

Standard Operating Procedure for Lime Stabilization

Objective

Lime stabilization treatment is an important component of Fecal Sludge Management. It consists of pathogen removal and deactivation by raising the pH of fecal sludge to 11-12 using hydrated lime (>90% calcium hydroxide). Disinfection with lime is done on-site immediately after desludging into the pond. Solid-liquid separation is achieved through Filter Bed.

System Information

The lime stabilization system consists of the following components:

Mixing Pond

Sludge from Pit/septic tank is directly transferred into the mixing pond. After that, sludge is mixed with the proper amount of lime.

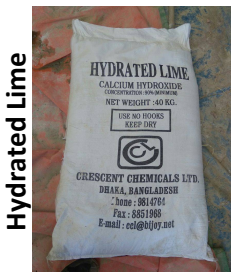
Filter Bed with Soak pit

After lime treatment, sludge is transferred into the filter bed to segregate solid and liquid.

Drying Bed with Soak pit

Solid portions accumulate into the drying bed for drying.

Equipment Required



Hydrated Lime

1. Hydrated lime with 90%+ Calcium Hydroxide
2. Robin Pump (5 hp / 7.5 hp)
3. Hose pipe (minimum 500 feet)
4. Flexible pipe (minimum 100 feet)
5. Steel Tray, Sample Jar
6. pH meter
7. Measuring Tape
8. Mixing rod
9. Spade
10. Bucket
11. Kerosene
12. Weight Machine
13. PPE Equipment (Gloves, mask, helmet, gumboot)



pH meter

Manpower

- **Desludging team:** For mechanical transport by pumping, every team consist of 8 volunteer and 1 team leader. Each team can desludge minimum 6 twin pit latrine / 2 septic tank one day.
- Desludging team will operate the lime mixing and other activities in the treatment plant. Treatment procedure and pH value testing supervised by one supervisor

Operation Procedure

1. Transfer the sludge from latrine to the mixing pond.
2. Lime Mixing Process:
 - a. Weigh lime powder at a rate of approx. 20kg per 1000L and spread over the sludge in the mixing pond. Then mix the powder with sludge thoroughly.
 - b. Add lime into a bucket of water at a rate of approx. 20kg per 1000L of the volume of the sludge. **Add lime to the water** and **never pour water onto hydrated lime** as it can cause an explosive reaction.
3. Continue mixing lime for 30 minutes and check sludge has reached the desired range of pH 11 to 12.
4. Continue to check the pH and add more lime as required to maintain it at the following levels for the following times:
 - a. pH 12 for 30 minutes
 - b. pH 11.5 for 1 hour or longer
 - c. pH 11 for 2 hours or longer



pH Test

5. Leave the sludge in the mixing chamber for the pH to reduce to a level of 8 to 6 . This step takes minimum 24 hours.
6. After pH reduced to normal, start dewatering into drying bed to separate solid and liquid. Solid particles stay on the drying bed and the liquid particle passes through the bed to filter bed
7. Leave the sludge to drying bed until it completely gets dried. This step will take minimum 7 days
8. Liquid particles goes into soak pit after filtration.
9. Always take proper PPE material during operation. No staff allowed in the site without proper PPE.

Final Disposal

Dry solid should be handled carefully. Gloves should be worn when handling sludge or handling crops which have been fertilized by sludge, and good hygiene practices must be observed.

Due to the potential risk from parasite eggs, sludge may be used as a fertilizer but as a precautionary measure it should not be directly applied to crops which will be eaten uncooked, such as vegetables. It may be used as a fertilizer for fruit trees or bushes, such as banana trees, where it will not be in direct contact with the fruit which will be eaten uncooked. It may also be used as a fertilizer for crops which will be cooked before eating, as parasites are effectively destroyed at high temperatures.

If suitable trees are not available for use of the fertilizer, or farmers are unwilling to use sludge as a fertiliser for reasons of social acceptability, the sludge must be buried. Studies on mobility of helminth eggs have indicated a maximum travel distance through soil of 7cm (2.8 inch). A burial site which is 6 inch above the water table can therefore be considered safe. After burial, sludge should be covered with a 6 inch layer of soil.

Health, Hygiene and Safety

- Every person working on desludging should receive training on hygiene and on standard operating procedures for desludging.
- Gloves will be issued to workers who are handling sludge or chemicals (lime or chlorine) Eye protection will be issued to workers who are handling chemicals (lime or chlorine).
- Water supply should be constantly available on site for cleaning and in case of emergency washing needs.
- Precaution on lime handling:
 - Lime is damaging to the skin and causes burns.
 - Gloves should be worn when handling lime.
 - If dry lime is spilt on the skin, then brush away as much of the lime as possible before it causes burns. **DO NOT WASH THE SPOT WITH WATER** as lime does not start to burn the skin until it becomes wet.
 - If lime burning starts to occur then wash the skin with water containing vinegar (2 teaspoons vinegar to 1 pint of water)
- Take very great care to avoid getting lime in the eyes; wear safety glasses when using lime and do not put your hands near to your face if you have been handling lime. If lime enters the eyes then irrigate the eyes with large amounts of clean water. Eyes should be irrigated for at least 20 minutes with at least 4 litres of water (1 gallon). Due to the pain cause by lime in the eye, it may be necessary to hold the victim's eyelids apart during irrigation. Hold the victim's head in a position that allows water to flow from the inside corner of the eye toward the outside. Do not allow the water to fall directly on the eye; do not use greater force than is necessary to keep the water flowing across the eye.
- After removing their clothing, workers must take a shower before putting on their home clothes.
- Workers should disinfect their hands with 0.05% chlorine solution / soap before eating or smoking.
- All direct contact with sludge must be avoided unless the worker is wearing gloves.