ARE YOUR FIBREGLASS ABOVEGROUND STORAGE TANKS SAFE?

Gary L Arthur, executive director and president of Fiberglass Reinforced Plastics Institute, Inc, gives an overview of emerging standards and inspection best practice for fibreglass aboveground storage tanks

While fibreglass reinforced plastic (FRP) aboveground storage tanks (ASTs) have a small footprint in the oil & gas industry, they tend to contain the most highly hazardous chemicals stored at a facility due to the corrosion resistant nature of fiberglass materials.

Managing these assets can be very challenging given emerging government regulations; historically little to no FRP industry standards providing guidance for inspection of tanks, plus the idiosyncrasies of fibreglass as a material of construction. To address these challenges and provide safer FRP ASTs, the Fiberglass Reinforced Plastics Institute (FRPI) introduced the industry's first comprehensive full-fledged fibreglass tank inspector certification practice on 8 October 2018.

REGULATIONS

Looking back to 1987, there were essentially no formal industry AST inspection practices published. Then came the 1988 Ashland oil spill and October 1989 Phillips 66 chemical complex explosions. These events catalysed Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) initiatives to protect better the environment and citizens of the United States of America. From lessons learned, the EPA Spill Prevention, Control and Countermeasure Guidance for Regional Inspectors (SPCC), OSHA Process Safety Management of Highly Hazardous Chemicals (PSM) and EPA Risk Management Program (RMP) regulations started to take shape. Over the next decade these efforts became law, where today they are referred to as EPA 40CFR112 SPCC, OSHA 29CFR1910.119 PSM and EPA 40CFR68 RMP.

EPA and OSHA regulations formed a framework characterising AST inspection requirements including standards, inspection and test plans and accountability. Programme elements covered employee participation, process safety information and hazard analysis, operating procedures, training, contractors, pre-startup safety review,

A failed FRP Tank

An FRPI 8310 inspector is more than just an inspector registration number

Managing FRP assets can be very challenging

mechanical integrity, hot work permits, management of change, incident investigation, emergency planning and response, compliance audits plus trade secrets. These elements included establishing periodic documented inspection intervals, officially training and qualifying inspectors plus developing written inspection and testing procedures that must be followed. About 20 states then followed on to these Federal mandates with parallel requirements and some taking a deeper, more specific stance.

By 2014 a coalition of special interest groups formed under the name Environmental Justice and Health Alliance for Chemical Policy Reform, and published a report titled "Who's in Danger". This report was a demographic analysis of chemical disaster vulnerability zones throughout the United States. A total of 18,764 chemical spills were reported. Over 134 million Americans lived under threat of leaks and spills emulating from 3,433 facilities. This Alliance then filed a lawsuit against EPA in July 2015, claiming EPA was negligent in protecting citizens as a result of not responding to mandates by Congress in 1972 to issue regulations aimed at mitigating risks in the chemical industry as they had in the petroleum industry.

In 2018 the EPA responded to the United States District Court for the Southern District of New York with a proposed rulemaking that pertains to the issuance of additional Clean Water Act Hazardous Substance regulations. In doing so the EPA presented a study they conducted to see if the need for a new rule was justified.

This study identified 285,867 chemical releases reported to the National Response Center from 2007 to 2016, 9,416 of which impacted water in EPA's jurisdiction, 3,140 reached water and 2,491 of this number were from non-transportation sources where 117 or 4.7-percent of these resulted in evacuations, injuries, hospitalisations, fatalities, waterway closures or supply contamination. Based on this analysis and a framework of existing regulations plus overall multiple statutory and regulatory requirements established under different Federal authorities, the EPA is not proposing additional regulatory requirements at this time.

> Assuring FRP ASTs are safe is in the best interests of all stakeholders

STANDARDS

In response to SPCC, PSM and RMP plan mandates, AST owners have been required by law to prevent, prepare for and respond to oil and chemical related disasters. To meet requirements at law, inspectors must be trained plus qualified under very specific terms to create accountability and achieve results. Consequently, industry organisations needed to publish standard practices that produce well qualified inspectors.

The American Petroleum Institute (API) was at the forefront of standards development, introducing API 653 Tank Inspection, Repair, Alteration and Reconstruction in 1991, API 580 Risk-based Inspection in 2002 and API 571 covering Damage Mechanisms in 2003. The Steel Tank Institute also published SP001 Standard for the Inspection of Aboveground Storage Tanks in 2000.

Results in qualifying individual inspectors accelerated for steel ASTs in the Petroleum Industry and beyond, with over an estimated 5,000 inspectors qualified now in the United States alone. These steel tank inspection standards have long preceded and therefore established a precedence for standardisation of inspector qualifications for the FRP AST industry.

The FRP Industry, where fibreglass ASTs are predominantly used for storing hazardous substances, historically has made limited progress with developing full-fledged robust sustainable inspector qualification practices. Niche industry organisations with well-intended professionals supporting the Pulp and Paper, Petroleum and Chemical Processing Industries had made a commendable effort at responding to EPA and OSHA mandates from 1999 through 2016. However, practices published were lean on technical content and administration programmes, found to have several remarkable errors and omissions, fallen significantly short on enabling industry controlled sustainable practices, plus not been notably updated in over 10 years.

IDIOSYNCRASIES

FRP, being a composite material composed of many layers and raw materials all designed to optimise performance for a given application, is a mystery material for many. In the steel world we have mass produced homogenous material with isotropic properties available in common grades such as A36 Carbon Steel or 316 Stainless Steel, whereas the FRP world consists of multiple non-homogeneous composite designs with anisotropic properties and no standard grades that are essentially handmade job-by-job. As a result, modes of failure are substantially different between steel and FRP composites as well as within a single composite design that may appear to be the same for different AST's.

Premature failure studied for FRP ASTs goes back to a formal FRP industry study in 1991, capturing a total of 388 types and 328 causes of failure, and more recent events spanning the past 15 years. Current case histories have also revealed three ASTs in the same service required replacement in eighteen months, seven years and sixteen years, underscoring the unpredictable nature of FRP composite failure. Case histories compiled since the failure study have shown failure emerges year after year emulating a similar proportionality of types and cause as identified decades ago. It is estimated premature failure of FRP ASTs costs industry over US$107 million per year, not considering consequential damages.

NEW INSPECTOR CERTIFICATION

FRPI, with the help of a balanced group of industry professionals, has finally answered the call and published a comprehensive robust standard practice for the education, qualification and administration of FRP AST inspectors. It was published in 2018 and is called "SP8310 Licensed Aboveground Storage Tank Inspector Certification". This standard practice addresses emerging regulations, precedence set by the steel industry and idiosyncrasies of FRP ASTs.

Assuring FRP ASTs are safe is in the best interests of all stakeholders. Stop engaging inspectors that simply appear to know something about FRP ASTs and start employing certified and licensed FRPI 8310 Inspectors. This is the new FRP industry recommended best practice and a smart move from an owner's asset management perspective, too. Require an FRPI 8310 Inspector today, it is more than just an inspector registration number.

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