Developments in bench top sterilisers

The latest sterilisers have come a long way in recent years

By Deborah Thame, B.Pharm

"Developments in technology, based on the science of sterilisation, have allowed engineers to include significant advancements into the design of sterilisers... raising the standards of sterilisation available to dental professionals..."

When choosing a new steriliser for the modern dental practice, you can be faced with an overwhelming selection of equipment to choose from. To assist with your evaluation of bench top sterilisers, it can prove useful to understand some of the recent developments in these sterilisers and how the various features will impact on day to day operation.

The fundamental function of a bench top steriliser is the same as it has always been: to create steam under pressure in order to kill any living organisms present within a load. It is how they do this and how they carry out and monitor the total process that has changed dramatically in recent years.

In basic steam sterilisers, water is put into the chamber, the chamber is then heated by elements, boiling the water and producing the steam. As more steam is created in the sealed chamber, the steam rises and the air is pushed downward through the load and finally pushed out of the chamber through one-way vents in the bottom of the chamber. This is commonly referred to as "downward-displacement" as the air is displaced by the downward movement of the steam. Most old bench top sterilisers and some new ones are downward-displacement sterilisers. The chamber is then heated further until the sterilising temperature is reached and it is then held at that temperature and pressure for the holding period of sterilisation. The steam is then vented out of the chamber and, in some cases, the load is dried before removal of the items from the chamber for use. Functional improvements have been made to many of these stages of the sterilising process that not only provide a better quality and reliability of sterilisation but usually a faster cycle speed as well.

Steam generators

A significant development first introduced in the new generation of B-class sterilisers is 'pre-boiling' the water outside of the chamber by means of an 'internal steam generator' and then injecting steam directly into the chamber. The development of internal steam generators has revolutionised bench top sterilisation. Sterilisers with steam generators have much faster cycle times than those that do not and they rarely have any problems with wet or dry steam, two serious problems often seen with older sterilisers.

Steam generators are new and patented technology and so their inclusion will affect the price of the steriliser. Only certain models of some brands of sterilisers include this technology and there is significant variation between different brands of sterilisers with respect to the quality and speed of their steam generators

Vacuum pumps

The use of a vacuum pump to actively pull air and/or steam out of the chamber is another significant addition to bench top steam sterilisers. The vacuum can be used many ways to remove air from the chamber, often with just one pull of vacuum

(for simple loads) or by repeating a pull of vacuum followed by an injection of steam a few times. This repeated pattern is very useful in removing air from 'difficult to sterilise' places within the load. This is important because if the air is not removed completely, the steam cannot get in completely and the 'difficult' places will not be sterilised. 'Difficult to sterilise' places include the inside of narrow tubular spaces such as reusable aspirator tips and handpieces (often referred to as Hollows) as well as inside thick packages of fabrics. Sterilisers that use a combination of repeated vacuum and steam injection allow the operator to safely sterilise such items.

The use of the vacuum pump during drying is another improvement. Not all downward displacement sterilisers include drying, but those that do dry by heating the chamber to make the air hot enough to evaporate the moisture from the load. The use of vacuum pumps in sterilisers provides significant improvement in drying. Moisture evaporates at a lower temperature under vacuum. B-class sterilisers dry under vacuum; they dry much faster and at lower temperature than older sterilisers. The result is a shorter cycle time and also reduced heat-related damage to instruments. Both of these are important. Choosing a steriliser that dries well is essential when sterilising wrapped loads, particularly for 'critical' dental instruments which must always be sterilised wrapped (refer AS/NZS 4815:2006 6.1.2). Reducing heat-related damage is important, particularly for sharp instruments that can be easily damaged by high temperatures.

The size and quality of the vacuum pump has a significant effect on the speed of the cycle, the steriliser's robustness under busy use and its expected working life. Larger, heavy duty vacuum pumps deliver the fastest cycles and improved reliability when used for busy workloads but will naturally cost more. Smaller pumps will result in a longer cycle and increased workload on the pump which ultimately affects the reliability and the working life of the pump. 'You get what you pay for' definitely applies to vacuum pumps.

S-class sterilisers that have a vacuum pump normally only have a small one which is very effective at removing air from simple loads but they are not suitable for sterilising Hollows. Certain S-class sterilisers utilise pressure-pulsed technology to enable sterilisation of Hollow A items. Downward displacement sterilisers have no vacuum pump and are not suitable for sterilising Hollows.

The state-of-the art Mocom steriliser production line

Internal condensation coils

To remove the steam at the end of the sterilisation cycle, downward displacement sterilisers normally vent the steam from the chamber into the room in which the steriliser is located. Most new sterilisers condense the steam within cooling coils, collecting the waste water in an internal tank or emptying it directly into a sink drain. This much quieter function reduces the safety hazard of venting hot steam and also problems such as mildew caused by the increased humidity in the environment of the steriliser.

Process Monitoring Systems

All B-class sterilisers, and some S-class sterilisers, now include comprehensive process monitoring systems (PMS). These small 'computers' constantly monitor all the functions of the steriliser, including constantly monitoring the chamber for temperature and pressure via temperature and pressure probes. They will alarm if any of the essential functions or parameters of the sterilisation fails, giving the operator complete confidence in the sterilisation process. The PMS facilitates the printout of the cycle parameters and also enables the downloading of the cycle parameters electronically for storage purposes, both of which are useful in providing confirmation of successful sterilisation. As the PMS monitors the parameters inside the chamber throughout the cycle, some of these sterilisers have been programmed to shorten the cycle time if the load is smaller, which is particularly useful for emergency processing of one or two instruments.

The technology of modern sterilisation equipment has come a long way in recent years. Developments in technology, based on the science of sterilisation, have allowed engineers to include significant advancements into the design of sterilisers for use in office-based practices, raising the standards of sterilisation available to dental and medical professionals.

About the author

Deborah Thame is the co-founder and Managing Director of STS Health, an Australian company specialising in the sale and maintenance of steam sterilisation equipment. STS Health imports the Mocom range of Millennium sterilisers available through Henry Schein Halas nationwide. For more information, call (08) 9244-4628 or visit www.stshealth.com.au