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# Winery Sanitation Driven by Changing Regulations and Consumer Demand

By Paul Franson

Winery sanitation used to be fairly straightforward: Wineries cleaned barrels and tanks with TSP, chlorinated cleaning materials and soda ash solutions, used chlorinated tap or well water for washing, while no one worried excessively about drains and a little sulfur dioxide was fine for sterilizing.

It seems that all of those practices are under fire, however. Product quality, consumer concerns, worker safety and the environment have all played a part in making winemakers and owners take a hard look at the practices once taught in schools. They're now eliminating chlorinated water, adopting aggressive barrel and tank cleaning equipment using new cleaners, using ozone and steam for sanitation, and taking a hard look at winery discharge. Many are also rethinking the use of sulfites in view of government and consumer demand, even considering screwcap closures that reduce its need.

More and more, wineries are recognizing that their products are truly food, and need to be produced to the same standards of sanitation as other foods, even if they are not as perishable as milk or meat. Fortunately, the alcohol component of the beverage helps preserve wine, as does the addition of SO<sub>2</sub> but, though these largely ensure the safety of the products, they don't equally ensure quality.

## No More Chlorine

Let's start with the simplest but most radical change: The elimination of chlorinated water. In the United States, of course, using chlorine to sterilize water has been commonplace for more than a century. An effective means to kill most pathogens, it is almost universally used by municipal water treatment facilities and also by most small-scale units designed for well water.

Unfortunately, it has been discovered that trichloroanisole, the compound responsible for 'corked' wines, is caused when certain bacteria feed on chlorinated water. This can be transmitted by corks, but also simply by contamination lurking in drains, barrels, tanks and even cardboard and wood products in the cellar.

The upshot: Chlorine, chlorinated water, and chlorine-based cleaning products and sterilizers have no place in any winery. Fortunately for many European and other wine companies, alternative sterilization methods such as ozone are widely used overseas. But since most American municipal systems use chlorine, wineries dependent on this source must install filters to eliminate it from their cleaning water.

## Ozone Attracting Wide Attention

Perhaps the most promising if somewhat controversial new development is the use of ozone for sterilization. The triatomic oxygen molecule is a very effective oxidizing agent, but is also highly toxic and can be a significant danger to workers if not handled carefully.

According to the Piper Environmental Group, ozone can oxidize organic compounds such as tannins and lignins, iron and sulfur-reducing bacteria, and volatile and synthetic organic compounds. It naturally kills a wide range of bacteria, viruses, molds, giardia and other threatening microbes. It can also



oxide inorganic compounds of iron, manganese, arsenic, bound heavy metals and also sulfides, cyanides and nitrates.

Ozone has a half-life of several hours at low concentration in dry air. In water, its half-life is instantaneous to several hours, depending on temperature, pressure and pH. Because ozone is highly reactive in a water solution, it can oxidize material between 10 to 1,000 times faster than most oxidants used in water treatment.

Because ozone has such a short half-life, it cannot be stored but must be generated on-site and used immediately. The most widely used method of generating ozone is corona discharge of electricity. A corona discharge system splits oxygen molecules into atoms that react with other oxygen molecules to form ozone.

Though atmospheric ozone is quite toxic in large concentrations, and workers must be protected from exposure, when dissolved in water it is safe, and of course, it reverts to oxygen within a few hours at most. It is obviously neutral to pH so does not affect pH balance of water-like traditional cleaning and sterilizing caustic and acid compounds.

A big advantage of ozone is that it eliminates the need for chlorine or bromine, saving costs as well as eliminating a strong potential for TCA or TBA. Piper Environmental Group is a systems integrator that sells and services ozone equipment.

One of the largest suppliers of ozone generating equipment is McClain Ozone in Napa, which pioneered the use of ozone in wineries and has equipment installed in too many to mention. It makes both mobile and fixed systems for diverse applications such as sterilizing barrels, tanks, floors, presses and bottling lines.

McClain produces a variety of equipment that can work with water pressures from 10 to 150 psi, and from 3.5 to 60 gpm. Ozone gas output is five grams per hour to 90, and the ozone concentration ranges from three to 11 ppm or even higher.

Del Ozone is a large provider of ozone generators for diverse applications including wineries. One of its products is a compact mobile or wall-mounted unit for surface and similar sanitation.

GDT also offers a wide range of systems, including some that can even sterilize soils to kill nematodes and oxidize residual pesticides.

### **Steam Is Hot**

Hot water can also be an effective cleaner and sterilizer, while steam is a traditional method of sterilizing equipment including in hospitals, perhaps the most demanding application. It has a big advantage over ozone in sterilizing, naturally the benign fumes—as long as you avoid the heat itself.

ARS Enterprises in Santa Fe is a leading supplier of steam-cleaning equipment. Interestingly, its initial business was repairing medical autoclaves (the name was Autoclave Repair Specialists), and then evolved into manufacturing these critical medical sterilizers before branching out into industry. "Compared to hospitals, the demands of wineries are modest," and the technology is finding increasing use in wineries. "Steam is hot," jokes Glenn Caster, the company's CEO, adding the company's motto is, "We work well under pressure."

ARS and its acquired steam equipment producer Beverly Pacific have served the food and beverage industry for five decades. With its heritage in sterilization, the company approaches food and beverage facility sanitization with the viewpoint of a pharmaceutical grade supplier. Its products can be used to clean



the floor or clean or sterilize equipment, tanks and piping in-place. In the past few years, it has developed an exclusive line of products and expertise in sanitization and sterilization of winery facilities. It, for example, is the exclusive importer of the French-made Bitard oak barrel rinsers specifically designed for cleaning wine barrels.

Water at 180 degrees meets the legal standard to kill pathogens, but steam, naturally at 212 degrees at sea level is the most efficient way to deliver heat. Steam delivers heat very rapidly through the condensation process while hot water must depend on absorption. When steam contacts a cooler surface, it virtually instantly condenses, giving up the latent heat as it does. This heat, combined with moisture, destroys the proteins that create microbes. "Virtually all bacteria in food and wine are killed by 212 degrees," says Caster. For that reason, steam at 212 degrees is far more effective than water at the same temperature in sterilizing. Steam naturally leaves no toxic fumes.

ARS claims that the most efficient way to produce this steam is with a pressurized electric steam generator, which operates quickly and with minimal water consumption. As a bonus, the steam more quickly dissolves tartrates that collect in barrels than does hot water. And as a gas, steam penetrates crevices better than water, even penetrating the outside surface of the wood. This helps remove and destroy unwanted contaminants.

Though many worry that the steam will remove desired flavors, Caster says that studies have found that wood is such an efficient insulator that the steam doesn't damage volatile flavor compounds found in the wood. "Even with the interior of the barrel at 212 degrees, 1/8 inch inside, the temperature is only 95 degrees after 20 minutes." Special wands from ARS help simplify using steam for cleaning barrels and other equipment. Steam can also be used to clean filters as well as piping. Among the wineries using ARS steam equipment are Shafer Vineyards, Napa Wine Company and Opus One in Napa Valley and Taft Street in Sonoma. Elias Fernandez, the winemaker at Shafer, says he uses steam to sterilize the winery's bottling line. "It's the best way to sterilize a very critical part of the winemaking process." He notes that the metal of the line conducts heat throughout the line. "It gets into every nook and cranny." He finds that chemicals don't reach every niche, opening the possibility of contamination. The winery also uses steam to clean floors and dissolve thick tartrates. Electro-Steam of Alexandria, Virginia, also produces instant steam equipment, marketing to wineries. An excellent series on use of ozone in wineries by Marne Coggan appeared in the January and March 2003 issues of *Vineyard & Winery Management*.

### **Surface and Floor Coatings**

Well-publicized examples of environmental wine contamination by TCA at Beaulieu Vineyards, Hanzell and Gallo of Sonoma have heightened interest in the drainage pipes and systems once considered an after thought. It's become clear that they can be a major source of lingering contamination, so ensuring that a winery is plumbed with drainage that can be thoroughly cleaned without standing spots is a big issue. Likewise, pipes must withstand thorough cleaning and even sterilization perhaps including steam, strong chemicals or ozonated water. The ultimate solution may be stainless steel drainage systems such as that provided by Blücher-Josam. Though expensive, these systems assemble as easily as Legos, yet provide a drainage that can withstand virtually any treatment without corrosion or degradation. Even flooring can be critical. International Coatings Inc. protects rough concrete and masonry with a smooth but resilient epoxy that's easy to keep clean. Degussa Building Systems supplies polymer, acrylic and other coatings that serve a similar function.

Likewise, Enerfab makes coatings that will protect the inside of concrete wine tanks, ensuring that they can be cleaned and won't contaminate wine. ❀