

WATER RECLAMATION PLANT, ST. PETERSBURG, FLORIDA, USA

DISINFECTION MIXING IMPROVES PERFORMANCE, LOWERS COSTS

The object

Saint Petersburg, Florida, is home to about 250,000 residents who enjoy „Florida’s Sunshine City“ located on Tampa Bay. The city has one of the largest water reuse programs in the country; it serves residential, commercial and industrial customers via a dual municipal distribution system delivering over 37 million gallons of reclaimed water per day (MGD). The St. Petersburg Northeast Water Reclamation plant is a 16 MGD activated sludge plant that is one of three reclamation plants servicing the area. The process stream consists of screening, aeration, clarification, filtration and disinfection with Sodium Hypochlorite (NaOCl). Average flows are 8 - 10 MGD, with approximately 50% of the water being reused for irrigation with the remainder disposed of via deep well injection.

The task

Disinfection is accomplished by feeding 12.5% sodium hypochlorite into a splitter box where it reacts with ammonia to form chloramines used as final disinfectant. Sodium hypochlorite dose rate is controlled based on the residual chlorine concentration which is set at 5 ppm.

St Petersburg’s Department of Environmental Protection (DEP) permit requires to monitor for fecal coliform in the plant effluent. Any tests showing a fecal coliform concentration greater than 25 CFU/100 ml is reportable. Also, 75% of all tests must be below detectable levels; anything higher than that also becomes reportable to the Florida Department of Environmental Protection. On most days there were no fecal coliform present in the discharge. However some days fecal coliforms in a range of 1 - 3 CFU/100 ml were detected in the effluent. Although these were not reportable levels, the goal was to rectify the problem and have no fecal coliforms at any time in the effluent.

Operators started investigating the root cause of the problem by reviewing effluent quality data and grabbing samples. The positive fecal coliform results were more prevalent when plant flows were lower, suggesting that mixing may be the most important factor leading to the disinfection efficiency. The two (2) 5 HP mixers installed in the mix chamber generated a velocity gradient (G-value) of approximately 300/sec. To confirm the theory, grab samples were taken at different depths of the chlorine contact basin to determine mixing efficiency across the tank. The high variability of chlorine in the basins indicated a poor distribution of the disinfectant in the water flowing through

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Four good reasons to install the Water Champ® FX system:

- Improved disinfection at variable flow rates to non-detect levels
- 2 x better mixing and diffusion than other systems
- 30% reduction in chemical consumption, cost and handling
- No dead zones; complete chemical dispersion



the contact chamber. This led operation personnel to enlist the help of the consulting engineers, who concluded that the mixing was insufficient. According to experts, the mixing energy provided was 20% of what is ideal for disinfection. The G-value should exceed 1,000 to provide efficient mixing and reliable disinfection in the contact chamber.

The solution

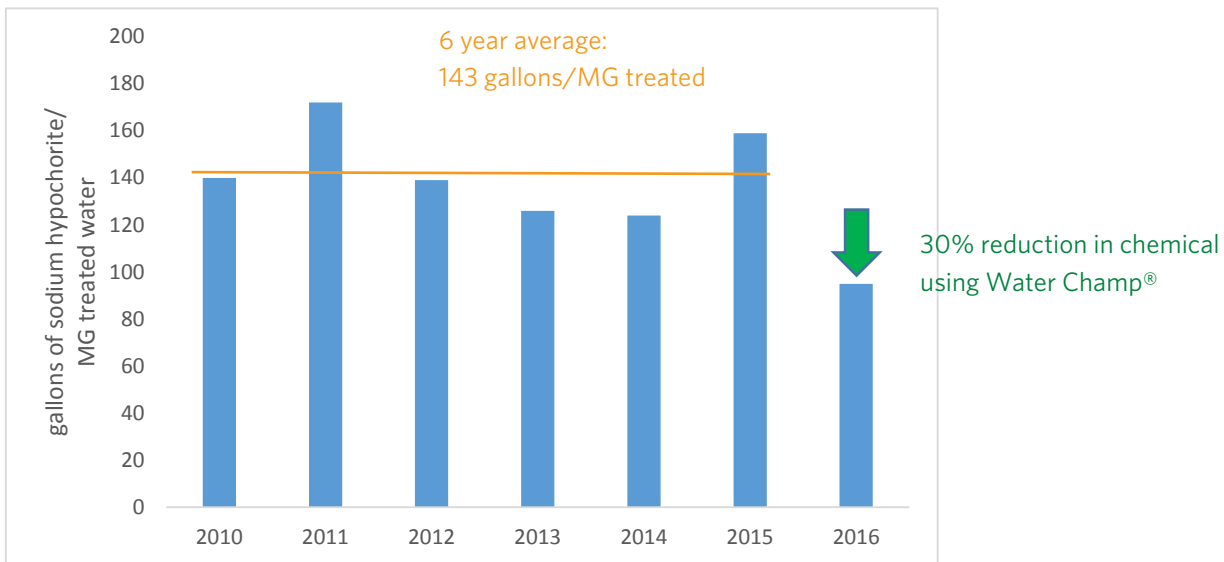
As part of the renovations at the chlorine contact basins, the consulting engineers recommended the installation of one (1) 10 HP Water Champ® FX Chemical Induction Unit to replace the two existing mixers. The Water Champ FX unit uses a proprietary design to mix the NaOCl at high velocity gradients with the incoming effluent, ensuring complete dispersion of the disinfectant. The mixing energy created by the airfoil propeller turning at 3450 rpm disperses chemical at a velocity of 60 ft/sec as it leaves the propeller.

The result

The improved disinfection mixing resulted in the elimination of the appearance of fecal coliforms in the effluent, and a 30% reduction in chemical usage. The graph shows disinfectant usage before and after Water Champ installation which occurred late 2015. The data is normalized for flow, but the average bleach usage for the previous 6 years was over 140 gallons/MGD of water treated. After installation of the Water Champ unit, the average usage dropped to about 100 gallons/mega gallon of treated water. Over 100,000 gallons reduction in consumption of liquid sodium hypochlorite resulted in chemical savings by 24 fewer tank truck deliveries per year, reducing risk associated with transporting and unloading of bulk chemical. Fecal coliform events have become a non-issue at this plant.

Scope of supply:

10 HP Water Champ FX Chemical Induction Unit



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