TETRA TECH RPS ENERGY | TRAINING

N609: Aboveground Storage Tank Management: Design, Integrity and Safety

Instructor(s): Philip Myers

Format and Duration

Classroom - 3 Days
Virtual - 5 Sessions

Summary

The course provides a complete overview of various kinds of "tanks" used aboveground as well as purposes and attributes. Although the course primarily focuses on tanks used in the oil and chemical business which are large flat bottom tanks, we will also cover smaller tanks, both vertical and horizontal as well as belowground tanks. We cover the fundamentals for the design, construction, operation, maintenance, and inspection of petroleum terminal and tank facilities. This includes the safe designs, operations, and considerations in the form of safety moments, incident reviews, and risk management from real world example. We discuss the different kinds of designs, best practices and the general considerations associated with storage tanks including the hazards of petroleum storage. Also addressed is what you need to know and how you can make a difference about keeping your tank personnel safe based on lessons learned from past incidents that have shaped the industry.

Learning Outcomes

Participants will learn to:

1. Identify the key standards for aboveground storage tanks (ASTs), such as API 650, API 653, API 2610, API 2350, API 579, NFPA 30, UL 142 and STI SP001, explaining their specific applications in tank design and integrity management.
2. Describe the principles of AST design, including shell design, floating roofs, foundations, venting, hydrostatic testing, and materials of construction, highlighting how these factors contribute to tank safety and compliance.
3. Explain the factors that govern the thickness of tank components and how these are determined by specific standards, focusing on their impact on tank safety.
4. Differentiate between the metallurgical considerations for tanks of varying sizes, detailing how these impact the design and construction of tanks ranging from 10 to 150 ft in diameter or larger.
5. Summarize the essential elements of foundation design and piping considerations in AST construction, explaining their importance in maintaining tank integrity.
6. Compare the roles of API 650 and API 653 in managing tank integrity at different stages of the tank life cycle, outlining the specific damage mechanisms they address, such as corrosion, settlement, and stress corrosion cracking.
7. Illustrate strategies for optimizing tank inspection programs, incorporating risk-based inspection (RBI) techniques to manage tank integrity effectively across multiple sites.
8. Describe the methods for detecting leaks and implementing secondary containment practices, emphasizing their role in ensuring environmental safety and regulatory compliance.
9. Explain the steps involved in conducting a fitness-for-service (FFS) assessment to evaluate tank conditions and determine maintenance needs.
10. Apply best practices for tank cleaning, inspection documentation, and stakeholder communication, ensuring effective management of AST safety and integrity.

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Training Method

This is a classroom-based course. There will be some in-class exercises on fundamental problems as well as a pre-read that helps to establish context for the course.

Who Should Attend

This comprehensive and broad course is aimed at engineers, inspectors, regulators, administrators, auditors and managers responsible for storage tank facilities who wish to improve their overall knowledge and understanding of these facilities in the petroleum, chemical, aviation and paper and pulp industries.

Course Content

Part 1: Design

Part 1 of the course will provide an overview of all the important tanks standards such as API 650, API 653, API 2610, API 2350, API 579, NFPA 30 and STI SP001. It will provide additional detail on API 650 and provide the basic principles of shell design, floating roofs, foundations, fixed roofs, venting, hydrostatic tests, materials of construction, and many other issues associated with building new tanks. Some issues addressed in this section are:

- What governs the thickness of tank components.
- Which standards can/should be used for various types of tanks.
- What metallurgy should be considered for tanks in the diameter range from 10 to 150 ft or for larger tanks.
- Elements of foundation design
- Piping considerations

Part 2 Tank Integrity

Part 2 of the course addresses ongoing integrity. Having designed and built a good tank the next problem is to ensure it remains safe and leak free. The focus is on the well-known tank inspection standard, API 653 as well as STI SP001.

Some of the topics covered:

- How do standards API 650 v API 653 manage tank integrity and at what point in the tank life cycle are these standards relevant?
- What are the relevant design and age related damage mechanisms including brittle fracture, corrosion, settlement, repairs, corrosion, stress corrosion cracking, and more?
- How does one optimize a tank inspection program for a population of tanks?

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- What is risk based inspection and how can it be applied effectively to tanks?
- Various methods of leak detection design.
- Best practices for secondary containment.
- Best practices for documenting tank inspections and tank data.
- What is a fitness-for-service assessment and how is it done?
- Best practices for cleaning tanks?
- How to deal with top management policy, regulator, auditors, and others who are important stakeholders in the tank operation.