CASE STUDY

LARAMIE

New Mixing Technology Helps Mountain District Eliminate Ice and Improve Water Quality

OVERVIEW

South of Laramie Water and Sewer District (SLWSD), situated in a valley between the Laramie Range and the Snowy Range Mountains, is a consecutive system that buys water from the City of Laramie, Wyoming. With a population of 480, one water tank and about ten miles of pipeline, SLWSD is typical of many of the water systems in Wyoming. At an elevation of 7,200 feet, the Laramie area experiences bright sunny days for much of the year, but very cold weather conditions in the winter.

Since SLWSD was formed in 1996, managing icy conditions and maintaining water quality in their only tank, a 300,000 gallon pedosphere, has been a concern (Figure 1). "This tank is at the end of our system," explained Foster White, Operation/Manager of SLWSD. "While we have only 220 active meter services, we have nearly 230,000 gallons in volume in our pipes to provide for fire flow as well as regular consumption. It can take up to a week for water to make it through our system and into the tank, and this makes managing water quality inside the tank a challenge."

In winter, icing issues inside the tank were severe. "We often see daytime temperatures no higher than 10 to 20 degrees Fahrenheit and nights well below zero for an entire month," noted White. "We would commonly find a girdle of ice 4 - 6 inches thick and 2 - 3 feet wide where the water level around the outer tank wall fluctuated." The ladder access tube passes through the center of the tank and a "pineapple ring" of ice 4 - 6 inches thick would form around the access tube and float up and down with the tank level. The scraping action of this ice ring scoured the paint, requiring repairs every time a tank inspection was done by divers. The damage was increasing to the point, that in a few years, the tank would have to be taken off line, drained, sand blasted and repainted. A repair of that magnitude would require the tank to be out of service for 3 - 4 weeks and would create a severe problem for a system with only one tank.

Another major concern for SLWSD was water quality. With the tank at the end of the distribution system, water age was high. "Because water temperature can vary so much from season to season, we were concerned about thermal stratification and high water temperatures accelerating residual loss and disinfection byproduct formation," noted White. "We wanted to make sure we went with a mixing technology with a proven track record."

Figure 1. 300,000 gallon pedosphere in Laramie, WY. Winter temperatures are commonly below freezing for weeks at a time.

SLWSD contacted Cleanwater1 a PAX Water Technologies after learning about the effectiveness of their tank mixing technology from the Utility Division in Casper, WY. Initially, a PAX Water Mixer (PWM200) was installed and operated in the tank. But, because the tank had to remain full at all times, the installation was performed by a diver who used a complicated mounting. When the mounting lost its grip during the winter, the mixer turned off and the SLWSD tank lost its sole defense against ice. "We were really concerned that we would need to bring a diver back in to put the mixer back upright, and we'd have to wait until the end of the winter."

But unbeknownst to SLWSD, PAX Water Technologies had been developing a novel vortex mixer (PWM100) designed specifically for smaller tanks. Unlike PAX Water's main line of mixing systems, which leverages the PAX Lily impeller technology openly spinning in the tank, this new technology utilizes a PAX patented nozzle that produces the same vortex flow of water, but without a spinning impeller (Figure 2). While this new configuration requires more energy to operate than the highly efficient Lily impeller design, it has the advantages of being compact, easy to install and a lower capital cost

Figure 2. The PAX Water Mixer (PWM100) for small tanks. The vortex mixer is 30 inches tall, weighs 40 pounds and can be self-installed.

The new mixer was installed in early March 2013. The tank had large masses of ice floating in the water and clinging to the walls (Figure 3a). Temperatures were still well below freezing for many hours of the day. "We were impressed by how easy the mixer was to install and operate," notes White. "It's a drop-in system that can be easily retrieved by an operator, so we didn't have to worry about paying for a diver." Temperature probes were also installed in the tank to record the effect of the mixer on the temperature profile in the tank.

Within the first 24 hours, ice within the tank had already shrunk in size and extent (Figure 3b). With each fill and drain cycle, new water entered the tank and was circulated by the mixer to melt the volume of ice. After about a week, the tank was ice-free (Figure 3c). This visual demonstration of the power of the mixer was all the operators needed to be convinced that they had selected the right mixing system.

Figure 3a. Ice conditions inside the tank prior to turning on the mixer. Note the damaged coatings above the water line.

Figure 3b. Ice conditions inside the tank after 24 hours of mixer operation. The ice has substantially melted and open water is visible in many areas.

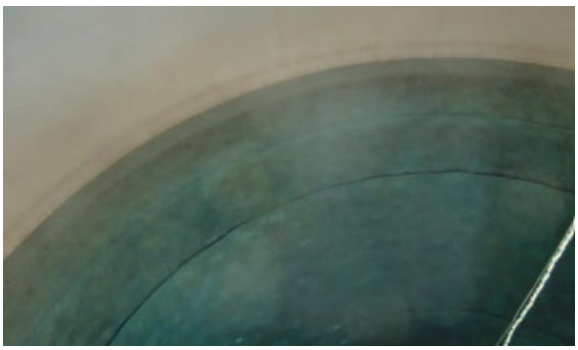

Figure 3c. Image of tank after operation of the mixer. Despite subfreezing temperatures, the tank was rendered ice-free after a week of mixer operation.

"We were very impressed with this new technology," said White. "This mixer seemed ideally suited to a tank and system of our size, and the ability to easily install and remove it ourselves is a big advantage." "We were also pleasantly surprised that PAX stepped up to work with us for a solution to our problem. We had purchased the PWM200 from PAX but had done the install ourselves, so they could have said that it should have been installed differently or been designed differently. Instead, they involved themselves with our problem and came back with the PWM100 option that addressed all of our concerns."

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- Foster White, Operation/Manager, South of Laramie Water and Sewer District

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