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CASE STUDY

Steubenville Wastewater Treatment Plant Peragreen® 22WW Trial Interim Data Summary

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Purpose

The purpose of this study is to determine the efficacy of the peracetic acid (PAA) product **Peragreen® 22WW** (22%) as a chemical disinfectant for use in a secondary wastewater treatment facility. Steubenville Wastewater Treatment Plant (WWTP) and its cost effectiveness when compared against a 12% PAA formulation.

MATERIALS AND METHODS

The **Peragreen® 22WW** trial began at the Steubenville WWTP, OH on September 24, 2015. The Steubenville WWTP has a nominal daily flow of 7 MGD and dry weather flow of 4 MGD. Plant capacity is rated for 13.5 MGD however, the facility is capable of processing up to 40 MGD of wastewater and storm water per day.

Two totes of **Peragreen® 22WW** were set above the existing chlorine contact chamber and connected to feed using a 16 GPD Iwaki Walchem diaphragm pump. The PAA was fed "neat" into a 36" diameter pipe which feeds directly from the three (330,000 gal) secondary clarifiers, 25 ft. upstream from the contact chamber (see Figure 1). Feed was controlled based on a 4:20 follower for flow pacing. The pump was manually adjusted in order to maintain a PAA residual monitored using a hand-held Hach Colorimeter DPD method.

Grab samples were collected once daily for influent and effluent fecal coliform counts performed at the facilities laboratory. Facility flow and residual PAA were monitored and recorded every two hours. Chemical usage was tracked daily. The trial was to run 24/7 for 30 days however a 60-day extension is required in order to monitor **Peragreen® 22WW**s performance during wet weather events and run the same trial using the 12% product to perform a cost analysis between the two products.

RESULTS

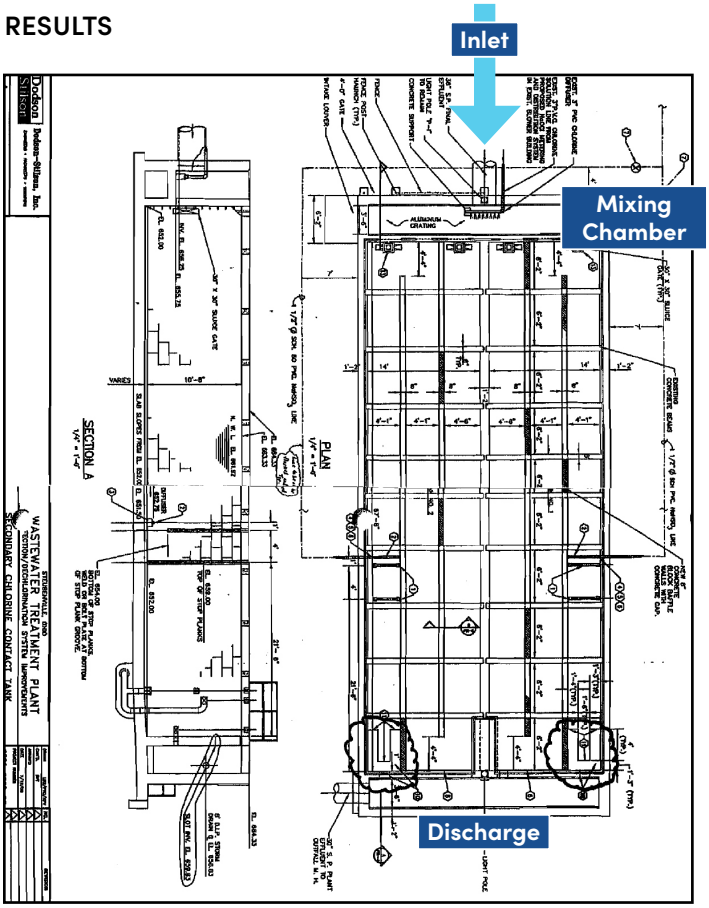

FIGURE 1. The Steubenville WWTP contact chamber schematic. PAA was fed 25' ahead of the mixing chamber to the effluent of the secondary clarifiers.

Steubenville WWTP G 22% PAA Trial G Data Summary						
Date	Time	Flow Rate (MGD)	PAA Residual (ppm)	PAA Used (GPD)	Influent Fecal (CFU/100mL)	Effluent Fecal (CFU/100mL)
8/24/15	13:00	4.31	0.74		4000	4.1
8/25/15	9:00	4.17	0.66	15.1	3500	9
8/26/15	11:30	4.02	0.33	14.7	2000	16.3
8/27/15	9:00	4.63	0.22	7.3	1500	32
8/31/15	9:00	4.08	0.24	6	1900	31.7
9/1/15	9:00	4.02	0.25	6	1200	21.3
9/2/15	9:00	3.92	0.18	4.6	1800	35
9/3/15	9:00	8.6	0.25	4.1	3100	1666.7
9/8/15	9:00	4.42	0.15	4.1	4500	593.3
9/9/15	9:00	4.33	0.13	4.1	1400	62
9/10/15	9:00	9.07	0.35	43.1	30000	443
9/11/15	9:00	6.04	0.32	8.3	7000	437
9/15/15	9:00	5.08	0.29	7.3	2200	21.3
9/16/15	9:00	4.08	0.29	9.6	2400	23.7
9/17/15	9:00	4.42	0.3	7.3	2600	25.7
9/21/15	9:00	3.06	0.29	10.1	990	27.7
9/22/15	9:00	4.7	0.32	13.8	1200	39.3
9/23/15	9:00	4.07	0.3	9.6	1500	43
					Wet Weather Event	

TABLE 1. **Steubenville WWTP – 22% PAA Trial – Data Summary. Data collected during the 30Vday Peragreen® 22WW trial included daily measures of plant flow rate (MGD), PAA residual (ppm), chemical usage (GPD), influent and effluent fecal count (CFU/100mL).**

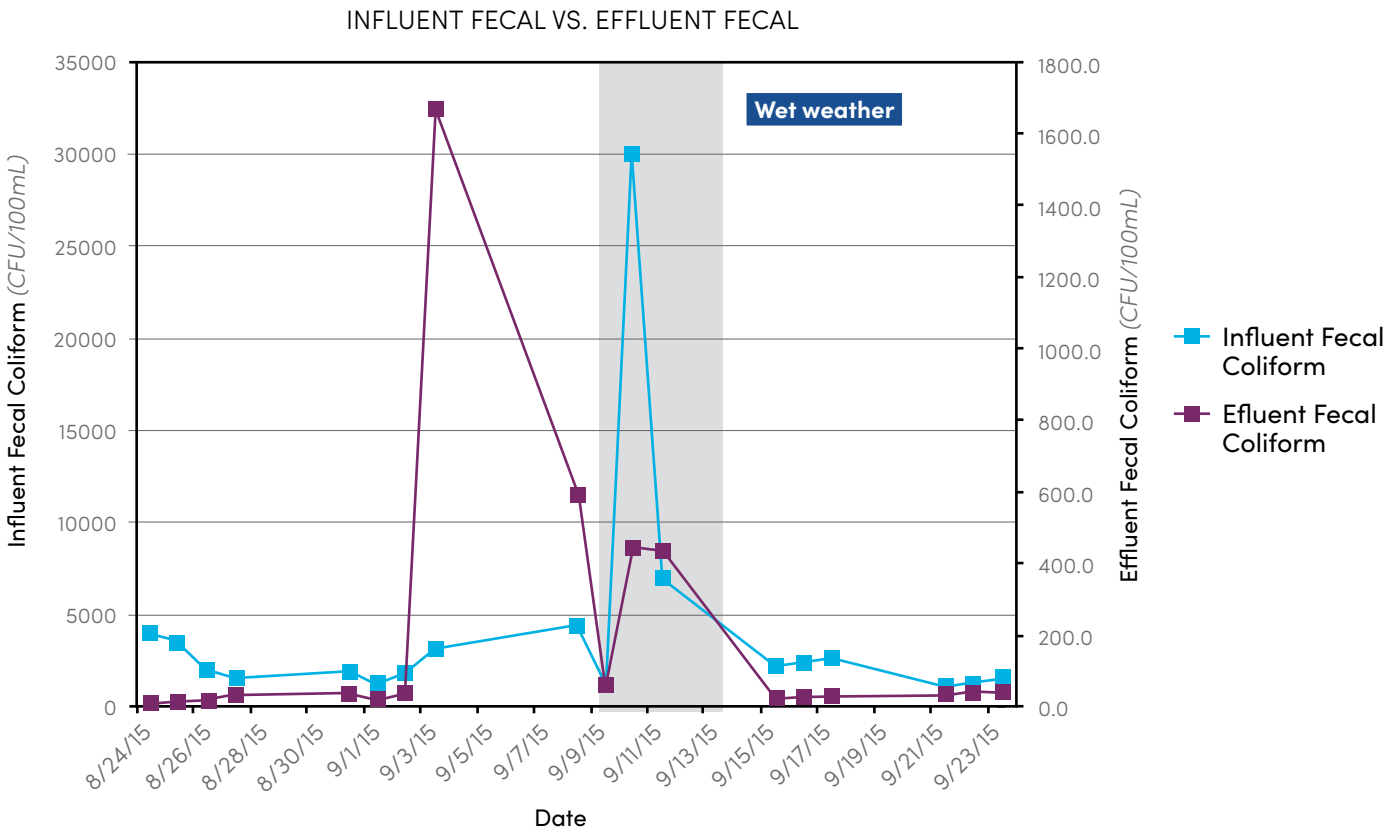

FIGURE 2. **Influent Fecal Coliform vs. Effluent Fecal Coliform. Pathogen numbers were measured and recorded prior to the contact chamber and compared to those taken at the effluent of the contact chamber. Effluent numbers were to remain below the permit limit of 200 CFU/100 mL. Numbers surpassed the limit when residual PAA numbers fell below 0.30 ppm (see Figure 3) and during the wet weather event.**

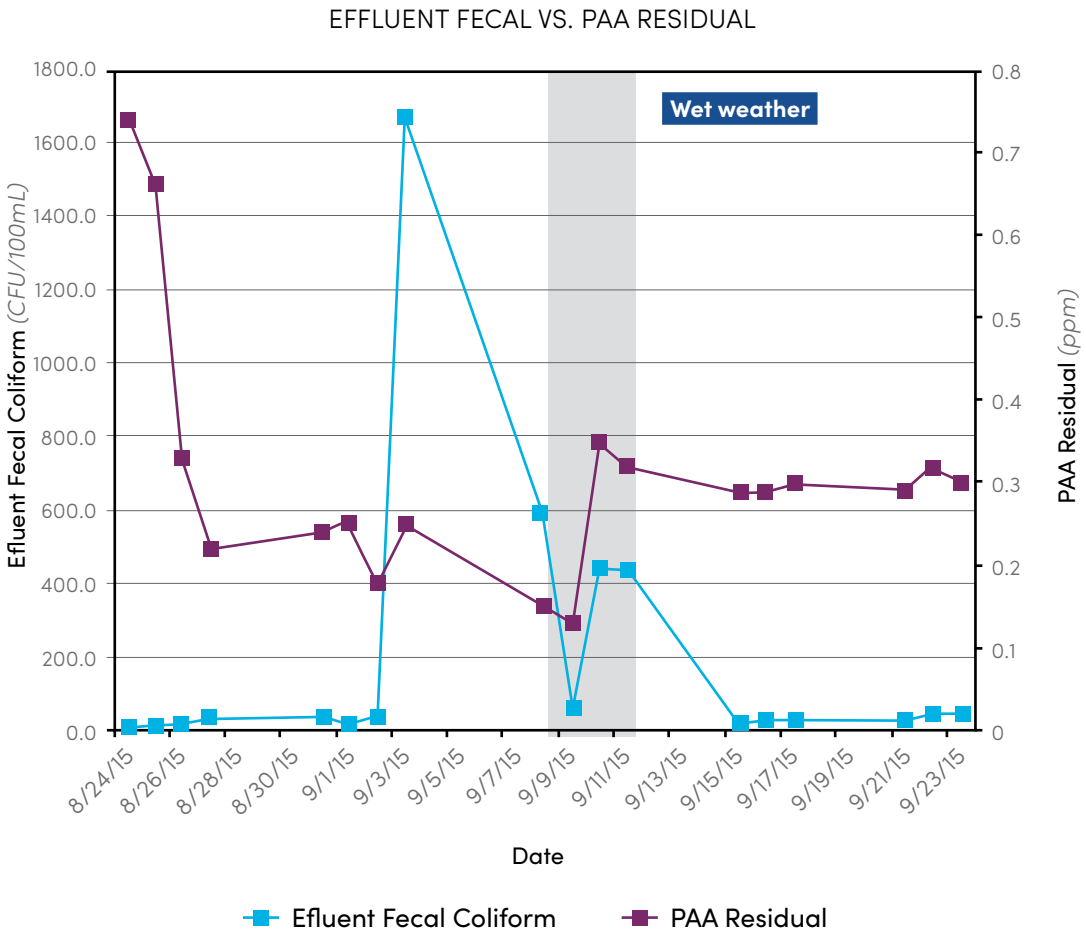

FIGURE 3. **Effluent Fecal Coliform vs. PAA Residual. Effluent pathogen numbers were measured and compared with the measured PAA residual number. Spikes were seen in the Effluent Fecal Coliform numbers during a wet weather event and when PAA residual numbers were held below 0.30 ppm.**

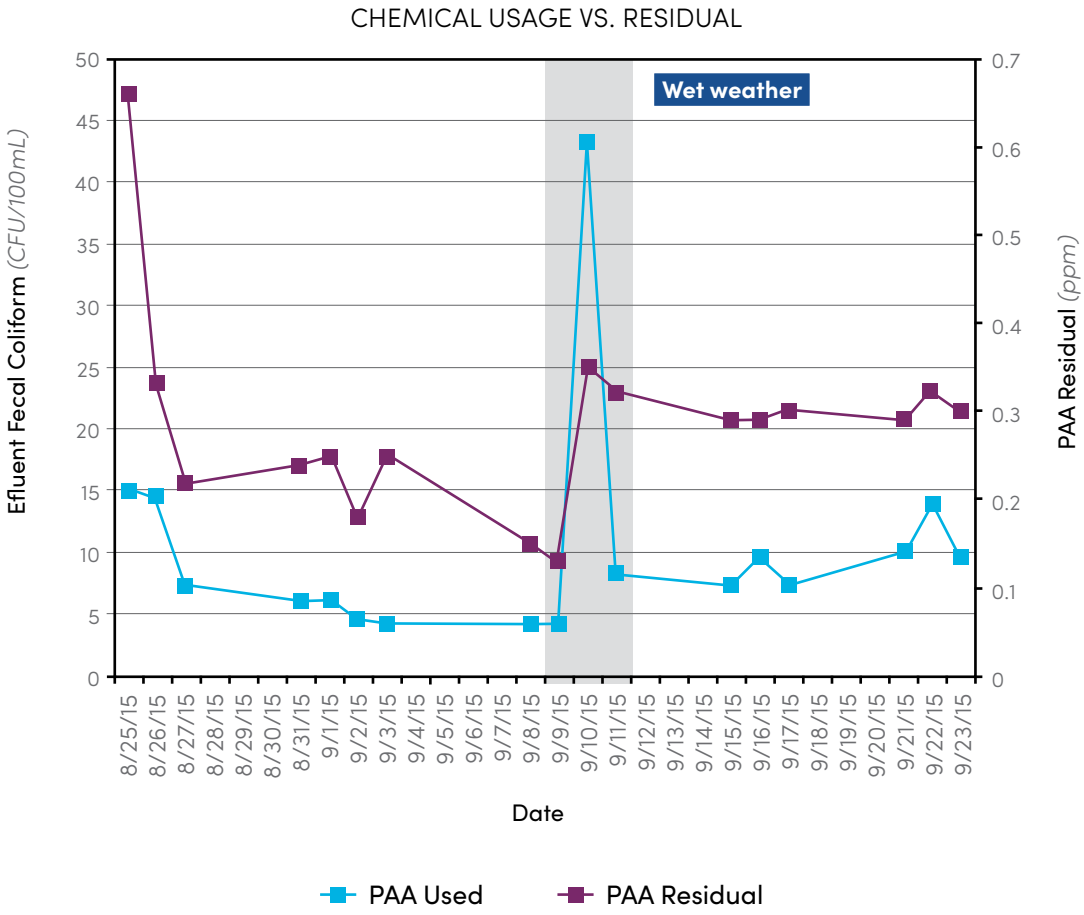

FIGURE 4. **Chemical Usage vs. PAA Residual. Chemical usage was tracked daily and compared against effluent PAA residual. Chemical usage ranges between 43 GPD (wet weather) and 9 – 13 GPD (dry weather) when PAA residual is maintained above 0.30 ppm.**

Steubenville WWTP G 12% PAA Trial G Data Summary						
Date	Time	Flow Rate (MGD)	PAA Residual (ppm)	PAA Used (GPD)	Influent Fecal (CFU/100mL)	Effluent Fecal (CFU/100mL)
10/5/15	9:00	5.52	0.37	22.5	1400	29.3
10/6/15	9:00	6.03	0.37	22.5	1300	18.7
10/7/15	9:00	5.54	0.39	22.9	1700	25.7
10/8/15	9:00	5.17	0.36	21.6	2000	36.3
				Cost Reduction		63.11111111

TABLE 2. **Steubenville WWTP – 12% PAA Trial – Data Summary. Data was collected during the first week in October in which the facility switched from feeding the 22% PAA product to the 12% PAA product. This was in order to perform an accurate cost analysis on both products. Based on estimate calculations, the cost reduction of switching to 22% from 12% is 63.11%.**

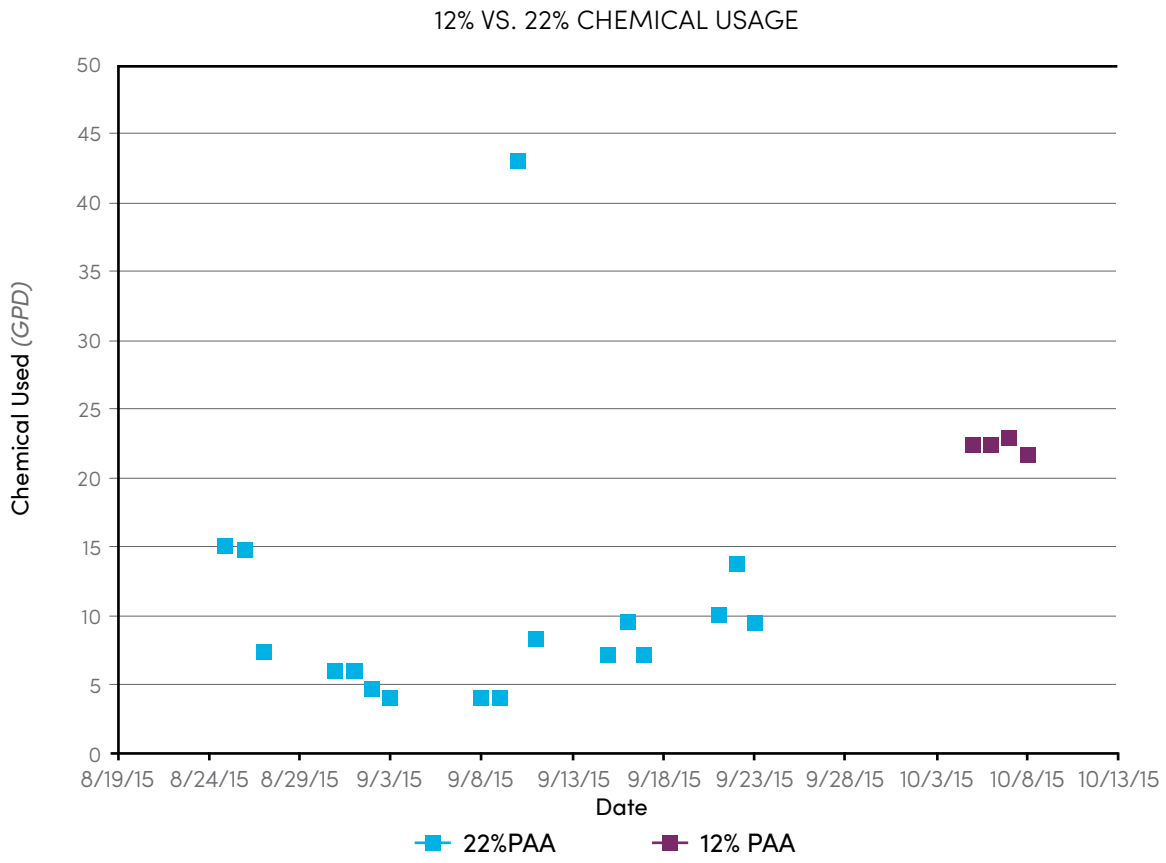

FIGURE 5. 12% vs. 22% Chemical Usage. Chemical usage was tracked in gallons per day and compared for both 12% and 22% PAA formulations. It can be seen that the 12% PAA daily usage was almost double that of the average daily usage for 22%.

Conclusion

PERAGREEN® 22WW EFFICACY

Peragreen® 22WW was able to inactive fecal coliform within permitting limit (200 CFU/100 mL) during dry weather flows when a PAA effluent residual was maintained above 0.30 ppm. Effluent pathogen numbers were seen to meet permit when the PAA residual was lower than 0.30 ppm however, was unable to maintain permit level at these residuals when incoming pathogen numbers increased above 1,200 CFU/100 mL.

Peragreen® 22WW was unable to meet permit during the wet weather event, achieving a 99.47% reduction but an effluent fecal count of 800 CFU/100 mL. Further testing will be conducted during the trial extension to determine **Peragreen® 22WW**s efficacy during wet weather events.

PERAGREEN® 22WW COST ANALYSIS

Data collected to perform the cost analysis included feed rates, number of thousand gallons treated, and chemical usage. Based on the results of this study, it has been calculated that there is a 63.11% chemical usage reduction between the 22% PAA and 12% and it is estimated that 17% of chemical cost was saved. Further data is being collected to finalize this estimate.