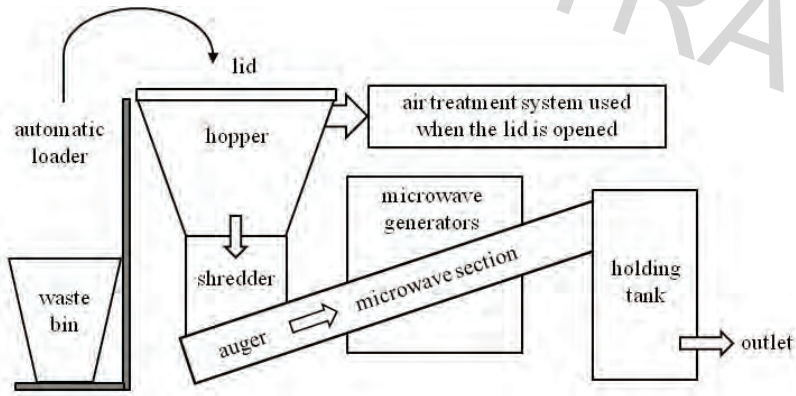
Overview of technologies for the treatment of infectious and sharp waste from health care facilities

World Health Organization

Figure 7. Continuous microwaving process



Credit UNEP 2007

Capacities and consumptions

Continuous microwave technologies are available in the range of 100 to 800 kg per hour. The cycle time includes the time needed for adding waste, steam exposure, and waste removal. The table below provides some examples of capacities and consumption. The consumption is based on a maximum load capacity, per cycle and with standard parameters configuration:

Capacity (kg/batch):	100	175	300	500
Continuous System: Waste decontaminated in (minutes):	60	60	60	60
Energy Consumption (kWh/cycle):	20	45	60	100

Data provided by: AMB ecosteryl, Belgium.

4.1.3 Frictional heat treatment

Frictional heat can also be used to destroy health care waste. The technology is based on the use of heat generated by friction and impact of the waste by rotor blades, supplemented by resistance heaters to ensure that the temperature can be adjusted if required. The waste is heated up to 150°C, while the waste is shredded into small, unrecognizable pieces. Heat is provided by heaters or generated by a rotor operating at high speeds (typically 1000 to 2000 rpm). A moist environment is kept inside the chamber by negative pressure.

To decontaminate the waste, it is kept between 135°C and 150°C for several minutes. Vapours generate flow through heat exchangers where the water is condensed. They continue to a filter group (activated carbon and HEPA filters) before being released to the environment.

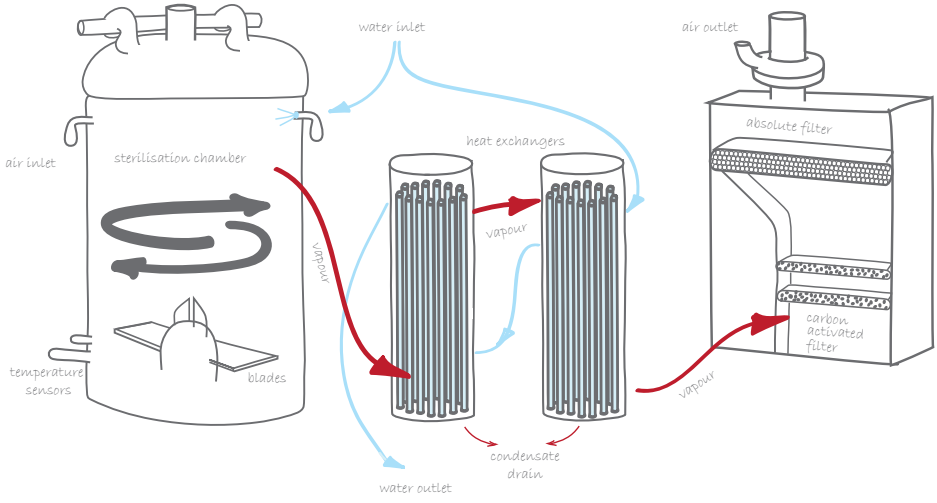
The use of frictional heat treatment includes the following advantages and disadvantages:

Advantages	Disadvantages
✔ Low environmental impacts ✔ Residue is non-hazardous ✔ Reduction of waste volume ✔ Residue is unrecognizable ✔ Complies with Stockholm Convention	✘ Reliable electricity connection needed ✘ Higher maintenance (internal moving parts)

Health and environmental aspects

Frictional heat treatment is an environmentally friendly technology. No hazardous emissions or effluents are generated. There are no specific pollutant emission limits for frictional heat treatment systems. The system needs to be completely enclosed to prevent emitting aerosols during the waste shredding process.

Figure 8. Frictional heat treatment process



Credit: Newster System Srl, Italy

Installation requirements

- Electricity: 400 Volt – 50 Hz
- Water connection: Yes
- Quality of water: Running water (should meet the quality specified by manufacturer)
- Waste water connection: Yes

Capacities and consumptions

Frictional heat treatment systems range in capacity from 10 to 600 kg per hour. The cycle time includes the time needed for adding in waste, frictional heat exposure, and waste removal. The table below provides some examples of capacities and consumption. The consumption is based on a maximum load capacity per cycle and with standard configuration of parameters:

Capacity (kg/cycle)	11–13	18–20	45–50	55–60
Cycle time (minutes)	40–50	30–45	45–50	35–45
Energy consumption (kWh/cycle)	10–12	12–14	30–35	35–40
Water consumption (l/cycle)	5–15	15–40	30–50	75–90

Data provided by: Newster System Srl, Italy.

4.2 Chemical-based processes (automated)

4.2.1 Sodium Hypochlorite-based technology

This chemical-physical treatment technology ensures the disinfection of infectious wastes by using the oxidation power of sodium hypochlorite (NaClO). Contrary to manual treatment of infectious waste by chemicals, the process is automated and controlled continuously, to ensure effective and safe decontamination of waste. This is still a technology with limited evidence and examples of effective application. The system automatically controls chemical-physical parameters during the oxidation process (pH, temperature and conductivity). The waste is fed into the system by a conveyor belt or directly into the shredder where it is shredded under negative pressure conditions and in an oxidizing atmosphere. The air is filtered by a HEPA filter. During the oxidation process in the reactor, an air-aspiration system passes all the gases into a liquid chemical trap (neutralization), and then through carbon filters, so there are no hazardous emissions into the atmosphere. After