VIGOROX® WWT II: SUCCESSFUL WASTEWATER DISINFECTION WITH LOW DOSE AND SHORT CONTACT TIME

VigorOx® WWT II Wastewater Disinfection Technology

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This edition of Disinfection Forum discusses an important benefit of using VIGOROX® WWT II for wastewater disinfection when compared to the chlorination process: significant disinfection performance under low dose and short contact time conditions.

INTRODUCTION

While the chlorination process is the most commonly used disinfection technology for municipal wastewater in the U.S., the typically high dose and long contact time required for effective disinfection pose a challenge in its use. A chlorine dose of 5 mg/L as Cl2 or higher (depending on the water quality characteristics to be treated, such as levels of ammonia and nitrate) and contact time of 30 minutes, if not longer, are often needed for a chlorination system to meet its intended microbial control. Sufficient data exist indicating that VIGOROX® WWT II wastewater disinfection technology is extremely effective against a broad range of indicator bacteria. Dosing for most municipal wastewater treatment plants will lie in the range of 1 – 5 mg/L (as PAA) with a contact time between 15 and 30 minutes to achieve a 4 log (99.99%) to 5 log (99.999%) disinfection efficiency [(1)]. In addition, VIGOROX® WWT II can achieve a significant level of microbial inactivation even with shorter detention time (10 to 15 minutes) and at lower dose (1 to 2 mg/L as PAA) for most secondary and tertiary effluents. This is an advantage of VIGOROX® WWT II compared to the chlorination process, which often requires a higher dose and longer contact time to achieve similar level of disinfection. This advantage may make VIGOROX® WWT II more cost effective and could be critical for wastewater plants lacking sufficient contact time in their existing contact basins, which may need capacity expansion to meet tightening regulations.

PERFORMANCE DATA

PeroxyChem has conducted disinfection tests for numerous wastewater utilities in the U.S. as part of our technical services to assist utilities evaluating the effectiveness of using VIGOROX® WWT II at each plant. Results of the disinfection performance of VIGOROX® WWT II under low dose and short contact time are shown in Figure 1 and Figure 2. Due to the large amount of data available, only results from tests conducted during the period from the fourth quarter in 2014 to the first quarter of 2015 under the following test conditions are included: VIGOROX® WWT II dose of 1.0 and 1.5 mg/L (as PAA) and contact time of 10 and 15 minutes [(2)]. This data set covers 21 wastewater treatment plants with a broad range of geographical locations (shown in Figure 3). The wastewater tested was either secondary effluent or tertiary effluent with a wide range of upstream biological treatment processes, from conventional activated sludge process to various types of biological nutrient removal processes. Observations and conclusions drawn from this data set are general rather than based on few special cases.

Figure 1

Disinfection Performance of VIGOROX® WWT II at Low Dose (1.0 mg/L) and Short Contact Time (10 & 15 minutes). One of the following Indicator Organisms was tested: E.coli, Fecal Coliform or Enterococci.

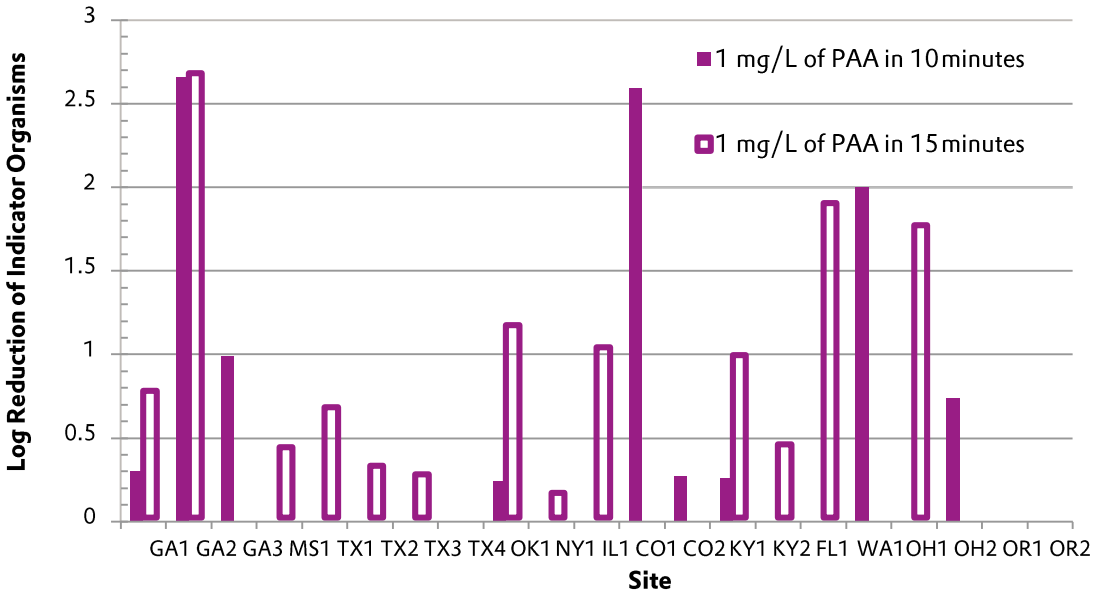


Figure 2

Disinfection Performance of VIGOROX® WWT II at Low Dose (1.5 mg/L) and Short Contact Time (10 & 15 minutes). One of the following Indicator Organisms was tested: E.coli, Fecal Coliform or Enterococci.

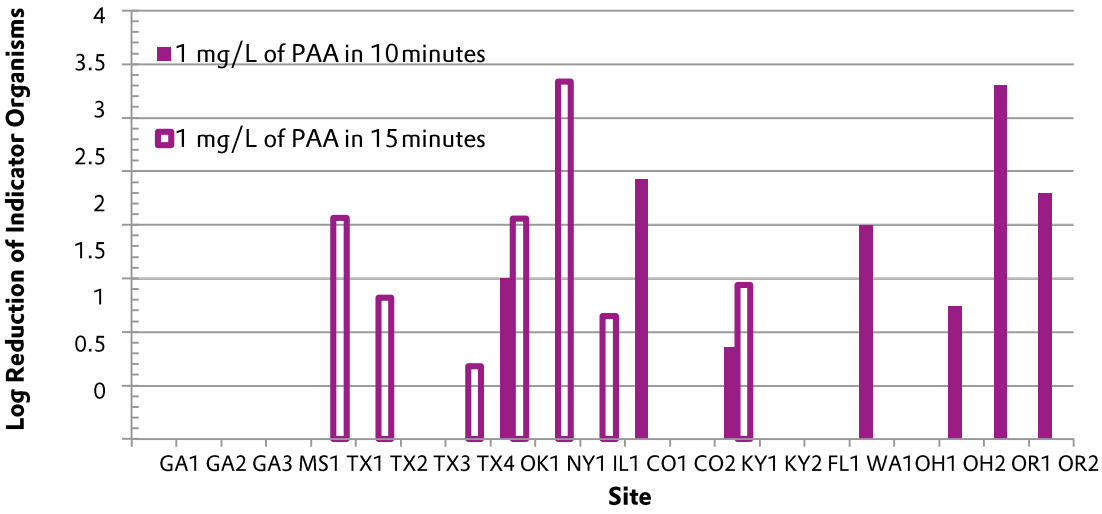
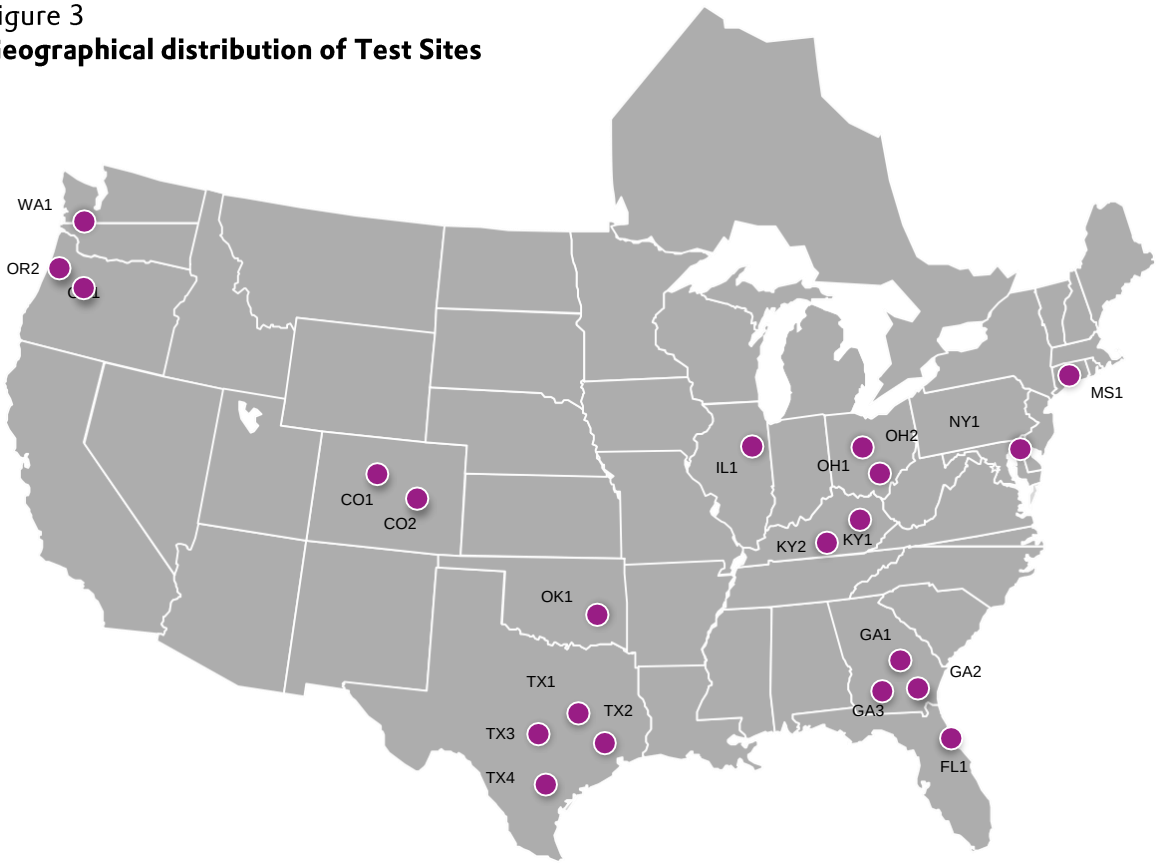


Figure 3
Geographical distribution of Test Sites



The performance data indicate the following:

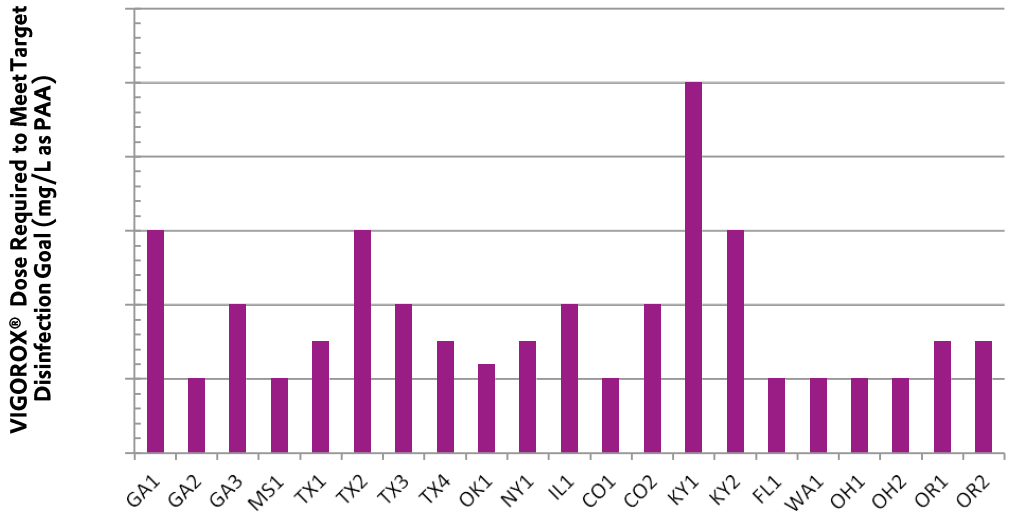
- Disinfection efficiency for VIGOROX® WWT II dose of 1.0 mg/L and contact time of 10 minutes varies from 0.3 logs to 2.7 logs (Figure 1). For the same site, disinfection efficiency generally increases when contact time increases from 10 minutes to 15 minutes.
- For the same site, increasing dose from 1.0 mg/L to 1.5 mg/L enhances disinfection performance. Efficiency varies from 0.9 to 3.3 logs for dose of 1.5 mg/L and contact time of 10 minutes (Figure 2). Similarly, disinfection efficiency at the same site increases with increased contact time.
- These levels of disinfection are considered significant regarding the need to achieve target disinfection goals for these sites, as explained below.

Shown in Figure 4 is the VIGOROX® WWTII dose required to achieve compliance with the National Pollutant Discharge Elimination System (NPDES) permit disinfection requirements for each site in contact time of 10 or 15 minutes. The results indicate the following:

- For more than half of the sites, VIGOROX® WWT II dose of 1.0 or 1.5 mg/L can already meet the permit limit value in a contact time of 10 or 15 minutes.
- For the remaining sites, disinfection criteria can be achieved under the short contact time period (10 or 15 minutes) when VIGOROX® dose increases to 5 mg/L or lower.

Figure 4

VIGOROX® Dose Required to Achieve Compliance with the National Pollutant Discharge Elimination System (NPDES) Permit Disinfection Criteria in Contact Time of 10 or 15 minutes



CONCLUSIONS

Test data based on numerous wastewater plants across U.S. demonstrate that VIGOROX® WWT II can achieve significant level of microbial inactivation in short detention time (within 10 to 15 minutes) and at low dose (1 to 2 mg/L as PAA) for secondary and tertiary effluents. This is an additional benefit of VIGOROX® WWT II compared to the chlorination process, which often requires a higher dose and longer contact time to achieve a similar level of disinfection. VIGOROX® WWT II has several advantages over other disinfection technologies. Some advantages are ease of use, low toxicity to aquatic organisms and the absence of the formation of harmful disinfection byproducts. Its ability to perform under short contact time and low dose provides another advantage. Wastewater utilities with restriction on contact time will particularly benefit in using VIGOROX® WWT II wastewater disinfection technology.

REFERENCES

(1) PeroxyChem (2014). An Introduction to VIGOROX® ® WWT II for Wastewater Disinfection. Disinfection Digest, No.1

(2) For additional data, please contact PeroxyChem at water@peroxychem.com.

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