

Autoclave

Autoclave is an instrument used **moist heat sterilization** techniques by using steam in the range of 121-134°C. Steam under pressure is used to generate high temperature needed for sterilization. Saturated steam (steam in thermal equilibrium with water from which it is derived) acts as an effective sterilizing agent. Steam for sterilization can be either wet saturated steam (containing entrained water droplets) or dry saturated steam (no entrained water droplets) as shown in figure 1.



Figure 1: shows Autoclave

Autoclaves use pressurized steam to destroy microorganisms, and are the most dependable systems available for the decontamination of laboratory waste and the sterilization of laboratory glassware, media, and reagents.

Why is it called an autoclave? Because it describes a device that automatically locks shut when the pressure rises (to avoid steam spraying out if you open it by accident).

The word is French, and comes from the Greek "auto" for automatic and the Latin "clavis," for key (as in lock and key).

Theory of Operation

An autoclave is a large pressure cooker; it operates by using steam under pressure as the sterilizing agent. High pressures enable steam to reach high temperatures, thus increasing its heat content and killing power. Most of the heating power of steam comes from its latent heat of vaporization. This is the amount of heat required to convert boiling water to steam. Ensure that there should be sufficient water in the autoclave to produce the steam. The stages of operation of autoclaves include air removal, steam admission and sterilization cycle (includes heating up, holding/exposure, and cooling stages).

1. Operation Principle

The diagram of an autoclave that shown in figure 1 describe the simplicity of its operation as following:

- Basically, steam enters the chamber jacket, passes through an operating valve and enters the rear of the chamber behind a baffle plate.
- It flows forward and down through the chamber and the load, exiting at the front bottom.
- A pressure regulator maintains jacket and chamber pressure at a minimum of 15 psi, the pressure required for steam to reach 121°C (250° F).
- Overpressure protection is provided by a safety valve.
- The conditions inside are thermostatically controlled so that heat (more steam) is applied until 121°C is achieved, at which time the timer starts, and the temperature is maintained for the selected time.

2. Parts of Autoclave

Autoclave is consist of the following components as shown in figure 1, they are:-

1. **Pressure regulating:** A device that regulate the pressure of autoclave.
2. **Pressure gauge:** A mechanical device that indicate the vapour pressure inside the autoclave.
3. **Safety valve:** A device that impedes the vapour pressure from rising above a determined value.
4. **Autoclave (Cover)**
5. **Handles:** to allows the operator to open and close the door.
6. **Sterilization chamber:** The space where objects or materials to be sterilized are placed.
7. **Steam release valve:** is a device remove all the steam out of autoclave.
8. **Vacuum release valve:** is a device remove all the air from inside autoclave.
9. **Outer stand:** to fix the device on the surface.

3. Application of Autoclave:-

1. Cleaning
2. Decontamination
3. Inspection
4. Preparation and packing
5. Sterilization
6. Storage
7. Delivery of materials

Notification: - **Not all objects** can be sterilized with moist heat, some require sterilization procedures **at low temperature** according to the type of material such as **rubber**, **plastics**. The degree of autoclave is selected according to the following table:-

Materials	Temperature C	Pressure Kg/cm²
1-Porous loads 2- Textiles 3- Wrapped instruments 4- Tubes	135	2.2
Open instruments 1- Utensils 2- Glassware 3- Open containers	135	2.2
Heat sensitive materials 1-Rubber 2-Plastic	121	1.1
Liquids in open or semi-closed containers	121	1.1