

## Safety, Hazard Containment & Sterilising Equipment

### Taking care with autoclave loading

Lee Oakley, Sales Director, Priorclave

The whole purpose for research institutions and industrial laboratories using autoclaves is that of sterilisation. The aim, to destroy any micro-organisms in waste products before discarding or sterilising glassware, etc. before re-use. Improperly autoclaved items could result in contamination, lost time and wasted money and in extreme circumstances much worse.

In steam sterilising the sterilising agent is, by definition, saturated steam. To ensure that sterilisation takes place the autoclave chamber, (a sealed pressure vessel) must contain dry saturated steam held at temperatures, typically, up to 140°C and a pressure of 2.4bar.

This steam must come into contact with the items being sterilised. If items in the autoclave chamber do not come into direct contact with saturated steam, they will not be sterilised properly. It is therefore essential to ensure correct loading of the autoclave chamber, allowing adequate steam flow and penetration of the items.

To create proper sterilisation air must be removed from both the load and the chamber. This can be accomplished in a number of ways. Air removal from high mass low surface area items (i.e. comprising mainly solid areas that contain little or no air pockets such as bottled media) will require little air removal, this can be facilitated by automatic air purging. Here air is allowed to leave the chamber through a vent as steam enters the chamber either from an integral source (upward displacement) or an external supply (downward displacement) with the vent only closing when all of the air is removed from the chamber.

This method can be further advanced by 'Freesteaming' when the vent is allowed to stay open for a set length of time once the autoclave is above 100°C. The turbulent steam then passes through the vent forcing any trapped air out of the autoclave. This helps with air removal and is useful in a different way for liquid loads as it effectively holds the autoclave chamber at 100°C so that the liquid load temperature can catch up with it.

In some systems there is the option to pulse the 'Freesteaming' by repeatedly allowing pressure to build and then releasing it to assist with air removal from laboratory waste loads in particular. Freesteaming of Pulsed Steaming is however not suitable for liquid loads.

For more stubborn loads that contain a number of air pockets such as wrapped instruments or fabrics, especially where large or tightly packed loads are concerned air removal can be further assisted by using a vacuum system at the start of a cycle to remove air from within the autoclave chamber and load, which can then be replaced actively with steam as the autoclave heats up.

#### A false economy

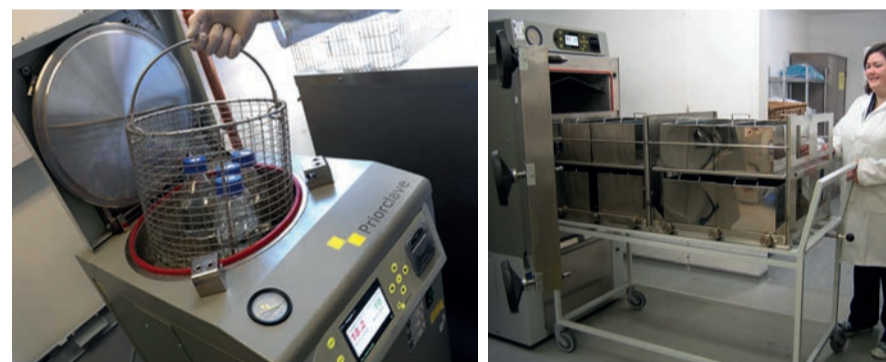
Having established what is required within the chamber, (dry saturated steam) it is important to appreciate the care required when loading. Sterilisation can only take place when the steam is allowed to flow freely within the chamber so that it comes into direct contact with items to be sterilised – waste, glass bottles, etc.

Laboratory and Research Grade autoclaves, in the main, are available with either cylindrical, rectangular or square chambers.



When making a purchase, chamber size and style can have a major influence on lab efficiency.

Where higher daily throughputs are required, many lab managers may opt for a rectangular chamber, straight sides mean more items can be loaded into the sterilising chamber, from wall to wall, top to bottom. But, when fully loaded is the rectangular chamber design more efficient, does it provide effective sterilisation and what about overall cost of ownership? Could a cylindrical chamber be a more viable alternative?



Laboratories looking to invest in a new autoclave and requiring a higher throughput may initially look to purchase a rectangular chamber design. Size for size in chamber capacity, it would seem to offer better loading than that of a cylindrical machine and look to be the right choice; more items could be crammed into the chamber. Are they a better buy? Is it false economy?

#### What are the pros and cons? Here a just four basic comparisons.

Rectangular Chamber Autoclave	Cylindrical Chamber Autoclave
More expensive, could be up to 50% dearer.	Less expensive, simpler manufacturing process, quicker customer delivery.
More metal, greater density - longer to heat-up.	Less metal, heats up more quickly.
Uses more energy.	More efficient, lower energy costs.
Extended heating time reduces number of sterilising cycles per day.	Faster heat-up means more sterilising cycles per day.
Potential for easily overloading the chamber.	Cylindrical chambers by their nature tend to prevent overloading.

The above comparison hopefully will encourage autoclave purchasers to raise more readily issues such as cycle times for heating and cooling, and become more aware of the important of load density. It could sway the buying decision – what can process more.

In fact, a cylindrical chamber autoclave often offers a Lower Cost of Ownership and is more energy efficient.



Read, Share and Comment on this Article, visit: [www.labmate-online.com](http://www.labmate-online.com)