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Performances of CLAIRIFY¹² powered by Quantum Disinfection™

Document N° 1

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Quantum Disinfection™ is:

- A NSF Certified Component to NSF/ANSI 42 for material requirements only: Certificate #: C0292640-01
- Tested by IAPMO to NSF/ANSI 61: Certificate #: 23033
- Certified MOH - China: Certificate #: 2015KF2513

Description

The document N° 1 regroups all results obtain in Laboratory & Pilots tests of the CLAIRIFY 12 system.

The documents includes statistical data concerning the Germicide Activity of the unit, the Silver leaching and the End-of-Life, all in accordance with specific and general operational parameters.



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1. CLAIRIFY ¹²

Four versions of the CLAIRIFY ¹² unit were tested: V1, V2, V3 and V4. The volume, the shape, the size and the quantity of the Quantum Disinfection™ media inside the units are approximately the same (tab. 1).

The general view of all units is presented in the following pictures.
The common characteristics of the units are regrouped in the following table.



Figure 1. CLAIRIFY ¹² units: V1: 2.7 x 10" Atlas Filtri refillable cartridge; V2: 2 x 11" PVC pipe; V3: Claire Unit no longer in use and V4: Claire Unit in use

Table 1. CLAIRIFY ¹² units: common characteristics

Cylinder space size filled with QD (inch)	2.7 x 10
Quantity of QD media (g)	600
Operating Temperature (°F)	41 - 100
Min - Max Operating Pressure (psi)	25 -125
Inlet/Outlet Connection Size (inch)	1



2. Pilot Tests

2.1. Germicide Activity

2.1.1. Test Unit

The germicidal capacities of the CLAIRIFY 12 systems were evaluated using the Pilot Test Unit presented in Figure 2.



Figure 2. Pilot Test Unit: general views

The test unit is composed of a 500 gallon water tank (initially 300 gallons), a distribution pump (up to 15 GPM), a digital flow-meter, a pre-filter (1-5 micron), 2 pressure gages (one up-stream, one down-stream) and 2 faucets (taps) as sampling points (one up-stream, one down-stream). The CLAIRIFY 12 units were installed in between the sampling points.



2.1.2. Operational Parameters: General Test

Several tests were realized using the Pilot Test Unit and about 95% of the tests were carried out following the General Test Operational Parameters:

The tank was filled with about 200-300 gallons of reverse osmosis (RO) water (source: well water) adjusted for pH as well as temperature and then inoculated with *Escherichia coli*, strain ATCC 11775 or ATCC 11229 (10^6 CFU/100ml, LOG 6 in average). The challenge water is passed through the CLAIRIFY¹² unit with a flow rate of 8-10 GPM for 20-30 minutes into an open circuit.

The general test operational parameters are grouped in the following table:

Table 2: Operational parameters: general test

Parameter	Value
Quantity of QD ceramics in the CLAIRIFY ¹⁰ units (g)	600
Water flow (GPM)	8-10
Sampling time intervals (min)	5, 10, 15, 20, 30
Bacteria concentration in the challenge water (CFU/100ml)	10^6 (Log 6)

The RO water quality is tested regularly (once/month). One example of results is the following:

Table 3: Water characteristics: tested water (RO)

Parameter	Value
pH	7.02
Total Suspended Solids: TSS (mg/L)	< 0.001
Total Dissolved Solids: TDS (mg/L)	29.3
Turbidity (NTU)	< 0.001
Lead, flushed (mg/L)	< 0.003
Nitrate (mg/L)	< 0.5
Nitrite (mg/L)	< 0.1
Alkalinity (mg CaCO ₃ /L)	5
Silver (mg/L)	< 0.01
Arsenic (mg/L)	< 0.005
Barium (mg/L)	< 0.05
Calcium (mg/L)	2.2
Cadmium (mg/L)	< 0.001
Chloride (mg/L)	< 5
Chlorine (mg/L)	< 0.001
Bromine (mg/L)	< 0.001
Chromium (mg/L)	< 0.02
Fluoride (mg/L)	< 0.1
Iron (mg/L)	< 0.001
Hardness (mg CaCO ₃ /L)	4.5
Magnesium (mg/L)	1.5
Manganese (mg/L)	0.03
Selenium (mg/L)	< 0.005
Sodium (mg/L)	1
Zinc (mg/L)	< 0.1
Mercury (mg/L)	< 0.0002



2.1.3. Sampling

25 ml of water samples were taken up-stream and down-stream of the CLAIRIFY¹² unit at different time intervals. From the 25 ml sample, only 50 µl were plated on LB-agar in Petri dishes and incubated (37 C, 16-24h) for the bacteria colony growth. We quantify the bacteria concentration, both upstream and downstream, by total plate counts of colony forming units. The germicide activity results are expressed in percent and log reduction.

2.1.4. Results

All results obtained on the Pilot Test Unit are regrouped in the following table:

Table 3: All results: Germicide Activity

N°	Date of Test	Unit	Flow (GPM)	Temperature (°C)	pH	Upstream Bacteria Concentrations (Log)	Activity (%)
1	02/24/16	V1	10.0	-	-	6.0	100.00
2	03/28/16	V1	9.0	-	-	5.9	100.00
3	03/31/16	V1	9.0	20.0	-	5.9	99.94
4	04/05/16	V1	9.0	20.0	-	4.2	100.00
5	04/08/16	V1	9.0	-	-	5.9	99.65
6	05/05/16	V1	9.0	19.5	-	5.4	100.00
7	06/03/16	V1	5.0	20.0	-	5.9	99.78
8	06/12/16	V1	9.0	20.0	-	5.2	99.85
9	08/16/16	V1	9.0	28.8	-	5.2	100.00
10	09/21/16	V1	10.0	28.1	-	5.1	100.00
11	10/14/16	V1	7.7	25.0	6.78	3.4	100.00
12	10/18/16	V1	7.6	25.0	6.50	3.5	100.00
13	10/18/16	V1	7.8	25.0	6.50	3.5	100.00
14	10/21/16	V1	8.0	27.0	6.70	3.6	100.00
15	10/24/16	V1	8.0	25.5	7.01	3.7	100.00
16	10/25/16	V1	7.8	25.0	6.72	3.6	100.00
17	10/26/16	V1	8.3	25.2	6.86	3.8	100.00
18	10/27/16	V1	7.8	22.2	6.70	4.1	99.94
19	10/27/16	V1	7.8	22.1	6.70	6.0	100.00
20	10/28/16	V1	7.5	22.2	6.50	6.1	100.00
21	10/31/16	V1	7.8	22.5	6.52	4.0	99.96
22	11/01/16	V1	8.1	22.2	6.51	4.3	100.00
23	11/01/16	V2	7.7	22.1	6.78	4.3	100.00
24	11/10/16	V2	7.8	20.6	6.51	3.8	100.00
25	01/31/17	V2	10.3	24.9	7.80	6.7	100.00
26	01/31/17	V2	10.9	25.0	7.50	6.7	100.00
27	02/14/17	V2	10.0	24.1	7.59	6.3	99.80
28	02/21/17	V2	10.0	26.9	7.49	6.7	99.99
29	02/24/17	V2	10.0	25.6	7.52	6.5	100.00
30	02/27/17	V2	10.0	25.0	7.70	5.6	99.88
31	05/10/17	V2	10.0	27.0	7.70	6.5	100.00
32	05/02/17	V2	10.3	26.0	6.40	4.2	100.00
33	05/10/17	V2	10.0	27.0	7.80	6.6	100.00
34	05/16/17	V2	10.0	25.4	7.30	6.4	100.00
35	03/09/17	V2	10.0	25.3	7.45	6.2	100.00
36	05/25/17	V2	10.0	24.8	7.25	6.2	100.00
37	06/08/17	V2	10.0	23.7	-	6.3	100.00
38	06/22/17	V2	10.0	25.8	7.30	6.1	100.00
39	07/21/17	V2	9.1	23.0	7.25	5.7	100.00
40	07/24/17	V2	10.4	23.5	7.30	4.9	100.00
41	07/28/17	V2	8.9	25.0	7.70	6.1	100.00
42	08/03/17	V2	9.4	24.9	7.20	5.9	100.00
43	08/29/17	V2	9.7	25.5	7.08	6.2	100.00
44	09/29/17	V2	9.7	25.4	7.30	6.0	100.00



N°	Date of Test	Unit	Flow (GPM)	Temperature (°C)	pH	Bacteria Concentrations (Log)	Activity (%)
45	10/05/17	V1	10.0	24.1	7.59	6.0	100.00
46	10/05/17	V1	10.0	27.1	7.40	6.0	100.00
47	10/11/17	V1	10.0	25.5	7.43	5.9	100.00
48	10/20/17	V1	10.0	26.2	7.53	6.1	99.96
49	11/10/17	V1	10.0	26.9	7.49	6.4	100.00
50	11/13/17	V1	10.0	25.9	7.50	5.0	100.00
51	11/13/17	V1	10.0	25.9	7.50	5.3	100.00
52	11/14/17	V1	10.0	25.6	7.52	5.5	100.00
53	12/07/17	V1	10.0	25.0	7.70	4.0	99.99
54	12/18/17	V1	10.0	27.0	7.70	7.3	99.98
55	12/20/17	V1	10.3	26.0	6.40	6.9	99.98
56	12/21/17	V1	10.2	25.3	7.51	7.1	100.00
57	01/11/18	V1	10.0	27.0	7.80	6.9	100.00
58	01/17/18	V1	10.0	25.4	7.30	6.8	99.99
59	01/17/18	V1	10.0	25.3	7.45	7.6	99.99
60	01/17/18	V1	10.0	25.5	7.53	7.6	99.99
61	01/29/18	V1	10.0	24.8	7.25	7.6	99.98
62	02/05/18	V1	10.0	23.7	-	7.0	99.98
63	02/05/18	V3	10.0	25.8	7.30	6.7	100.00
64	02/12/18	V1	9.1	23.0	7.25	6.6	100.00
65	02/13/18	V3	10.4	23.5	7.30	6.1	100.00
66	02/20/18	V3	7.1	24.2	7.10	7.3	99.98
67	03/05/18	V3	8.9	25.0	7.70	7.3	100.00
68	03/05/18	V3	9.4	24.9	7.20	7.3	99.80
69	03/06/18	V3	9.7	24.8	7.20	7.5	100.00
70	03/06/18	V3	9.0	25.0	7.20	7.8	100.00
71	03/07/18	V3	8.5	27.0	7.10	7.8	99.99
72	03/09/18	V3	8.9	25.0	7.82	7.4	99.99
73	03/13/18	V3	9.7	25.5	7.08	7.5	99.98
74	03/13/18	V3	9.2	23.0	7.30	7.1	99.99
75	03/13/18	V3	9.7	24.6	7.45	7.2	99.99
76	03/13/18	V3	9.7	25.4	7.30	7.3	99.99
77	03/13/18	V3	8.7	25.3	7.30	7.4	99.99
78	03/14/18	V3	8.1	25.3	7.30	7.4	99.99
79	03/14/18	V3	8.7	25.5	7.27	7.4	99.99
80	03/16/18	V3	7.7	24.9	7.26	7.5	99.99
81	03/16/18	V3	7.7	22.5	7.20	7.3	99.98
82	03/16/18	V3	7.0	25.3	7.80	7.2	99.98
83	03/16/18	V3	7.1	25.0	7.90	7.0	99.98
84	03/19/18	V3	7.3	24.5	7.35	7.1	99.98
85	03/20/18	V3	7.3	24.5	7.35	7.4	99.99
86	03/27/18	V3	7.0	24.4	7.47	7.5	100.00
87	04/04/18	V3	7.1	24.0	7.38	7.4	100.00
88	04/04/18	V3	7.1	24.0	7.38	7.3	99.99
89	04/04/18	V3	7.4	23.7	7.50	7.5	99.99
90	04/04/18	V3	7.1	23.7	7.55	7.2	99.99
91	04/04/18	V3	7.5	24.3	7.30	7.4	100.00
92	04/06/18	V3	7.8	26.0	7.25	7.5	99.99
93	04/06/18	V3	6.9	24.5	7.58	7.5	99.99
94	04/06/18	V3	7.5	24.3	7.40	7.6	100.00
95	04/10/18	V3	7.5	24.0	7.36	7.6	100.00
96	04/19/18	V3	7.3	24.1	7.44	7.5	100.00
97	04/23/18	V3	7.2	24.6	7.22	7.4	100.00
98	04/23/18	V3	7.6	24.0	7.40	7.4	100.00
99	04/26/18	V3	7.5	24.0	7.36	7.5	100.00
100	05/01/18	V3	8.1	25.1	7.20	7.0	100.00
101	05/08/18	V3	6.9	24.9	7.48	7.4	100.00
102	05/14/18	V3	7.1	25.0	7.60	7.7	100.00
103	05/15/18	V3	7.0	25.0	7.50	6.8	100.00
104	05/18/18	V3	1.2	25.0	7.50	7.6	100.00



N°	Date of Test	Unit	Flow (GPM)	Temperature (°C)	pH	Bacteria Concentrations (Log)	Activity (%)
105	05/29/18	V3	10.3	26.8	7.40	7.1	100.00
106	06/04/18	V3	10.0	25.4	7.20	7.4	100.00
107	06/11/18	V3	10.6	25.8	7.32	7.2	100.00
108	06/18/18	V3	10.5	27.3	7.14	7.4	100.00
109	06/25/18	V3	10.0	25.5	7.14	7.8	100.00
110	03/19/19	V3	9.5	25.0	7.40	7.4	100.00
111	03/27/19	V3	9.9	26.0	7.52	7.3	100.00
112	03/28/19	V3	10.2	25.0	7.50	7.3	100.00
113	03/29/19	V3	10.2	25.0	7.70	7.5	100.00
114	04/02/19	V3	10.0	24.0	7.60	7.6	100.00
115	04/05/19	V3	10.0	23.2	6.20	7.5	100.00
116	04/15/19	V3	10.0	24.2	7.20	7.5	100.00
117	04/17/19	V3	10.0	25.0	7.40	7.4	100.00
118	04/22/19	V3	10.0	24.0	7.40	7.3	100.00
119	04/25/19	V3	10.0	24.0	7.50	7.9	100.00
120	04/29/19	V3	10.0	24.0	7.36	7.2	100.00
121	05/06/19	V3	10.0	23.5	7.32	7.5	100.00
122	05/13/19	V3	10.0	22.0	7.36	7.4	100.00
123	06/11/19	V3	10.0	25.0	7.41	7.2	99.98

The averages and the statistical analysis of this data are presented in the following table:

Table 4: Averages and the statistical analysis of all data

N° of tests	Period of time (months)	Flow (GPM)	Temperature (°C)	pH	Bacteria Concentrations (Log)	Activity (%)
123	40	8.7	24.6	7.20	6.5	100

As an average, from 123 tests realized in the last 40 months (one tests per week, every week) it results that the CLAIRIFY¹² units eliminate, at least 99.99% from a LOG 6.5 (CFU/100 ml) of *Escherichia Coli* (strain ATCC 11775 or ATCC 11229 growth at 37°C for 16 h and injected in RO water), at a water flow of 8.3 GPM, at 24.6 °C and pH 7.20.



2.2. End-of-Life

In order to evaluate the End-of-Life of the CLAIRIFY¹² units, 5 tests were realized (37.6 days for each test, in average) according to the following protocol.

2.2.1. Operational Parameters

The End-of-Life test is composed of 2 steps test: the Germicide Activity Test and the Endurance Test.

The Germicide Activity Test was realized following the exact same protocol as described at 2.1.2. and the sampling was made using the same method as described at 2.1.3.

After the 20-30 minutes test with the challenge water (*E. Coli*) the CLAIRIFY¹² units are then transferred to a Second Test Unit similar with the First Pilot Test Unit presented in figure 2 and described at 2.1.1.

The difference in the 2 testing units is that the Second Test Unit (for the Endurance Test) is a closed loop system running on a non bacterial challenge RO water. This Units purpose is to quantify the water volume that passed trough the CLAIRIFY¹² units at an approximative flow of 8-9 GPM. The systems are taken, at different intervals, and connected back to the Germicide Activity Test unit for the germicide activity evaluation.

This sequence is repeated several times, until the systems endure a passage of 200,000 - 250,000 gallons.

2.2.3. Results

All the End-of-Life results are regrouped in the following table:

Table 4: All results: End-of-Life

N°	Unit	Date	Water volume (gallons)	Flow (GPM)	Temperature (°C)	pH	Bacteria Concentrations (Log)	Activity (%)
1	V3	01/31/17	0	10.0	24.9	7.8	6.7	100.0
		01/31/17	300	9.0	25.0	7.5	6.7	100.0
		02/01/17	13000	10.0	24.9	7.6	5.9	100.0
		02/02/17	28000	12.0	25.6	7.5	5.5	100.0
		02/04/17	44000	10.0	25.1	7.3	6.5	99.8
		02/06/17	75000	10.0	26.1	7.5	6.1	99.6
		02/07/17	91000	10.0	26.5	7.3	6.5	98.6
		02/08/17	108000	10.0	26.9	7.7	6.2	98.9
		02/09/17	120000	10.0	25.6	7.4	6.0	98.9
		02/10/17	136000	10.0	25.8	7.4	6.2	100.0
		02/17/17	165000	10.0	30.0	7.3	6.3	100.0
		02/28/17	180000	10.0	26.4	7.4	6.2	99.6
		03/01/17	200000	10.0	29.0	7.8	6.1	100.0
03/03/17	215000	10.0	25.0	7.5	5.8	99.0		
Average				10.1	26.2	7.5	6.19	
2	V3	02/24/17	0	10.0	25.6	7.6	6.5	100.0
		03/02/17	15000	10.0	27.0	8.0	5.8	100.0
		03/09/17	62000	10.0	26.4	7.4	5.8	97.9
		03/14/17	120000	10.0	25.1	7.7	6.4	100.0
		03/17/17	165000	10.0	25.0	7.2	6.4	99.7
		03/20/17	210000	10.0	25.5	7.5	6.7	100.0
Average				10.0	25.8	7.6	6.27	



N°	Unit	Date	Water volume (gallons)	Flow (GPM)	Temperature (°C)	pH	Bacteria Concentrations (Log)	Activity (%)
3	V3	06/16/17	0	10.0	25.6	7.6	5.4	100.0
		06/20/17	45000	10.0	26.0	7.2	6.7	100.0
		06/23/17	80000	10.0	26.4	7.4	6.4	100.0
		06/26/17	115000	10.0	25.0	7.2	6.0	100.0
		07/21/17	225000	10.0	25.0	7.2	6.5	100.0
Average				10.0	25.6	7.3	6.20	
4	V3	06/23/17	0	10.0	24.5	7.6	6.2	100.0
		07/28/17	38000	10.0	26.0	7.2	5.2	100.0
		08/01/17	76000	10.0	25.0	7.4	5.1	100.0
		08/08/17	145000	10.0	25.0	7.2	6.1	100.0
		08/23/17	217000	10.0	23.2	7.2	6.7	100.0
08/28/17	270000	9.0	27.5	7.4	6.2	85.4		
Average				9.8	25.2	7.3	5.92	
5	V4	03/16/18	0	7.8	24.7	7.2	7.0	100.0
		03/17/18	11000	7.3	24.1	7.3	7.1	100.0
		03/18/18	24000	7.3	24.0	7.3	7.2	99.8
		03/19/18	36000	7.2	24.4	7.2	7.3	100.0
		03/20/18	50000	6.9	25.2	7.2	7.5	100.0
		03/21/18	62000	6.7	24.3	7.2	7.4	100.0
		03/22/18	74000	7.3	24.6	7.2	7.5	99.9
		03/23/18	87000	7.3	24.5	7.4	7.4	99.9
		03/24/18	100000	6.7	24.4	7.1	7.3	99.8
		03/26/18	113000	6.8	24.4	7.2	7.4	99.9
		03/27/18	125000	6.7	24.5	7.2	7.4	100.0
		03/29/18	137000	6.8	24.7	7.3	7.6	99.6
		03/31/18	150000	6.9	24.5	7.4	7.3	100.0
		04/03/18	162000	7.5	24.3	7.1	6.7	100.0
04/04/18	162000	7.8	25.3	7.1	7.5	100.0		
04/06/18	174000	8.8	25.5	7.1	7.5	100.0		
04/10/18	212000	8.0	25.0	7.2	7.1	99.9		
Average				7.3	24.6	7.2	7.31	

Table 5: Averages before germicide activity starts dropping

N°	Unit	Date of Test	Max Water Volume before Activity drop (gal)	Flow (GPM)	Temperature (°C)	pH	Bacteria Concentrations (Log)
1	V3	01-03/17	200000	10.1	26.3	7.5	6.22
2	V3	02-03/17	210000	10.0	25.8	7.6	6.27
3	V3	06-07/17	225000	10.0	25.6	7.3	6.20
4	V3	06-08/17	217000	10.0	24.7	7.3	5.86
5	V4	03-04/18	212000	7.3	24.6	7.2	7.31
Average			212800	9.5	25.4	7.4	6.37

After 5 tests, each test including 9.6 (in average) Germicide Activity tests, the End-of-Life of the CLAIRIFY¹² can be estimated at 212,800 gallons of water that can pass through the units before its Germicide Activity dropped from 99.99% to 99.98% or lower.



2.3. Silver (Ag) leaching

All the Silver Leaching tests were realized during the Germicide Activity tests using the same Pilot Test Unit as described at 3.1.1.

2.3.1. Sampling

The water samples were taken, in all tests, approximately 20 min after the Germicide Activity test started and only from the downstream of the CLAIRIFY¹² unit.

The silver concentration was analyzed by Inducted Couplet Plasma (ICP) (Sensitivity for Ag: <5 ppb) in collaboration with North Carolina State University (ref. Kim Hutchison, Environmental and Agricultural Testing Service (EATS) Laboratory, Manager Dept. of Crop and Soil Sciences, NCSU).

2.3.2. Results

All results are regrouped in the following table:

Table 6: All results: Silver Leaching

N°	Date of Test	Unit	Flow (GPM)	Temperature (°C)	pH	Bacteria Concentrations (Log)	Activity (%)	Ag Leaching (ppb)
1	08/29/17	V3	9.7	25.5	7.08	6.2	100.00	84.0
2	10/05/17	V3	8.7	25.3	7.30	6.0	100.00	106.1
3	10/11/17	V3	8.7	25.5	7.27	6.1	99.96	140.0
4	12/19/17	V3	7.6	24.0	7.40	6.9	99.98	38.4
5	12/21/17	V3	8.1	25.1	7.20	6.9	99.97	35.0
6	01/29/18	V3	5.5	24.3	7.46	7.0	99.98	10.7
7	02/05/18	V3	7.0	25.0	7.20	6.7	99.98	67.1
8	02/13/18	V3	6.0	25.3	7.15	7.3	99.96	8.0
9	02/20/18	V3	8.3	24.2	7.20	7.3	99.98	8.0
10	03/05/18	V4	9.0	24.8	6.96	7.4	99.78	72.0
11	03/05/18	V4	8.9	24.8	6.96	7.3	99.70	19.7
12	03/05/18	V4	8.8	24.8	6.96	7.5	99.80	18.0
13	03/06/18	V4	8.7	24.8	6.96	7.8	100.00	25.2
14	03/06/18	V3	8.3	26.0	7.35	7.8	100.00	55.5
15	03/09/18	V4	8.2	24.9	7.42	7.5	99.99	0
16	03/13/18	V3	8.0	23.7	7.45	7.1	99.98	3.2
17	03/13/18	V4	8.2	23.7	7.45	7.2	99.99	2.3
18	03/13/18	V4	8.0	23.7	7.45	7.3	99.99	81.4
19	03/13/18	V4	8.2	23.7	7.45	7.4	99.99	96.8
20	03/13/18	V4	8.2	23.7	7.45	7.4	99.99	39.7
21	03/15/18	V3	7.9	25.3	7.49	7.3	99.97	39.6
22	03/16/18	V4	7.7	24.7	7.20	7.3	99.99	103.0
23	03/16/18	V4	7.7	24.7	7.20	7.2	99.98	89.0
24	03/16/18	V4	7.6	24.7	7.20	7.0	99.97	98.0
25	03/16/18	V4	7.8	24.7	7.20	7.0	99.98	98.0
26	05/01/18	V4	9.8	24.8	7.27	7.4	100.00	11.0
27	05/08/18	V4	9.9	24.2	7.10	7.7	100.00	35.0
28	06/18/18	V4	10.5	27.3	7.14	7.4	100.00	55.0
29	06/25/18	V4	10.0	25.5	7.14	7.8	100.00	11.0
30	03/19/19	V4	9.5	25.0	7.40	7.4	100.00	28.0
31	03/27/19	V4	9.9	26.0	7.52	7.3	100.00	72.0
32	03/28/19	V4	10.2	25.0	7.50	7.3	100.00	82.0
33	03/29/19	V4	10.2	25.0	7.70	7.5	100.00	66.0
34	04/02/19	V4	10.0	24.0	7.60	7.6	100.00	66.0
35	04/05/19	V4	10.0	23.2	6.20	7.5	100.00	25.0
36	04/15/19	V4	10.0	24.2	7.20	7.5	100.00	9.0



N°	Date of Test	Unit	Flow (GPM)	Temperature (°C)	pH	Bacteria Concentrations (Log)	Activity (%)	Ag Leaching (ppb)
37	04/17/19	V4	10.0	25.0	7.40	7.4	100.00	0.0
38	04/22/19	V4	10.0	24.0	7.40	7.3	100.00	0.0
39	04/25/19	V4	10.0	24.0	7.50	7.9	100.00	0.0
40	04/29/19	V4	10.0	24.0	7.36	7.2	100.00	0.0
41	05/06/19	V4	10.0	23.5	7.32	7.5	100.00	0.0
42	05/13/19	V4	10.0	22.0	7.36	7.4	100.00	0.0
43	06/11/19	V4	10.0	25.0	7.41	7.2	99.98	2.0
Average			8.3	24.9	7.20	7.2	99.99	41.9

From 43 water samples taken during the last 2 years it results that the QD media from the CLAIRIFY¹² units leach less than 42.0 ppb of Silver in the downstream water, concentration that is under the EPA drinking water standard limitations (100 ppb).

As a representative example of leaching curve, it can be considered the 5th End-of-Life test, where water samples were taken and analyzed for silver presence during all the Germicide Activity tests.

The results are presented in the following picture:

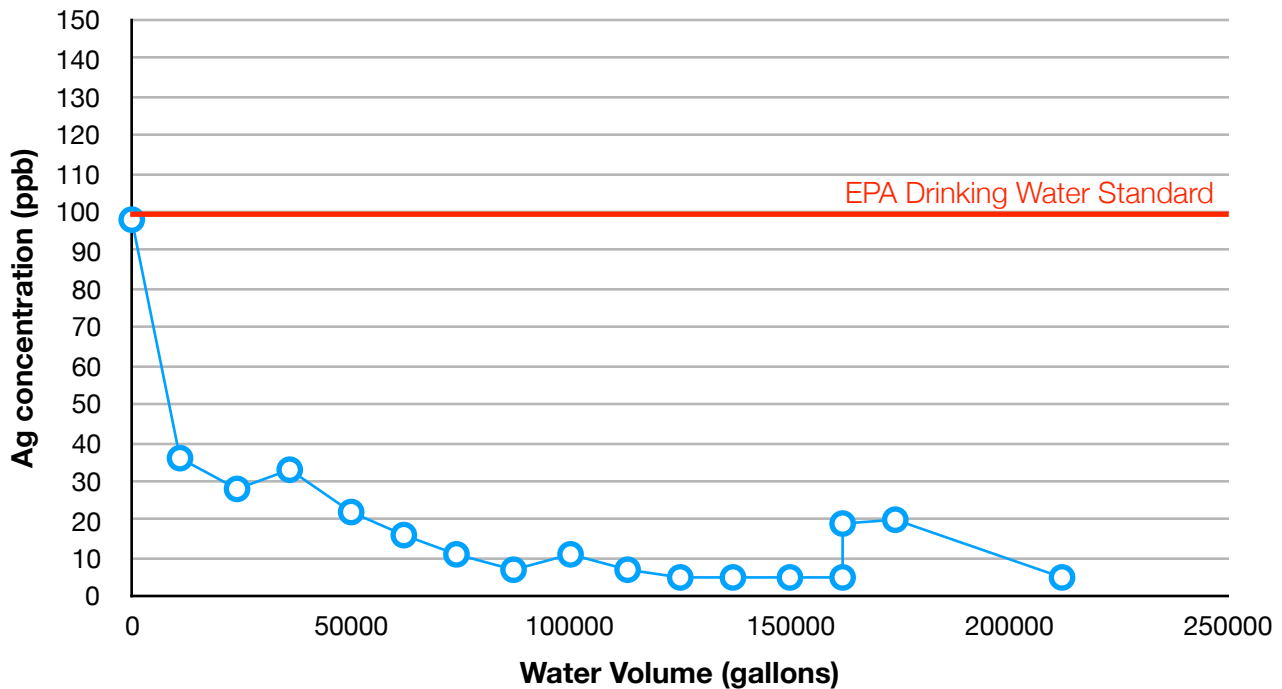


Figure 2. Evolution of the Silver concentration in function of the water volume that passed through the CLAIRIFY¹² unit

Figure 2 shows that the silver leaching is not constant but decreases significantly in function of the water volume that passed through the CLAIRIFY¹² unit. After the first 11,000 gallons the Ag concentration dropped 3 times and then again 10 times after 75,000 gallons. After 87,000 the silver traces are practically undetectable.



Conclusions

- CLAIRIFY¹² Germicide Activity: the unit eliminate more than 99.99% of *E. Coli* out of Log 6 upstream concentration, at a water flow of 8.3 GPM;
- CLAIRIFY¹² Germicide Activity remains constant at 99.99% for, at least 212,800 gallons that pass through the unit; After 212,800 gallons the germicide activity of the unit can drop from 99.99% to 99,98% of lower;
- CLAIRIFY¹² Silver leaching: the unit leach < 42 ppb Ag (EPA limitation: 100 ppb) in the first minutes after installing the system. These silver traces go away completely with flushing.