



# Water Treatment Woes

## Controlling the Growth of Bacteria and Related Safety Concerns in the Stone Fabrication Shop

By Darin Dunphy

Right now, your hand is home to about 150 different species of bacteria. These single-cell organisms live in every climate and location on earth. The good news is that most of this bacteria is harmless to people, and many are even beneficial to human life.

However, the wet environment of a stone shop, the cutting and polishing of quartz, granite and other natural and man-made products, gives rise to all sorts of harmful bacteria, living and dead. The bacteria problem goes far beyond the stone industry and exists anywhere water is used in manufacturing, where bacteria growth is allowed to go unmonitored and uncontrolled. Just ask the United Auto Workers Union (UAW) about its challenges with bacteria and endotoxins, and its litigation over the work environment in which they are known to exist. The stone industry has seen OSHA go after it for airborne silica and its effect on the health of workers, but the next round is yet to come and you may rest assured the industry is on OSHA's radar.

This problem is not just for those who use recycled water. Bacteria thrive in places that are warmer and darker where there is a food source. The stone industry for the most part incorporates trenches and pits, so even though a fabricator might use just city water and discharge it, there is still some volume of water that resides in a shop at all times, and maybe for days. And there is an abundant source of food in every stone shop.

### Background on the Bacteria Problem

The most significant problem with bacteria is the presence of what are called endotoxins. The endotoxin material is actually a part of their organic structure; it forms a protective outer shell or membrane around the creature. In the



normal life cycle of bacteria, it is believed they release small quantities of endotoxins. However, when they die, this outer endotoxin shell breaks apart (for lack of a better phrase) and the organic material is released into the environment in which they live. Generally endotoxins are not lethal, but they do create immune system responses that often present themselves in humans as a fever. This is the problem regarding worker health, and it is the employer's responsibility not to create a work environment that causes illness.

The problem with the live and dead bacteria and their endotoxins is that they are so small they easily become airborne. The use of cutting, grinding or polishing equipment creates a spray or mist area that engulfs workers and contains these creatures and their dead remnants that are introduced into the lungs, and onto the skin of workers. In recent studies endotoxins in particular may be more dangerous than coming into contact with the live bacteria, as endotoxins are a proven source of immune system reactions. Lawsuits, particularly in the metalworking and automotive industries, are underway against companies that have, and continue to expose employees to these contaminants.

But, you might ask, "How does enough bacteria to cause harm get into my water in the first place and how can it live there?" Bacteria can enter a system in a variety of ways. Because they can thrive almost anywhere, it can be found riding the dust in the air of a shop, or many workers spit on the floor, in general or as a result of the use of chewing tobacco. The human mouth alone is a breeding ground for bacteria that should not be introduced into your water supply. Combine this with poor shop hygiene, allowing food waste, soda, coffee, gum, cigarette butts and all

sorts of general trash — all of which end up on the shop floor — and you have a real witches brew simmering in these trenches and pits. This environment is just the place for millions upon millions of bacteria colonies to grow and die and become the source of worker illnesses.

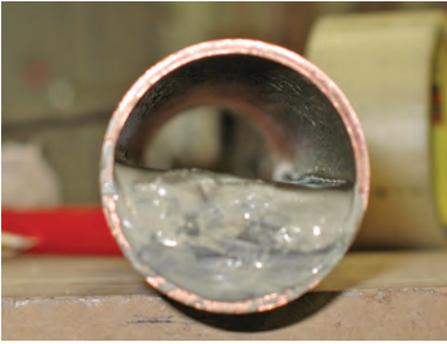
Bacteria and its food source will always be an unpleasant reality in a stone shop, to a greater or lesser degree. The question is what steps can be taken to prevent its introduction, arrest its growth, protect workers and prevent a loss of productivity or worse?

### City Water vs. Recycled Water

Certainly for those who use only city water, the flushing effect of its use causes lots of bacteria to be discharged down the drain continuously. However, because of the cost of water and sewer charges and the demands of the Clean Water Act, many shops are looking at the benefits of water recycling at various levels. Obviously shops using some level of recycled water have a more serious problem than do those who use only city water, as the elimination of bacteria cannot and does not occur in the same way.

Regardless of whether city water or recycled water is used, the first place to start to control the growth of bacteria is the control of trash. Owners and managers must run a cleaner operation that prevents fueling bacteria growth by controlling the food sources. Regular shop cleaning and good worker hygiene are the first places to start in helping to cut down on waterborne contaminants.

Even with the best of intentions, these housekeeping steps will not be adequate to protect workers, and unfortunately this housekeeping practice or notices are not



**Figure 1** — Even the pipes that deliver recycled water are not immune from buildup of bacteria (and their endotoxins).

adequate to absolve management of its responsibilities. Additional steps must be taken.

It would be preferable not to wait until a health problem arises, but should you delay, you can expect that this bacteria growth will begin to express itself in a foul, sewer type of odor. Or you will notice a slimy coating on your equipment and storage tanks, or discoloration on water surfaces, even floating pads of bacteria that have broken away from main colonies. Workers may also observe rashes on their skin where they have been exposed to the shop water, which is nearly impossible to avoid, even with protective outerwear. By the time these conditions present themselves, you are dealing with both live and dead bacteria by the millions in your system, sufficient to cause a negative impact on employee wellness and productivity.

Thankfully, there are various ways to control and manage bacteria levels in any fabrication facility, and to create an environment that facilitates worker wellness, fewer sick days, increase productivity and peace of mind.

#### Treatment with Chlorine Bleach

There are a few ways that bacterial contamination can be handled. Traditionally, chlorine bleach is added to water used in a stone shop to help control bacteria buildup, either by continuously maintaining low chlorine levels and/or periodically by “shocking” the water stored in the system, in the trenches, pits and tanks. This is the same method used by most of us who own swimming pools (although some pools use other chemistries). The active ingredient in household bleach is called sodium hypochlorite, and it is an aggressive oxidizing agent that kills many forms of bacteria. In a pool, these dead bugs are then continuously being removed



**Figure 2** — CNC collection trays and sawjet tables that can hold thousands of gallons of water can also hold large amounts of potentially dangerous sludge.

by the pool’s filtration system, and the result is clear pool water that is safe to swim in.

While chlorine bleach is fine for a swimming pool, it has some drawbacks in the stone shop. Once the bleach has killed the bacteria, the dead bacteria are left behind if the shop water is not being continuously purged by new city or well water or filtered.

Again, bacteria (and their endotoxins) will collect and multiply anywhere in a shop that suits them, even in the pipes that deliver recycled water (see **Figure 1**). Not exempt are CNC collection trays, sawjet tables that can hold thousands of gallons of water and sludge (see **Figure 2**), pits, collection bags, trenches, tanks and recycling systems of all types (see **Figure 3**); in short, any place there is quiet dwell time, the warmer and the darker the better.

While recycled water supplies create the biggest challenge, every stone shop creates a breeding



**Figure 3** — Any place where water has quiet dwell time, particularly dark spaces, such as pits, collection bags, trenches, tanks and recycling systems of all types can develop bacteria problems. The warmer and the darker the place, the higher the potential for problems.

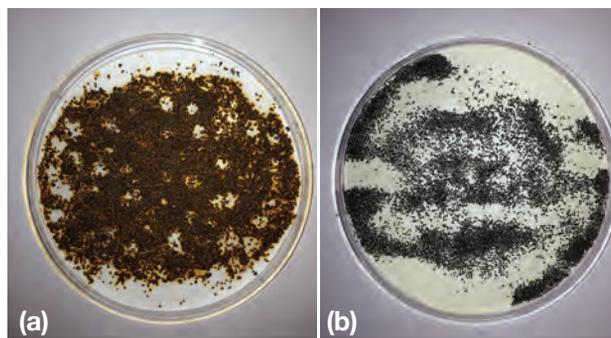
ground, to a greater or lesser degree. Bacteria and endotoxins are present everywhere so the potential for them to become airborne in the shop and to invade their human hosts is quite real.

In addition to the endotoxin problem, if too much bleach is used, it can significantly contribute to the wear and tear of the ferrous (containing iron) and nonferrous (like aluminum) metals that make up large portions of many types of stone fabrication equipment. Water in general is the enemy of ferrous metals, causing rusting that accelerates as water chemistries become more and more complicated, or conductive. Excessive quantities of chlorine bleach are no friend to aluminum either, as the surface can be eaten away or pitted, reacting with the surface to create the appearance of black water, and after drying leaving behind a white residue or deposit. At high levels chlorine can also be harmful to employees to breathe, and can cause skin irritations.

It is also difficult to maintain a zero tolerance of bacteria with bleach, hence the need to both treat with lower levels continuously and periodically to shock the entire system, while filtering the shop water continuously to remove these unwanted contaminants — just like treating your swimming pool.

#### Treatment with Coolants or Grinding Fluids

For years, the metal, glass and automotive industries have used a coolant or grinding fluid to control bacteria and their resulting endotoxins, as well as to prevent rusting, stabilize pH and create increased lubricity (allows increased line speeds by reducing friction and lowers operating costs). If this additive, we will call a coolant hereafter, is properly formulated with corrosion inhibitors, biocides and fungicides, and



**Figure 4** — A before (a) and after (b) iron chip rust test shows the rusting benefits of the use of a properly design coolant.

if it is maintained at predetermined levels, it will prevent equipment rusting, stop the bacteria population from growing, and inhibit this growth by maintaining pH levels. If properly formulated, it will work well in the presence of both ferrous and nonferrous metals, and it will have no effect on the surface of your product.

Rusting in the stone industry is a huge problem for owners, one that shortens the useful life of equipment by years, increasing fixed operating costs and reduces profits. Properly designed coolants can produce significant differences in rusting (see **Figure 4**).

The use of a proper coolant can limit potential harm to employees and equipment. However, coolants are not interchangeable. You cannot simply buy a coolant made for glass or metal fabrication equipment and use it as an additive to your stone fabrication operation. It must be specially formulated for the industry and its methods of operation. There does not yet seem to be a specific coolant developed for stone industry operations. However, in the near future, it is likely that a manufacturer of closed-loop water treatment systems will have refined, developed and tested a coolant that has been

properly formulated for the industry — maybe as soon as at the next industry trade show.

The use of a coolant requires the need to employ a closed-loop system, and the closer you approach a 100 percent closed-loop design, the more obvious the economic benefits of using of a coolant become. To be effective, coolants require maintenance at certain concentrations in a water supply. If water is allowed to be discharged into the city sewer or elsewhere, and new city or well water is introduced, then the coolant concentration is reduced, and more must be added. If new coolant is not added with every new gallon of water, the benefits of the coolant will be reduced or eliminated.

#### In Conclusion

It is a simple fact that stone shop water systems, like any other body of water, will contain bacteria, whether the shop uses city water only or some form of water recycling system. However, with the use of recycled water, the problem is more complex, as outlined above.

Whether a shop owner decides to use chlorine bleach to kill bacteria, or a coolant for the

additional benefits it offers, killing bacteria is the first step, and removing them with a filtration system must be the second step. Being proactive will also help you in your efforts to manage your ongoing relationship with OSHA.

Whether 100 percent use of city water, use of a 100 percent closed-loop water recycling system or anything in between, all require eliminating the growth of bacteria in shop water, and thereby eliminating the effects of their harmful endotoxins. Early attention to this problem will improve employee health and wellness, and will increase the bottom line, a balancing act that all can agree with. **ISFA**

#### About the Author

*Darin Dunphy is a freelance writer/researcher based in the Moline, Ill., area of the Quad Cities. He can be reached at [darind1972@gmail.com](mailto:darind1972@gmail.com).*

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- LaPel Solutions, 11304 NE 66th St., Suite 102, Vancouver, WA 98662, phone (360) 597-4958, email [info@lapelsolutions.com](mailto:info@lapelsolutions.com)
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