

# HETI Horizons

## Medical Waste Treatment Technologies – An Update Part 2: Evaluating & Selecting Treatment Technologies

This is the second of a two-part update summary of technologies used for treating “infectious” waste generated at healthcare facilities, research and clinical laboratories, biotechnology and pharmaceutical laboratories, and the like. In the January 2023 issue of *HETI Horizons*, Part 1 reviewed what are considered currently viable technologies. Part 2 presents a recommended method and criteria for evaluating and selecting the best, most cost-effective system for a facility-specific application.

### Proven vs. Innovative Technologies

A 2001 paper by an environmental activist group identified 49 potentially viable, non-incineration medical waste treatment technologies that included 36 thermal processes, 10 chemical disinfection processes, and two irradiation processes. Before 2010, virtually all of those technologies proved to be failures and were no longer commercially available.

Today, the only long-proven, viable, medical waste treatment technologies are incineration, steam autoclaving, and possibly pyrolysis. However, somewhat unique, “innovative” technologies are periodically introduced and heavily promoted as being quintessential treatment systems having minimal costs, negligible or “zero” emissions, and simple trouble-free operations. Such “groundbreaking” technologies appear very appealing on vendor websites and marketing materials – particularly to those unfamiliar with the historical and



Medical Waste Pyrolysis System

technical aspects of medical waste treatment technologies – but they are all basically reincarnations of failed technologies from decades ago. In addition, marketing and promotional materials for such “innovations” are invariably misleading and replete of useful operating and performance data. In fact, most if not all of them are only conceptual or under development with none in actual, full-scale operation.

### Determining the Best Alternative

The process of evaluating and determining the best medical waste treatment technology for any particular facility-specific application could be a relatively difficult, perplexing task – whether for evaluating and comparing an array of different technologies or for determining the best system offered by different vendors within a specific treatment category, such as incineration or autoclaving. The biggest difficulty is being able to filter through vendor marketing propaganda and claims and to fill in the gaps of missing data and information. A recommendation for facilitating such evaluations is to apply each of the seven criteria below to each technology or vendor under consideration – thereby deriving a quantitative comparison and ranking that should identify what could be considered the best alternative or a short-list of the best or top two to three technologies for selection or further evaluations.



Medical Waste Microwave System

## Recommended Evaluation Criteria

### 1. Demonstrated Performance Criteria

Should focus on the overall viability and degree of demonstrated success for each particular technology or system. Relevant factors for consideration include the number of full-scale operational systems in place and the duration of successful operation for each. For example, technologies that are still under development with no full-scale operational systems in place should be ranked lower than those having long-term successful installations.

### 2. Technical & Performance Criteria

Should focus on the operational and processing capabilities and performance for each particular technology or system. Relevant factors for consideration include daily and hourly process rates; weight and volumetric reductions or increases; degree of disinfection or sterilization; recognizability of treated residues; and waste container size limitations. For example, technologies that can process large volumes of waste at a high hourly rate without requiring special handling should be ranked higher than small-capacity systems requiring special or additional waste handling measures.

### 3. Vendor Qualification Criteria

Should focus on the ability and resources of each particular treatment system vendor to provide support services during initial planning and permitting, during system installation and commissioning, and during the course of long-term operations inclusive of routine maintenance and emergency repair work. Relevant factors for consideration include the number of years in business in manufacturing the specific technology; financial stability; and location. For example, vendors that have been in business for many years in manufacturing and servicing their waste treatment systems should be ranked higher than those having limited resources, a small support staff, and a minimal track-record of successful installations.

### 4. Environmental & Permitting Criteria



Should focus on the ability of each particular treatment system to comply with applicable, site-specific environmental regulations and permit requirements without unacceptable risks to the environment or public health. Relevant factors for consideration include potential air pollutant emissions from stacks and vents and possible need to install air pollution control equipment; liquid effluent discharges and contaminants and the possible need to install wastewater treatment equipment; and the acceptability of treated waste residues for off-site transport and disposal.

*Medical Waste Ozonation System*

### 5. Occupational Safety & Health Criteria

Should focus on the ability of facility personnel to operate, maintain, and service each particular system and piece of equipment without being exposed to unacceptable safety and health risks or the need for unusual, specialized personnel protection measures.

### 6. Facility & Infrastructure Requirement Criteria

Should focus on such parameters as overall space and elevation requirements, infrastructure and general construction requirements, and utility and commodity usage requirements for each particular system and component.

### 7. Economic Assessment Criteria

Should include the preparation of budgetary cost estimates and preliminary economic analysis for each potentially viable or selected treatment technology or system inclusive of:

- Estimated total capital cost requirements inclusive of system procurement and installation, site and general construction work, utility connections, commissioning, compliance testing, etc.
- Estimated total annual operating and maintenance costs inclusive of operating labor, utility and consumable usage, maintenance and repair, residue disposal, and compliance costs, such as periodic testing, certifications and reporting
- Lifecycle costing analyses inclusive of annualized owning and operating costs, unit costs, and return-on-investment (ROI) comparisons

Using these criteria as recommended may be a bit time-consuming but it is a relatively simple process and well worth the effort. It should serve to quickly identify and eliminate those technologies unworthy of consideration. The assignment of a priority-specific rating value to each of the above criteria based on facility-specific considerations should provide a definitive comparative, numerical ranking of each technology and system under consideration.

## HETI Services

HETI has extensive expertise, experience, and full-service capabilities involving all aspects of medical waste management, treatment and disposal – including feasibility evaluations, engineering and design, permitting, construction administration, and ongoing compliance support. HETI staff have provided such services to more than 500 healthcare, university and biomedical research facilities throughout the U.S. and internationally.

**To find out more about HETI's environmental and regulatory support services,  
please contact us.**

***Lawrence G. Doucet, PE, DEE***  
***Senior Professional Engineer – Eastern Regional Manager***

Phone: 978.263.4044  
development@hetiservices.com



**1.800.347.HETI**  
**www.hetiservices.com**

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