CASE STUDY

SOUTHERN CALIFORNIA

Southern California Utility Puts Mixers to the Test: Demonstrates Large Difference in Mixing Power

OVERVIEW

A city in Southern California owns and operates several storage tanks. Two of these reservoirs are oversized for emergency situations, and City staff constantly struggled to maintain water quality due to low demand and high water age. In an effort to improve the quality and reliability of its drinking water, the City researched various active mixing technologies. Two candidates were selected for a side-by-side trial to test their mixing performance in one of the City's most problematic tanks: **the PAX Water PWM 400 Mixer and a competitor's lower priced mixer.**

Both manufacturers claimed that their products would be able to fully mix the tank, but the City required a performance test to evaluate these claims. Water department staff understood there was a significant price difference between the two units, but they wondered if mixing performance would be equal.

To compare the mixers, the City isolated the tank and dosed it with 50 gallons of hypochlorite solution, letting the dose settle for 24 hours to create a chemically stratified condition in the tank. The mixers were tested to determine if each could fully mix the 4 MG tank within 38 hours. Measurements were taken at four sample locations and three water depths every four hours to track the effectiveness of chemical mixing. The competitor's mixer trial began on May 8, 2012 and the PWM 400 trial began on May 22, 2012. City employees independently supervised the data collection. In total, over 230 chlorine grab samples were taken from different water levels in the tank during the course of the test. Tank water levels remained relatively constant

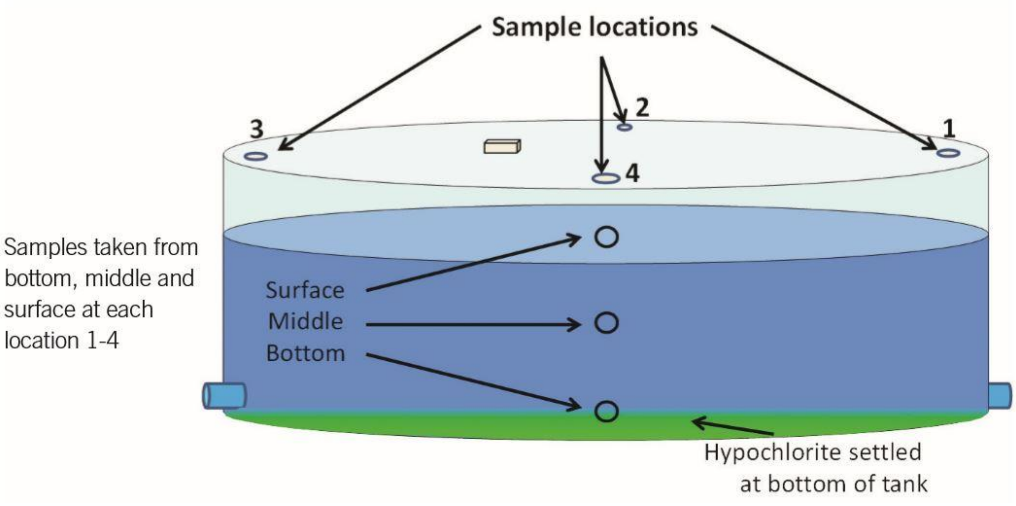

Figure 1. Samples taken from four different areas of the tank (sample locations 1-4) and three different depths within the tank (surface, middle and bottom).

After 16 hours, the PWM 400 established a 25,000 GPM flow structure and the data showed the tank rapidly converging on a mixed condition. After 24 hours, the tank was fully mixed. The heavy layer of hypochlorite was evenly mixed into the tank volume, with no large doses going out to customers after the test was completed. After 16 hours, the competitor's mixer had mixed only a small zone directly above the mixing device. No other areas of the tank showed signs of chemical convergence. After 24 hours, there was still no convergence. After 38 hours, the tank still showed very little improvement: High concentrations of chlorine were still present in areas at the bottom of the tank. At this point the test was halted.

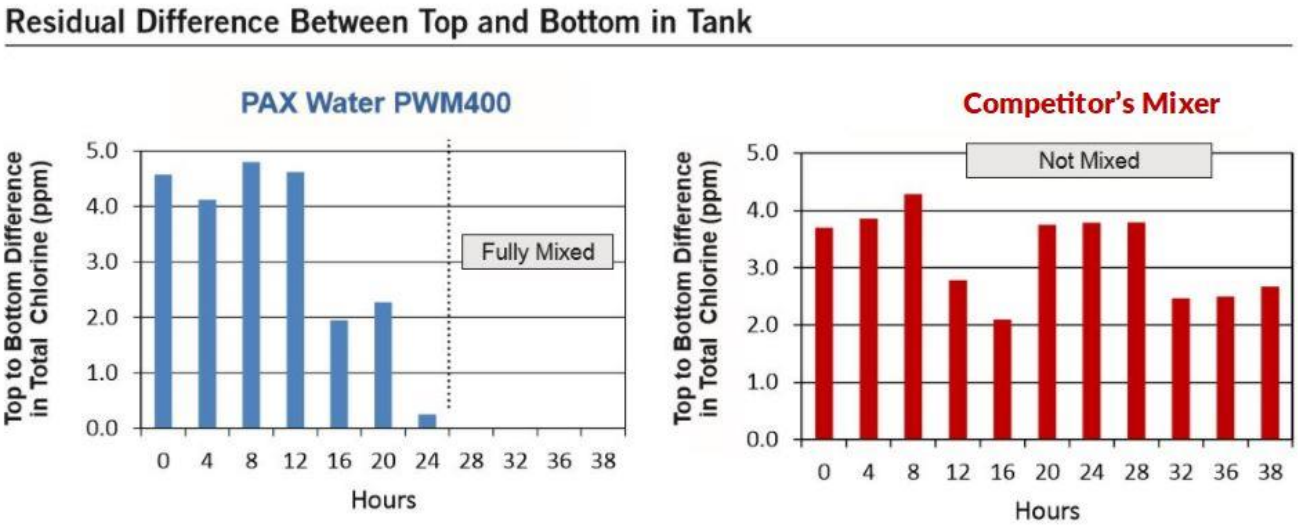

Figure 2. Plots show difference in total chlorine [ppm] between the top and bottom of the tank (averaged across all four sample sites). The PWM 400 achieved mixing in 24 hours. The competitor's mixer failed to mix the tank.

The PWM 400 blended the entire tank volume in 24 hours, whereas the competitor's mixer never achieved a mixed condition. Statistical analysis of the data demonstrated that the estimated blend time for the competitor's mixer would be 200 to 240 hours (approximately seven to 10 times longer than the PWM 400). But, because the fill and drain cycles are much shorter, under realistic tank operating conditions the competitor's mixer would probably never have achieved a fully-mixed condition in this tank.

The data confirmed that **the PWM 400 was roughly seven to 10 times more effective than the competitor's mixer** in mixing the water storage tank.

Municipalities are always watching their budgets and may be tempted to select low-cost tank mixing systems that claim to be effective. This study confirms, however, that mixing effectiveness is the most important consideration.

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