The SPD force multiplier: Ultrasonic cleaning

by Kati1n Slaper-Hawranko, MBA and Sandra Beauclair, BSN, RN, CNOR

“Baseball, hot dogs, apple pie and . . . ” Every American baby boomer can finish this ad slogan. Written by copywriter James W. Hartzell for a 1970’s commercial, it has remained in our memories far longer than even Hartzell himself might have expected. You might even say it has become part of our American culture.

Inside the healthcare sterile processing culture, there is no such memorable slogan for “cleaning, decontaminating and sterilizing.” These three words, however, do go together, just like baseball, hot dogs, and apple pie. They are the indelible triune of activities at the core of instrument processing, not just across the United States but around the globe. How well the sterile processing community executes each of these activities has a direct effect on the safety of patients and healthcare workers, and on the reputations of healthcare providers.

As sterile processing professionals, we know that successful sterilization and high-level disinfection of reusable devices, including those with lumens, is dependent on 100 percent complete cleaning beforehand. But thorough cleaning can be challenged by a multitude of factors, such as multiple types of instrument substrates, complex device configurations, challenging organic (blood, tissue, fat and bone) and inorganic (IV fluids, medicines, skin cement) soils, inconsistent practices, and ineffective or insufficient cleaning tools.

Not having effective tools for each job is a major hindrance for any sterile processing department (SPD), but is especially problematic for those with many highly specialized, delicate instruments to clean. The good news is; there are many great tools for instrument cleaning jobs in the SPD. This module specifically discusses the ultrasonic washer as a force multiplier in the SPD.

Ultrasonic cleaning: Why do we need it?

If surgical technicians have done their job in the operating room, reusable surgical instruments used in procedures will have been cleaned of gross soils, flushed to remove blood and debris, and moistened with an enzymatic solution or a moisturizing spray for transport. Once they arrive at the decontamination area of the SPD, the next event in the cleaning process is to remove the remaining bioburden.

Ideally, instrument sets would arrive one at a time and be processed immediately. However, in busy multi-OR facilities, SPD technicians must sometimes deal with back-up delays (instruments arriving at a faster pace than they can be processed in the decontamination area). Delays afford microbes the opportunity to grow, biofilm the chance to develop, and blood the time to dry.

Blood has unique properties that make it particularly challenging to remove. As a liquid, blood acts much like the molten meteor in the 1958 science fiction film, The Blob. It oozes into the cracks and crevices of surgical devices. Once settled into these hard-to-reach spaces, blood coagulates and dries. The fibrin filaments in coagulated blood cling to microscopic irregularities on instrument surfaces, requiring rehydration and mechanical action to remove. Once all pre-cleaning steps (soaking, inspecting, priming, brushing, flushing and rinsing) are complete, there are two washing options; manual or automated processes. Washer-disinfectors, when used with the correct detergents, time, temperature and impingement action, are extremely effective at removing bioburden. However, automated washers are not an option for every reusable medical device, especially for delicate robotic or eye instruments.

An ultrasonic washer is an effective alternative for these delicate devices, if it’s used following the manufacturer’s instructions for use. It is gentle enough for delicate instruments or instruments that have a complex, intricate design, yet powerful enough to dislodge bioburden from hard-to-reach places. The primary role of ultrasonic systems is to provide another qualitative level of mechanical...
cleaning that enables a consistently effective process and outcome.

The science of sound — from the sea to the SPD

Ultrasonic (ultra = beyond, sonic = sound) technology has been around for a long time. The science of sound dates to the sixth century BC, when Pythagoras, a Greek philosopher and mathematician, first documented the mathematical properties of stringed instruments. Sound waves continued to be studied during the following centuries. In 1790, one hundred years before ultrasonic technology had a human application, biologist Lazzaro Spallanzani discovered that high-frequency sound waves were used by bats. In 1916, the hydrophone, an underwater microphone, was invented as a result of the Titanic tragedy. This electric oscillator emitted and received a high-frequency signal to indicate the presence of objects in the water, e.g., icebergs. This ultrasonic technology is known as sonar.

Ultrasonic cleaning was introduced to the healthcare industry in the 1950s. The advantage of ultrasonic cleaning is that it can effectively contact the bioburden hidden in hard-to-reach places of intricate reusable medical devices and remove it.

Ultrasonic cleaners and ultrasonic irrigator systems are becoming more common in healthcare. Although there are no universal standards for ultrasonic systems yet, ANSI/AAMI ST79:2013 does state that “ultrasonics are of great value” when used as part of the manual cleaning process. In addition, ultrasonic cleaning is starting to be documented as a best practice. The greatest benefit of the ultrasonic technology is that it allows microscopic bubbles to reach surfaces of instruments that have either been missed during the manual cleaning process or are unable to be reached by a technician due to the complexity of the instrument.

Ultrasonic technology is quite simple, yet it’s powerful. All ultrasonic units are equipped with a generator and transducers. The generator creates and sends energy to the transducers, which are most commonly bonded to the outside of the unit’s tank, but can also be mounted inside the tank (these are known as submersible transducers). The transducers, once energized, push sound waves through a medium. When the sound waves are passing through, they create vibrations, which in turn create microscopic bubbles. These microscopic bubbles are under varying states of pressure during a cycle. When the bubble can no longer withstand the pressure, it collapses, and as it collapses it forms a stream of water. This stream of water, when next to the surface of an instrument, can push gross soils from the intricate crevices and surfaces of the device.

Although the basic technology of ultrasonic systems has remained the same throughout the years, there have been some practical advancements, such as increased chamber capacity and the ability to sonically irrigate the lumens of newer minimally invasive and robotic devices.

Before you buy: Consider everything you need

There are numerous ultrasonic cleaning systems on the market for use in the healthcare industry. Here are some key items to consider when determining which one will best meet your needs:

1. Space considerations. Budget conscious SPD management needs to be able to do more with less — and that includes less space, which is at a premium in many SPDs. Smaller equipment footprints are a must-have. Even if space is an issue, there are options available that allow an ultrasonic to be added to the workflow. For example, a reprocessing sink can have an integrated ultrasonic bay, or smaller tabletop units are available that can fit nicely on a counter. These options allow departments to benefit from ultrasonic cleaning if they have space constraints or just need a lower capacity unit.

2. Capacity and tray flexibility needed to keep up with your SPD. To keep workflows moving, units that have the capacity to process more trays, more lumens, and a higher weight load are of utmost importance. It is equally important for hospitals to be able to use their own hospital trays in their ultrasonic units. It’s time-consuming to require a technician to clean a set of instruments and then remove them from the original tray to put them into a different tray that is specific to the ultrasonic system. Ultrasonic units that can accept the most commonly used trays can keep the workflow moving.

3. Ability to track, store and export cycle parameters. To be compliant with industry standards and recommended practices, data retention is becoming an important topic. Auditors want to know things like how technicians are verifying their water temperature, and how they assure that the correct chemistry dosage is being delivered. In any fast-moving SPD, no one has time for yet another task to monitor and track these details. Many ultrasonics today can capture the date, time, user ID, temperature, cycle time and chemistry dosage. Having a system that can capture these key cycle parameters, and can export them when needed, helps audits run smoothly and keeps the SPD in good standing.

4. Cycle flexibility. It is important to remember that no one instrument is the same and there may be specific types of instruments that require different cycle phases. Having the flexibility on the unit to customize cycle times and phases can prove to be beneficial and further help to streamline the cleaning process.

In addition to these key workflow factors, there are other important features to consider. For example, while many instrument
started. If the foil comes out with a uniform foil is placed in the tank and the ultrasonic is system has been degassed, the form with form covered by a piece of foil. After the the tank. This test is conducted with a wire method to check for ultrasonic activity in the unit is functioning.

The foil test is a simple, yet tried-and-true feature to have on a unit. This means that the external surfaces as well as internal surfaces are being exposed to ultrasonic energy. Many units on the market today only flush the lumen channels, but there are ultrasonic systems that also include special technology to produce a sonically charged jet of solution that is pushed through the internal channels. This leads to more effective cleaning.

Ultrasonic maintenance To ensure that your ultrasonic cleaner is working optimally it’s important to conduct routine maintenance on the unit. ANSI/AAMI ST79 recommends that “mechanical cleaning equipment ... be tested upon installation, weekly (preferably daily) during routine use, and after major repairs” (2013, p. 97). Users have options for what methods they use to verify that the unit is functioning.

The foil test is a simple, yet tried-and-true method to check for ultrasonic activity in the tank. This test is conducted with a wire form covered by a piece of foil. After the system has been degassed, the form with foil is placed in the tank and the ultrasonic is started. If the foil comes out with a uniform pattern of indentations, then cavitation is present. If a different method is preferred, there are other products currently on the market that monitor ultrasonic activity within the tank. Some indicators out there are also considered dual-purpose, and act as a cleaning indicator that will also prove cavitation is present in the tank.

Professionals plus equipment plus QMS equals verifiable outcomes The use of automated washing equipment is a force multiplier in the cleaning process. When properly used and maintained, it is effective, consistent, improves worker safety and turn-around times, and most importantly, it can improve patient outcomes. But it’s not enough to simply purchase an ultrasonic washer, plug it in and call it a day.

For any cleaning process to produce the desired outcome (squeaky clean instruments ready for sterilization) every time, it is necessary to have a robust quality management system (QMS) in place that will assure the safety of healthcare workers and patients. AORN states that a QMS provides a mechanism to:

• Evaluate effectiveness of processes
• Ensure compliance with manufacturers’ written IFU
• Develop processing policies and procedures
• Monitor the function of equipment

Cleaning reusable medical devices is a challenging endeavor that requires sufficient numbers of staff to help minimize delays in the cleaning process, both at the point of use and in the SPD. These professionals must also be well trained in all aspects of the cleaning process, and must have a working knowledge of how equipment works and the science behind the technology. Infection prevention and SPD leadership must develop a QMS that produces effective outcomes and that cultivates a culture of communication and compliance among all team members involved in the reprocessing cycle. Ultimately, it’s the human element that affects safe patient outcomes. HPN

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References
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Circle the one correct answer:

1. The sterile processing department must navigate and overcome several obstacles and challenges. A major obstacle can be the lack of capital equipment to meet the reprocessing demands of the department, while a challenge is often the inadequate pre-cleaning at the POU, both of which can cause delays at the decontamination space.
   a. True
   b. False

2. 100% complete device cleaning can be challenged by a multitude of factors, such as
   a. Multiple types of instrument substrates, complex device configurations, challenging soils
   b. Workflow back-ups that cause soils to dry on surfaces
   c. Inconsistent cleaning practices and lack of appropriate cleaning tools
   d. a and c
   e. a, b and c

3. The introduction of ultrasonic cleaning in the 1950s has been advantageous to the healthcare industry because it can:
   a. Remove gross soil without pre-cleaning instruments at the POU
   b. Remove bioburden from all surfaces except seams, lumens, nooks and crannies
   c. Remove soils trapped within hard-to-reach places of intricately designed surgical instruments

4. Ultrasonic technology is powerful because:
   A. Sound waves created by transducers are passed through the water creating vibrations that shake organic material loose from instruments
   B. Microscopic bubbles succumb to pressure and implode, creating a stream of water, which when next to the surface of an instrument will push gross soils off
   C. Hidden bioburden is removed from microscopic bubbles, created by the vibrations that when they encounter debris bump it free from the instrument

5. There are four key factors to consider when purchasing an ultrasonic washer. They are: unit size, tray and load capacity, data storage and export, and cycle flexibility.
   a. True
   b. False

6. All ultrasonic washers offer a thermal disinfection feature that renders instruments safe to handle, and therefore instruments do not need to be processed in a washer/disinfector before sterilization.
   a. True
   b. False

7. Sonic irrigation means:
   a. external surfaces are exposed to ultrasonic energy
   b. Internal surfaces are exposed to ultrasonic energy
   c. Both a and b
   d. Neither a nor b

8. Per ANSI/AAMI, mechanical cleaning equipment should be tested:
   a. When the system is installed and after significant repair work
   b. Weekly and after any big repair jobs
   c. At installation, weekly or preferably daily during routine use, and after major repairs
   d. None of the above

9. Per AORN, a quality management system provides a mechanism to evaluate the effectiveness of processes, ensure compliance with manufacturers’ IFU, develop sterile processing policies and procedures, and monitor equipment function.
   a. True
   b. False

10. There are ultrasonic function verification products available, but a simple “homemade” method is the:
    a. Aluminum foil test
    b. Aluminum can test
    c. Ceramic ring test

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