CASE STUDY

SOUTHLAKE, TX

Southlake, Texas Successfully Tames Disinfectant Residual Variability in Distribution Network with Mechanical Tank Mixers

OVERVIEW

Southlake, Texas is a suburb of the Dallas-Fort Worth metroplex that prides itself for possessing a quiet sophistication with ready access to the urban excitement that its location easily affords. Southlake Water Utilities has kept pace with the growing community of over 30,000 inhabitants and over 11,000 service connections while keeping a keen focus on opportunities to improve water quality to the rate payers.

As a consecutive system that purchases all its chloraminated potable water from the city of Fort Worth, Southlake has no treatment plant and therefore has limited means to actively control disinfectant residuals in its distribution network. A few years ago, Southlake operations personnel began to examine techniques to improve disinfectant residual levels throughout their system. They focused on their seven water storage tanks as places to intervene with disinfectant residual boosting. Water storage assets are ideal locations to boost residuals and reduce the risk of nitrification as they can be places of high water-age coupled with large volumes. Safety is optimized by being able to incrementally improve the disinfectant levels in tanks or reservoirs versus in-pipe boosting which can often be a "fire-and-forget" exercise with no ability to fine-tune residuals in a subsequent pressure zone.

As water sits in reservoirs or tanks, it tends to layer itself into "strata" of common temperature and disinfectant residual concentration. "Newer" water flowing into a tank is typically cooler and possesses a higher disinfectant concentration than the water already in the tank. This "new", more dense water tends to "stratify" into a layer at the bottom of the tank in the same way cooler water can be experienced by swimmers at the bottom of a swimming pool on a hot day. As water moves out of the tank during a drain-cycle, the lower layer tends to leave first with the "older", warmer water remaining stagnant in the layers above (Figure 1). These upper layers of water have more disinfectant residual decay due to their warmer temperature and higher water-age. Inevitably, as water demand increases these low-residual layers are pumped down and out of the tank. Taste and odor issues can result, and in the worst case, compliance issues such as nitrification can occur due to low disinfectant residuals in the downstream pressure zone. Full-time mechanical mixers properly sized to "de-stratify" or mix layers of low chlorine residual with higher concentration "newer" water have been shown to improve overall chlorine residual and effectively lower water-age.

A Southlake Elevated Storage Tank (EST)

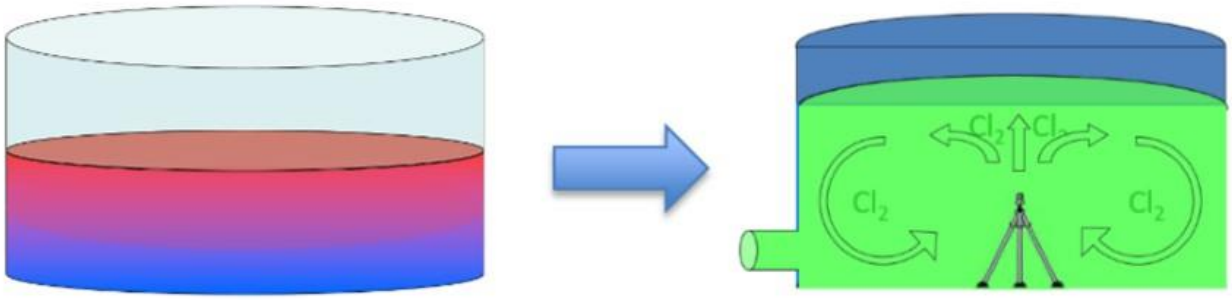

Figure 1

Kyle Flanagan, Water Supervisor, realized that a two-step process might be ideal in Southlake's efforts to exert more control over water quality. He postulated that adding tank mixers first would provide system-wide improvement and with that knowledge, he could more precisely determine which tanks and pressure zones would benefit from more active disinfectant residual control to be added later.

In 2018, Southlake installed seven PAX Tank Mixers in their four elevated storage tanks (ESTs) and their three ground storage tanks (GSTs). Immediately, the system was able to reach a new equilibrium with a system-wide more stable disinfectant residual. Essentially, the PAX Mixers were able to fully mix incoming "new" water possessing better residuals with the aging water in the tanks and deliver a more consistent result. This stability is illustrated in Figure 2 as a fill and drain cycle is depicted in green on the left of the graphic. Even as the tank goes through a dramatic fill and drain cycle, the disinfectant residual concentration (in yellow) remains steady and in-control. Normally, disinfectant residual concentration would rise quickly during a fill cycle and degrade with age during a drain cycle. Figure 3 examines a five-day cycle with multiple fill-and-drain events (in green) with an attendant steady residual throughout the cycle (in yellow).

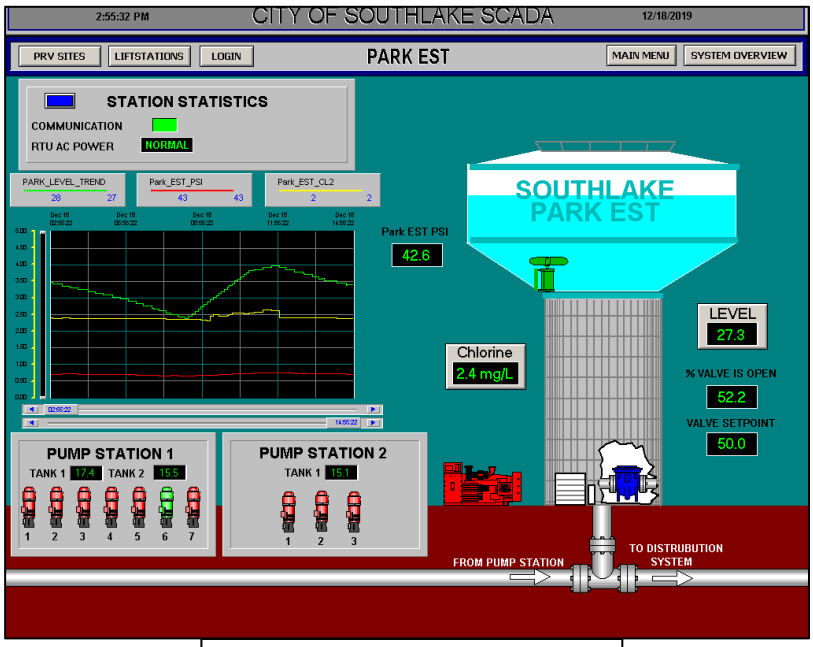

Figure 2 – Bicentennial Park Tank

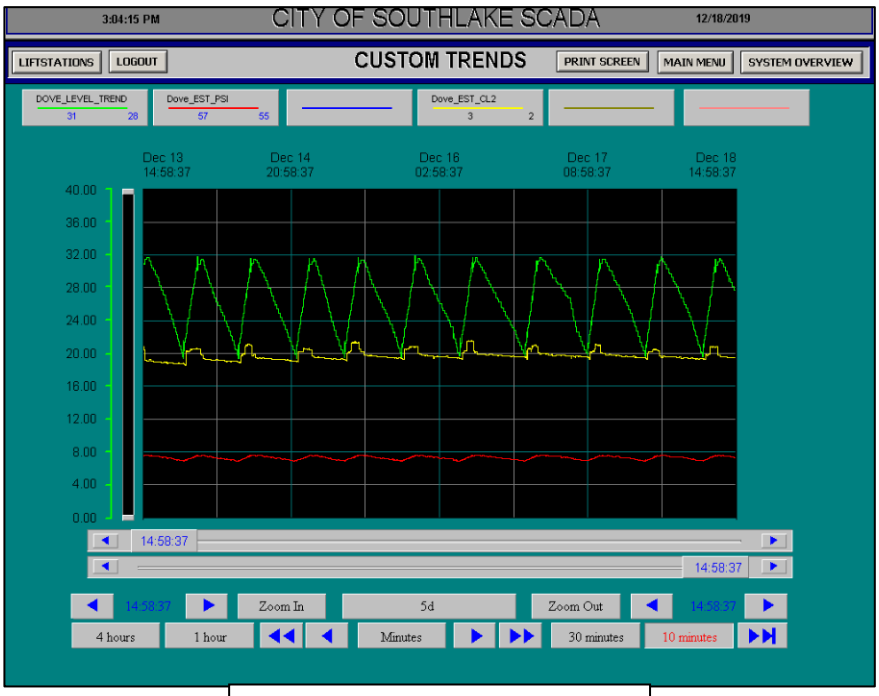

Figure 3 –Dove Tower Tank

With the newly achieved residual stability, Southlake staff could more precisely determine the location and quantity of the disinfectant residual boosting stations. In fact, by installing the PAX Mixers first, Southlake and their engineering firm determined that they would only require two boosting locations versus the originally anticipated seven.

As Southlake Water Utilities demonstrated, fulltime-mechanical tank mixing has become one of the most accessible water quality management tools in the water utility operator's toolbox and becomes a necessary stepping-stone for additional, more active improvement processes.

> *"The PAX Mixer are the real deal – they immediately improved the uniformity of our water and allowed us to more thoughtfully add more active water quality improvement measures."*
>
> **Kyle Flanagan, Water Supervisor, Southlake Water Utilities, Texas**

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