Disinfection and Emerging Contaminant Removal with HyDOZ®

Project Overview

Technology

HyDOZ®

Application

Wastewater Disinfection

Location

Arkansas

Project Requirements

- Demonstrate disinfection to meet current fecal coliform permit levels
- Show effective removal of E.coli
- Provide significant reduction of emerging contaminants.

Results

- A 0.1mg/L ozone residual reduced Fecal coliform colonies to well below permit levels
- The 0.1mg/L ozone residual reduced E.coli to single and double digit numbers.
- 29 of the 31 emerging contaminants were reduced to some degree, with 28 of 31 reduced at least 25%, and 16 of 31 reduced to below detection.

Introduction

In the summer of 2012, BlueInGreen partnered with a facility in Arkansas to study disinfection of wastewater and removal of emerging contaminants of concern (ECC) by utilizing dissolved ozone. The plant has a firm capacity of 12 MGD and includes primary clarification, activated sludge, secondary clarification, and sand filtration prior to the existing UV system.

Ozone reacts rapidly with contaminants, which allows for a comparatively short disinfection contact time when compared to chlorine based systems. BlueInGreen's HyDOZ system provides high ozone concentrations with a small footprint and uses less energy to deliver the same level of disinfection. Ozone exits the HyDOZ system dissolved in a carrier water stream, minimizing the footprint of an ozone contactor basin and associated equipment, therefore, greatly reducing capital costs. The HyDOZ can ramp up or slow down ozone delivery to match plant flows or desired set points. Coupled with the system's exceptionally efficient gas transfer, power consumption and operating costs are greatly reduced. The ability of the HyDOZ to dissolve high ozone concentrations means more effective elimination of target microorganisms and pathogens, while simultaneously providing COD reduction, color removal, and elevated dissolved oxygen levels. Only BlueInGreen's patented technology allows up to 60% of the oxygen generated for producing ozone to be recaptured and routed to other locations within the plant, which can offset a facility's aeration costs.

Methods

To study the effects of established ozone residuals ranging from <0.1mg/L to 0.8mg/L, an ozone contactor was built with 3 sample ports along the length corresponding to contact times from 0 to 2 minutes. Disinfection results were evaluated over varying contact time and established ozone residuals.

Samples of the disinfection system' influent were sent to Underwriter's Laboratory, LLC, where a total of 81 ECC were analyzed, including pharmaceutically active compounds, endocrine disrupting compounds, and a broad range of hormones. 31 of the ECC were detected at or above reporting limits in the influent sample. Ultimately, results of the ozone treated effluent were compared to the effluent of the existing UV treatment at equivalent disinfection dosages.

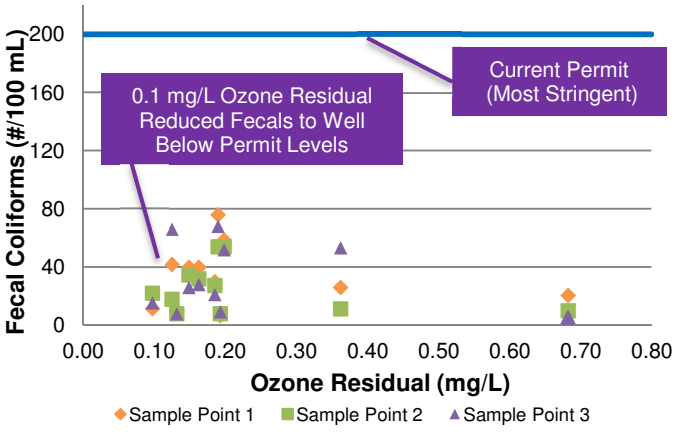

Figure 1. Ozone Treated Water Fecal Coliform Levels

BlueInGreen® solutions for water quality

Results

Figures 1 and 2 show that residuals as low as 0.1mg/L provided disinfection of coliform from an average 2500 cfu/100mL to well below the most stringent permit level. A reduction from an average of 2000 cfu/100mL down to single and double digit E.coli numbers was achieved with no sign of regrowth. The HyDOZ system also reduced the COD by an average of 21% and greatly improved the color and odor as seen in Figure 3. Of the 31 emerging contaminants originally detected in the disinfection system influent, the HyDOZ system removed a much greater span of contaminants, nearly twice that of the UV system. Figure 4 shows the difference in the number of contaminates affected and the extent to which they were eradicated. All but one of the contaminants reduced by UV were further reduced by minimum of 25% with ozone. The HyDOZ system completely removed over half of the contaminants, whereas the UV system was unable to entirely rid the water of any of the contaminants.

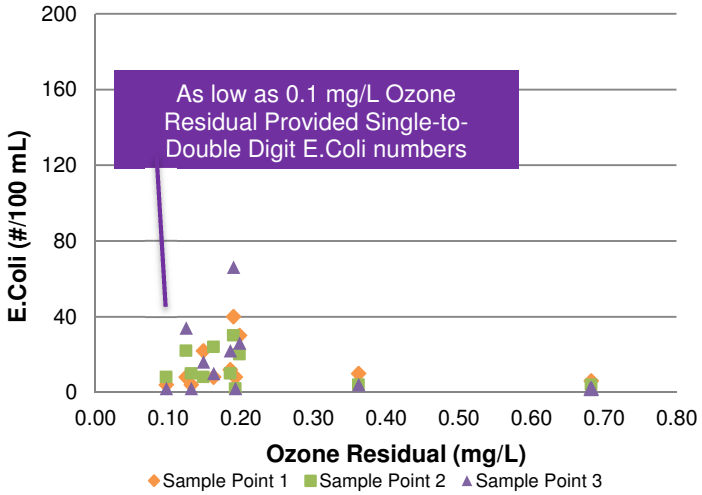

Figure 2. Ozone Treated Water E.Coli Levels

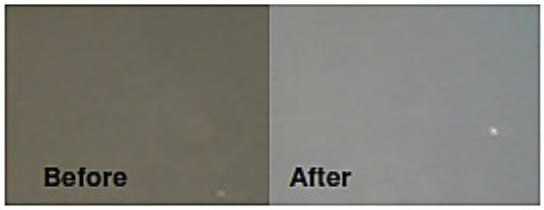

Figure 3. Color Improvement of the HyDOZ Effluent

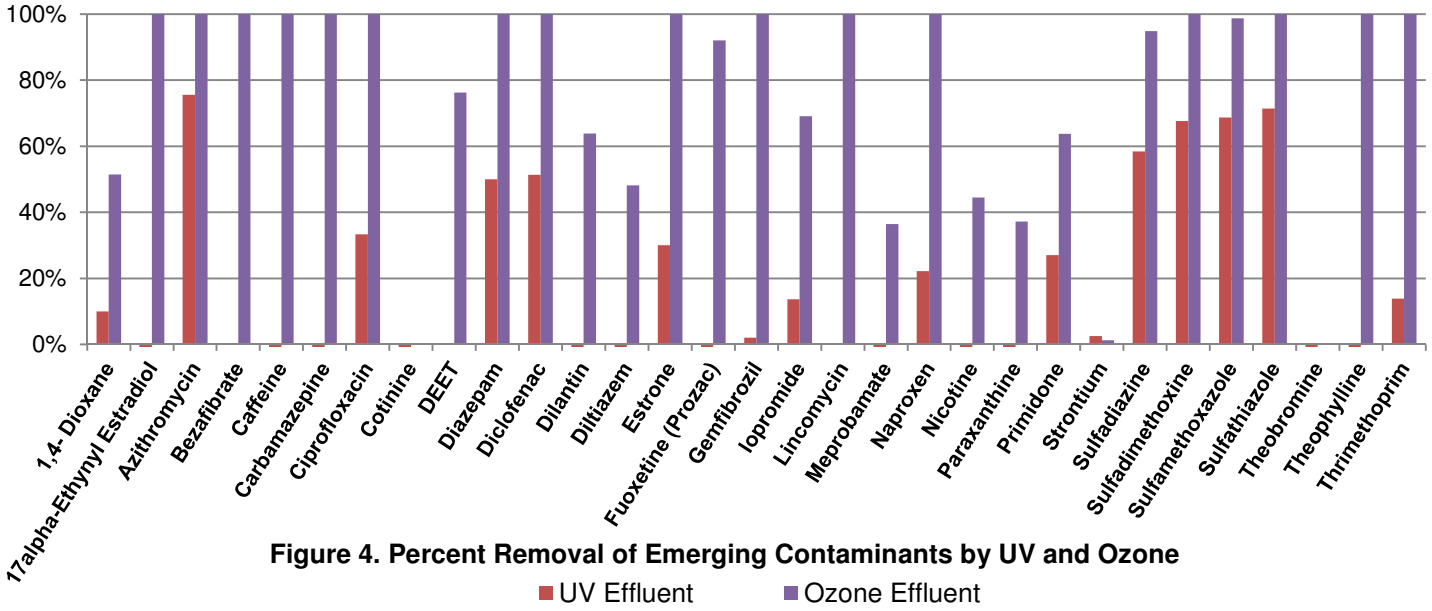

Figure 4. Percent Removal of Emerging Contaminants by UV and Ozone

Summary

BlueInGreen's HyDOZ unit was able to successfully reduce Fecal coliform below plant effluent permit levels. ECC were reduced by an average of 90%. Secondary benefits included a reduction in COD, a dramatic improvement of color and odor over the previously installed UV system, and the need for post aeration was negated by raising DO levels.

Please contact a BlueInGreen representative today to find out how you can benefit from HyDOZ, or any of BlueInGreen's side-stream gas dissolution technologies.

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