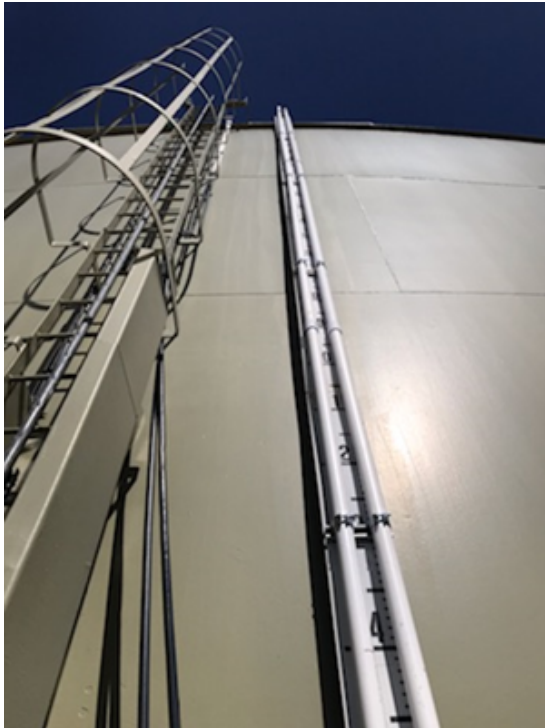


CHLORAMINE BOOSTING SYSTEM AND TIDAL WAVE MIXER IN 6-MG STORAGE TANK

OVERVIEW



In March of 2021, Big Wave Water Technologies installed a Tidal Wave Mixer in a 6-million-gallon steel constructed reservoir. This agency observed a trend of decreased total chlorine residual levels in one of their six storage tanks, and often found residual levels that were undetectable. This was due to water age caused by low consumer demand. The agency attempted to increase total chlorine residual levels by manually adding 12.5% sodium hypochlorite but found that method to be unsuccessful.

APPROACH

An active potable reservoir mixer can maintain chlorine residual levels however, low turnover can lead to a residual loss over time if the tank isn't treated with additional sodium hypochlorite. The Chloramine Boosting System (CBS) paired with The Tidal Wave Mixer was a favorable solution for this tank due to the mixers' effective mixing power; the CBS's ability to continuously monitor and dose chemistry to achieve the agencies targeted total chlorine setpoint. To test the effectiveness of The CBS and Tidal Wave Mixer, the tank was isolated from the system and a pilot study was performed over a 30-day period.

The 6-million-gallon above-ground steel tank was filled to its capacity at the time of the pilot study. The Tidal Wave Mixer was installed on 3/09/2021, and total chlorine levels were measured prior to starting the system and injecting chemistry into the tank. Manual grab samples were taken from the top, middle, and bottom levels of the tank with a HACH DR/890 chlorine test kit from a sample point located 120 feet away from the Tidal Wave Mixer. The CBS analyzer was also programmed to measure total chlorine residual levels from a sample point 45 feet away from The Tidal Wave Mixer. Manual grab samples were taken until the desired total chlorine residual level was met, and the CBS analyzer continued monitoring residual levels for the remainder of the study.

Manual grab samples taken prior to injecting chemistry and powering on the mixer indicated total chlorine residual levels ranging from 0.00-0.03 PPM. Due to the substantial amount of organic demand in conjunction with non-detectable residuals required the system to conduct a free chlorine burn by powering on The Tidal Wave Mixer and dosing 12.5% sodium hypochlorite from the CBS metering pump at 10 GPH. The system ran for one hour and manual grab samples were collected from the top, middle, and bottom of the tank; these grab samples indicated zero residual. At this point, the feed rate was increased to 15 GPH. The CBS metering pump continued feeding 12.5% sodium hypochlorite at 15 GPH for an additional four hours until total chlorine residual levels reached 0.20 PPM. Once manual grab samples indicated a total chlorine residual level of 0.20 PPM, The CBS was set to "chloramine mode" and began injecting ammonia in addition to sodium hypochlorite at a 5:1 ratio.



RESULTS

Manual grab samples began on 3/09/2021 and were taken once an hour. The samples indicated that total chlorine residual levels steadily climbed each hour, starting from 0.00-0.03 PPM at 12:00 and ending at 0.72-0.94 PPM at 18:00. Manual grab samples continued the following day and were taken once an hour starting at 06:15. The first sample indicated total chlorine residual levels ranging from 1.04-1.27 PPM and continued to increase over the subsequent nine hours (Figure 1).

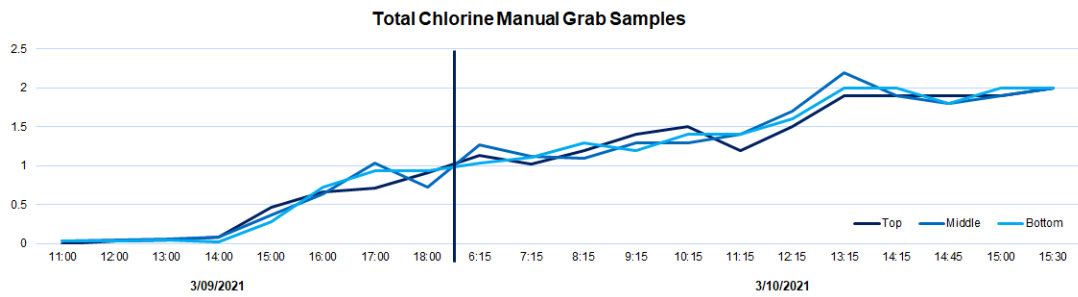


Figure 1: Manual grab samples taken from 120 feet from injection point.

At 15:25 manual grab samples indicated the targeted total chlorine residual of 2.00 PPM was reached at each sampling location. Manual grab samples were stopped, and The CBS analyzer continued monitoring total chlorine residual levels from 3/10/2021 to 4/08/2021. The system ran in "auto" mode with the setpoint being increased to from 2.00 PPM to 2.50 PPM on 3/21/2021. Total chlorine residuals ranged from 2.00-2.56 PPM over the 30-day analysis (figure 2).

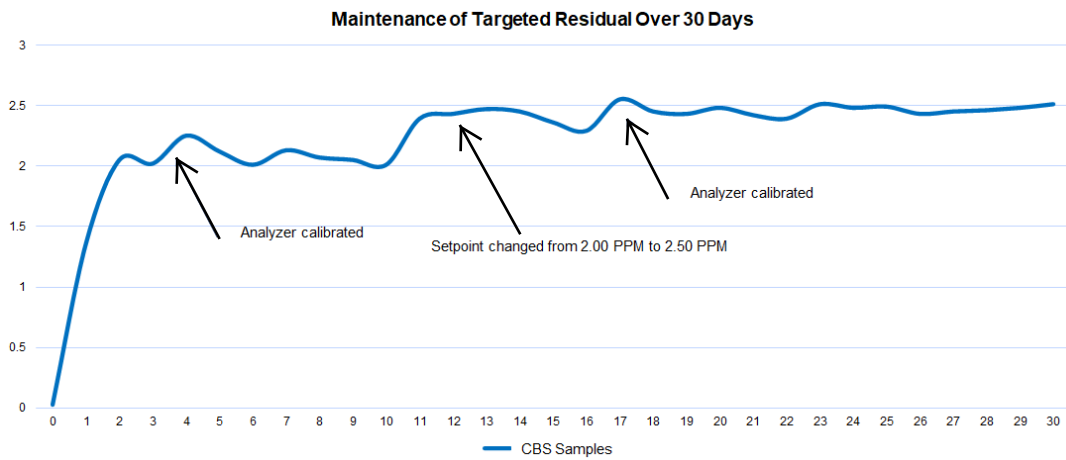


Figure 2: Readings from The CBS total chlorine Analyzer located 45 feet from injection point.



CONCLUSION

This agency was able to achieve their desired residual level of 2.00 PPM in just a short 26.5 hours. Despite adding 12.5% of sodium hypochlorite at 10 GPH for two hours, and at 15 GPH for two hours, residual did not deviate more than 0.20 PPM at the top, middle, and bottom grab samples. With the Tidal Wave Mixer, a dosage change was recognizable within an hour at both the analyzer and the grab sample port. These results demonstrate The CBS's automated chemical dosing and 24/7 monitoring paired with The Tidal Wave Mixer can greatly improve water quality. The Tidal Wave mixer moves a significant amount of water which allows for a more instantaneous response to chemical dosing and the chloramine reaction.