damage the embankment.
  - Screenings may end up floating on the surface if not removed at the inlet.
- Direct the tanker pipe to the inlet screens or drain.
- The tanker discharge valve should be opened once the discharge pipe is at the correct position (i.e. where the septage will go into the inlet through the screens) for discharge.
- Remove any screenings thereafter using a rake, a spade and put them in a wheelbarrow
- A wire may be needed to remove screenings hooked on the screen bars
- Take the screenings on the wheelbarrow and bury them as discussed in the section below.

2.3.1 Screenings collection

Figure 5: *Screenings collection*

- No screenings should be allowed to enter the ponds. Influent should always be allowed to pass through screens at the inlet.
- Any material blown into the ponds should be removed as soon as possible.
- Collected screenings should not be left on the ponds banks as they may be blown into the ponds again.
- Never force material through screens. The screenings forced through the screens may block the inlet or/and end up floating on the ponds surface.
- In cases of theft and vandalism, a practical solution to prevent theft could include:
    - Cut a flat zinc to fit the inlet. Make strips from the zinc and twist the strings to form a grid that will not minimise the inlet flow. The grid could be made into something like the one shown on the picture below.

Figure 6: *Grid for screenings removal*

- Floating screenings can be collected using a rake and/or a scooping net (i.e. a pool scoop).
- If the scooping net handle is short, it can be extended using a pole tied to the existing one.
- If the required scooping net cannot be purchased, a self made scoop using an orange sack carefully tied to a pole with a thin wire (Gaydon, 2008 recommendation).
- The edges of the orange sack can be made firm by making a wire frame within the net.

2.3.2 Screenings disposal

Figure 7: *Screenings disposal*

- An area on site that is far from the units of the treatment system, wind direction is not towards the community, away from the water body and soil type is not easily eroded should be identified to bury the screenings.
- Dig a hole/pit with a spade and keep the heap to cover the buried screenings.
- Dispose the screenings into the hole.
- Bury the screenings with the soil again.
- It is recommended to dig the hole in an order where it forms a trench as shown in the picture on the left.

2.3.3 Grit removal

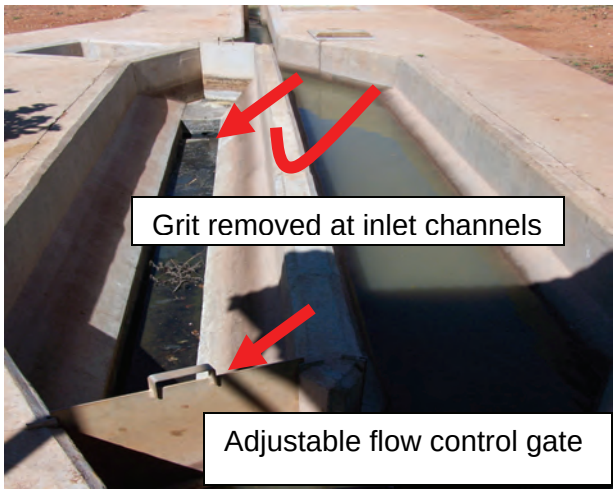


Figure 8: *Grit removal*

- Grit accumulating at the inlet should be frequently removed. Suggested frequency for grit removal is every two weeks (i.e. must be easy to scrape off and handle) depending on the amount of solids in the influent received. If it is noticed that there is significant accumulation of grit after two weeks, review and clean more frequently.
- Under no circumstances should the inlet be by-passed. Any material that could result in inlet blockages should be removed.
- To remove grit, close one side of the grit channel with a gate to stop the flow. If the required gate is not readily available, cut a piece of zink that fits the channel.
- Scrape the grit off the channel with a spade and put it in a wheelbarrow.
- Open the clean channel and close the other side of the channel and clean.
- Dispose grit at a proper landfill site that has been indicated by a supervisor.

2.4 Lining/embankment protection

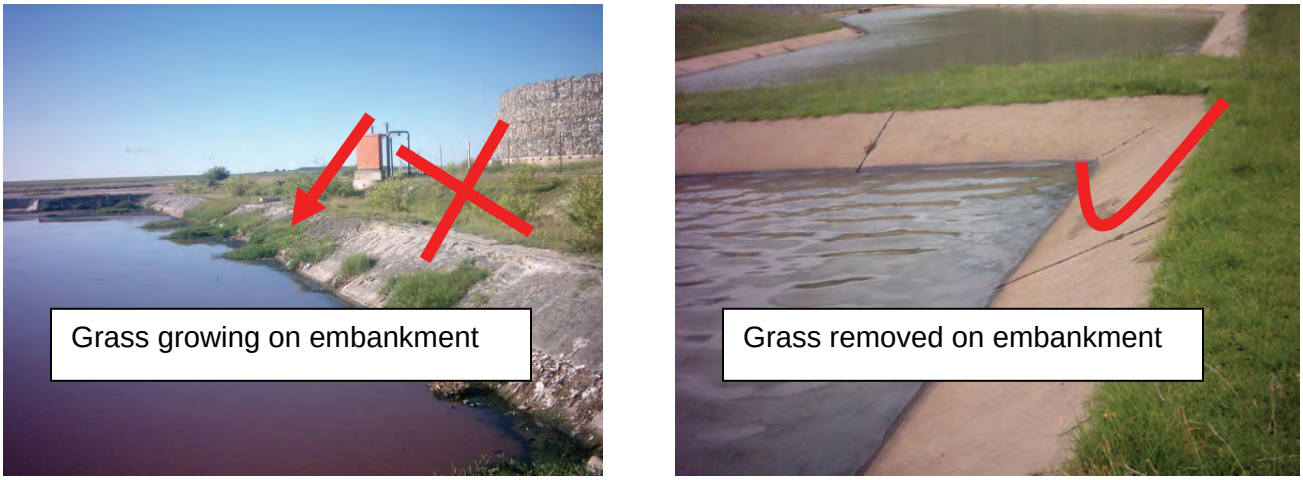


Figure 9: *Lining/embankment protection*

- Grass and weeds should be removed on the embankment. Grass growing on the embankment may cause cement embankment to crack or break. Cracks may lead to infiltration thereby contaminating the soil and groundwater.
- Remove the grass on the cement embankment with a spade. Try to remove as much of the root system as possible to avoid re-growth.
- Remove the grass close to the plastic material lining by hand to avoid damaging the lining.
- For deep rooted weeds try to pull by hand (wearing gloves).
- Put the grass/weeds into a wheelbarrow.
- Dispose grass/weeds at a suitable dumping site that has been indicated by a supervisor.

2.5 Proper operation of the system

Operating the waste stabilisation ponds means the person responsible has to observe, use all senses to identify and record any unusual occurrences and take notes or records. Most of the information collected when operating a waste stabilisation ponds system is used by supervisors or managers to identify issues of concern, changes within the system and for future planning.

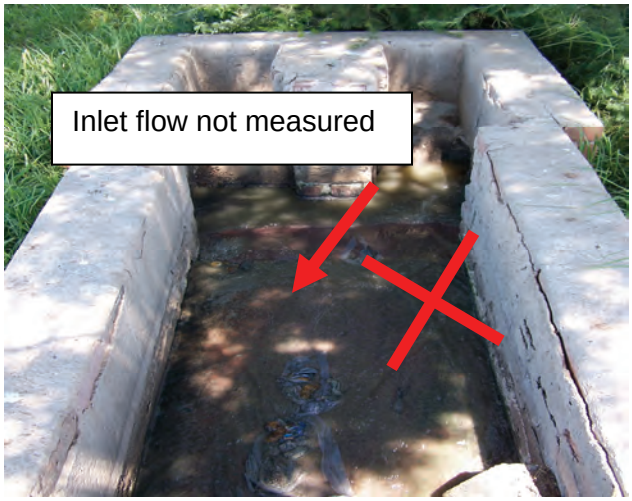
2.5.1 Influent considerations

Type of influent

Figure 10: *Influent type received*

- The colour or type of influent coming into the system should be recorded.
- Blood should **NEVER** be allowed into the ponds system as it because it affects the functioning and performance of the waste stabilisation ponds badly. If blood is observed to be entering the waste stabilisation ponds system, supervisor should be informed immediately.

Volume of influent



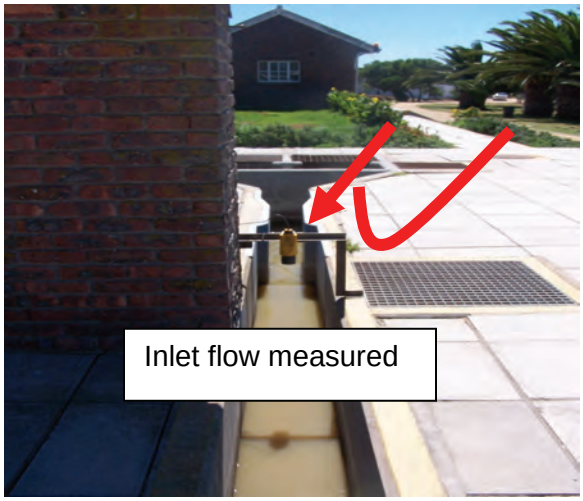


Figure 11: *Influent flow measurement*

- Every waste stabilisation ponds system requires a permit or licence from DWAF to operate. The permit or licence states the maximum volume to be treated by that particular system. Therefore it is a legal requirement to check and record the influent flow daily to compare with the permit or licence requirements.

- The influent volume should be read from the inlet flow-meter. If there is no inlet flow-meter, practical methods used could include the two methods described below.

- The type of inlet should determine which influent measuring method should be used (see following figures). For systems where the influent can be collected with a container (i.e. a bucket or measuring cylinder), the cylinder with a stop watch method could be used.

    - Make sure to wear gloves, mask and safety boots when performing the practise.

- Collect water with the cylinder whilst recording the time at least three times.

- Measure the volume of water collected for each time. Take the average of 3 readings and take the average.

e.g. Volume 1 = 1,5 L in 194 sec
Volume 2 = 1 L in 183 sec
Volume 3 = 1,2 L in 200 sec

Average = (1,5 + 1 + 1,2) L/(194 +183 +200) s
= 0.00966 L/sec
= 34,77 L/hr

- For rectangular inlet channels where influent cannot be collected, the length and width of the inlet channel should be known or measured.

- Dip a stick at the inlet in the middle of the inlet channel (where the flow is maximum) and make a mark of the water level. Measure the liquid height with a tape measure and record. Make sure to indicate the units (e.g. centimetres (cm) and that is expressed per second.

- The volume of influent flow can be calculated as indicated below.

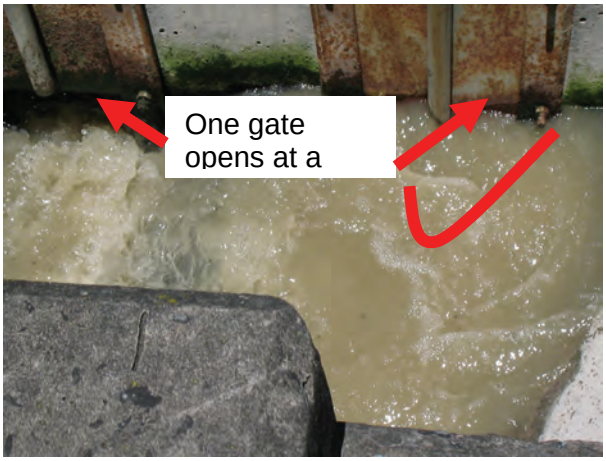
e.g. Channel length = 1 m
Channel width = 0,5 m
Measured liquid level = 0,2 m/s

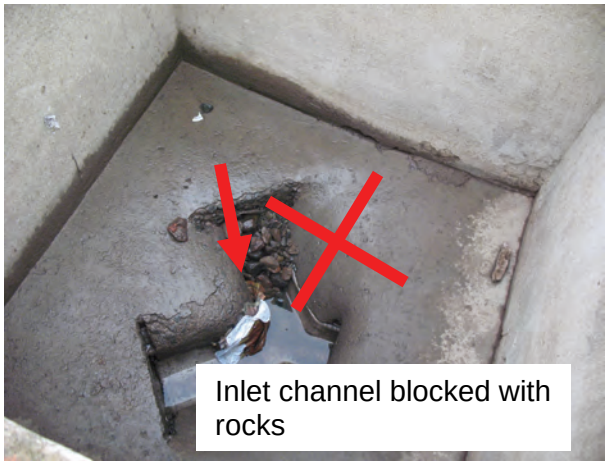
Approximate average flow:
$F = 0,8 \times v\ (m/s) \times A\ (m^2)$

Where: 0,8 is used to obtain average, as velocity is slower near the channel sides
v is linear velocity of the influent (which is the measured liquid level/second)
A is the cross sectional area (which is the length x width of the inlet channel)
$F = 0,8 \times 0,1\ m/s \times (1\ m \times 0,5\ m)$
$= 0,04\ m^3/s$
= 144 000 L/hr

Figure 12: *Practical influent flow measurement*

2.5.2 Ensuring that any flow splitting devices actually split the flow into the required proportions





- Any blockages at the inlet should be cleared to make sure that the inlet flow splits into required proportions.
- If gates are used, it should be monitored that the gates are open or the flow is directed to receiving pond that is currently functional. If both gates are closed, the influent will not be received within ponds but will overflow on site.
- In cases where there are no gates and flow splitting methods, a practical method of controlling flow could include:
  - cutting a zink the same size and shape as inlet channel and use it to control flow.

Figure 13: *Inlet flow splitting device*

2.5.3 Algal and scum layer handling

Figure 14: *Algae and floating scum removal*

- Algal and scum layer forming on the ponds surface should be removed. Algae are a food source for bacteria however it can be too much such that it covers most of the pond surface. Therefore removal of algae would allow oxygen and light to be received within the pond.
- Scum is only an advantage in anaerobic ponds where oxygen or sunlight is not necessary.
- Use the scooping net and rake to remove the floating algae or scum.
- Put algae or scum into a wheelbarrow or container. It is recommended to dispose algae or scum the same way as sludge.

2.6 Sludge handling within ponds

Figure 15: *Sludge accumulation*

- Remove settled solids at the inlet because they affect the flow pattern and thereof mixing within the pond. Settled solids at the inlet may also block the inlet resulting in raw wastewater overflow to the following ponds. The effluent quality may also deteriorate.

- Sludge or settled solids are removed to make room for more settling of solids.

2.6.1 How do you know when to desludge?

- Recommended that after every two years (depending on the effluent received) measure the sludge depth.

- The simplest way of doing this is so called the “white towel method”.

- A white cloth is wrapped around an approximately 2 m long pole attached together with tape measure.

- Try to get to the centre (maximum depth) of the pond where most sludge is likely to accumulate. Ideally, this is a difficult exercise in most waste stabilisation ponds system, however, some ponds have an extended inlet channel that can be used to stand or lie on. The exercise can be done at the accessible position to get some indication.

- The depth of the sludge is measured by lowering the pole vertically into the pond until it reaches the bottom, it is then slowly withdrawn.

- Sludge particles are trapped on the towelling material so that the sludge is clearly visible as shown in the following picture.

- The sludge depth and full depth of the liquid can be read from the marks left on the white towel and stick using the attached tape measure.

- Anaerobic ponds require desludging when they are one third full of sludge (by volume).

- Facultative ponds may be desludged when they are half full.

- Maturation ponds are not expected to contain significant sludge that could require desludging because settled solids are removed within anaerobic and facultative ponds.

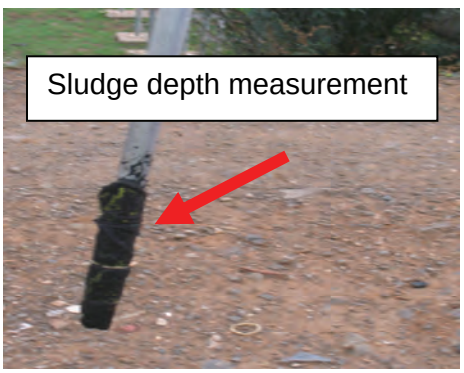


Figure 16: *Sludge depth measurement*

2.6.2 How to desludge?

- Sludge could be drained or sucked from the bottom using a honey sucker (most appropriate for single inlet waste stabilisation pond systems).
- For multiple inlet/receiving ponds divert the influent to one pond (that is not being desludged). Drain the pond effluent from the surface to avoid sucking the bottom sludge.
- Once you reach the sludge level stop draining.
- Let the sludge dry at the bottom of the pond and remove using spades and excavator.
- Removed sludge should be disposed at an appropriate landfill sites indicated by the supervisor.
- Put the clean pond back into operation and clean the second pond.

Operating the system includes reporting all observations within the system to the supervisor. Below is an example of what could be included in the record sheet. See **appendix** for a record sheet which can be used for on-site purposes.

Below is an example of a filled in record sheet for demonstration purposes. Some sections of the record sheet are expected to remain unchanged every time the record sheet is filled (e.g. name of the system, number of ponds and type, etc.). These sections could be filled in by a supervisor in all record sheets prior the process controller observations.

EXAMPLE OF A PONDS OPERATION AND MAINTENANCE RECORD SHEET FOR DEMONSTRATION PURPOSE

Ponds system name	*ABC ponds system*
Date and time of inspection	*24 July 2008; 11h00*
Influent flow (specify units):	*960 L/day (calculated using a beaker and stop watch)*
Population size served by ponds:	*Only one location; approximately 5000 households*
Influent colour (green, brown, grey, red, milky)	*Brown, normal colour always received*
Influent nature (domestic, industrial, buckets, combination)	*Only domestic*
Season (summer, winter, etc.)	*Winter, 14°C*
Screenings removed at the inlet (yes, no)	*Yes*
Screenings buried or burnt ((buried, burnt)	*Dumped next to the inlet*
Grit removal (yes, no)	*No, normally removed after two weeks. Should be removed next Monday*
Total number of ponds and types	*2 anaerobic, 2 primary and 1 secondary*
Number of ponds with effluent	*All 5*
Number of ponds discharging effluent or overflowing	*1 secondary- discharging*
State of embankments in all ponds (erosion, vegetation, etc.)	*Cement embankment in good condition, no weeds/grass.*
Water level within ponds (full, empty, etc.)	*Half – just where the cement embankment starts*
Odour onsite (state which pond)	*No odour at time of assessment*
Scum/ foam on anaerobic ponds	*Scum on standby pond (i.e. the one not functioning presently)*
Final effluent flow (state units or none)	*Final effluent flow not measured*
Final effluent reuse (state or none)	*Not reused, just flows to the field*
Sampling conducted (yes, no)	*No sampling conducted*
Fence (security) available/no signs of vandalism	*No fence, no gate*
GENERAL OBSERVATIONS	*The amount of water entering seems to have increased. Based on previous experience, in winter the amount within ponds drops but this year is a different situation.*
Signature	*B. Majeke*

2.7 Final effluent monitoring

Normally waste stabilisation ponds are not meant to discharge to the environment. If discharge occurs, the quality needs to be monitored and compared to DWAF General Authorisation limits for discharge.

Monitoring of the final effluent of a waste stabilisation ponds system is required to address the following needs:

- Detect whether or not the effluent complies with the local discharge or reuse standards,
- Detect any sudden failure, or determining if the pond effluent has started to deteriorate and
- Identify the cause of the problem and the remedial actions to be taken.

As per General Authorisation, 2004 wastewater monitoring in waste stabilisation ponds should be performed by grab sampling.

Grab sampling is when one sample (i.e. final effluent sample) is taken at a specific time. A grab sample reflects performance only at the point in time that the sample was collected, and then only if the sample was properly collected. Details on how to conduct monitoring are provided below.

2.7.1 What equipment do you need?

The following equipment is required for monitoring:

- Two types of sampling bottles;
  - clean 1 litre bottles for physical and chemical analysis
  - sterilised bottled for bacteriological analysis (do not rinse)
- A scoop to collect water from the outlet
- A cooler bag/box with ice
- Watch
- Thermometer
- Pen and log book to record observations

2.7.2 What do you need to record at the time of sampling?

It is recommended to fill in the operations and maintenance record sheet presented in the previous section when conducting monitoring. The records include:

- Date and time when the samples were collected
- Both environmental and water temperature
- Indicate from which pond/s is/are the sample/s collected
- Write a code on the bottle to identify the system from which the sample/s was/were collected.

2.7.3 After sampling

- Keep the sample bottles cool by putting them in the cooler bag/box with ice.
- Take the samples to the nearest (preferably accredited or DWAF approved) laboratory for analysis preferably within 6 hours maximum (for microbiological analysis) and 12 hours maximum (for physical and chemical) from the time of collection.
- Parameters to be analysed for if discharging and or used for irrigation are shown in the following tables.

Strictly speaking waste stabilisation pond systems are designed not to discharge to the environment (and in particular streams/rivers), and this is verified by the conditions attached to *Permissible Utilisation and Disposable of Treated Sewage Effluent*. A DWAF license / permit/ exemption should be obtained by the municipality or any person/ industry for the operation of waste stabilisation ponds system.

If the waste stabilisation ponds system is discharging or final effluent re-used, the final effluent results should be compared to the DWAF General Authorisation as shown in the tables below.

Table 1: *Wastewater limit values applicable to discharge of wastewater into a water resource*

Substance/parameter	**General limit**
Faecal coliforms Electrical conductivity	1000/100 ml
Chemical Oxygen Demand	75 mg/l (after removal of algae)
pH	5,5-9,5
Ammonia (ionised and un-ionised) as Nitrogen	6 mg/l
Nitrate/Nitrite as Nitrogen (mg/l)	15
Chlorine as Free Chlorine	0,25 mg/l
Suspended solids	25 mg/l
Electrical Conductivity	70 mS/m
Ortho-Phosphate as phosphorus	10 mg/l
Fluoride	1 mg/l
Soap, oil or grease	2,5 mg/l

Irrigation with waste stabilisation ponds effluent should only be practiced in a manner indicated by the supervisor. Conditions under which waste stabilisation ponds effluent could be used for irrigation are set out in **Appendix D** of the Guide for Management of Waste Stabilisation Ponds.

Table 2: *Wastewater limit values applicable to irrigate with wastewater*

Determinant	**Quality**
Electrical conductivity	<200(mS/m)
pH	>6-9 pH units
COD	<400 mg/l
Feacal coliforms	<100 000/100 ml
Sodium Absorption Ratio (SAR)	<5 for biodegradable industrial wastewater

2.8 Process controller's safety

Figure 17: *On-site personnel requirements*

- Personnel on-site should be provided with gloves, rain suit, gum boots and masks.
- A room for shelter and to eat should be provided.
- A toilet, toilet paper, soap and clean towels should be provided.
- Drinking water tap should be provided
- A spade, rake and wheelbarrow are necessary

2.9 Public safety

Sites not enclosed, animals on site

Sites enclosed, no entry signs put up

Figure 18: *Public safety aspects*

- The ponds sites should be fenced and the gate kept closed. A 2m high razer mesh type of fence is recommended as vandalism may occur. Anecdotal accounts indicate that other types of fencing are often stolen or vandalised.

- Animals and unauthorised people should be kept out of the ponds site. A visitor's record sheet may be provided for any person entering the site.

- No animals should be deliberately kept on-site for grazing and drinking.

- Put up "No entry" signs on the fence or gate.

2.10 Leak detection

Possible leaks could be detected by observing if there are any:

- Cracks through the cement embankment or peeling of synthetic lining.
- Signs of moist soil around the waste stabilisation ponds.
- Water pools at the inlet or anywhere on site and the source are not known.

REFERENCES

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Mara, D. D. (2005) Pond treatment technology. IWA Publishing. London

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APPENDIX A

Ponds operation and maintenance record sheet

Ponds operation and maintenance sheet

Recommended that the supervisor fills in static portions before given to the process controller

Ponds system name	
Date and time of inspection	
Influent flow (specify units):	
Population size served by ponds:	
Influent colour (green, brown, grey, red, milky)	
Influent nature (domestic, industrial, buckets, combination)	
Season (summer, winter, etc.)	
Screenings removed at the inlet (yes, no)	
Screenings buried or burnt ((buried, burnt)	
Grit removal (yes, no)	
Total number of ponds and types	
Number of ponds with effluent	
Number of ponds discharging effluent or overflowing	
State of embankments in all ponds (erosion, vegetation, etc.)	
Water level within ponds (full, empty, etc.)	
Odour onsite (state which pond)	
Scum/ foam on anaerobic ponds	
Final effluent flow (state units or none)	
Final effluent reuse (state or none)	
Sampling conducted (yes, no)	
Fence (security) available/no signs of vandalism	
GENERAL OBSERVATIONS	
Signature	