Fiberglass Underground Storage Tank

Success In the USA

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I. Introduction and Scope

Competition between steel and fiberglass tank manufacturers has resulted in product comparisons and superiority claims in several areas. While tanks typically are warranted for 10 to 30 years, the owner recognizes that the liability costs associated with premature failure far exceed the replacement value of the tank itself. As a result, the probability of success is of importance to the tank owner.

Often negative claims are biased by reports based on incomplete information and the reader will need to look at both sides of what is often competing marketing information. For example, while not identifying the incident date or circumstances, there was a report on limited single-wall fiberglass tank failures that occurred in certain European countries. This negative European report is inconsistent with the historical and essentially release-free success rate of single-wall and 100% release-free success of double-wall fiberglass underground storage tanks in the USA. Industry in the USA is known to be innovative and not bound to traditional technologies. Thus, when fiberglass underground tanks were introduced some 50 years ago (i.e., 1965) this new product changed the methods by which tanks were manufactured (Quality-Assurance-Quality-Control known as "QAQC" procedures) and installed. This paper addresses the success rate of single-wall fiberglass reinforced plastic (FRP) tanks and the reasons for their successful application in the USA petroleum storage market.

II. Methodology to Determine Success Rate of Single-wall FRP Tanks

A. Study Time Frame: One must decide on a practical time frame over which a tank's condition should be evaluated. For example, there is a population of single-wall fiberglass tanks that have enjoyed leak-free service for some 50 years based on when FRP tanks were Underwriters Laboratories labeled in 1965 and on historical manufacturer warranty records (i.e., the current FRP tank warranty period in the USA is typically 30 years). However, some 50 years of tank ownership changes have made it impractical to gather historical maintenance and product storage data, which is often not available with these changes. Realistically, a shorter time frame needs to be selected where data are available to develop a valid study sample.

B. Data Collection: An ideal study could result from excavating a statistically significant sample of tanks and evaluating their condition. However, the excavation of non-leaking tanks and disruption of a customer's place of business is not practical.

C. Tightness Testing Data: Another approach could be to tightness test the tank sample to evaluate tank condition. At least one previous study compared test results with excavated tank examinations and found that the tanks may be in worse condition than that demonstrated by testing. [EPA Tank Corrosion Study; EPA 510-K-92-802; November 1988; page 3]. Therefore, relying on tank testing alone would likely indicate tank failures (i.e., leaks) but would not fully evaluate tank condition and potential near-term failure conditions.

In summary, reasonable valid data sources would be from non-tank manufacturer or installer studies of excavated tank condition experience and tank testing data.

III. Data Sources

Scope of available studies: Third party contractors and certain major oil companies conducted underground tank condition studies by examining excavated tanks. In addition, one contractor researched and analyzed tank tightness tests to identify the tank condition of failed tanks. These studies are broad in scope, covering most geographic areas and environmental conditions. In addition, the study samples cover a significantly large number of single-wall fiberglass tanks spanning ages up to 14 years. Following is a listing of these studies:

a. Service Station Testing, Inc., San Antonio, Texas report to Midwest Research Institute, dated September 16, 1987. This report is on a study of 207 single-wall fiberglass tanks up to 14 years in age that were excavated and examined, primarily in Austin and San Antonio, Texas. The fiberglass tanks were found to be leak free.
b. Major Oil Company "A" report on FRP tank leak data. This company had 11,396 single-wall fiberglass tanks in service at the time of the study. Their leak tracking system indicated two leaks, both of which were attributed to improper tank installation.
c. Major Oil Company "B" report on FRP tank leak data. This company had 7,410 single-wall fiberglass tanks in service at the time of the study. Their leak tracking system indicated two leaks, one of which was attributed to improper tank installation.
d. Tank Corrosion Study (EPA 510-K-92-802). This is an EPA field study conducted in Suffolk County, New York by the Suffolk County Department of Health Services. The report analyzes observations made on the condition of 500 excavated underground storage tanks from February 1987 to September 1988. Two of the excavated tanks were 8 and 10 year old single-wall fiberglass tanks. The tanks were leak free.
e. Service Station Testing, Inc., San Antonio, Texas report to Midwest Research Institute, dated July 21, 1987. This was a report on the analysis of tank tightness testing conducted on 1,921 tanks of which 228 were single-wall fiberglass. The tests were conducted primarily in the Austin and San Antonio areas of Texas and portions of Colorado over the period of 1981 to 1987. The fiberglass tanks were found to be leak free.

IV. Single-Wall Fiberglass Tank Data Summary

Data Source	Number of FRP Tanks in Study	Average age (Est.)	Number of Failures	
			Tank	Installation
1	204	7	0	0
2	11396	8	0	2
3	7410	6	1	1
4	2	9	0	0
5	228	7	0	0
	Totals: 19,240	8	1	3
		% of Total	0.005%	0.02%

V. Single-wall Fiberglass Tank Success Experience

Impartial tank condition study data show that single-wall fiberglass tanks':

- Installation success rate was 99.9896% successful or successful in 999.9 tanks out of 1,000 installations.
- Non-failure rate (excluding installation) was 99.995 successful, or successful in 999.95 out of 1,000 installations.
- Total non-failure rate (including installation problems) was 99.984% successful, or successful in 999.84 out of 1,000 installations.

VI. Reasons for High Success Rate

The historical success rate for the application of fiberglass tanks in the United States of America (USA) is primarily due to industry requiring the following high manufacturing standards/quality, industry installation procedures and installer training/oversight.

A. Manufacturing Standards/Quality: Fiberglass underground petroleum storage tanks are manufactured in an automated process rather than a job-shop operation. This automated process lends itself to standardized manufacturing and Quality Control procedures from the time raw materials and components are received, to interim composite sampling and final product testing. While each tank manufacturer follows its patented procedures, the product is performance tested to meet a third party independent laboratory standard Underwriters Laboratories UL 1316 Standard for Glass-Fiber Reinforced Plastic Underground Storage Tanks for Petroleum Products, Alcohols and Alcohol-Gasoline Mixtures. Finally, UL is retained as the Quality Assurance contractor and routinely inspects the manufacturing facility to ensure that Quality Assurance Quality Control (QAQC) procedures are followed. Thus, USA fiberglass tanks are quality manufactured, meet a third party performance standard, follow third party QAQC procedures and come with a 30-year warranty.

B. Industry Installation Procedures: While each fiberglass tank manufacturer publishes detailed installation procedures, the petroleum industry (American Petroleum Institute) and the tank installer industry (Petroleum Equipment Institute) also publish and routinely update underground tank installation standards (API 1516 Installation of Underground Petroleum Storage Tanks and PEI 100 Recommended Practices for Installation of Underground Liquid Storage Systems). These installation standards are codified in the Model Fire and Building Codes by the Authority Having Jurisdiction (e. g., cities, counties and states) and required by the federal government (i.e., Environmental Protection Agency). Thus, the proper procedures for the installation of fiberglass tanks are readily available and mandated in the USA.

C. Installer Training/oversight: Both the petroleum industry and fiberglass tank manufacturers recognized early on that installation contractors required training to change old detrimental practices. Improper practices (e. g., allowing foreign objects in the backfill, supporting tanks on hard objects, poor backfill compaction) caused many premature steel tank failures. As a result, beginning in late 1960, oil company personnel and fiberglass tank manufacturers conducted contractor installation training programs and the record shows that over 25,000 personnel were trained. In addition, since 1980, this number has grown considerably as many states required additional installer training and refresher courses.

Installer oversight has also become an important part of successful tank installations. Oversight in the USA is required by federal government rules, state inspectors and fire code jurisdictions. For example, New York City has historically required on-site fire personnel oversight while a tank is being installed.

V. Summary

A year 2000 market study Havill Consultant survey of retail petroleum marketers showed that 55% of the underground storage tanks in the USA are fiberglass. Most of this tank population consisted of single-wall tanks and the foregoing record shows that these tanks have performed successfully. Thus, there may be isolated manufacturing, installation or oversight reasons when a tank failure occurs. The petroleum industry is best served in the public arena by identifying failure causes and implementing proven overall QAQC procedures.

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