

under pipe
res. The
at right
ow. A free
at the top.

ed air may
plate diffusers
one side
re diffusers
p, though
commonly

Unit-VI

✳ Stabilization Pond:- or Oxidation Ponds

Stabilization Pond (or lagoon) is an open, flow through earthen basin of controlled shape, specifically designed and constructed to treat sewage and biodegradable industrial wastes. It is relatively low-cost treatment system which has been widely used, particularly in rural areas. These ponds may be considered to be completely mixed biological reactors without solids return. Stabilization pond provides comparatively long detention periods.

• Stabilization ponds are usually classified according to the nature or biological activity that is taking place as:

(i) aerobic (ii) anaerobic or (iii) facultative (aerobic-anaerobic)

→ Pg. 458

Advantages :-

- (1) Low initial cost
- (2) Lower operating costs
- (3) Treatment system is not significantly influenced by a leaky sewage system

Disadvantages:-

- (1) Requires extensive land area.
- (2) Assimilative capacity of certain industrial wastes is poor.
- (3) There are potential odour problems
- (4) It is used in Urban area.

Faculative Ponds (Oxidation Ponds)

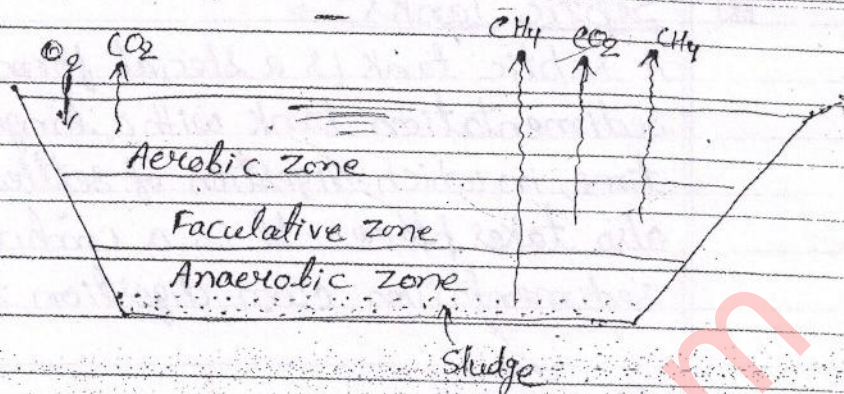
A faculative pond combines the features of the aerobic and anaerobic ponds. Constructed of intermediate depth (1 to 1.5 m), a faculative pond consists of three zones: (i) aerobic zone at the top (ii) anaerobic zone at the bottom and, (iii) faculative zone situated between the aerobic and anaerobic zones. The top aerobic layer acts as a good check against odour evolution from the pond. Their treatment is like conventional secondary treatment processes. Hence the faculative pond is best suited and most commonly used for treatment of sewage.

Aerobic

Such which that pond in oxy by on In of the time orga Def the e: H

area.
certain

& problems
'a'



ion Ponds)

[*] Aerated Lagoons:->

Such ponds are known as aerated lagoons which represent a system of treatment that is intermediate between oxidation ponds and activated sludge systems.

In contrast to oxidation ponds, the oxygenation is provided in aerated lagoons by mechanical surface aerators installed on floats or rafts or on fixed platforms.

In aerated lagoons, much less because of the greater depths and smaller detention times needed for the stabilisation of organic matter.

Depending upon the extent of mixing, the lagoons may be classified as either (i) Complete mix or (ii) partially mixed

⇒ Pg. 472

❑ Septic Tanks:->

A septic tank is a special form of primary sedimentation tank with a longer detention time, in which digestion of settled sludge also takes place. It is a combined sedimentation cum digestion tank.

Design:-

Since it is a settling-cum-digestion tank, its rational design is based on the following three functions it is expected to perform:

- (i) Sedimentation to remove the maximum possible amounts of suspended solids from the sewage.
- (ii) digestion of settled sludge resulting in a much reduced volume of dense, digested sludge.
- (iii) Storage of sludge and scum accumulating in between successive cleanings thereby preventing their escape.

Hence, the tank should be large enough to provide for the above three requirements.

Cons
→ Pg. 518

The
max
Conc
light
of 2

Comp
and
appr
prox
The t

Conc
the s
well
to m

Adva

(1) E
(2) V
a

(3) T

(4) T

(5) T

rem of primary
mger detention
tled sludge :
bined
n tank.

→ Pg. 518

- digestion
is based on
is it is expected

the maximum
nded solids

'ge resulting
of dense,

Scum
successive
ing their escape.

large enough
ree requirement

Construction:-

The tank may be constructed of brick masonry, stone masonry or even in concrete. They are provided with water tight cover along building within a radius of 90 m for smaller capacity, only the compartment is provided. The inlet and outlet are located at the two opposite ends. Baffles are generally provided at both inlet and outlet. The floor of the tank should be of Cement concrete and slope towards the sludge outlet. Both the floors as well as walls should be well plastered to make them water tight.

Advantages:-

- (1) Easily constructed
- (2) Very little attention and skilled attendance is required.
- (3) The sludge is relatively small
- (4) The cost is quite small
- (5) There are no moving parts of its operation

Disadvantages:-

- (1) The size required is large and uneconomical.
- (2) Functioning and action is erratic.
- (3) The effluent is dark.
- (4) Leakage of gases cause bad smell and environmental pollution.
- (5) Periodic cleaning, removal and disposal of sludge is often tedious/required.

is so
cham
diges
two

Adva

- (1) They
- (2) They
- (3) There
- (4) They
- (5) There
- (6) The

Imhoff Tanks:- Pg. 524

It is designed and developed by Karl Imhoff (Germany), is an improvement over the septic tank.

The tank, which is basically a sedimentation-cum-digestion tank, has two chambers. The upper chamber is called sedimentation chamber or flowing-through chamber, through which sewage flows at a very low velocity so that sedimentation may take place.

The lower chamber is called the 'digestion chamber' in which anaerobic or septic decomposition occurs. The process that takes place in an Imhoff tank is similar, except that the tank

Disac

- (1) Becau
- (2) Unsu
- (3) They
- (4) They

ge and
is erratic

is so designed that the flow-through chamber is separated from the lower digestion chamber, resulting into a two storied tank.

rd smell
ation.
and disposal
ues/required.

Advantages:-

- (1) They are quite economical in operation.
- (2) They do not require skilled attention during operation.
- (3) There are no moving parts.
- (4) They require only preliminary treatment.
- (5) There is no difficulty in sludge removal.
- (6) The results obtained are good.

ped by
is em
septic tank.
lly a
ion tank has
re chamber
amber or
through which
o velocity so
re place.

Disadvantages:-

- (1) Because of greater depth, cost of construction is higher.
- (2) Unsuitable for acidic influents.
- (3) They give offensive odours.
- (4) They have tendency to foam or boil.

rd the
anaerobic
is. The
is Imhoff
at the tank

* Sludge Treatment Processes :->

Sludge treatment may include all or a combination of the following unit operations and processes :-

- (1) Thickening or Concentration
- (2) Digestion
- (3) Conditioning
- (4) Dewatering
- (5) Drying
- (6) Incineration

=> Pg. 477

1) Thickening :->

The purpose of thickening is to reduce moisture content of the sludge, and consequently to increase the solids concentration. This is adopted for the separation of greater amount of water from the sludge solids that can be attained in settling tanks. Three types :-

- (i) gravity thickening (ii) air floatation.
- (iii) Centrifugation

2) Digestion :->

The principal objective of sludge digestion is to subject the organic matter present in the settled sludge to anaerobic or

3) Cond

It is prior of d am

4) Dea

The the the

prim com, 90%

5) Heat

The the dew suc heat inc

6) Int

it in

ies :->

all or a
unit

ion

to reduce
dge., and
solids

ed for the
it of water
n be

three types:
ation.

ge digestion
& present in
ic or

aerobic decomposition.

3) Conditioning:->

It improves the durability of digested sludge. Prior conditioning of sludge before application of dewatering methods renders it more amenable to dewatering.

4) Dewatering:->

The purpose of dewatering is to further reduce the volume of sludge and thereby increase the solids concentration. Most of the digested primary or mixed sludges can be compacted to a water content of about 90% in the digester itself by gravity.

5) Heat Drying:->

The purpose of this is to reduce further the moisture content and volume of dewatering sludge. Several methods such as sludge drying under controlled heat have been used in combination with incineration devices.

6) Incineration:->

It involves the combustion of the sludge in a reactor under high temperature

Its purpose is to destroy the organic material, the residual ash being generally useful as landfill.

7) Sludge disposal: →

The ultimate disposal of dewatered sludge or the ash (after incineration) may be on to the land or into the sea.