Autoclaves Summary

Autoclaves are used in many areas to sterilize materials by high heat and pressure. The hot (132 oC [270 oF]), pressurized (30 psi) steam that autoclaves generate make them serious burn hazards as well. Burns can result from physical contact with the autoclave structure and from contact with the steam leaving the unit. Explosive breakage of glass vessels due to temperature stresses can produce mechanical injury, cuts and burns during opening and unloading the unit. Burns can also result from careless handling of vessels containing hot liquids.

Additionally, because of the extreme conditions created inside steam autoclaves, they can easily malfunction if not carefully maintained. Because each autoclave make / model has unique characteristics, it is imperative that you read and thoroughly understand the manufacturers operating procedures before you use an autoclave for the first time.

An autoclave uses different patterns of high heat, vacuum and pressure to sterilize material. The main types of runs are:

- liquids, for any type of water-based solutions,
- dry goods with vacuum, and
- dry goods without vacuum

Autoclaves often have an additional drying cycle in which hot air is drawn through the chamber to dry materials after sterilization. Remember, controls for different brand of autoclave vary making it important to carefully follow the manufacturer's instructions about loading, load sizes, and cycle types and settings.

The *liquids* run is longer than the other two types, but uses lower temperatures to minimize evaporation of the liquids being sterilized. Insure seals on liquid containers are loose so any expanding vapors produced during heating will not cause an explosion. Use a tray with a solid bottom and walls to contain the bottles and catch spills. Never autoclave any flammable or volatile liquids.

The *dry goods with vacuum* run moves steam and heat into the deepest part of large bags or bundles of materials and produces the best conditions for killing persistent organisms. During this procedure, they chamber alternates between cycles of high pressure, steam and vacuum. It is important that steam and pressure be able to reach the entire load, so carefully loosen bag closures once they are in the autoclave.

The *dry goods without vacuum* run simply pressurizes the chamber with steam for the duration of the cycle and then returns to normal. This process is primarily used for items that have been cleaned but need to be sterilized. Materials should be packed so that the heat and pressure can readily reach the whole load.

Autoclaves generate extreme heat and high pressures, users should understand and respect the hazards these create. To prevent a sudden release of high-pressure steam, firmly lock autoclave doors and gaskets in place before you run the autoclave. Most, but not all autoclaves, have safety interlocks that prevent operation if the door isn't closed properly. Know if your autoclave has interlocks and take extra precautions if it is not equipped with interlocks.
Some older autoclaves have little or no heat shielding around the outside. For these systems, attach *Hot Surfaces, Keep Away* warning signs to remind people of the hazard. Do not stack or store combustible materials (e.g., cardboard, plastic, volatile or flammable liquids, etc.) next to an autoclave.

When operating an autoclave, follow these precautions:

- Load the autoclave properly. Be sure to clean the drain strainer before loading. Don’t load plastic materials that are not compatible with the autoclave. Individual glassware pieces should be within a heat resistant plastic tray on a shelf or rack, never place them directly on the autoclave bottom or floor.

- Be sure the autoclave is OFF and the steam pressure is down before opening the door.

- Open the door slowly, keeping head, face and hands away from the opening.

- Wait at least 30 seconds after opening the door before reaching or looking into the autoclave. Before removing autoclaved items, wait 5 minutes for loads containing only dry glassware and 10 minutes for autoclaved liquid loads.

- When removing items from the autoclave, wear heat-resistant, long-sleeved gloves and safety glasses or goggles treated with anti-fog solution. Remove solutions from the autoclave slowly and gently, some solutions can boil over when moved or when exposed to room temperature.

- Let glassware cool for at least 15 minutes before touching it with ungloved hands. Be alert for autoclaved liquid bottles still bubbling. Let liquid loads stand in an out-of-the-way location for a full hour before touching them with ungloved hands.

- Clean up any spills immediately.