Effect of Water Treatment on Septic Systems

Produced by

AIR & WATER QUALITY INC.
"Maine's Water Experts"
Types of Systems

- Filtration
- Oxidation Filtration
- Adsorption
- Acid Neutralization
- Ion exchange
- Membrane technology
- Aeration
- Disinfection
Water Treatment and Septic Systems

Filter Operation

From Well (Raw Water) → Head → To Drain → To House
Water Treatment and Septic Systems

Filter Operation

To House (Filter bypasses raw water if needed at house)

From Well (Raw Water)

Head

To Drain

Bed Expansion

Backwash
Water Treatment and Septic Systems

Filter Operation

From Well (Raw Water) → Head

To House (Filter bypasses raw water if needed at house) → To Drain

Rinse
Filtration

- Filtration removes turbidity (particulate matter) from the water.
- The turbidity could be sand, fine pieces of bedrock, iron, or manganese.
Oxidation Filtration

- Oxidation of iron and/or manganese is caused by either oxygen from the air, chlorine or potassium permanganate (pot perm).
- The oxidized compound is a particle that is mechanically filtered.
Adsorption

• Volatile organic compounds (VOC) and radon are adsorbed onto granular activated carbon (GAC).
• Arsenic and Uranium are adsorbed onto iron based sorbents (IBS) or anion resins
Acid Neutralization

• Calcium Carbonate (Calcite) or Magnesium Oxide (Corrosex) are placed in the flow of water. The mineral is dissolved and raises the pH. The media needs to be replenished periodically.

• Chemical injection uses a solution feed pump to inject either potassium carbonate or sodium carbonate to raise the pH.
Ion Exchange

- Either water softeners or anion exchange systems
- They all use salt as a regenerate.
- They remove minerals from the water by exchanging either the sodium or chloride ion on the media with the mineral in the water.
Water Softener
Membrane Technology

- Either reverse osmosis (RO) or filtration
- Reverse osmosis passes water through membrane without passing dissolved minerals.
- Filtration – micro (MF), ultra (UF) or nano (NF) remove small particles like colloids and very large molecules. It works like a sieve would to separate sand from rocks.
Aeration

• Forces air through water to provide a large surface area for dissolved gasses to pass through and be carried off by the air.

• Used to reduce radon and VOC’s.
Disinfection

- **Chlorination** - sodium hypochlorite is injected with a solution feed pump. The water is then held in a retention tank before delivery to the home.
- **Ultraviolet Light (UV)** – UV light passes through water and destroys DNA of pathogens.
Types of Waste Streams

• Some systems do not create any waste

  – Acid neutralizing with solution feed
  – Non-backwashing adsorption systems
  – Aeration
  – Disinfection
Filter Waste Streams

• Automatic backwashing filters-
  – Filtration
  – Some adsorption systems
  – Acid neutralization with calcite or corrosex
  – Oxidation filtration

• Concentrated stream of filtered material is created by all the backwashing systems

• Some add very low concentrations of chlorine

• Some add pot perm – 4 oz per regeneration
Softener Waste Streams

- Ion exchange – softeners and anion exchange
  - concentrated stream of removed materials (iron, manganese, and hardness)
  - sodium chloride - High efficiency systems use as little as 2.5 lbs of salt and low efficiency systems use as much as 20 lbs of salt per regeneration
Membrane Waste Stream

• Membrane Technology –
  – Whole House RO (WHRO) – large volume - 100% more volume - 2 times the concentration
  – Point of Use RO (POURO) - a few gallons
  – MF, UF, NF – 25% more water – 4 times the concentration
Water Treatment and Septic Systems

Path Without Treatment

Contaminant Path

Bath

Kitchen

PT

DHW

Septic Tank

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Water Treatment and Septic Systems


Misconception

• Treatment systems do not add more filtered material to the waste stream.
  – They only keep the materials from passing through the house to get to the waste treatment
  – These contaminants were going to the waste treatment system regardless of the treatment
  – Only a few types of systems add foreign chemical to the waste stream
What about hydraulic shock?

- Filters-
  - The largest quantity of water that is added by filtration equipment is 140 gallons per regeneration.
  - This volume is typically added over a 1-2 hour period
  - 1-2 times per week
What about hydraulic shock?

- Ion Exchange Systems
  - 70 gallons per regeneration for inefficient systems over a 1-2 hour period
  - 30 gallons per regeneration for efficient system over a 30 min period.
  - Typically 1-2 times per week
What about hydraulic shock?

- **WHRO**
  - Doubles the hydraulic load – should never go to septic
- **POURO**
  - 2-3 gallons per day
- **MF, UF, NF**
  - Adds 25% more water to the waste stream spread over the day
Other Hydraulic Loads

• Top load washers
  – These machines typically use 40 gallons per wash
  – 4 loads of wash in a day exceeds the largest residential water filter load

• Leaking toilets, faucets or water treatment
  – A drizzle of .1 gpm will be 140 gallons per day.
  – A stuck flapper valve (2 gpm) will be 2,880 gallons per day
What is the evidence?

• There have only been two studies done on water softener discharge on septic systems - University of Wisconsin and the National Sanitation Foundation (NSF). Both were done in the ’70s.

• Anecdotal evidence from site evaluators and water treatment companies
Studies

• Both studies concluded that water softeners did not have deleterious effects.
• The studies did not address backwashing filters.
• Filters can produce higher volumes of water.
Anecdotal Information

• Site evaluators will sometimes conclude the water treatment caused a failure when they don’t find any other obvious problem.
• Designers of aerobic systems have found hardness build up in their systems where there is water softening.
• We have not seen a single failure due to the water treatment with thousands of systems installed.
Water Treatment and Septic Systems

What should we do?

– Educate consumer about septic systems
– Size systems to handle possible extra hydraulic load
– Strive to understand the problems and possible solutions using existing systems
– Let’s document system failure
– Look for alternatives to using septic systems for waste discharge
Educate Consumer

• Create understanding that the system does need to be maintained
• Leaking devices need to be fixed
• Identify what can or can not be flushed into the system
• Purchase or upgrade appliances to more efficient models
Sizing System

• If there is an existing well, determine if it will or does have treatment and size system for the extra load
Understanding Problems

• People need water treatment
• There are extra hydraulics (peak and total) loads exerted by treatment systems
• Aeration systems are more sensitive to hard water
Document Failures

- Compare failures of systems with treatment to non failures with treatment
- Compare failures of systems without treatment to non failures without treatment
Alternative Discharge Options

- Gray water systems
- Separate dry wells
- Water recycle systems