Recirculating Systems

Automated Watering Systems for Laboratory Animals

Edstrom INDUSTRIES, INC.

WATER TREATMENT

Option 1: Ultraviolet Disinfection

UV helps control bacterial growth in the watering system. It can best be described as invisible radiation that kills microorganisms by striking the cell. UV energy penetrates the outer cell membrane, passes through the cell body, and disrupts its DNA, preventing reproduction. UV treatment does not alter water chemically; nothing is added except energy. UV lights provide up to 99% bacterial kill, but only kill bacteria at one point in a watering system. Bacteria can still attach downstream and form a biofilm. Water should be regularly sampled and tested throughout the system for bacteria counts to determine the performance of the UV unit. Periodic flushing and sanitization may be necessary to control bacteria levels.

Option 2: Chlorination

Chlorination is effective for killing detached bacteria and controlling biofilm growth in the watering system. Chlorine penetrates the bacteria cell and oxidizes the proteins within the cell, resulting in the death of the bacteria. Chlorine kills free-floating bacteria, such as *Pseudomonas aeruginosa*, before animals consume them. Chlorine is also helpful in managing biofilm – by destroying its sticky polymers, chlorine reduces the thickness of biofilms. Using free chlorine as a residual disinfectant helps maintain low bacteria counts throughout the entire watering system.

Option 3: Acidification

Acidification is another commonly used disinfectant in animal drinking water systems, with Hydrochloric acid most often being used. However, low pH water is not bactericidal against most bacteria, it is instead bacteriostatic, meaning it will not kill most bacteria, but it will prevent replication, and therefore, growth. There are exceptions to this, one of which is *Pseudomonas aeruginosa*, and a few other Gram-negative bacteria, will be killed by acidification. Unlike chlorine, the pH of acidified water is extremely stable which is why it is popular in water bottle systems. If the pH is 2.5 today, it will be 2.5 a week from now. It is important to remember that the benefit of this stability comes at the cost of reduced effectiveness in killing bacteria.

Introduction

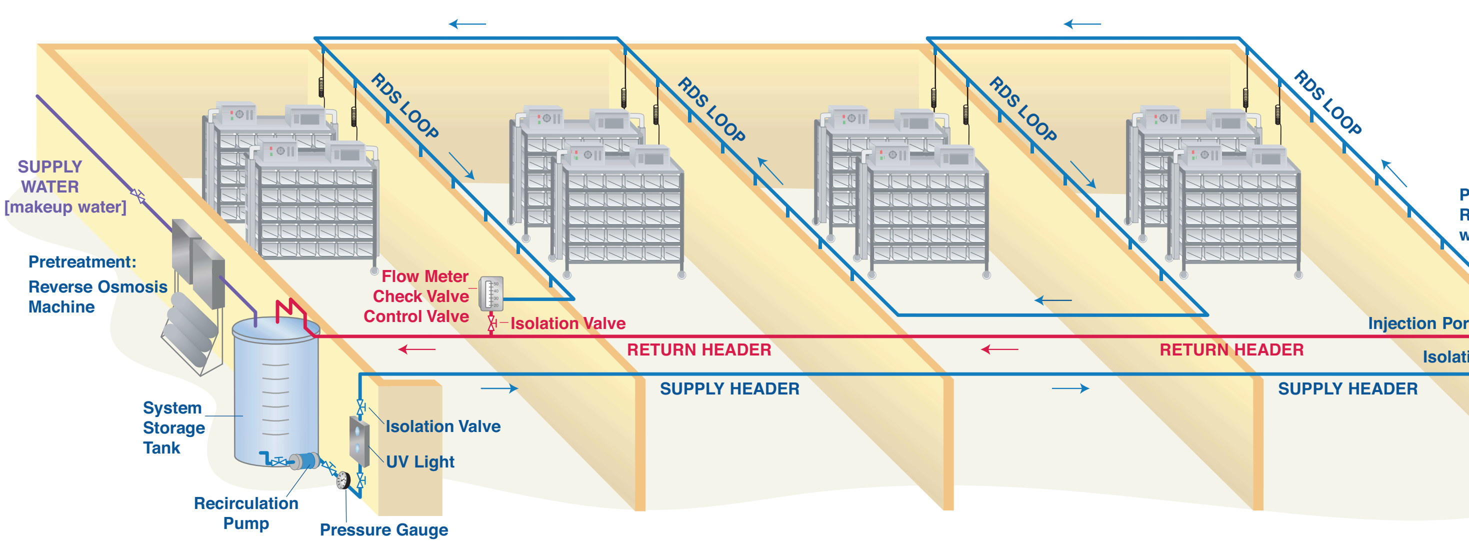
An Edstrom Recirculating System is a unique design that provides water savings in either a chemical-free system, or in a system that uses residual disinfectants. Recirculation provides continuous water flow in an effort to keep animal drinking water from becoming stagnant. The concept is simple – water is pumped from a storage tank, through an ultraviolet (UV) disinfection unit, to the room distribution system, and back to the storage tank. Therefore, water is never wasted.

RECIRCULATING ARCHITECTURES

Header – Room Distribution System Recirculation

In this type of system, water is recirculated through the header and room distribution system (RDS), but not through the rack manifolds. Water is pumped from the storage tank, through the UV unit, and through the supply header at high pressure. Each room distribution loop then feeds off of the supply header at a controlled, reduced pressure. Water exits the RDS loop, and goes back to the storage tank through the return header.

A facility using this design may choose to incorporate an On-Line Rack Flush system as well. This will guarantee a fresh supply of water into the racks, by periodically draining the water in the manifolds.

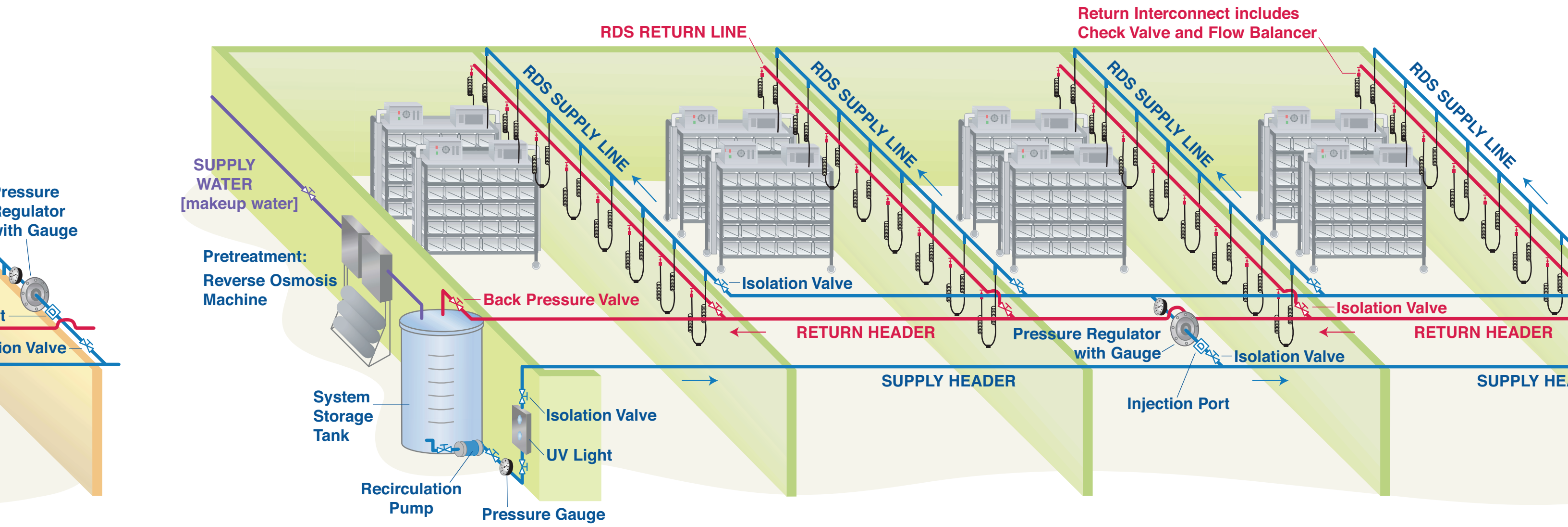


Balanced Flow Recirculation System through Header and RDS

Through the Rack Recirculation

In a rack recirculation system the water is recirculated similar to the header room distribution system, except the water also enters the rack manifolds, bringing fresh water to each animal drinking valve. This is particularly important for species such as mice, that consume small amounts of water.

Water is pumped from the storage tank, through the UV unit, and through the supply header at high pressure. Each room distribution loop feeds off of the supply header at a controlled, reduced pressure. Water is distributed evenly through the racks from the RDS supply line. The water exits the RDS return line, and goes back to the storage tank through the return header.

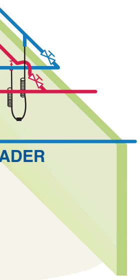


Balanced Flow Recirculation System through the Racks

RO8600 Reverse Osmosis Machine

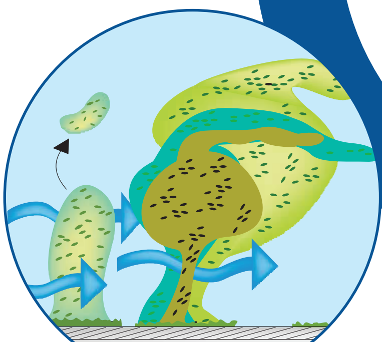
Pretreatment

The quality of the water going into the storage tank is very important. Because water is constantly being recycled in the recirculating system, it is best to begin with purified water. Reverse osmosis removes 95-99% of most contaminants in the water including microorganisms, organic compounds, dissolved inorganic compounds, microbial by-products such as endotoxins and pyrogens, and many carcinogenic compounds. Reverse osmosis also provides nutrient-poor water, which supports less biofilm* than regular tap water, resulting in a thinner, less harmful biofilm.



*What is Biofilm?

Biofilms are communities of micro-organisms surrounded by the slime they secrete – a place where bacteria can thrive and multiply. Biofilms are the source of much of the free-floating bacteria in drinking water that is consumed by laboratory animals. These bacteria can cause infection and disease. Biofilm will develop on any surface that comes in contact with water – even in ultrapure water systems.



(Costerton 1995)

Advantages of an Edstrom Recirculating System

- Conserves water, helping to protect a critical natural resource
- Controls water costs associated with treating and disposing of waste water as well as the cost of the water itself
- Provides continuous water flow to reduce water stagnation
- "Green" system - using UV as a disinfectant means no chemicals are required
- Simple design
- Supply header has ample pressure and flow, allowing it to be tapped into for supplying water to other devices such as a bottle filling station
- On-Line Rack Flush option for Header-RDS Recirculating System ensures racks receive fresh water
- Clean Joint Fittings eliminate crevices in the watering system where harmful bacteria can grow
- Plastic piping available for economy systems
- Electro-polishing of stainless steel components makes the system more resistant to corrosion
- Electronic monitoring of flow conditions available
- High quality, dependable watering systems backed by 30 years of experience
- Flexibility – we can design any recirculating system to meet your needs

Edstrom INDUSTRIES, INC.

Automated Watering • Water Purification
Vivarium Management Solutions

US Office:
819 Bakke Avenue • Waterford WI 53185
Tel: 262 534 5181 • Fax: 262 534 5184
Email: edstrom@edstrom.com

European Office:
PO Box 13 • HEREFORD • HR1 4ZU UK
Tel/Fax: +44(0)1432 830 026
Email: europe@edstrom.com

www.edstrom.com