Sludge Incineration

Incineration is a sludge disposal option that involves the firing of sewage sludge at high temperatures in an enclosed structure. This process reduces the sludge to a mass of ash that is less than 20 percent of its original volume. EPA and the states generally support the beneficial use of sludge. Many urban sewage treatment facilities produce large volumes of sludge and have limited available space for sludge management. They are likely to see incineration as their most viable option.

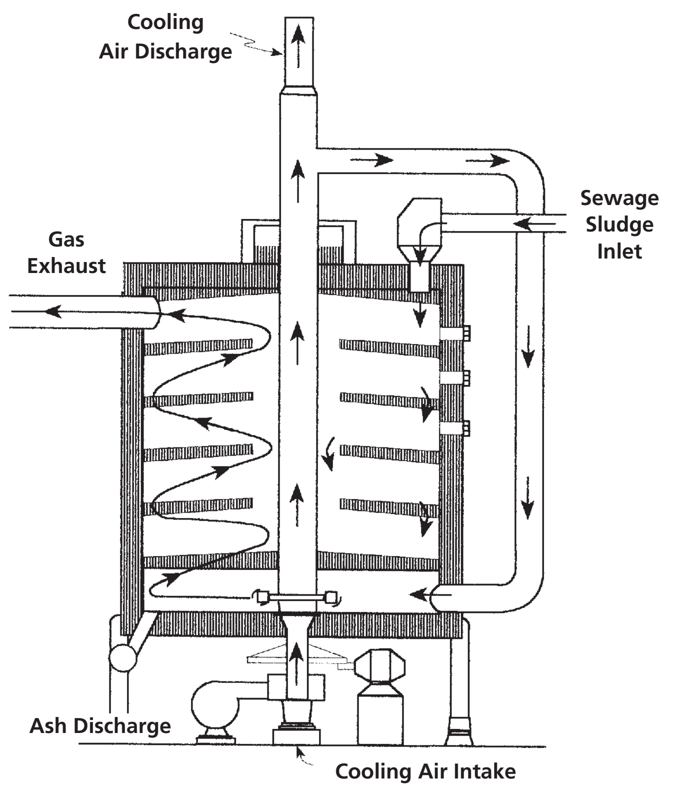
Sludge incineration eliminates some environmental and health problems by destroying pathogens and toxic organic chemicals. Anyone who fires sludge in an incinerator must meet the sludge incineration requirements in Subpart E of the Part 503 rule, which address pollutant limits for seven metals, limits for total hydrocarbons, general requirements and management practices, frequency of monitoring requirements, and recordkeeping and reporting requirements. In addition, states have their own air quality requirements for incineration.

Incineration Systems

Incineration systems generally consist of an incinerator (furnace) and one or more air pollution control devices. In New England, the two most commonly used incineration systems are multiple hearth furnaces and fluidized-bed reactors. There are also other types of incinerators.

Multiple-Hearth Furnaces (MHFs), which have been utilized since the mid-1900s, employ a series of vertically-stacked chambers, or hearths. Air is fed from the bottom, and sludge is fed from the top. The sludge in each chamber is plowed to "drop holes," where it falls into successive hearths below. The bulk of the burning takes place in the center hearths; the ash cools at the bottom levels.

Multiple Hearth Furnace



Fluidized-Bed Reactors, thought by many in the industry to be the cleanest, are one of the newest incineration technologies and one of the least expensive for large-scale operations. These systems employ a layer of sand, which is "fluidized" by a constant, high-pressure stream of air. The air, essentially, "fans the fire," which results in a much more intense and complete burn and less ash than in an MHF.

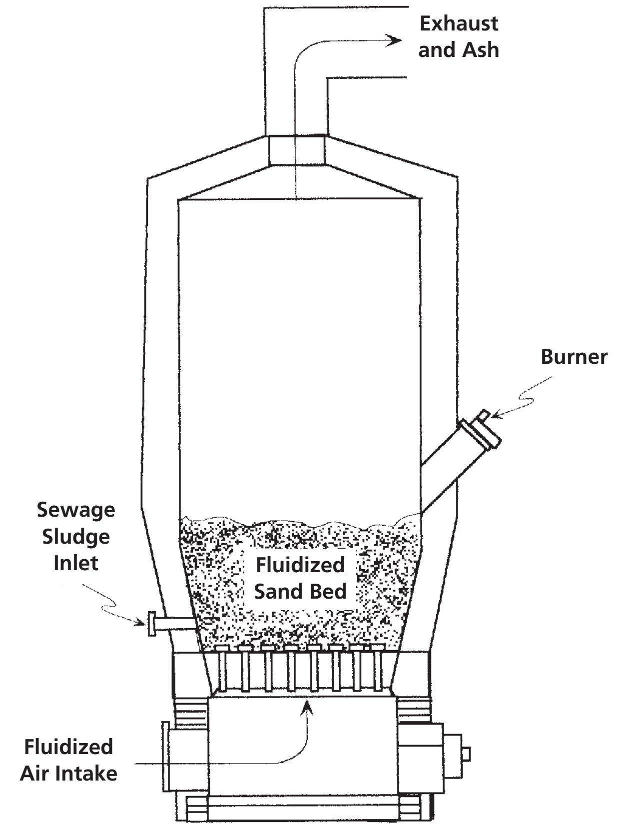
Fluidized-bed incinerators are also less mechanically complex than MHF incinerators—making these units substantially easier to operate. With less mechanical upkeep, equipment, staffing, and repair costs, fluidized beds tend to be less expensive to operate and maintain than MHFs. Most of the region's newer incinerators use the fluidized-bed technology.

All sludge incinerators use auxiliary fuel (e.g., oil or natural gas) to initiate and occasionally maintain burning. Ash is removed from MHF incinerators by ash-handling systems and then disposed at landfills. Ash from fluidized-bed units is very fine and can be removed with periodic sand changes and continuous scrubbing of the exhaust. Ash disposal is regulated under solid waste disposal regulations. Beneficial use of this ash is actively being investigated.

Air Pollution Control Equipment

In general, air pollution control devices are used to either remove small particles and metals in the exhaust gas or to further decompose organics. Devices such as wet scrubbers and dry and wet electrostatic precipitators are used to remove metals. Afterburners are used to more completely burn organics in exhaust gases. More recently, regenerative thermal oxidizers (RTOs) are being utilized as part of the air pollution control system in incinerators.

Fluidized Bed Reactor



Cost and Technical Feasibility

When considering whether or not to incinerate sludge, or which incineration technology to use, cost is always a major consideration. A sludge incinerator is a very mechanized and capital-intensive investment that must be managed with a high level of expertise and attention to maintenance.

The incineration option is a long-term commitment that is most cost-effective for large volume wastewater treatment systems or as a regional solution. In evaluating this option, communities must consider ash disposal, economies of scale, and air quality.

How much will it cost to build and operate an incinerator or upgrade and refurbish an existing incinerator? The answer to that question depends on the site, how much sludge the wastewater treatment facility produces, and what other technically feasible options exist. Most sites within approximately a half mile of a residential neighborhood are not good candidates for incineration facilities.

While questions of technical feasibility and cost can be examined through extensive site-specific engineering studies, a general rule of thumb is that most incinerators should handle a sludge input rate between 0.25 and 3 dry tons per hour. Anything less that 0.25 dry tons would most likely be too expensive for this technology; over 3 dry tons per hour tends to exceed the limit of the technology and may require multiple incinerators.

Beneficial Use/Production of Energy

Energy recovered from the incineration of sludge may be used to support some of the energy needs of the Wastewater Treatment Plant. Heat from the incinerator may be used to pre-dry the sludge. Incinerators may also be utilized to assist in odor control at a facility. Ash by-products may be used as a substitute raw matter in the manufacturing of cement and brick and as a landfill cover.

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Biosolids are a Natural Resource!

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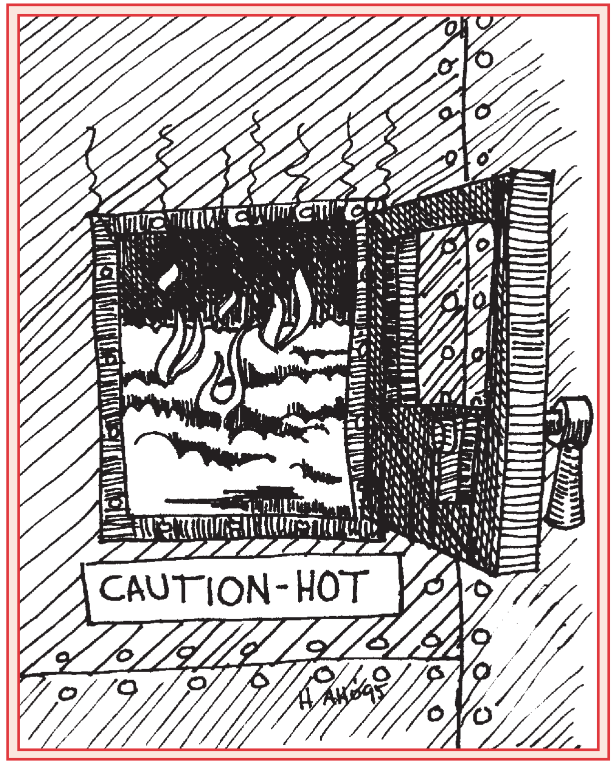
Sewage SLUDGE Incineration



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A Residual of Worth

Sludge is an organic solid, semi-solid, or liquid by-product of the wastewater treatment process. Sludge characteristics vary depending on each treatment facility's wastestream and the processes that are used. Sludges that meet EPA standards for land application, which include reduction or elimination of pathogens and very low limits for heavy metals, are referred to as ***Biosolids***.

Although there has been significant research on the beneficial use of biosolids, and history has demonstrated, in the U.S. and other regions of the world, that high quality biosolids can be beneficial soil additives and plant nutrients when applied properly, concerns still exist. These concerns relate primarily to the quality of the biosolid material and its impact on soil productivity, water resources, and adjacent land uses.

To ensure that sludges that are used as biosolids are treated and managed in a manner that protects both human health and the environment, Congress directed EPA to develop a comprehensive national Sewage Sludge Program aimed at reducing risks and maximizing the beneficial uses of sludge. In February of 1993, EPA issued its sewage sludge use or disposal regulation, 40 CFR Part 503, commonly referred to as the "503s." The 503s set minimum quality standards and dictate proper management practices for all sewage sludge that is used or disposed of through land application, surface disposal, and incineration. Many states have more stringent rules.

The Northeast States, NEIWPCC, and the EPA believe that, when managed and applied properly, biosolids can be valuable resources. With the phaseout of unlined landfills, the federal ban on ocean dumping, and growing public awareness of environmental issues, communities have begun to recognize that biosolids can be a resource and not a waste. Many communities have discovered viable, safe, and environmentally sound options for the beneficial use of their biosolids. Some communities have implemented a single beneficial use method, some employ a combination of different sludge use and/or disposal methods, others have entered into regional solutions or contracted with privately-owned facilities. In choosing an option, communities must consider cost, odor control, and siting issues.