Efficacy of the Ultra-S3 Process for Treatment of Hydrogen Sulfide at the Northern California Wastewater Treatment Plant

Introduction

The Ultra-S3 process was utilized to treat municipal wastewater flowing into the head works at a Northern California Wastewater Treatment Plant (NCWWTP) that treats 30 million gallons per day (MGD). Hydrogen sulfide concentrations in the influent air ranged as high as 250 ppm with an overnight average of 123 ppm prior to treatment. For the period of the study, average hydrogen sulfide readings from air monitoring equipment upstream of Ultra-S3 treatment were 102 ppm. Influent hydrogen sulfide concentrations ranged from 7 to 10 ppm within the wastewater at the head works prior to implementation of Ultra-S3 treatment.

The high levels of hydrogen sulfide measured within the wastewater exceeded the expected influent concentration (approximately 5 ppm). Feed pumps selected for the project were, therefore, slightly undersized to achieve complete oxidation of the hydrogen sulfide.

The objective of the study was to reduce the levels of hydrogen sulfide within the wastewater to a point, which allowed for acceptable levels of hydrogen sulfide within the air (i.e. < 10 ppm).

Field Treatment Strategy

An injection point upstream of the bar screens allowed the Ultra-S3/peroxide contact time of less than 3 minutes. Metering rates for the 50% hydrogen peroxide were set to deliver 500 GPD into a wastewater flow of 30 MGD. Ultra-S3 was metered at a range of application approximating 40 GPD. Injection rates were adjusted proportionally with the flow of the plant.

Hydrogen peroxide and Ultra-S3 were metered into the wastewater line with anticipation that proper mixing would occur within the line prior to exiting at the headworks. It is surmised that better mixing at the injection point may result in improved performance.

Both air and water samples of hydrogen sulfide were taken from the wastewater stream prior to treatment and at the bar screen at selected times throughout the study. Air samples were taken by utilizing the onsite air monitoring systems located at the headworks and within the air prior to and immediately after treatment.

Results

The average concentration seen through the study was 7.7 ppm prior to treatment, while after the treatment the hydrogen sulfide concentrations at the bar screens was from 2 to 3 ppm. Atmospheric hydrogen sulfide showed consistent reductions within the influent trunk from an average of 123 ppm to about 4 ppm at the bar screen. No alarms were detected in the headworks maintenance room during the study indicating levels were reduced below the acceptable 10 ppm limitation. The alarm frequently sounded prior to treatment with Ultra-S3.

Conclusion

The Ultra-S3 process was successful in reducing hydrogen sulfide levels within the air and wastewater at the NCW-WTP headworks. Levels of hydrogen sulfide were reduced impressively within the air from levels ranging from 102 ppm to 250 ppm to less than 10 ppm throughout the study. Wastewater hydrogen sulfide levels were reduced from an average of 7.7 ppm to approximately 3 ppm over the course of the study, which correlates to an estimated mass reduction of approximately 1200 pounds of hydrogen sulfide.

The Ultra-S3 process worked rapidly with most of the treatment being accomplished within 3 minutes of contact time.

Additional study may be necessary to determine if more efficient mixing at the injection point would improve the efficiency of the process. Further testing is being conducted to further refine the data.