Sanitization Overview

DEFINITION OF SANITIZATION:

Sanitization is not an absolute phenomenon. It is a partial removal of organisms. Depending on the system, a sanitization operation should reduce the organism population by some 90%. In water, sanitization is frequently defined as a 3-logarithm (log) or 1,000-fold reduction in the number of bacteria.

THERE ARE TWO BASIC APPROACHES FOR CONTROLLING BACTERIAL GROWTH IN A POTABLE WATER SYSTEM.

CONSTANT SANITIZATION LEVELS

PERIODIC SANITIZING

BOTH APPROACHES ARE NEEDED WITHIN AN AUTOMATED WATERING SYSTEM

Maintain a constant residual level of biocide chemical within the system (continuous dosing) This is the technique that municipal water treatment facilities use when they inject enough biocide (typically chlorine) to provide a residual throughout a citywide distribution system. Some research facilities continuously chlorinate or acidify their animal drinking water to control bacteria.

Since biocide sanitization does not kill 100% of bacteria in a watering system, the remaining bacteria can regrow in the system. This means that the components of a drinking water system will need to be resanitized periodically. While monthly sanitization is typical, the frequency for your particular system will depend on its design, the frequency of both flushes and filter changes, the supply water quality, and the bacterial quality you are trying to maintain. To determine the sanitization frequency, establish a regular schedule for drawing samples and monitoring the total bacteria count levels. Increase or decrease the frequency of sanitization based on the measured bacterial quality.

MOST COMMON SANITIZING BIOCIDE AGENT?

The most common sanitizing agent is chlorine. Chlorine is the least expensive, most readily available, and is effective and easy to use. While ozone and chlorine dioxide are also effective biocides, there is little experience using these chemicals to sanitize automated watering systems.

Typical sanitization of an automated watering system is accomplished using 20 ppm chlorine for 30–60 minutes. Higher concentrations or longer soak times will increase effectiveness; however, do not use a sanitizing solution with a chlorine concentration higher than 50 ppm. Repeated sanitization at higher concentrations can cause corrosion of stainless-steel wetted components in an automated watering system.

SEE A FULL LIST OF BIOCIDES ON THE LAST PAGE

For more information of the other sanitizing agents, properly handling of corrosive chemicals and recommendations on customized sanitization processes for your facility, contact your Avidity Science sales rep for additional assistance.

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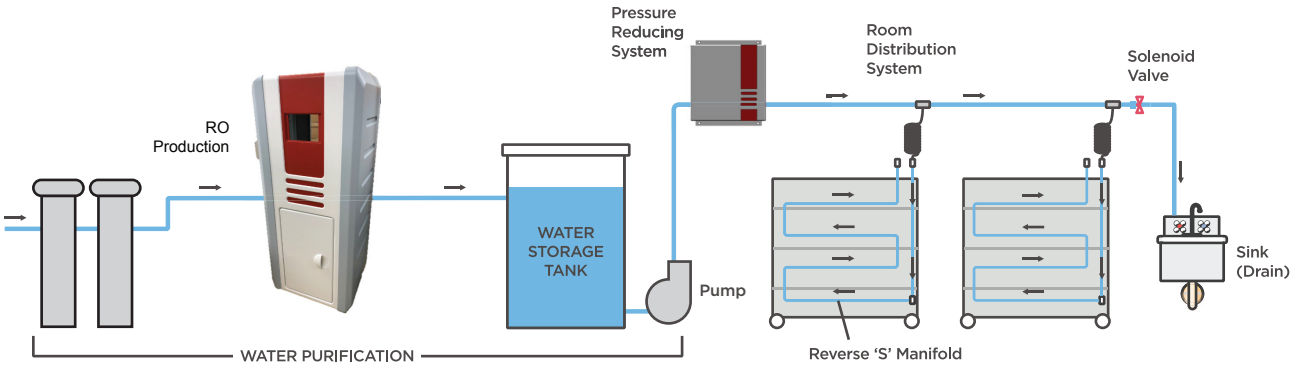
Periodic Sanitization
for Automated Watering



Unless water contains a continuous biocide like chlorine, a biofilm will develop on wetted piping surfaces in an automated watering system and high numbers of bacteria could be present in animal drinking water. Regular flushing will limit bacterial accumulation in an automated watering system, but no amount of flushing alone will totally eliminate biofilm. Periodic sanitization with a chemical biocide may be necessary to remove and destroy biofilm.

All the components in an automated watering system should be sanitized at regular intervals. This section describes how to sanitize these components.

RO MACHINE

CONTINUOUS CHLORINATION. For reverse osmosis (RO) systems using cellulose acetate membranes, continuous chlorine pretreatment is used to prevent bacteria growth in the RO machine. Chlorine injection is adjusted to provide 0.5 – 2.0 ppm of free chlorine in the feedwater and a minimum of 0.3 ppm free chlorine in the RO product water. This low chlorine concentration in the product water is also beneficial for controlling bacteria growth within the storage tank and downstream in the room distribution system.

STORAGE TANK

Typically, the water in storage tanks will contain a continuous chlorine residual that helps prevent bacterial regrowth. If storage tank sanitization is required (based on water testing or once per year as preventative maintenance), refer to the RO system manual.

Frequency: Typically, bi-annually or annually.

ROOM DISTRIBUTION PIPING

Automated watering systems should contain injection ports where a sanitizing solution can be introduced. These are typically located at the inlet to each pressure reducing station. Use a portable sanitizer to inject chemical sanitizing solutions into the room distribution piping. Usually, animal racks are disconnected from the room piping during sanitization.

Frequency: Typically, once every 1-12 months.

RECOIL HOSES

Recoil hoses can be chlorine-sanitized in the cage wash area using the Avidity Science Chlorine Injector Station and Recoil Hose Flush Station.

Frequency: Typically, every 1–2 weeks

MANIFOLDS

Manifold piping on mobile animal racks can be chlorine-sanitized following the wash cycle in the cage wash area using the Avidity Science Chlori-Flush Station.

Frequency: Typically, every 1-2 weeks (the same as the rack wash frequency).

VALVES

Please reference Avidity Science's Valve Care Guide for more details on valve sanitizing, sterilizing and storage recommendations.

DESTROYING ESTABLISHED BIOFILM

For example: a watering system that has been in operation for some time and has never been sanitized) repetitive sanitizing cycles are usually required. The initial chlorine exposure may only kill the top layer of biofilm. Chlorine will also destroy the glycocalyx or slime which is the "glue" that holds biofilm bacteria together and to the pipe wall. This weakens the biofilm structure. For that reason, it is a good idea to follow chlorine exposure with a high-flow flush. Fresh chlorine is then reintroduced to the piping to kill the next bacterial layer. This chlorine sanitization/flush cycle may need to be repeated several times on consecutive days until the accumulated biofilm has been removed. For a well-established biofilm, 3-10 cycles may be needed (WQA, 1998).

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Biocides For Santization
Typical Dosing & Contact Times

THE EFFECTIVENESS OF A SANITIZING AGENT IS A PRODUCT OF BOTH CONCENTRATION AND CONTACT TIME.

Chart below provides some general information about biocides. The table includes recommended contact times for various concentrations, as well as factors to consider when choosing a biocide to use with automated watering systems. Note that some biocides are not recommended for use with automated watering systems at all.

			National Standard:			
			Water Quality Association (WQA)		Mittelman	
	Biocides	Application for Automated Watering System	Concentration	Contact Time	Concentration	Contact Time
OXIDIZING	**Chlorine**	Typical application is 20 ppm & 30–60-minute contact time. Chlorine is corrosive, so do not exceed 50 ppm or 2 hours contact.	10–200 ppm	1 min. @ 50 ppm	50–100 ppm	1–2 min.
	Ozone	Stronger biocide than chlorine at equal concentrations. Not commonly used. Must be generated on-site.	4 ppm	1 min.	1–2 ppm	<1 min.
	Chlorine Dioxide	Biocidal activity similar to chlorine. Unstable, must be mixed on-site. Corrosive like chlorine. More expensive than chlorine			0–100 ppm	1–2 min.
NON-OXIDIZING	**Peracetic Acid**	Certain types of acid can pose a health issue to animals.	1% wt/wt	30 min.		
	Hydrogen Peroxide	Not used. More expensive & less effective than chlorine.	30,000 ppm	180 min.	10% (v/v)	2–3 hours
	Quaternary Ammonium Compounds	Not commonly used in water systems. Requires exhaustive flushing to remove “suds”			300–1,000 ppm	2–3 hours
	Formaldehyde	NOT used. Carcinogen!			1–2% (v/v)	2–3 hours

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