API 650 – Aboveground Storage Tanks 120 hs

Online Course: Design of Aboveground Storage Tanks according to API 650 for industrial applications.

Enrolment can be to the full course or to each part individually (three).

Who Should Attend?

This course is intended for graduates (or soon to be), designers, freelancers, technicians and engineers involved in: calculation, design, selection, manufacturing, safety, quality and maintenance of systems and equipment in industrial processes.

Previous knowledge of this subject is not required to attend to the course.

Training Objectives

The main objective of this course is to transfer to participants the theoretical and practical skills required in projects, obtained from experience and sound engineering practices.

What to Expect?

Get familiar with the terminology and acquire vocabulary and fundamentals.

Understand the code organization and learn to define loads and design conditions.

Learn to design and calculate all the main components of Storage Tanks.

Benefit from Lessons Learned and Best Practices from different international projects

Course Duration

Full Course: 120 hs; to be completed in 90 days. The Virtual Campus will be open for 150 days (flexibility).

Parts (three): 40 hs, to be completed in 30 days. The Virtual Campus will be open for 60 days (flexibility).

Methodology

Self-guided, Hands-On Course
Available 24/7, Self-paced course
“Learn by doing” concept
Non-scheduled sessions
Instructor available during the entire course

Included in the course

Study Notes
Summary Videos
Conceptual Questions
Case Studies based in real designs
Design & calculation sheets
Part I: 40 hs

Lesson 1: Codes & Design Conditions
Design Codes
API 650 code
Code organization, Scope
Other applicable codes
Design conditions
Design loads
Internal and External pressure
Design temperature

Proposed Case Studies
- Vocabulary and terminology
- Code organization, scope
- Design Loads
- Operating conditions

Lesson 2: Material Selection
Material selection
Corrosion types
Corrosion Allowance
Essential properties of materials
Material designation
Most used materials
General requirements

Proposed Case Studies
- Vocabulary and terminology
- Materials designation
- Allowable Stress selection
- DMDT Verification

Lesson 3: Tank Shell Design
Design Considerations
One-foot calculation method
Thickness due to Liquid Level
Minimum Thickness
Fabrication requirements
Welding
Non-destructive examination
Hydrostatic Test

Proposed Case Studies
- Material Selection, Allowable Stress
- Number and height of shell courses
- Thickness calc’s
- Nominal plate thicknesses

Lesson 4: Tank Bottom Design
Bottom plates design
Plates arrangement, minimum thickness
Annular ring
Width calculation, minimum thickness
Fabrication requirements
Plate edge finishing
Welding

Proposed Case Studies
- Material Designation (shell, bottom, annular ring)
- Mechanical properties
- Annular ring requirement
- Bottom plate thickness & annular ring
Part II: 40 hs

Lesson 5: Design of Wind Girders

Tank shell stability
Top ring
Self-supported roofs
Supported roofs
Tank shell stiffeners due to wind
Top and Intermediate rings
Profile selection

Proposed Case Studies
• Top ring profile selection
• Top angle calculation
• Transformed height calculation
• Intermediate rings calculations

Lesson 6: External Pressure - Vacuum

Design considerations
External pressure verification (Vacuum)
External pressure range
Tank shell verification
Load combinations: wind + pressure
Wind girders
Number of girders and spacing
Moment of inertia required

Proposed Case Studies
• Transformed height calculation
• Design external pressure/Allowable calculation
• Number and spacing of rings
• Standard profile selection

Lesson 7: Fixed Roof Design

Types of fixed roofs
Conical type
Dome & umbrella type
Fixed roofs configuration
Self-supported roof
Supported roof
Structure for supported roofs

Proposed Case Studies
• Self-supported roof calculation
• Loads and plate thickness
• Supported roof calculation
• Frame & columns calculation

Lesson 8: Floating Roof Design

Floating roof selection
External floating roof
Single & double deck roofs
Floating roofs appurtenances
Buoyancy – Pontoon design
Internal floating roof
Types of roofs
Design requirements, materials

Proposed Case Studies
• Material properties
• Pontoon design
• Pontoon buoyancy verification
• Deck stress verification
Part III: 40 hs

Lesson 9: Nozzle Design

Nozzle configuration
- Standard flanges
- Nozzle necks
- Reinforcements

Nozzles in tanks
- Tank shell nozzles
- Tank roof nozzles
- Cleaning nozzles

Proposed Case Studies
- Material selection
- Material designation for components
- Flange selection / Rating
- Nozzle selection as per code

Lesson 10: Wind Loads

Wind loads
- Wind profile according to job site
- Wind speed and pressure

Wind overturning verification
- Impose loads
- Overturning resistance
- Tank sliding due to wind

Proposed Case Studies
- Tank components weight
- Overturning moment calculation
- Resistant moment verification
- Tank horizontal sliding verification

Lesson 11: Seismic Loads

Seismic Loads
- Seismic Spectrum (accelerations)
- Overturning moment & base shear
- Vertical loads
- Design loads verification
- Resistant moment
- Sliding verification
- Freeboard requirement

Proposed Case Studies
- Seismic parameter definition
- Tank components weight calculation
- Overturning moment & base shear calc
- Resistant loads verification

Lesson 12: Tank Anchorage

Anchor bolts requirements
- Wind loads
- Seismic loads
- Internal pressure

Tank uplift
- Bolts number and cross-section

Chairs design

Proposed Case Studies
- Anchor bolts requirement
- Factor J & sliding calculation
- Uplift load calculation
- Bolts number & cross-section calc
Instructor

Senior Mechanical Engineer and Master in Business Administration (MBA). More than 20 years of experience in design, calculation and fabrication of pressure vessels, heat exchangers, storage tanks, piping systems and structures in general.

Duties of the above-mentioned positions cover the entire cycle of an equipment, from the very conception, drawings, design and calculation, technical specifications, technical requisitions, vendor drawings, to the manufacturing phase and installation assistance. Among the developed projects, clients such as SHELL, EXXON, REPSOL, CHEVRON, GALP, CEPSA, TUPRAS and SAUDI ARAMCO can be found.

Vast experience providing specific training sessions in both classroom and online approaches. More than 75 training courses carried out in different institutions and in-company, courses oriented to graduates, designers, engineers and experienced professionals.

Arveng Training

Arveng Training has developed effective and practical courses for the needs of today’s industrial challenges by delivering specific and high-quality engineering training courses utilizing all three approaches: classroom, on-line and tailored training. We are proud to have imparted more than 100 classroom courses, 200 online courses and over 15 in-company sessions. Our training activities has benefited over 1,500 professionals. Our greatest pride is in the letters of recommendation we receive from so many of our customers in this area.

We consider the time of our students as the most valuable. For this reason, all our courses have been designed with the main objective of quickly the professional skills of the participants, through our expert instructors in different disciplines. We stimulate creativity, innovation and initiative to make the participants inquisitive to bring good engineering practices and lessons learned to the field that benefits their employers in the long term.

Tailored Training

The most effective training is one that satisfies the needs of each company's business focus and deliverables. We adapt our training programs to each specific requirement, offering bespoke solutions for each need. The result, 100% tailored programs, developed to maximize the time investment and deliver tangible and intangible returns to the work teams.

After an assessment phase, a tailored training plan is designed jointly with the client. This plan is specifically tailored to meet the client's needs, focusing on effectively enhancing the capabilities of the work team. We provide practical, dynamic and hands-on training, making available the best instructors in each subject.

Our Company

Arveng Training & Engineering SL is a leading company providing Training and Engineering services based in Madrid, Spain. Our mission and vision are to be a leading training and engineering services company. We are a team of highly motivated, talented high qualified professionals with more than 20 years of experience. Our main goal is to provide our clients, the best training and engineering services and to exceed their expectations in all their spheres of industrial activity, through our renowned services which are based on efficient, innovative, cost-effective and transparent principles.

Established in July 2010, mainly oriented to the industrial sector, from the very beginning Arveng has always worked with closeness, responsibility and commitment in the different areas of activity.