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North Tonawanda Water Board

Tuesday 02/04/2025 - Session 13: Asset Management

ABSTRACT TITLE:

Case Histories - Extending Fiberglass Tank Life Under New NYS DEC Chemical Bulk Storage Regulations Lowers Cost: Erie County and North Tonawanda Lessons Learned

MINI ABSTRACT:

The New York State aboveground hazardous substances storage tank inspection regulations have changed in late 2023 and continue to have an even more significant impact on asset management plans. These regulations have pitfalls, putting owners of tanks in harm's way. The Erie County Division of Sewerage Management and North Tonawanda Water Board share their lessons learned on how to use most recently promulgated inspection standards to extend fiberglass tank life and lower cost. Mitigating harm.

ABSTRACT DESCRIPTION:

INTRODUCTION

Municipalities have been subjected to the New York State (NYS) Department of Environmental Conservation (DEC) chemical bulk storage (CBS) tank regulations since 1999. Specifically, Title 6 Subpart 598-3.3(c)(3) pertaining to Aboveground storage tank systems leak detection methods for five-year inspections. These regulations mandate the owner or operator must inspect aboveground storage tanks (AST's) consistent with a consensus code, standard or practice developed by a nationally recognized association or independent testing laboratory and meet specifications of the Title 6 subdivision.

In developing an asset management plan, owners have had an AST inspection consensus code, standard or practice to reference for rules in determining residual tank life plus life cycle and replacement costs for steel and thermoplastic tanks but not fiberglass. No rules for objectively calculating remaining useful life, suitability for continued service and next inspection interval have existed for fiberglass AST's until 2018. Consequently, owners have been falling victim to

unqualified low bid AST inspector determinations and learning asset management lessons the hard way. Costing municipalities and their ratepayers millions across New York State.

The Erie County Division of Sewerage Management and North Tonawanda Water Board have firsthand experience discovering what it looks like to fall into harm's way due to the absence of recognized and generally accepted good engineering practices (RAGAGEP) for fiberglass AST inspection. Their lessons learned include cost overruns caused by unqualified short inspection intervals, unjustified repair and unfounded premature tank replacements. As well as cost savings now, resulting from extending the life of their fiberglass tanks.

This presentation reveals harmful pitfalls inherent in regulations and highlights unfortunate tank replacement case histories that both Erie County and North Tonawanda experienced. It then demonstrates an asset management success case, where North Tonawanda engaged the most recently promulgated RAGAGEP to extend the life of their fiberglass AST's. Lessons learned may enable other owners to better optimize their maintenance and capital investment too.

PITFALLS INHERENT IN REGULATIONS

The former NYS DEC CBS Title 6 Chapter V Subchapter E Part 598 Hazardous Substance Bulk Storage regulation for AST five-year inspections was updated on October 17, 2023, to Title 6 Subpart 598-3.3(c)(3) five-year inspections. This is the latest update since October 2015. It has been remarkably reorganized and includes the same inspection rules as the 2015 version with a noteworthy addition, where it now requires a remaining useful tank life calculation. Despite the update, the 2015 version pitfalls are still in the 2023 version.

There are three (3) pitfalls inherent in the latest 2023 regulations. These pitfalls are created by the following regulation statements: "inspection must be consistent with a consensus code, standard or practice and be developed by nationally recognized association or independent testing laboratory and meet the specifications of this subdivision paragraph", "inspection must consist of a calculated useful remaining life of the tank" and "for tanks with a capacity of 10,000 gallons or more, inspection must be conducted under the direction of a qualified engineer".

These statements become harmful pitfalls to AST owners when they do not require a specific tank inspection RAGAGEP, assure the newly required calculation for useful remaining life is performed and properly qualify the engineer when AST size dictates this mandate.

UNFORTUNATE TANK REPLACEMENT CASE HISTORIES

Erie County Division of Sewerage Management

In this case, three inspection reports for a 10,000 gallon sodium hypochlorite AST spanning a 20-year period of tank life were audited for Erie County. The first report was completed at 11 years of service, the second at 16 years, and the third at 19 years. All three reports indicated signs of normal inner surface resin attack, while the third report at year 19 also indicated minor veil erosion. No other damage mechanisms were reported. At year 16 the tank was declared in good condition, yet the next inspection interval was reduced to three years. In year 19, it was declared not fit for continued service and replaced in year 20 assuming it exceeded its service life.

The 0.096 inch inner corrosion barrier (ICB) was structural, erosion was at most 0.010 inches deep, and ICB permeation was estimated at 0.035 inches. There was essentially no remarkable inner corrosion barrier change in degradation from year 11 to 19. Over 19 years, the degradation rate averaged approximately 0.002 inches per year. In simple terms, this indicates permeation may theoretically reach the structural layer in about 30 years after year 19.

No RAGAGEP was used to qualify the inspectors nor followed for AST inspection. This tank, although reports were stamped by a professional engineer given capacity, was replaced too soon and unnecessarily cost Erie County hundreds of thousands of dollars.

North Tonawanda Water Board

In this case, two inspection reports for twin 13,000 gallon ferric chloride AST's were audited for North Tonawanda, where the reports were completed at an estimated 34 years of service. Both reports indicated inner corrosion barrier failure and insulation jacket cracking, where the Tank 1 report also identified a wall bulge approximately 12 inches in diameter. The inner corrosion barrier failure was characterized as resin attack, blistering and exposed chop plus wicking and weeping into the chime area, with a manway neck inner surface delamination. The bottom and chime were claimed to be showing signs of failure. The tanks were deemed serviceable, where heads, shells, bottoms and nozzles were shown to be acceptable. A two year remaining life was estimated, the next inspection interval was set at one year and the AST's were replaced in a compressed timeframe based on an assumed tank life of 15 to 25 years.

Inspection report auditing was accompanied by an onsite exterior inspection of AST's removed from service, with a Tank 2 core specimen evaluation using a cutout extracted from the bottom and internal inspection through openings conducted. The internal inspection found the shell and bottom inner surface fully intact, as evidence of the shell mylar and bottom wax mold imprinting was observed plus no exposed fiber was seen and report photos verified these observations. The inner corrosion barrier observations were simply product staining and normal aging, where the wicking and weeping as evidenced by green appearance is normal permeation and discoloration in ferric service. A shell bulge as shown is most likely a mold depression. The area referred to as the chime describes a steel tank critical area configuration, as opposed to a fiberglass AST, which does not fail similarly. Glass content testing also revealed an inner surface veil was present and tensile testing proved the bottom to be greater than 19 percent stronger than the minimum design required. No structural damage was noted. The AST's appear to have been able to be given a 10-year estimated remaining useful life and set to a five-year inspection interval.

No RAGAGEP was used to qualify the inspector nor followed for AST inspection. In addition to these shortcomings, reports were not stamped by a licensed professional engineer as required by NYS DEC and included numerous obvious errors, omissions plus inconsistencies between them. These tanks were replaced too soon, unnecessarily putting North Tonawanda into a hurried tank replacement costing hundreds of thousands of dollars.

ASSET MANAGEMENT SUCCESS CASE HISTORY

Two inspection reports for twin 4,000 gallon aluminum sulfate AST's were audited for North Tonawanda, where the reports were completed at 36 years of service. Both external and internal inspections were conducted following a side manway field installation. Photos in the reports

showed a like-new inner corrosion barrier inner surface condition, with some alum staining. No other damage mechanisms or leaks were reported. The tanks were declared to be in good condition, with the next inspection interval set at two and a half years based on an assumed tank design life of 40 years and facing an imminent replacement decision.

Inspection report auditing was accompanied by an onsite tank inspection training exercise and core specimen evaluation using the side manway cutout saved. The internal inspection found the shell and bottom inner surface fully intact, as evidence of the like-new shiny surface plus shell mylar and bottom tape mold imprinting was observed. No other damage was noted. Glass content testing also revealed an inner surface veil was present and tensile testing proved the shell to be two and a quarter times stronger than the minimum design. The AST's were given a 15-year estimated remaining useful life based on erosion and modulus decay rate calculations, with the next inspection interval set at five-years given NYS DEC maximum limitations.

RAGAGEP introduced in 2018 for fiberglass AST inspection, FRPI SP8310, was used in the procurement process and to qualify the inspector plus for the AST inspection procedures to be followed and determinations made. This reassessment saved North Tonawanda hundreds of thousands of dollars over imminent tank replacement suggested by prior inspections.

CONCLUSION

Regulations leave selection and implementation of proper RAGAGEP for fiberglass AST asset management decisions up to owners and/or their consulting engineers. Most have historically not been aware of or did not know how to handle this designation, which essentially left it for the unqualified low bid inspectors to decide. Lessons learned show proper designations can result in significant maintenance and capital investment savings. Prudent use of RAGAGEP provides an attractive return on investment, rewarding asset management teams working in the best interests of all stakeholders. While RAGAGEP plays a significant role when working to optimize maintenance and capital investment, the next step to success is holding inspectors accountable to work required by RAGAGEP. This step necessitates writing a detailed inspection and test plan to quantify work scope for AST inspection service bids.

PRESENTATION LEARNING OBJECTIVES:

After attending this presentation, participants should be able to (1) Recognize key requirements of tank inspection regulations, (2) Apply most recently promulgated recognized and generally accepted good engineering practices for fiberglass tank inspection, and (3) Prevent financial, safety and environmental hardship for all stakeholders.

PRESENTER BIOGRAPHY:

Gary Arthur: Gary is a second-generation fiberglass industry pioneer like his father, who started a grassroots tank shop in 1958. He has a thirty-six year legacy, beginning with fifteen in manufacturing, field fabrication, inspection, repair, and alteration of fiberglass tanks. His manufacturing company was awarded industry's first ASME RTP-1 pressure vessel stamp in 1993. In 2003 Gary founded a nonprofit industry trade certification organization, named the Fiberglass Reinforced Plastics Institute that he has been President of since. As a crusader supported by

hundreds, Gary oversaw creation of and delivers three United States Patent and Trademark Office registered certification mark tank reliability programs.

Angela Horton PE: Angela is a Senior Sanitary Engineer for the Erie County Division of Sewerage Management and has over 25 years of experience with chemical bulk storage with the Division. She is currently in charge of managing 24 chemicals tanks with more being added this year. This has included the 5 year inspections and reports involving them. In 2023, she completed the FRP831 Field Inspection of Aboveground Chemical Bulk Storage Tanks to have a better understanding of the issues that were encountered through the years and begin to perform inspections in-house to save costs for the Division.

Matthew Lehman: Matt is the Senior Operator for the North Tonawanda Water Treatment Plant. He has 9 years of operations experience with the last 2 years being in a management role. One of his job duties is maintaining compliance for the facility's chemical bulk storage program. In 2024, he was tasked with finding a vendor to inspect the facility's Aluminum Sulfate chemical bulk storage tanks, which were on a 2.5-year inspection interval. In 2024, he found FRPI and was successful in hiring them for a coaching/inspection of these fiberglass tanks to gain a better knowledge of what to look for during these inspections as well as what guidelines to follow when writing a request for proposal. This success allowed NTWTP to increase the inspection interval to 5 years, saving money on inspection costs, and saving time that was consumed in taking these tanks out of service prematurely.