

High laboratories is
now also available for



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High heat system uses the process of combustion pyrolysis to destroy the waste by operating at temperatures ranging from 600° C to 1500°C.

Various kinds of thermal equipments which are used for treatment of hospital waste are the Autoclave, the Microwave system and the Incinerator.

1. Autoclaving:

The process of autoclaving of sterilisation by steam under high pressure, generally used for sterilisation of instruments and linen in operation theatres and microbiology laboratories is now also available for final treatment of hospital biomedical waste.

Autoclaves can be classified into two basic types: i. Gravity type autoclaves: Where air is evacuated from the treatment chamber by steam pressure alone. It operates with steam temperature of 120°-122°C and has a cycle time of 60-90 minutes to achieve full steam penetration into the articles to achieve complete sterilisation. ii. Prevacuum type autoclaves: Where a vacuum pump is used to evacuate air from the treatment chamber in order to reduce cycle time to less than 60 minutes, with temperature reaching up to 132°C for full steam penetration into the articles. The important point to note is that proper temperature, pressure and holding time have to be matched to achieve desired level of sterilisation.

Generally, all infectious waste should be treated at 121°C with holding time of 30-60 minutes. Autoclaving reduces the volume of waste by a small amount, with plastic material melted and disfigured. Addition of equipment like shredder, grinder and compactor helps in shredding, pulverising and compacting the waste. This helps in volume reduction.

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2. Microwaving:

Microwaves are electromagnetic waves which enter into or penetrate materials. When exposed to microwave energy, molecules of a mass are put to vibration which produces heat, resulting in disinfection. Unlike autoclaving which heats the waste from the outside, in the microwave heating occurs inside the waste material. Maintenance of temperature of 95° to 100°C for a holding time of 25 minutes ensures that all microorganisms are killed. Unlike autoclaving, microwave process is a more automated process. It results in volume reduction of the waste upto about 80 per cent of its original mass even though there is no weight reduction. However, one of the major disadvantages is that it is not able to penetrate large objects like amputated limbs and similar anatomical waste.

Its capital cost and operational cost are quite high, besides requiring skilled operators.

3. Incineration:

Incineration is a process by which combustible material is burned at high temperature under controlled conditions to convert waste into harmless mineral residue and gases. Combustion of biomedical waste is a chemical process that involves rapid Oxidation of organic substances in the waste (notably carbon, hydrogen and oxygen).

Complete combustion of organic constituent's required exposure of the material to required temperatures and specified residual times. From the initial incinerator technology of single-stage type where the waste was simply placed on a grate with under fire injected by natural draft and

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emissions let out directly into the atmosphere, the technology advanced to two-stage incinerators which employ the use of an afterburner with excess-air injectors. Volatile chemicals and combustion gases produced in the first chamber are heated in the second chamber to about 1050°-1100°C with excess air, and held at this temperature for a period of a few seconds. The main objective of this stage is to destroy all chemicals and volatile products produced during stage one, including dioxins and furans. Even with this it is not possible to eliminate the polluting gases, which are barely visible particulate matter, and carbon monoxide due to incomplete combustion. Hydrochloric acid vapours produced on burning of chlorinated plastics, oxides of nitrogen due to nitrogenous compounds in the waste, heavy metals like lead, nickel, cadmium and mercury, and dioxins and furans which tend to reform when gases are cooled below 400°C in presence of particulate matter and chlorine. Dioxins and furans: A special group of chemicals, these are persistent organic pollutants that can cause debilitating illness, and being carcinogenic can cause severe reproductive and developmental defects.

Dioxins and furans are born of inefficient incineration technology. They accumulate in the body via breathing, skin contact and through diet. They also harm the body's natural immunity, and exposure to dioxins is a significant factor in genetic birth defects. Burning of plastics is a major source of dioxins and furans.