EVOLVING US REGULATIONS IMPACT CHEMICAL STORAGE TANKS

The Fiberglass Reinforced Plastics Institute introduces industry's first comprehensive full-fledged fiberglass tank inspector certification practice

Storing chemicals is a highly hazardous operation in the oil and gas industry. Although chemicals are not flammable and explosive in nature, they are very corrosive and can cause injury, fatalities and environmental damage if not safely contained. Fiberglass Reinforced Plastic (FRP) is the material of choice most often for aboveground storage tanks (AST's) in chemical service due to its corrosion resistance. FRP AST's are substantially smaller in storage capacity than steel AST's storing oil, where regulations and industry standards development has focused more on oil applications. Consequently, FRP AST's in chemical service have been at risk. To address these challenges and provide safer operations, the Fiberglass Reinforced PlasticsInstitute (FRPI) introduced the industry's first comprehensive full-fledged fiberglass tank inspector certification practice on October 8, 2018.

Fiberglass tank inspection

REGULATORS GET ATTENTION

A coalition of special interest groups formed under the name Environmental Justice and Health Alliance for Chemical Policy Reform published a report in 2014 Who's in Danger. This report was a demographic analysis of chemical disaster vulnerability zones throughout the US. A total of 18,764 chemical spills were reported. Over 134 million Americans were identified as living under the threat of leaks and spills emulating from 3,433 facilities. This alliance filed a lawsuit against the Environmental Protection Agency (EPA) in July 2015 stemming from this research, 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.

The EPA responded to the United States District Court for the Southern District of New York in 2018 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% of these resulted in evacuations, injuries, hospitalisations, fatalities, waterway closures or supply contamination. Based on EPA's 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.

The existing framework EPA points to includes work by themselves and the Occupational Safety and Health Administration (OSHA). The work of these regulators was initially motivated by the 1988 Ashland oil spill and 1989 Phillips 66 chemical complex explosions. Lessons learned spawned 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) regulatory efforts. By the beginning of the 21st century 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 rules at law today form a framework characterising AST inspection requirements including standards, inspection and test plans and accountability. Programme elements cover employee participation, process safety information and hazard analysis, operating procedures, training, contractors, pre-startup safety review, mechanical integrity, hot work permits, management of change, incident investigation, emergency planning and response, compliance audits plus trade secrets. These elements include 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 on chemical applications.

LIMITED FIBERGLASS STANDARDS

The FRP industry has historically made limited progress with developing full-fledged robust sustainable inspector training and qualification practices in response to the EPA and OSHA rules at law. 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 these EPA and OSHA mandates from 1999 through 2016. However, practices published were lean on technical content and administration programmes were 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.

With regulatory efforts predominantly focused on the oil and gas industry during the 1990s, the American Petroleum Institute (API) introduced 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. These efforts were supplemented by the Steel Tank Institute (STI), which also published the SP001 Standard for the inspection of aboveground storage tanks in 2000. Both API and STI standards pertain to steel tanks as opposed to FRP. There are over an estimated 5,000 steel tank inspectors trained and qualified now in the US alone. These steel tank inspection standards have set a precedence for standardisation of inspection practices for the FRP industry.

FRP AST'S AT RISK

Not considering consequential damages, it is estimated that FRP AST premature failure costs industry over $107 million per year. FRP is a complicated material of construction and all too often not given the respect it deserves by specifying engineers plus job shop manufacturing operations. While FRP has earned great respect and a position as the material of choice for numerous chemical applications, its performance is less predictable and state more difficult to assess than mass produced homogenous steel materials with isotropic properties available in common grades such as A36 carbon steel or 316 stainless steel. These circumstances place a large importance factor on FRP AST inspector expertise.

The most recent formal FRP equipment premature failure study was conducted in 1991, where a total of 388 types and 328 causes of failure were captured. In looking at a slice of this research data for tanks and vessels, 39% of the types of failure were attributable to material issues and 70% of causes to manufacturing deficiencies. Case histories compiled since this failure study have shown failure emerges year after year emulating a similar proportionality of types and cause as identified decades ago. FRP AST's consist of multiple nonhomogeneous composite designs with anisotropic properties and no standard grades plus they are essentially handmade job-by-job. As a result, modes of failure are substantially different between steel and FRP composites.

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In looking at three different AST's in sodium hypochlorite service, it was found that the first required replacement within 18 months of commissioning, the second seven years and the third 16 years. To the specifying engineer who approved the tanks for installation, each tank looked the same. It is essential that a well-qualified inspector understands FRP failure mechanisms and their employers can identify such capable individuals in order to minimise failure risks for all stakeholders.

FRP INDUSTRY STEPS UP

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. Additionally, FRP AST failure modes are complicated and unpredictable. To meet these requirements at law and inspection challenges, inspectors must be trained plus qualified under very specific terms to create accountability and achieve results. Consequently, the FRP industry has needed to publish sustainable standard practices that produce well-qualified inspectors.

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 evolving regulations, precedence set by the steel industry and premature failure modes for FRP AST's.

Assuring FRP AST's are safe is in the best interests of all stakeholders. Stop engaging inspectors that simply appear to know something about FRP AST's 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. Employ an FRPI 8310 inspector today, it is more than just an inspector registration number.

FOR MORE INFORMATION

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Sodium hypo tank failed in 18 months

Sodium hypo tank failed in seven years

Sodium hypo tank failed in 16 years