

Blue Frog™ System Case Study:

Hog Confinement

Hog waste is different from dairy waste in that sand and straw fiber is not in the manure. As a result, hog waste treatment in the BFS is straightforward. The influent is urine, feces and flush water. The influent is different for a sow farm and a grow-out farm. The sow farm has bigger animals and more manure per animal. A grow-out farm typically has small and large animals in different barns at the same time, each in different stages of maturity.

The manure is consistent because the feed is consistent. Hog waste is relatively easy to digest anaerobically in the BFS.

The Luthi lagoon is 100m x 200m x 6m; there are 6,000 lactating swine. The lagoon volume is 20m³/lactating swine. The as-built HRT is 240 days (Basis: manure + flush volume). The as-presented HRT was 30days. The current HRT is 160days.

Objectives

1. Reduce sludge
2. Reduce odor

Results

In the Luthi Hog Confinement application, sludge was reduced 65% over two years.

There was no odor.

The Luthi pond BFS was installed in stages. The first stage had a single BF/CSTR. The farmer measured sludge levels periodically in the first year and found an expanding concentric circle around the CSTR where sludge was significantly reduced. This led to placing two additional free standing BFs in the 100m x 200m-long pond. Thereafter the sludge was reduced throughout the pond.

The ponds are 20ft deep and had 17ft of sludge. They now have 4ft of sludge.

Design

1. Place a BF/CSTR in the inlet to the first lagoon.
2. Place a free standing BF every 40m of longitudinal lagoon.
3. A GF/CSTR is added only if there is a specific requirement to reduce oil & grease in the irrigation water.
 - a. The oxygen added converts the insoluble fats into soluble fatty acids and glycerin.
 - b. In a sow farm, a screen is used to remove the occasional uterus and dead piglet from the influent.
4. A BF/CSTR is placed at the inlet of each pond with in-series lagoons.
5. Biological activity slows in cold weather, but does not stop, particularly at the sludge/water interface where the temperature is higher than the surface temperature.
6. Hog lagoons are designed to hold at least half a year of fluid because irrigation is only permitted during the growing season.
 - a. The remediation effort is embedded within this HRT.
7. A typical new lagoon is 300ft wide and 600ft long and is at least 20ft deep. It is plastic-lined to prevent liquid leaching into the soil.
 - a. This lagoon has a BF/CSTR and two free standing BFs.

Calculator

Hogs produce different amounts of manure depending on age, gestation and lactation. The manure for a lactating female is about $.01\text{m}^3/\text{day}$. Manure is flushed from the barn with fresh water or recycled water. The flush varies for each farm, but there is about a 10:1 ratio of flush water to manure (V/V).

HRT is calculated on the volume of flow traversing the barn. The flow used is $.1\text{m}^3/\text{hog}\cdot\text{day}$. [See attached spreadsheet.] This flow is the sum of the manure produced and flushes. Since the flush water volume/flush is relatively fixed, this number is independent of the swine type.

In practice, there is an ideal fixed investment in equipment (BF/CSTR + BF + GF/CSTR) plus a variable based on lagoon length (one incremental BF/40m of added length). When the number of hogs exceeds the calculated volume, add 40m length and one BF.

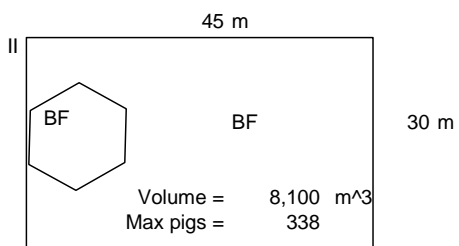
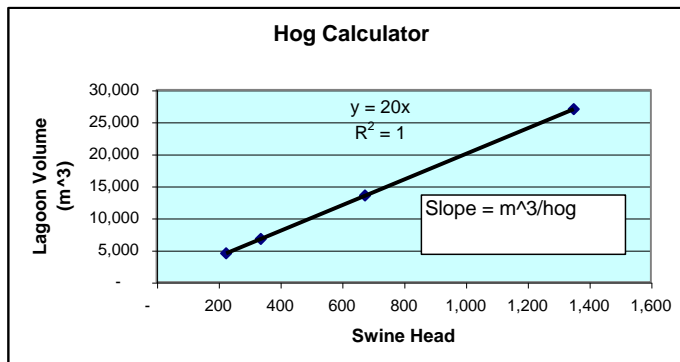
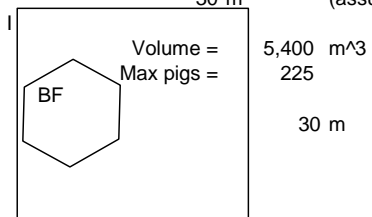
For existing lagoons, divide the number of hogs by 20m^3 to determine the minimum volume. [Ignore the berms for this calculation.] Mimic the closest fit layout shown in the calculator for the number of hogs. Adjust number of free standing BFs.

Hog Calculator

Depth = 6 m
30 m

HRT = 240 days
(assumes no berm angle for simplicity)

Pigs = 0.1 m³ total flow/day*pig
0.01 m³manure/day*lactating swine



- RULE**
1. Minimum lagoon = 30x30x6
 2. Each pig requires 20 m³ of incremental lagoon volume
 3. If O&G is specified, minimum lagoon is 60x45x6
 4. If pig count > maximum, step up to next design size
 5. Add a free standing BF every 40m

