

CEHA Fall Chloride Workshop

Chloride Treatment Options

Presented by Paul Hurlbut

Professional Water Systems, Inc.

Being Aware of a Problem

- The sodium and chloride problem is nothing new. What is new is how high the levels are going and in the areas we are finding it.
- The problem emerges when a homeowner experiences corrosion towards plumbing when they never had the problem before. They spring pin hole leaks in copper pipes and notice their stainless steel water heater is leaking within a few years. Or worse they don't realize it's the water and keep putting the same stainless steel water heaters in and those fail within a few years.
- Then they see the glassware coming from the dishwasher cloudy with a film that doesn't come off. They blame the dishwasher and start replacing appliances with the same effect.

Being Aware of a Problem

- One of the stainless steel water heater manufactures has a warning on the tank that voids warranty with chlorides over 100 mg/l.
- Unfortunately, many plumbers don't know enough to test well water before recommending what kind of water heater to install.
- Fortunately there is now a brand of water heaters that has a concrete lining. It uses a copper heating coil which can be replaced. So that means the whole unit doesn't need replacing just the coil.

Confirming a Problem

- A customer will call our office and describe some of the effects they are noticing. Film on shower doors, glassware and pitting of the faucets. At that point we schedule a time to meet with the customer.
- Our first step, once we arrive to the customers home, is to do a basic on-site test for pH, iron, total hardness and TDS (total dissolved solids). Once we see the high TDS, we ask the customer when the last time they did any lab testing of the water. Unfortunately many customers don't know to do periodic water sampling. That's when we tell them of some of the health concerns in certain areas such as arsenic, uranium and radon.
- That's when I throw out my line " You are your own private water company, so if you don't test your water, nobody else will".

Educating a Customer

- We need to see a comprehensive lab work up before we can make the correct recommendation for treatment.
- The lab work up would need to test for: Bacteria (coliform and e-coli) iron, manganese, copper, hardness, sulfates, alkalinity, sodium, chloride, pH, color, turbidity, nitrate, nitrites, arsenic, uranium and radon.
- Based on the age of the home, we discuss the concerns with lead piping. Homes built after 1990 we see very little lead in samples. This is for homes on well water. Municipal waters would always be a good idea to test for lead. If it's a newer home you would do a flushed sample to draw water in off the water main.

Looking for the Source of Contamination

- Our next step would be looking at the well's location and construction.
- If the well is close to the road or the roads water run off is near the well that would be the next thing to address.
- Hopefully the home owner would have access to the well completion report. We would want to know how much casing was put in when the well was drilled. We also want to know the flow rate and depth of well.
- If they don't have the completion report, we would then need to do a flow recovery test on the well. As we pump down the well, we would see if there is any water seeping under the well casing.

Looking at Feasibility of Treatment

- If the well only has a minimum of 20' of casing and is not very deep (150' or less) then we suggest maybe drilling the well deeper and extending the well casing 100'. This has only worked in a few cases.
- Depending on treatment, we will need a certain flow rate. If we are doing the whole house "Reverse Osmosis", we need 5+ gpm.
- The next thing we look for is space in the basement to install some type of treatment system.

Discussing Options of Treatment

- Depending on how high the chloride levels are and how much damage has been done to the plumbing, we look at a couple options for treatment.
- One option is installing a chemical feed pump. This would allow us to feed some form of coating agent in to the plumbing on a regular basis. Most commonly used is either sodium silicate if the water is soft or polyphosphate if there is hardness in the water.
- Sodium silicate seems to do a better job coating the pipes and its something a homeowner can do. Polyphosphate requires dissolving a powder in hot water and then make a mixture.
- The option of a feed pump system will do very little to slow the attack on stainless steel though.
- This option typically cost \$1500-\$3500.

Chemical Feed System



Reverse Osmosis Options of Treatment

- The second option which is becoming a more common option. That is using whole house reverse osmosis.
- The process of ‘Reverse Osmosis’ is where we put high pressure against a semi-permeable membrane. This separates about 90-95% of the dissolved solids from the water.
- This is a very slow process of producing water.
- “RO” units range in size based on how much water you need within a 24 hour period.
- They start as small as 10 gallons per day for just cooking and drinking water and up to enough to run municipality's.

Design Considerations

- Because of the chlorides eating up the plumbing in the home, we have to build systems large enough to keep up with the homes daily demand for water.
- Part of the systems design will require pretreatment of the water before going to the RO unit. Things like iron, manganese, sediment and total hardness will damage the membranes. This is another reason for having a comprehensive water report.

Design Considerations

- When designing a typical whole house RO system we think of pretreatment first. This starts with sediment filter, an alternating water softener to remove iron, manganese and hardness on a continual basis.
- Next we confirm the wells flow rate and a suitable place to discharge waste water.
- A good quality small 10-15 gpd RO unit will produce 1 gallon of purified water and send 2-3 gallons of water to drain. Commercial RO units will recirculate waste water back to the membrane. They would send 1 gallon of water to waste for each 1 gallon of product water.

Design & Flow

- The design of these style systems will have the well water flow through some form of pretreatment first.
- The water will then get processed through the RO system.
- The water coming out of the RO unit is low in dissolved solids and has a low PH value. This would make the water corrosive being so pure along with being acidic.
- We then run the water through a tank filled with crushed limestone. This adds minerals to the water along with raising the ph.

Design & Flow

- Because a RO unit produces water so slow, we have to store the water in holding tanks. The size and amount of tanks is based on the size of home and availability to get them in to the home.
- The water is then drawn out of the tanks using some form of booster pump system.
- The water is then sent in to the house as treated water ready for use.

This is a home a few miles down hill from the Stamford town dump. They used to store salt outside before they built a silo.

10534

JMS Environmental Services, Inc. WATER, SOIL AND AIR ANALYSIS Analytical Report Page 1 of 2

NEHI

Mailing Information: Name: NEHI Address: 3 Florence Road City: Riverside State: CT Zip: 06878 Phone: (203) 637-4665 Fax: (203) 637-3034

Collector's Information: Name: Ken White Address of site: 46 Wildwood Road City: Stamford State: CT Zip: Phone:

JMS ID: 101174

Sample's Information: Sample ID: 1

Site: Family Room Wet Bar Date Collected: 4/13/2011 Date Received: 4/13/2011 Preservative: N/A Time Collected: 12:30:00 PM Time Received: 6:15:00 PM Temperature: 3.0° C Lab No.: J1102042 Matrix: Drinking Water

Date Analyzed	Test Name	Result	MCL	Method
04/20/11	Radon Water	1073 pCi/L		SM 7500 A m
04/21/11	Lead (first draw)	10.1 ug/L	15 ug/L	300.5
04/13/11	6:20 PM E. Coli	Absent	Absent	Colitag
04/13/11	6:20 PM Total Coliform	Absent	Absent	Colitag
04/21/11	Iron	0.136 mg/L	0.3 mg/L	EPA200.7
04/21/11	Manganese	*0.063 mg/L	0.05 mg/L	EPA200.7
04/21/11	Sodium	*470 mg/L	28 mg/L	EPA200.7
04/14/11	Color (Apparent)	ND		SMWW 2120 B
04/14/11	9:04 AM Turbidity	1.12 NTU	5 NTU	SMWW 2130 B
04/14/11	Odor	ND	5 TON	SMWW 2150 B
04/15/11	Hardness, Total	312 mg/L	N/A	SMWW 2340 C
04/14/11	Chloride	*881 mg/L	250 mg/L	SMWW 4110 B
04/14/11	11:16 AM Nitrate	2.34 mg/L	10 mg/L	SMWW 4110 B
04/14/11	11:16 AM Nitrite	<1 mg/L	1 mg/L	SMWW 4110 B
04/14/11	Sulfate	20.3 mg/L	250 mg/L	SMWW 4110 B
04/14/11	9:04 AM pH	6.75 S.U.	6.4-10 S.U.	SMWW 4500 H B

Comments: *ABOVE MCL
At the time of the analysis the sample was Acceptable for Total Coliform
At the time of the analysis the sample was Acceptable for E. Coli

pH was received and analyzed out of holding time. pH needs to be analyzed immediately upon collection.

CFU = Coliform Forming Units MCL = Maximum Contaminant Level mg/L = milligrams per Liter
N/A = Not Applicable ND = Nono Detected NTU = Nephelometric Turbidity Unit
pCi/L = picocuries per Liter S.U. = Standard Unit TON = Threshold Odor Number
ug/L = micrograms per liter Units = Units

CONNECTICUT, NEW YORK AND NELAP CERTIFIED
41 Kenosia Avenue | Danbury, Connecticut 06810 | Telephone 203-798-2229 | Lab Fax 203-798-2107



AQUA ENVIRONMENTAL LAB
56 Church Hill Road • Newtown, CT 06470 • (203) 270-9973

Report of Analysis

Name: Professional Water Systems
963 Ethan Allen Highway
Ridgefield, CT 06877
Sample ID#: 54252
Sample Type: Drinking Water
Sampler: PH
Sample Date: 2/7/2005 8:52 AM
Receipt Date: 2/7/2005 3:00 PM
Report Date: 2/10/2005
Sample Site: Rhode • Stamford, CT

Parameter	Sample Result	Units	Limits
Metals			
Copper	0.26	mg/L	1.3
Iron	0.05	mg/L	0.3
Manganese	ND	mg/L	0.05
Minerals			
Chloride	364.5 *	mg/L	250
Hardness	ND	mg/L	No Limit Set
Sodium	450.4 *	mg/L	28
Sulfate	21.0	mg/L	250
Nutrient			
Nitrate as N	2.3	mg/L	10
Nitrite as N	ND	mg/L	1
Physical			
Color	1	CU	15
Conductivity as TDS	962	mg/L	No Limit Set
Odor	0	0-5 Scale	2
PH	6.4	SU	6.4 - 10
Turbidity	0.7	NTU	5

ND = Not Detected
* = Above Specified Limit

Report Approved by

CT Lic PH-0787

NY Lic 11706

This is another home not far from the Stamford town dump. The levels have slowly been coming down for the homes closest to the dump.

Brooks Environmental
Consulting, LLC

9 Isaac Street Norwalk, CT 06850 Phone: (203) 853-9792 Fax: (203) 853-0273

ANALYSIS OF WATER

Client: Aqua Sentry Sample Collection: 5/30/17
Address: Hygienist: Client
 Analysis: 5/31/17
Phone: Lab Number: 170315
Email: Sample Received: 5/31/17

Sampling Location: 97 Lord Highway, Weston, CT (kitchen Sink)

BACTERIOLOGICAL EXAMINATION		Method
Total Coliform	Absent	SM 9223B-PA
e.Coli	Absent	SM 9223B-PA
Chlorine	Absent	SM4500-CL

PHYSICAL PARAMETERS				
Analyte	Results, Unit	MCL, Unit	MCL, Unit	Method
pH	7.2	6.40-10.0	-SU	SM4500 H-B
Turbidity	0.35	5 NTU	0.1 NTU	SM2130 B
Color	ND	15	0	SM2150 B
Odor	1	?	0	SM2150

CHEMICAL EXAMINATION				
Analyte	Results, mg/L	MCL, mg/L	MRI, mg/L	Method
Fluoride	ND	4	0.3	EPA300.0
Chloride	647	250	3	EPA 300.0
Nitrite-N	ND	1	0.1	EPA 300.0
Nitrate-N	2.5	10	1	EPA 300.0
Sulfate	28	250-Desirable Limit	4	EPA 300.0
Calcium	12	None	0.5	SM 3111 B
Magnesium	5	None	0.5	SM 3111 B
Total Hardness	48	50-150-Desirable Limit	4	SM 2340 B
Sodium	250.2	100	0.5	SM 3111 B
Copper	0.40	1.30	0.04	SM 3111B
Iron	ND	0.3 Desirable Limit	0.04	SM 3111B
Manganese	ND	0.05 Action Limit	0.04	SM 3111 B

Comment: This Water is not Safe for drinking purposes at the time of collection.

Analyzed by: Aquatek Labs. Ref: C053117032

*Below State of Connecticut Recommendations,

**Above State of Connecticut Recommendations

***ND- Not Detectable, MCL- Maximum Contaminate Limit, mg/L-Milligrams per Liter of water (ppm)

K. Dzioka
Approved by

This is from a home in Weston on a steep hill with the well in the front yard. Storm water runs to the side yard and into a lake in the backyard.



AQUA ENVIRONMENTAL LAB
 56 Church Hill Road • Newtown, CT 06470 • (203) 270-9973

Report of Analysis

Name: Professional Water Systems Sample ID#: 141534
 963 Ethan Allen Highway Sample Type: Drinking Water
 Ridgefield, CT 06877 Sample Source: Prior to Water Treatment System
 Sample Date: 4/10/2013 11:30 AM Sampler: PWS
 Receipt Date: 4/10/2013 4:20 PM
 Report Date: 4/16/2013
 Sample Site: High Wind Rink, Mt Kisco

Notice the Low Sodium

Parameter	Sample Result	Units	Limits	Method	MDL	Analysis Date
Metals						
Copper	0.02	mg/L	1.3	200.5	0.01	4/11/2013
Iron	0.07	mg/L	0.3	200.5	0.01	4/11/2013
Manganese	0.09 *	mg/L	0.05	200.5	0.01	4/11/2013
Minerals						
Chloride	374.4 *	mg/L	250	EPA 300.0	5	4/15/2013
Hardness	421	mg/L	No Limit Set	200.5	5	4/11/2013
Sodium	19.2	mg/L	28	200.5	1	4/11/2013
Sulfate	28.4	mg/L	250	EPA 300.0	2	4/11/2013
Nutrient						
Nitrate as N	1.3	mg/L	10	EPA 300.0	1	4/11/2013
Nitrite as N	ND	mg/L	1	EPA 300.0	0.1	4/11/2013
Physical						
Color	0	CU	15	110.2a	0	4/10/2013
Conductivity as TDS	733	mg/L	No Limit Set	120.1-tds	1	4/16/2013
Odor	0	0-5 Scale	2	SM2150B	0	4/10/2013
Turbidity	0.4	NTU	5	180.1	0.05	4/11/2013

This is a property that has multiple wells next to the Croton Reservoir in NY. All have high sodium and chloride

ND = Not Detected
 * = Above Specified Limit

Report Approved by:  Lab Director CT Lic PH-0787 NY Lic 11706

Analytical results relate to the samples as received at the laboratory. Report shall not be reproduced except in its entirety without written approval from the laboratory.

This unit is designed to produce about 1000 gallons per day.



This is using an alternating water softener as pretreatment for hardness. It regenerates based on water use. One unit is on line at all times.



This is a 3 membrane system
each producing up to 600 gpd
@77 degree water.



3-300 gallon atmospheric tanks. Submersible pump in tank to re-pressurize the water.



The RO water will flow through a tank filled with crushed limestone before going in to the storage tanks. This will add some minerals back to the water and raise the PH.



This is a external booster pump drawing the water out of the tanks and sending it in to the house.



System Maintenance

- The systems will require every few months adding bags of salt for the water softener.
- There are pre-sediment filters that need changing every 2-4 months, depending on how much particulate is in the water.
- Once a year we recommend doing a water sample to verify performance. On site “tds” testing will confirm the membranes performance.
- Membranes usually last 3-5 years, but it depends on how high the tds is. Membranes cost around \$600-\$800 a piece.

Associated Costs

- Whole house “RO” units can range in price depending on pretreatment and amount of water needed.
- Typical systems run \$15,000- \$20,000 plus cost of the drywell
- There are smaller units available, but the real cost isn't the RO unit, its all the ancillary equipment and drainage locations.

Questions