

CASE STUDY

ANCHORAGE WATER AND WASTEWATER UTILITY

Powerful Submersible Mixers Help Prevent Ice Formation in Anchorage Tanks



OVERVIEW

Managing water distribution networks in cold northern climates comes with increased risks and operational challenges, such as main breaks and equipment outages. In Alaska, the Anchorage Water and Wastewater Utility (AWWU) is responsible for water and sewer services to over 297,000 residents in the greater Anchorage area. The 280-employee utility is owned by the Municipality of Anchorage and operates three wastewater treatment plants and two surface water treatment plants. The distribution system includes 65 million gallons of water in storage reservoirs throughout the city and 1,600 miles of underground pipes.

In 2010, AWWU began looking for equipment to prevent damage to its steel water storage tanks caused by ice forming inside the tanks. Operators observed that ice floating on the surface of the water scraped the coatings on the interior tank walls as water levels inside the tanks fluctuated. In addition, ice formation and movement caused extensive damage to roof support columns and tanks' interior ladders. Each spring, operators were faced with a list of storage tank repairs costing tens of thousands of dollars and requiring hundreds of hours of staff time.

As part of their search for equipment to prevent ice formation, AWWU officials discovered PAX Water Technologies at a national water industry tradeshow. They compared the PAX PWM400 Mixer to other available options, including installing exterior insulation on the tanks. As part of their due diligence, they checked with numerous customer references to determine how well PAX mixers perform in cold climates. Located roughly 500 miles from the Arctic Circle, Anchorage's winter temperatures average 5°F with a maximum of 6 hours of daylight per day in December. Calls to numerous references confirmed that the PAX mixer's performed in the harshest of climates.

In August of 2010, a PWM400 Mixer was installed in the Girdwood tank. Installation of the mixer was relatively simple, only requiring the 115VAC electrical power available at the tank. AWWU staff installed the mixer while the tank was offline for repairs. Once the tank was refilled, the benefits were immediately clear. As winter approached and temperatures dropped, operators observed no visible ice inside the tank. Despite extremely cold temperatures during the 2010-2011 winter, the tank remained ice-free.

To install the submersible PAX mixer, ice under the hatch had to be broken apart by AWWU staff so the unit could be lowered into the tank via a long bail handle. Once the mixer was powered up, operators observed the ice receding from the hole at a rate of approximately 15 feet per day, until the tanks were ice-free within about three days.

As time went on, operators noticed additional, unexpected benefits from tank mixing. During the warmer summer months the tank with the mixer no longer experienced thermal stratification. The mixer kept the water thermally homogenous and eliminated stagnant areas with high water age

AWWU officials were extremely pleased with the performance of the initial mixer installed at the Girdwood tank. Eliminating ice damage at the tank resulted in immediate savings in staff time and repair costs. They began planning ahead to obtain additional mixers through a Capital Improvement Project budget plan. After five years, AWWU identified funding for an additional 18 submersible mixers to allow for one in each of its 18 storage tanks. In order to ensure that any new mixers would meet the performance standard established by the PAX PWM₄₀₀ Mixer, AWWU engineers and staff included rigorous performance requirements in their specification. Their emphasis was on best performance, not on lowest cost. The specification called for water inside the tank (four million gallons or less) to turn over no less than six times within a 24-hour period and for water temperatures to converge to within 0.9°F degrees within that period. This level of turnover and chemical convergence was specified in order to keep a sufficient amount of water in motion to eliminate dead zones, force the warmer water at the bottom of the tank (in winter) to rise to the surface, and keep the surface from freezing.

By focusing performance rather than specific equipment, AWWU established the performance standard for the equipment, which is the key to achieving process control. AWWU staff and engineers held fast to the technical performance specifications throughout the procurement process. In the fall of 2015, 18 new PAX mixers were procured by AWWU.

Standardizing on specific mechanical equipment at a municipal treatment plant or factory makes operational sense. Common equipment simplifies employee training and streamlines maintenance and service. Equipment manufacturers must demonstrate a high level of performance, as well as a commitment to service, to merit consideration as a supplier of standard equipment. In the years since AWWU installed the PAX submersible mixers in its 18 storage tanks, deep cycling, the practice of “forcing turnover” by raising and lowering water levels, has been eliminated. The combination of performance, customer service and support enabled AWWU to confidently standardize its tank mixing equipment using PAX mixers.

"Icing was always a big problem for us until we added the PAX mixers."

- Jake Jokela, Operations Manager, Anchorage Water & Wastewater Utility

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