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## N686: Oil and Gas Storage Tanks: Design, Operation, and Maintenance

Format and Duration  
Classroom - 5 Days

Instructor(s): Prof. David Newman

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### Summary

The course provides a complete overview of various kinds of tanks used, their purposes and attributes. It covers 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. It considers the different kinds of designs, best practices and the general considerations associated with storage tanks including the hazards of petroleum storage.

### Learning Outcomes

Participants will learn to

1. Identify the different types of storage tanks used in the hydrocarbon industry.
2. Understand the different codes and standards in tank design and construction.
3. Recognise the different components of storage tanks.
4. Appreciate the criteria used in the selection of storage tanks.
5. Understand the practices and procedures of tank operations.
6. Define the principles of asset integrity management plans.
7. Understand tank safety, environmental and emergency response principles.
8. Recognise legislative and regulatory compliance issues.

### Training Method

This is a classroom course comprising a mixture of lectures, discussion, case studies, and practical exercises.

### Who Should Attend

This 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.

### Course Content

#### 1. Introduction

- Overview of the Oil & Gas Industry, Upstream, Midstream Sectors
- Hydrocarbons - Basic Properties and Characterisation
- Hydrocarbons – In Storage – Need for Safety and Associated Risks
- Storage Tanks – Considerations of the Supply Chain



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- Types Of Storage Tanks:
- Spherical
- Aboveground vs. underground tanks
- Crude oil vs. refined product storage tanks

### 2. Storage Tank Codes and Standards - Design and Construction

- API Standards 650 / 620 / 2610
- Types of Tanks, Bolted, Welded, etc.
- Tank Components, Fittings and Equipment
- Tank Roofs, Fixed, Floating, Roof Supports etc.
- Tank Rim and Seals
- Tank Vents & Vacuum Breakers
- Tank Drainage and Water Separation

### 3. Storage Tank Selection

- Tank Selection Criteria
- Tank Capacity & Volume Calculations
- Cylindrical and Spherical Tanks
- Tank Piping Systems, Pumps, BS&W Control
- Foundations Construction Basics

### 4. Tank Construction and Tank Operations

- Materials Design & Selection
- Welding, Weld Inspections/NDT
- Design Loading and Selected Tank Equations
- Tank Manufacturing and Assembly
- Tank - Corrosion Protection - Cathodic Protection (CP) Systems - Internal/External), Coating Systems
- Tank Filling and Emptying
- Venting Systems

### 5. Storage Tank – Inspection, Maintenance and Repair

- API Standard 653
- Asset Integrity Management Plans
- Asset Integrity – Establishing Tank Mechanical And Structural Integrity
- Tank Cleaning – Procedural NDT Inspections – Internal & External
- Tank Failure Case Studies
- Tank – Leak Detection – Tools and Technologies



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- Emerging Technologies
- Level Measurement Sensors, Techniques and Control

### 6. Tank Safety, Environmental and Emergency Response

- Safety Considerations
- Fire Protection And Suppression Systems
- Hazardous Area Classification
- Personal Protective Equipment (PPE)
- Environmental Management
- Spill Prevention And Control
- Emissions Management
- Legislative / Regulatory Compliance
- Emergency Response And Contingency Planning
- Tank Fire Scenarios And Response Strategies
- Emergency Shutdown Procedures

### 7. Case Study Scenario

- 'Fire and Explosion of Oily Water Storage Tank' – Establishing Mechanical and Structural Integrity under API 579-ASME FFS I – Level II