Not All Stainless Steel Resists Corrosion

Sauereisen's Solution Protected a Stainless Steel Structure From Future Degradation

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For Municipalities and Municipal Utilities Authorities struggling to deal with corrosion issues, knowing where to turn when faced with these challenges can be daunting. Logan Township Municipal Utilities Authority, of NJ was faced with such problems when it was discovered that a five year old stainless steel headworks tank at their wastewater treatment facility was experiencing extreme Microbiological Induced Corrosion (MIC) at the waterline with corrosion severe enough to open holes through the tank wall. Furthermore, the 304 stainless steel tank was no longer covered by the tank manufacturer's warranty and the manufacturer didn't offer any satisfactory solutions to rectify the corrosion issues. The problem became even more complicated for Logan Township MUA when a selected lining system was discontinued by the coatings manufacturer just one week before the installation was to take place. Unsure of where to go next, Corrosion Technology Systems, Inc., manufacturer's representative for Sauereisen Inc. of Pittsburgh, PA was contacted by Logan Township Municipal Utility Authority to assist the MUA in identifying an engineered solution, recommending a quality contractor/applicator and to provide on-site support to ensure the project was completed successfully.

Figure 1 Above grade stainless steel headworks tank at Logan Township MUA

Logan Township MUA is located in Gloucester County on the Delaware River with a population just over 6,000. A working class community, it boasts a unique mixture of residential, farmland, commercial, industrial and retail areas within their 23 sq. miles. While many other MUA's are facing reductions in their infrastructure and repair budgets, Logan Township MUA, through prudent fiscal management and good stewardship of rate payer's dollars, provide their rate payers with a consistent level of services with predictable cost. The Municipal Utility Authority (MUA) is dedicated to the

environment by only discharging highest quality effluent back into the Delaware River and has received several awards from New Jersey Department of Environmental Protection and United States Environmental Protection Agency for Clean Water Recognition Award and Operations & Maintenance Excellence.

The wastewater treatment process begins at the headworks structure in a complex process that brings raw wastewater into the treatment facility through miles of underground piping from the municipality's collection system and from septage waste delivered by truck. This raw wastewater (influent) entering the headworks is the first step in the process of reducing the level of pollutants in the wastewater stream. The headworks structure can be concrete or steel and located either below grade or above ground and its primary function is to remove debris such as solids, paper, sand & grit, metals, plastic, etc. before sending the raw wastewater stream to the Equalization tank for distribution to one of our four biological treatment units. It was in this first stage of the treatment process that the MUA noticed problems that allowed raw wastewater to leach out of the above ground structure, creating potential health hazards and unsanitary conditions around the stainless steel tank.

Logan Township MUA learned the hard way that not all stainless steel is equal and that the grade and surface finish will determine the suitability of the stainless steel to function properly for its intended use. Making the situation worse, the 57' long, 10' deep, and 6' wide tank had several solid stainless steel hatches which trapped H_2S within the unit above the waterline.

Figure 2 Stainless steel tank wall with holes resulting from MIC.

Testing by Logan Township MUA was very minimal; however the sulfides test that were run showed low levels of sulfides. The investigation revealed that the tank was constructed of 304 grade stainless steel, which is not sufficient enough to provide the necessary protection required in this environment. Stainless steel is a corrosion-resistant steel alloy with a minimum of 10.5% chromium content by weight. 304 stainless steel is the most common austenite steel with a composition of 18% chromium and 8% nickel and is not supposed to corrode or rust like that of common carbon steel. However, under specific conditions such as 100% O_2 environments, or containment with poor circulation, as is the case at Logan Township MUA, 304 stainless steel can corrode. Higher grade stainless, with sufficient chromium, will form a passive film of chrome-oxide on the surface to prevent attack and penetration into the steel substrate below in the form of iron-oxide. A higher grade of stainless steel could have prevented this corrosion from occurring.

Figure 3 View looking down the tank after six months in service (tank cleaned).

Jon Lattin, Sauereisen's representative in New Jersey, called in Aulffo Painting of Minotola, NJ to offer their expertise on tank rehabilitation to perform the tank refurbishment. "We constantly strive to provide long lasting service and affordability to our customers and in this unique situation we had to react quickly with a solution to minimize Logan Township MUA's tank downtime," said Jon Lattin. Logan Township MUA arranged for a separate contractor to weld in new sections of stainless steel in areas that were compromised. The stainless steel was then abrasive blasted by Aulffo Painting to achieve a 3-4 mil profile (SSPC-5 White Metal blast).

The lining material selected to protect the structure was Sauereisen's SewerGard™ No. 210X. The No. 210X was chosen because of its chemical resistance, elongation and abrasion resistant properties. "The No. 210X provides increased elongation, a lower permeability, and greater abrasion resistance than most other epoxy and urethane wastewater coatings on the market," Lattin said. Aulffo Painting spray applied the SewerGard™ No. 210X in two coats, totaling 60 mils to withstand the corrosion and abrasion from solids and debris in the wastewater. The walls were coated 12" below the low waterline up to the top of the tank, the area most susceptible to the corrosive effects of the MIC. Gary Aulffo, president of Aulffo Painting stated "we have been working with Corrosion Technology Systems and Sauereisen for over 10 years, and over the course of countless projects they have proven to provide the highest quality products, complemented by excellent customer service." Another preventative measure taken by the Logan Township MUA was to replace the closed hatch tops with open grates to minimize the accumulation of destructive hydrogen sulfide gases in the vapor zone.

Figure 4 Coated stainless steel sidewall after six months in service (tank cleaned).

Spraying epoxy in February and March in the Northeast adds additional challenges for applicators such as keeping the material and substrate at the proper temperatures to insure ease of application and proper cure. Southern New Jersey's late winter

temperatures are unpredictable with the average temperatures in the 30° – 45° range. Aulffo Painting erected a small heated storage area to store the materials before application and also piped heated air into the head-works tank during application.

Christopher Whalen, Logan Township MUA Superintendent indicated “The entire project team; CTS, Sauereisen, and Aulffo Painting were all very helpful and responsive, resulting in a successful project with no issues.” The structure was inspected by Sauereisen and Logan Township MUA six months and 1.5 years after being returned to service and it is exhibiting superior performance. The coating is 100% fully intact with no indications of areas of concern. It continues to be washable and serviceable and will be periodically monitored to ensure its longevity. “The coating looks to be holding up great. We will continue to check it, but to date we have no issues,” Whalen said.