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Learning Objectives

1. Explain why SPD professionals historically left the door to the sterilizer cracked open to dry loads.
2. Explain why leaving the sterilizer door cracked can actually inhibit the drying process and could compromise the sterility of a pack.
3. Describe the proper technique for drying loads to ensure sterility.
4. Understand the importance of addressing the underlying causes of wet pack issues.

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SELF-STUDY SERIES

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Cracking the steam sterilizer door: Dispelling the myth

by Linda Clement, marketing manager, and John Bliley, service engineering manager, STERIS Corporation

It's a typical day in the sterile processing department, with the whirl of continuous activity as department personnel are scrambling to meet the many needs of their internal customers. A steam sterilizer in the department buzzes to let the operator know that a cycle has just completed. The operator approaches the sterilizer, reviews the cycle print-out for appropriate sterilization parameters, and signs the print-out acknowledging that appropriate cycle parameters have been met. The sterilizer door is unlocked and cracked six inches and will be left in that position for approximately 15 minutes. This is a process that has been used for many years to help dry loads after steam sterilization, but is it a necessary process, or even a good one?

A bit of sterilization history

Back in the 1950s and 60s the only steam sterilizers in use were gravity-displacement models and the primary barrier product used at that time for packaging instruments was reusable muslin sterilization wrap. Gravity-displacement sterilizers were able

to sufficiently dry these muslin-wrapped packs with reasonable success. When an operator identified a wet pack problem (usually wet towels), the natural inclination was to let the packs bake in the sterilizer by leaving the load in the sterilizer with the door cracked for a period of time. This process took a while, but it was basically effective.

It is interesting to note that wet packs with muslin wrappers were almost universally wet *inside* the pack, while the outer wrapper was completely dry. Without a wet spot on the muslin wrapper, any organism, if present when the door was cracked, would not be able to penetrate the wrapper, so using the cracked door technique was not really a problem from a sterility maintenance standpoint.

In the late 1960s vacuum-assisted steam sterilizers became available and, with them, a much improved drying process - deep vacuums. Drying was more efficient and the cracked door technique was really only necessary for gravity-displacement sterilizers or when using gravity-displacement cycles, which was becoming less and less common in the modern sterile processing department.

Also during this time period, manufacturers became interested in providing good steam quality in steam sterilizers and in designing systems that could work with existing steam. However, the techniques for making improvements were still in the developmental stage, and this led to the increasing occurrence of wet loads. Sterilizer operators were forced to develop their own processes that allowed them to provide acceptable "product" to the operating rooms.

In the 1980s another change occurred that rocked the healthcare sterilization industry: the introduction of non-woven disposable wrap for sterile processing. Although this type of sterilization wrap created serious challenges for sterilizer manufacturers because of its less tolerant drying ability, non-





woven sterilization wrap was loved and heartily embraced by sterile processing professionals because it improved the shelf life of sterilized packs, eliminated the need to carefully inspect each reusable muslin wrapper prior to use, and did not require hole-mending (there was never a professional consensus to how many patches were allowed before a muslin wrap was considered to have reached the end of its useful life). It was soon evident that drying times that worked successfully with muslin wrapped items were now inadequate for the new non-woven disposable sterilization wrap. Sterilizer manufacturers expended great effort to figure out how to best improve processes and sterilization cycles to compensate for the challenges created by the new sterilization wrap.

One of the phenomena that occurred with the non-woven sterilization wrap was water droplets on the exterior of packs at the end of the cycle. Various methods were used to address exterior droplets (linen shrouds, pack placement, lining sterilizer cart shelves with absorbent materials, etc), and one of them was cracking the door at the end of the cycle. It was discovered that if you left the load in long enough, the exterior droplets would disappear. Although this practice was successful in removing the external water droplets, it was an issue from a sterility maintenance standpoint.

Let's look at the reason why. We are all taught that a breach in the barrier in any type of sterilization packaging can allow microorganisms to enter a package after it is processed. Any pack that shows evidence of moisture (e.g., visible stains) should be rejected by the sterilizer operator. In the case of a sterilized load we may open the sterilizer door and see external water droplets. This moisture has about the same potential for allowing organisms to penetrate the package barrier as a spilled cup of coffee has on the same package on a sterile storage shelf. Actually, there are some differences - the moisture repellent characteristics of a hot sterilization wrapper are different from those of a cold wrapper, and the likelihood of an organism found in the SPD surviving the very hot and humid environment that occurs in the sterilizer while the door is cracked is pretty minimal.

However, the overriding fact is this - there is no guarantee that this recontamination will not take place. Until a non-woven sterilization wrap manufacturer makes a

formal claim that their products can prevent recontamination when water droplets are present, SPD professionals need to reject any wrapped pack that has external moisture droplets at the end of a cycle. Unfortunately, this also means that personnel must not use the cracked-door technique to help finish the drying process.

If not the cracked-door, what should sterile processing personnel do to dry loads?

In the case of sterilized packs with internal moisture, leaving products in the sterilizer with the door cracked to assist drying may not work as well as pulling the load out of the sterilizer and into the cool-down area. As long as the sterilization wrapper does not have external moisture, the wrapper will protect the inside of the pack from contamination, even if the inside of the pack is still damp. If the load is left in the sterilizer with the door cracked, the inside chamber temperature is still very hot, and the differential between the pack and the outside air temperature is minimal, and probably not much more than 20°. The humidity inside the sterilizer is also not as low as it is outside, so any moisture that is still in the pack doesn't have much motive force to be driven outside of the pack. Because of the physics involved, leaving a load inside the sterilizer with the door cracked can actually inhibit the drying process.

When a pack is removed from the sterilizer, it remains hot from the sterilization cycle, usually more than 200° F (93° C). If the load is moved into the cool-down area, where the temperature is generally maintained between 68° and 75° F (20° to 24° C), the temperature differential between the inside of the pack and the cool-down area is approximately 130° F (54° C). This differential will help drive off the moisture from the inside of the pack. Once a cart is removed from the sterilizer and packs have reached room temperature, there is no temperature differential, and the drying process will be complete. This is the rationale for allowing packs to cool for at least an hour after processing.

It is also extremely important to avoid placing hot sterilized loads directly under air conditioning vents during the cool-down process. This would be as damaging as placing hot sterilized packs on a cold, solid, metal shelf. The pack would cool far too quickly, resulting in condensation or



“sweating” of the packs. The moisture that remains in the pack will become condensate instead of being driven off as vapor, causing the load to be considered contaminated and in need of reprocessing.

Address ongoing wet pack issues

If a healthcare facility is experiencing problems with external moisture on packages, there is an underlying issue that absolutely must be addressed, whether it is a problem with excessively wet steam, poor loading techniques, or a true sterilizer malfunction. Cracking the sterilizer door is NOT the answer. Over time, sterile processing staff members have used a variety of methods to compensate for poor steam quality, but the more prudent thing to do is to perform a thorough wet pack investigation to find the root cause of the moisture and work diligently toward resolving the underlying issue.

Although necessary in the days of muslin sterilization wrap, it is no longer necessary to crack the sterilizer door following a steam sterilization cycle and it may in fact hinder the drying process. The door-cracking process has been passed down in sterile processing departments over the years as a natural and necessary part of the sterilization process, without any factual basis. It is time to let go of one more of our sacred cows and reap the benefits of increased productivity by allowing the cooling process to begin as soon as possible after sterilization and freeing the sterilizer for additional loads to be processed. **HPN**

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