Biosolids Stabilization

The Environmental Protection Agency's 40 CFR Part 503, *Standards for the Use and Disposal of Sewage Sludge*, requires that wastewater solids be processed before they can be beneficially used. Biosolids originate as the leftover waste materials generated from domestic wastewater treatment and can be made safe for disposal or recycling through various methods of stabilization. Stabilization helps to minimize the potential for odor generation and destroys pathogens. A few common methods small communities use for stabilizing biosolids include: lime stabilization, digestion, and composting.

Method	Advantages	Disadvantages
Lime (Alkaline) Stabilization	• Reduces the number of pathogens • Simple technology requiring few special skills for reliable operation • Small land area is required	• High pH and not suitable for land disposal at all sites • Total volume of waste to be disposed significantly increased • Potential for odor generation
Digestion	• Reduces the number of pathogens • Widely used method • Reduces the total solids/sludge quantity by converting to biogas	• Not practical for smaller communities • Equipment is costly • Costly maintenance
Composting	• Produces a reusable product • Product can return valuable nutrients to the soil • Not subject to end use restrictions	• Increases the amount to be managed through addition of bulking agents • Potential for fires • Timely process

Costs

It is difficult to estimate the costs of stabilizing biosolids with alkaline materials without specific details, such as wastewater solid characteristics and quantities. The following items must be considered: processing equipment purchase and installation; product curing, loading and storage facilities; transport of product; alkaline additive; labor; odor control equipment; and regulatory compliance. Alkaline stabilization is less expensive than composting or thermal drying.

Source:

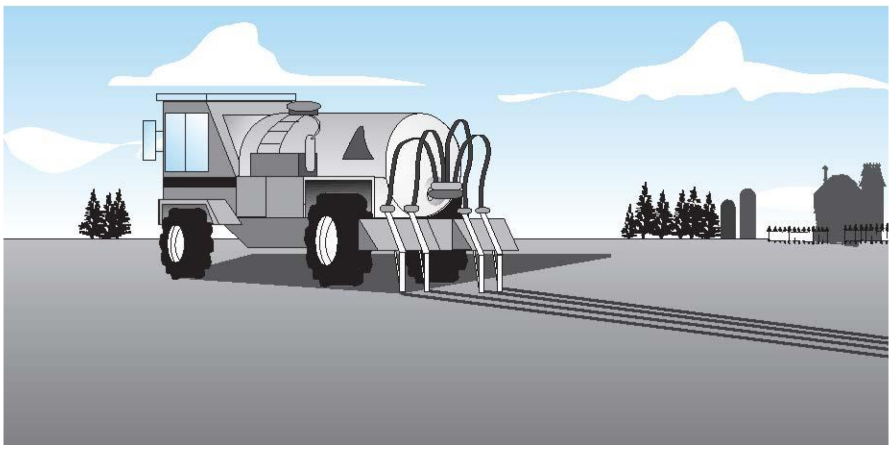
- National Small Flows Clearinghouse – Pipeline Fall 1998 Issue, "Managing Biosolids in Small Communities"
  http://www.nesc.wvu.edu/pdf/WW/publications/pipline/PL_FA98.pdf

Other Links

- United States Environmental Protection Agency. "Alkaline Stabilization of Biosolids"
  https://www.epa.gov/biosolids/alkaline-stabilization-biosolids
- United States Environmental Protection Agency. "In-Vessel Composting of Biosolids"
  https://www.epa.gov/biosolids/vessel-composting-biosolids
- United States Environmental Protection Agency. "Multi-stage Anaerobic Digestion"
  https://www.epa.gov/biosolids/multi-stage-anaerobic-digestion

Land Application of Biosolids

The addition of biosolids to soil to supply nutrients and replenish soil organic matter is known as land application. Biosolids can be used on agricultural land, forests, and even parks or gardens. The organic components of biosolids can improve soil structure and its ability to hold water. Biosolids that have not been dewatered and have a high liquid content often can be land applied by being sprayed on the ground surface or injected just below ground surface from specially equipped trucks. Biosolids with higher solids content often can be spread directly from the back of pumper-hauler trucks, farm tank trucks or tractors pulling a tank wagon.



Advantages

- Excellent way to recycle wastewater solids
- Relatively inexpensive option and capital investments are generally lower than other biosolids management technologies
- Returns valuable nutrients to the soil and enhances conditions for vegetative growth

Disadvantages

- Process can be labor intensive
- Limited to certain times of the year
- Potential public opposition

Costs

It is difficult to estimate the cost of land application of biosolids without specific program details. Several elements must be considered: purchase of application equipment, transportation, equipment maintenance, labor, storage, regulatory compliance, public education and land availability.

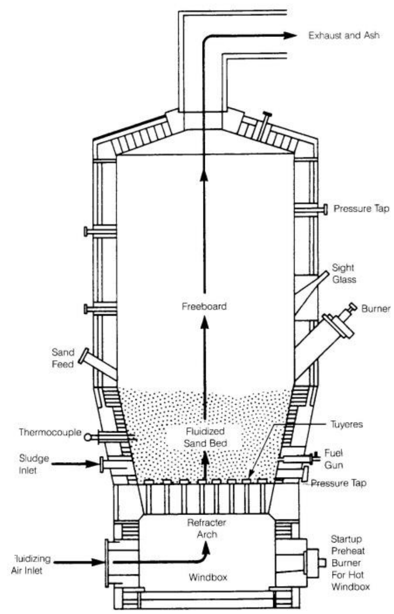
Source:

- United States Environmental Protection Agency. "Land Application of Biosolids" https://www.epa.gov/biosolids/land-application-biosolids
- National Small Flows Clearinghouse – Pipeline Fall 1998 Issue, "Managing Biosolids in Small Communities" http://www.nesc.wvu.edu/pdf/WW/publications/pipline/PL_FA98.pdf

Incineration of Biosolids

Incineration of wastewater solids takes place in two steps. The first step is drying the solids. Wastewater solids are dewatered to between 15 to 35 percent solids prior to incineration. The second step is the incineration process that converts the biosolids into inert ash. The volume of ash is significantly lower than that of the original biosolids and can be disposed of more readily due to its low volume and inert nature. The ash is typically landfilled but some facilities use other innovative methods to reuse the ash such as filler in cement and brick manufacturing or a subbase material for road construction.

Two types of incineration systems are commonly used for wastewater solids combustion – multiple heart furnaces (MHFs) and fluidized bed furnaces (FBFs). FBFs are generally better at meeting federal emission standards and most new installations use this technology.



Advantages

- Volume reduction
- Ash is a stable, sterile material
- Potential energy recovery

Disadvantages

- High capital investment
- Annual operating costs depend on fuel costs
- Potential for public opposition
- Potential operating problems

Costs

The cost of incineration is a function of many factors including: furnace type and size; solids content of the feed; volatile solids content and heating value of the feed; various design considerations; local labor; and air emission control requirements.

Source:

- United States Environmental Protection Agency – Biosolids Technology Fact Sheet June 2003, “Use of Incineration for Biosolids Management”- https://www.epa.gov/sites/production/files/2018-11/documents/use-incineration-biosolids-management-factsheet.pdf
- National Small Flows Clearinghouse – Pipeline Fall 1998 Issue, “Managing Biosolids in Small Communities” http://www.nesc.wvu.edu/pdf/WW/publications/pipline/PL_FA98.pdf

Landfilling of Biosolids

Landfilling is generally considered for wastewater biosolids when land application or other beneficial reuse is not possible. Limitations of reuse can include land acquisition constraints or poor material quality. Biosolids landfilling options include disposal in a monofill, a landfill that accepts only wastewater treatment plant biosolids, or in a co-disposal landfill, a landfill that combines biosolids with municipal solid waste.

Monofilling consists of preparing the site, transferring the biosolids to the site, and covering the biosolids with a layer of cover material. The three most common systems to monofill biosolids are the trench, area and ramp methods.

Advantages

- Suitable for biosolids with high concentrations of metals or other toxics
- Most economical biosolids management solution
- Landfilling improves packing of solid waste and increases biogas production

Disadvantages

- Eliminates their reuse potential
- Landfilling requires extensive planning
- Operation, maintenance and post closure care of landfills are labor intensive
- Potential for odor generation

Costs

The cost of landfilling biosolids is a function of many factors including: capacity of landfills serving the area; haul distance; method of leachate treatment and disposal; method of gas collection, disposal, or reuse; post closure use; purchase and maintenance of equipment; regulatory compliance; and local labor rates.

Source:

- United States Environmental Protection Agency – Biosolids Technology Fact Sheet June 2003, “Use of Landfilling for Biosolids Management”
  https://www.epa.gov/sites/production/files/2018-11/documents/biosolids-technology-factsheet.pdf
- National Small Flows Clearinghouse – Pipeline Fall 1998 Issue, “Managing Biosolids in Small Communities”
  http://www.nesc.wvu.edu/pdf/WW/publications/pipline/PL_FA98.pdf