Analysis of Rainshow'r® Gard'n Gro Filters For Performance in Reducing Free Chlorine

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Submitted By:

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Purpose:

This test is intended to determine the performance of Rainshow r¤ Gard n Gro filters using KDF¤

Process Medium and Granular Activated Carbon for reducing free chlorine from challenge water. All effort was made to comply with NSF Standard 42-2000 and all modifications to this protocol are as noted in this report. Results reported may vary between laboratories due to differences in water chemistries between testing locations.

Methodology:

Test Parameters:

Flow Rate:	2.0-gpm	
Free Chlorine:	2.00-mg/l	
Temperature:	57 ^{o}F	(NSF Standard 42-2000 requires 68 5 ^{o}F)
Pressure	50 10 psi	(NSF Standard 42-2000 requires static 60 psi)

Test Protocol:

Challenge water is delivered to the test filters using a system designed following NSF Standard 42-2000 guidelines, schematic Appendix I. The source for the challenge water is a shallow well drilled into a glacial drift aquifer (analysis Appendix I). The well feeds a 1_-inch main water line through a 30-gallon bladder tank that maintains an influent line pressure of 50 10 psi (50/40 psi pump off/on). Challenge water for testing is generated by chlorinating the well supply with dilute 12.5% sodium hypochlorite solution to an influent free chlorine concentration of approximately 2.00 0.20 mg/l. Preceding the chlorination stage is a 120-gallon mixing vessel followed by a mixed bed filter to remove suspended iron particles precipitated by the chlorine. Water flow through each filter at the testing station is controlled by a solenoid attached to two flow meters. The solenoid in turn is wired into a timer set for a fifteen minute on and fifteen minute off cycle. Additionally, each filter has a ball valve on its flow meter to set the correct flow through the filter.

At the start of testing, after an initial 15 gallons challenge water had passed through the filters, a 250-mL sample is grabbed from both the influent and effluent streams and tested for free chlorine using a HACH DR2000 spectrophotometer using HACH method 8021 (DPD). Thereafter samples are grabbed at 10% intervals of the expected life of the filter. Sampling and testing procedures follow those outlined in Standard Methods for the Examination of Water and Wastewater 19th edition (1992) and HACH Water Analysis Handbook 3rd edition (1997). Percent reduction of free chlorine is determined using the equation:

$$\% \text{ Reduction} = [(\text{Influent Chlorine} - \text{Effluent Chlorine}) / \text{Influent Chlorine}] \times 100$$

Results Table:

Free Chlorine Filter #1			

Influent	Effluent		
Gallons	**Free Chlorine**	**Free Chlorine**	**Percent**
15	1.72	0.10	94
1000	2.00	0.12	94
2000	2.14	0.12	94
3000	1.80	0.14	92
4000	1.88	0.09	95
5000	2.18	0.18	92
6000	1.94	0.14	93
7000	2.03	0.15	93
8000	1.96	0.15	92
9000	2.10	0.16	92
10,000	2.05	0.14	93

Free Chlorine Filter #2			
Influent	**Effluent**		
Gallons	**Free Chlorine**	**Free Chlorine**	**Percent**
15	1.72	0.11	94
1000	2.00	0.08	96
2000	2.14	0.08	96
3000	1.80	0.16	91
4000	1.88	0.16	91
5000	2.18	0.16	93
6000	1.94	0.11	94
7000	2.03	0.18	91
8000	1.96	0.16	92
9000	2.10	0.16	92
10,000	2.05	0.12	94

Appendix I:

Challenge Water Analysis

Parameter	
PH	7.14

Conductivity	656 S
TDS	316 mg/l
Alkalinity (Total as $CaCO_3$)	266 mg/l
Hardness (Total as $CaCO_3$)	321 mg/l
Fe (Total Iron)	0.13 mg/l
Ca^{2+} (Calcium)	92 mg/l
Mg^{2+} (Magnesium)	22 mg/l
K^{+} (Potassium)	0.87 mg/l
Na^{+} (Sodium)	13 mg/l
HCO_3^{-} (Bicarbonate)	325 mg/l
Cl^{-} (Chloride)	45 mg/l
NO_3-N (Nitrate as Nitrogen)	ND mg/l
SO_4^{2-} (Sulfate)	47 mg/l
PO_4^{3-} (Phosphate)	0.11 mg/l
SiO_2 (Silicate)	13 mg/l
Turbidity	<1 NTU
Total Organic Carbon (TOC)	0.50 mg/l

TOC concentration does not meet NSF Standard 42-2000 levels of 1.0 mg/l but has been proven not to have a bearing on filter efficiency.

Appendix II:

Filter Test Schematic