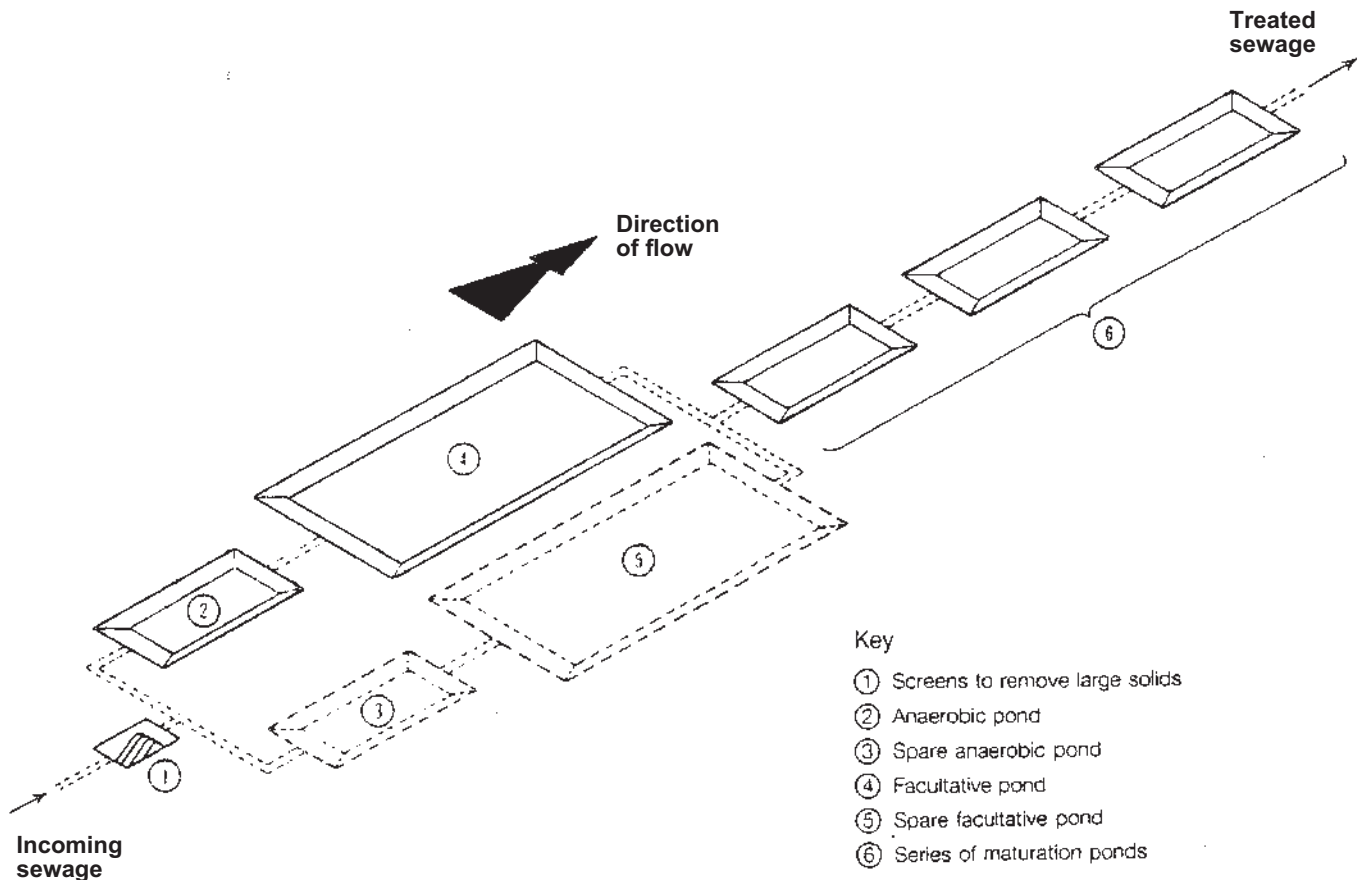


Waste stabilization ponds

Waste Stabilization Ponds (WSPs) are large, shallow, man-made lakes in which micro-organisms help to purify wastewaters. Sunlight and warm temperatures benefit the treatment processes.

A possible system of waste stabilisation ponds using several types of pond might look like this:



The sequence in which wastewater flows through a series of ponds is always the same: Anaerobic pond, Facultative pond, and finally a series of Maturation ponds. (Anaerobic ponds may sometimes be omitted.) So that any pond may be isolated for maintenance work or to allow sludge to be removed, it is helpful to share wastewater flows between more than one series of ponds.

This system is suitable for treating sewage (household wastewater and excreta) from quite large communities. Possible applications are:

1. Treatment of sewage collected by a network of sewers
2. Treatment of sewage collected in small-bore sewers
3. Treatment of nightsoil collected from a community.

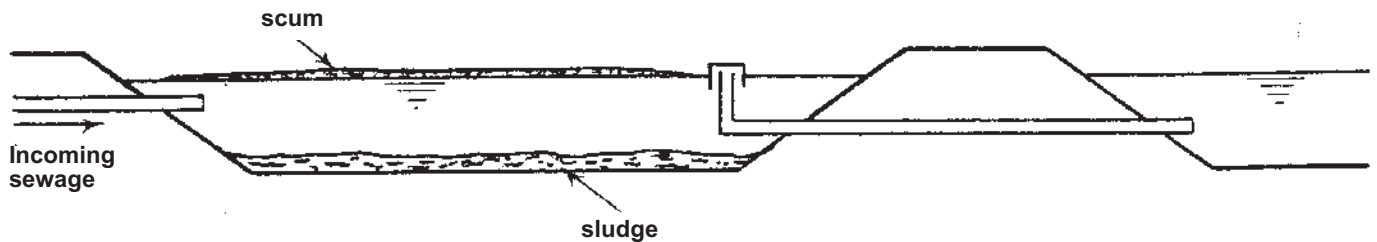
WSPs take up large areas of land and so are suitable only where land is easily available.

Several different design methods have been developed for WSPs. Design manuals that can be used in most countries can be downloaded from the Tropical Public Health Engineering web pages at the University of Leeds website:

www.leeds.ac.uk/civil/ceri/water/tphe/publicat/pdm/pdm.html (12/05/2004)

The purification process

Wastewater for treatment in WSPs should first have large and dense solids removed by passing the wastewater through metal screens and a grit-removal tank. Incoming sewage then enters a system of ponds. Some of the wastes float to the surface as scum, while other wastes sink to the bottom as sludge. The first pond in a series would look like this in section:



Over a period of time, bacteria living in the ponds feed on the wastes, partially treating them.

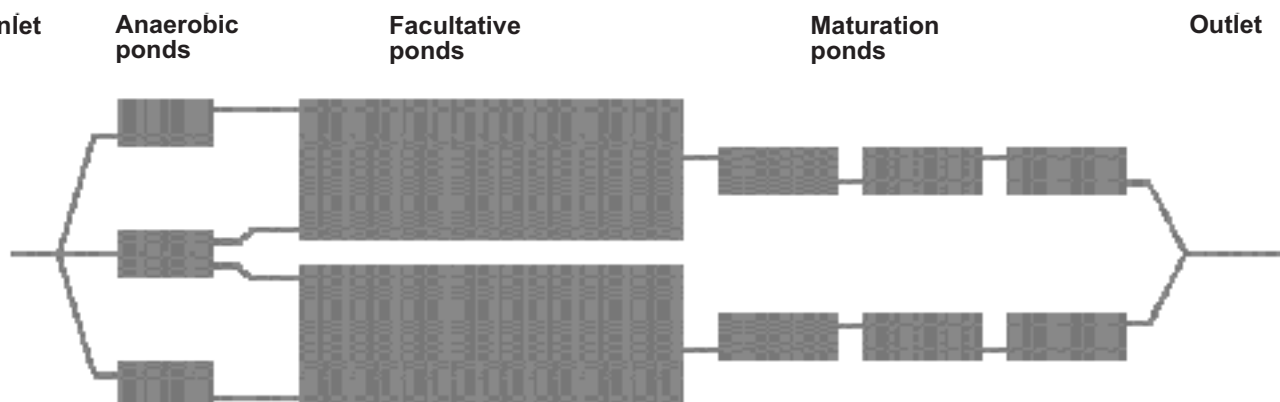
Sunlight is needed to encourage the growth of the algae which are essential to the purification process in facultative ponds. Warm temperatures accelerate the treatment of wastes, and wind is important to ensure good mixing of the pond contents. WSPs work well in hot climates. Algae encourage treatment of wastes by producing oxygen for use by aerobic bacteria which digest organic wastes.

Pond form and layout

Ponds are often rectangular in plan, with depths varying from 1 to 6 metres. There are three main types of pond which may be used:

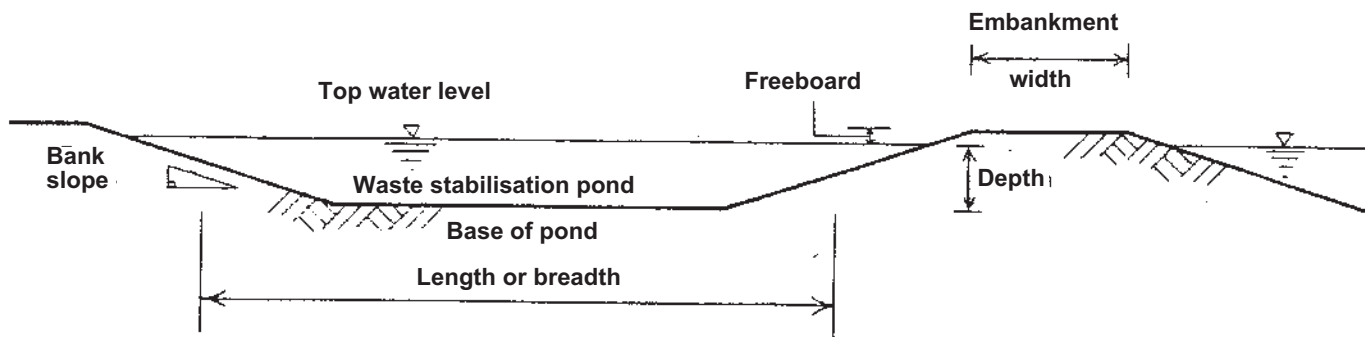
Type of pond	Main purpose	Typical depth (metres)	Typical retention time (days)
Anaerobic pond	Reduction in strength of wastewater, by settlement and anaerobic digestion	2 to 5	1 to 5
Facultative pond	Reduction in strength of wastewater by aerobic digestion	1 to 2	20 to 40
A series of three or more maturation ponds	Reduction in numbers of bacteria (pathogens and indicator organisms)	1. to 1.5	3 to 6 in each pond.

A typical system, for which flows are divided between two parallel sets of ponds, is shown below. Note that three anaerobic ponds are shown, allowing one to be taken out of use for cleaning or maintenance at any time.



Anaerobic ponds perform the same function as septic tanks, so are not necessary if the sewage comes from septic tanks along small-bore sewers.

Design features



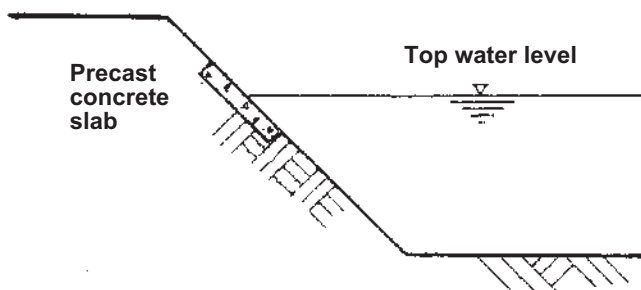
Length or breadth: The length and breadth of a pond are usually measured at half depth.

Freeboard: A clear height of about 0.5 metres should be provided between the top water level and the top of the embankment. The freeboard should not shelter the pond surface from the wind, but should keep the water surface below the top of the embankment.

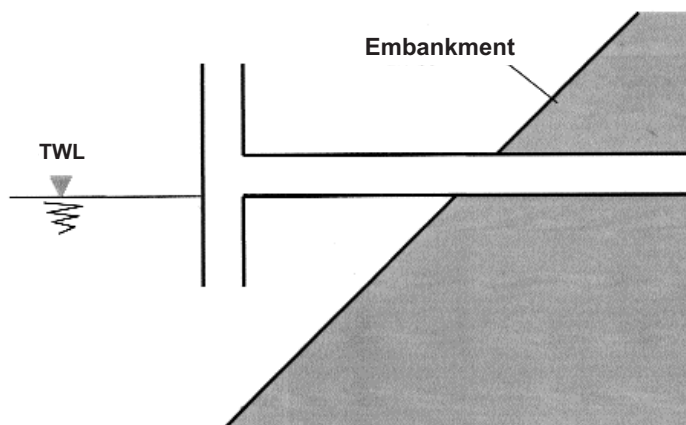
Bank slope: Embankment slopes in each pond should be at about 1:3.

Embankment width: Maintenance vehicles should be able to have access between adjacent ponds.

Base of pond: Pond bases should be impermeable, lined with clay, plastic, rubber or concrete, to prevent leakage and groundwater contamination.

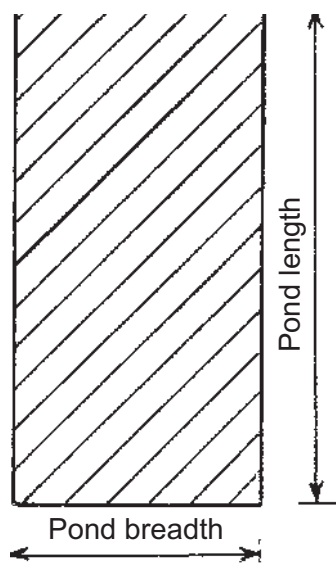


Pre-cast concrete slabs should be laid at top water level around each pond to discourage growth of weeds and to prevent bank erosion caused by wave action.



Scum guards should be provided around outlets from all ponds to prevent floating material from entering and possibly blocking the pipes. Various designs are possible.

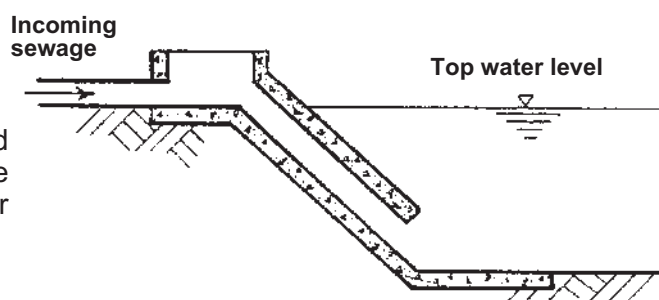
A simple 'T' shaped dip-pipe for outlets at inter-pond connections



In order to ensure that the pond contents are well mixed by winds the ratio of length to breadth should be in the range:

- Between 2:1 and 3:1 for the first pond in the series.
- Between 2:1 and 10:1 for other ponds.

Ponds should also be planned so that winds generally blow along the length of the ponds.



The inlet to a series of ponds should be constructed in concrete to prevent bank erosion, and should be designed so that sewage enters below top water level, to encourage mixing of incoming flows.

Maintenance

1. Any scum that collects on the pond surfaces should be removed and either buried or burned.
2. If screens or grit traps are used to collect the easily separated solid materials at the inlet to the ponds, the materials collected should be buried.
3. Grass around the ponds must be cut and removed regularly.
4. Anaerobic and facultative ponds will require desludging every few years as necessary. (Anaerobic ponds every 3 to 5 years; facultative ponds every 10 to 15 years.)
5. Some bird scaring may be necessary in order to reduce the likelihood of bird droppings polluting the partially treated sewage and also to reduce cross-pollution between ponds.

For further information:

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