

Review of above-ground tank standards for the pulp and paper industry

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The objective of this document is to review available standards for construction, in-service inspection, maintenance, repair, and alteration of above-ground storage tanks (ASTs) for their applicability to the pulp and paper industry. This is necessary because existing and pending government regulations have focused increased attention on the environmental and safety issues related to recent tank failures in several industries. The primary focus of this review is two American Petroleum Institute (API) tank standards. For many years API 650 has been used for tank construction; recently API 653 was issued and is now being considered for in-service inspection, repair, and alteration of pulp and paper tanks.

Background

Available standards and regulations

The lack of a pulp and paper industry-specific document for construction of new chemical storage tanks has resulted in widespread use of American Petroleum Institute Standard API 650, "Welded Steel Tanks for Oil Storage," as a minimum standard for construction for most ASTs in pulp and paper mills. API recently issued Standard API 653, "Tank Inspection, Repair, Alteration and Reconstruction." Regulatory agencies tend to mandate compliance with other existing standards when no specific industry standards exist. Since this is true, concern exists as to whether and how tank standards developed specifically for another industry can be applied to the pulp and paper industry.

General industry process differences

Significant differences in the process streams in the two industries make it illogical to universally apply petroleum-industry standards for new construction, in-service inspection, etc., in the pulp and paper industry. Pulp and paper process streams are primarily water-based solutions, suspensions, slurries, or both. They often have a higher specific gravity than water and are not flammable. They also usually avoid the low temperatures which make it necessary to consider the likelihood of brittle fracture and are generally classified as less environmentally sensitive or hazardous.

Petroleum streams are mostly organic solutions, which have a lower specific gravity than water and are flammable. They usually are not soluble in water and will stratify above a water layer due to density differences. Concerns regarding process-side corrosion in petroleum-industry tankage focus on the floors of the tanks, whereas pulp and paper tankage almost always corrodes on the walls. However, external and underside corrosion issues are similar in all chemical-service applications and much of what is known about that in the petroleum and chemical industries is relevant to the pulp and paper industry.

Standard review

New tank construction

Water- and oil-storage tanks in pulp and paper mills are typically constructed in accordance with AWWA and API tank standards for carbon steel tank construction. Most steel tanks for other process environments in pulp and paper mills have been constructed to the API Standard API 650, "Welded Steel Tanks for Oil Storage." This standard, which, although it was not written with the pulp and paper processes in mind, has generally proved to be satisfactory.

The older versions of API 650 do not specifically address use of stainless steel as a construction material and no design allowances are made for loads associated with agitators, clarifier rakes, or roof-mounted equipment. Plus, hydrostatic testing is less effective as a test of structural integrity (but is useful for leak and settlement testing) because of the differences in the densities of the respective process streams. Petroleum tank bottoms are bare steel while many liquor tanks have concrete floors, some of which may be several feet thick at the tank wall. Overall, however, API 650 can be used as a suitable basis for new tank construction in the pulp and paper industry, provided appropriate modifications are included to address these specific issues.

In-service tank inspection

Pulp and paper companies that have implemented formal programs for in-service inspection, repair, and alteration of tanks typically have used both the National Board Inspection Code (for boilers and pressure vessels) and API Standard 650

as reference documents for these functions. Now that API Standard 653 has been issued, questions regarding its relevance and usefulness to the pulp and paper industry have arisen. This is especially so because regulators and others may erroneously assume that API 653 requirements automatically apply to tanks constructed to API 650.

Review of API 653 has shown that it is useful for evaluating the suitability for continued service of corroded tanks and for specifying repair, alteration, and welding practices, which are consistent with the requirements of API 650. However, because API 653 does not address tanks made of stainless steel and because the corrosion characteristics in pulp and paper tankage can differ significantly from those in petroleum tankage, many parts of this standard are not directly applicable to pulp and paper tankage. This is especially so for the sections covering inspection and inspector qualification, although everyone agrees on the role of visual inspection as the cornerstone for proper inspection.

API 653 requires monthly and annual documented visual inspections, apparently to ensure even remote oil-storage tanks are regularly checked for early signs of deterioration or leaks. However, few tanks in pulp and paper mills are remote or isolated enough to escape regular attention, so problems are usually noted in a matter of hours or days and can be quickly addressed. Of course, critical or potentially hazardous tankage may require more frequent, formal external checks.

Because of the above-mentioned industry differences in the characteristics of contents, corrosion, materials, construction, etc., between pulp and paper and petroleum tankage, API requirements are very useful but are not universally applicable to the pulp and paper industry. Good engineering judgment is essential to modify the API Standards to make them appropriate for the pulp and paper industry.

Recommended action

American Petroleum Institute Standards API 650 and 653 serve as good references for tankage in the pulp and paper

industry. However, the differences between petroleum and pulp-and-paper process streams and the resulting corrosion experiences preclude direct application of these standards for construction, in-service inspection, repair, etc.

A commentary to these API Standards should be prepared which provides a basis for effectively applying them to tanks in the pulp and paper industry. A Tank Task Group should be responsible for this commentary and should specifically identify how the API tank standards need to be modified to make them directly relevant to the pulp and paper industry tankage. This same task group should also determine the most effective way of disseminating the resulting commentary and information to the industry. ■

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