FACT SHEET (ONLINE)

TEMA | Design of Shell & Tube Heat Exchangers: 120 hs

What to Expect?

Get familiar with the terminology and acquire vocabulary and fundamentals.
Understand the code organization, scope and most important sections.
Learn to design and calculate all the main components of S&T Heat Exchangers
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

Online Course: Design of Shell & Tube Heat Exchangers according to TEMA code 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.
Part I: 40 hs

Lesson 1: Intro & Design Codes

Introduction

TEMA Code
Application, Organization, Scope

HEI Code
Application, Organization, Scope

API 660 Code
Application, Organization, Scope

Comparison & Compatibility

Proposed Case Studies
- Parts of a Heat Exchanger
- Key Concepts in Design Codes: Quiz
- TEMA Code organization, scope
- Compatibility between codes

Lesson 2: Exchangers configuration

Shell & Tube Heat Exchangers
Tube Side | Shell Side
Main Elements
Types of Heat Exchangers

S&T Heat Exchangers Configurations
- Tubes Arrangement
- Number of passes in the Tube Side
- Number of passes in the Shell Side

Proposed Case Studies
- Conceptual Questions
- Identification of Main Elements
- Exchanger Type Selection
- Number of Tubes calculation

Lesson 3: Design Conditions

Design Conditions

Loads
- Sustained, Occasional
- Cyclic Loads | Local Loads

Weight Estimation
- Shell, Heads, Body Flanges
- Tubesheets, Tubes, Nozzles
- Supports | Insulation

Proposed Case Studies
- Key Concepts in Design Conditions Quiz
- Unitary Weights Estimation
- Components Weights Estimation
- Design Weights Calculation

Lesson 4: Material Selection

Material selection
- Corrosion types
- Corrosion Allowance
- Essential properties of materials

Material designation
- Most used materials
- ASME Tables
- General requirements

Proposed Case Studies
- Vocabulary and terminology
- Materials designation
- Allowable Stress selection
- MDMT Verification
Part II: 40 hs

Lesson 5: Joint Efficiency

Joint Efficiency
Welded joints, Joint types
Service requirement
Welded joint evaluation
Joint efficiency value
Selection charts
The full or spot dilemma

Proposed Case Studies
- Vocabulary and terminology
- Joint Category
- Welded Joints Specification
- Joint Efficiency Selection: Case Study

Lesson 6: Design of the Shell

External elements design
Cylindrical shells
Types of heads
Hemispherical | Elliptical | Torispherical
Flat Covers
Transitions
Conical transitions
Toriconical transitions

Proposed Case Studies
- Calc’s of Cylindrical & Spherical Shells: Case Study
- Calc’s of the different types of Heads: Case Study
- Calc’s of Conical, Toriconical transitions: Case Study
- Calc’s of Flat Covers: Case Study

Lesson 7: External Pressure Design

Design of parts under external pressure
Support lines, Cylindrical shells
Shell under external pressure
Stiffening rings under external pressure
Spherical shells
Heads and conical transitions
Conical heads & transitions

Proposed Case Studies
- Key concepts in External Pressure: Quiz
- Calc’s of PV against external pressure: Case Study
- Design of Stiffening Rings: Case Study
- Shell + Rings Verification: Case Study

Lesson 8: Tube Bundle Design

Tube Bundle Design
Tubesheet
Tube bundle structure
Baffles: longitudinal | transversal
Heat transfer tubes
Tube – tubesheet joint
Floating heads
Impingement plate

Proposed Case Studies
- Tube bundle configuration
- Tubesheet thickness calculation
- Transfer tubes thickness calculation
- Minimum thicknesses
Part III: 40 hs

Lesson 9: Nozzle Design

Nozzles

Nozzle Configurations
Standard flanges, Gaskets
Nozzle necks, Calculation

Reinforcement
Reinforcement requirement
Calculation methods
Self-reinforced nozzles

Proposed Case Studies
- Key concepts in Nozzle Design: Quiz
- Nozzle Neck Calculation: Case Study
- Reinforcement Pad Calculation: Case Study
- Self-reinforced nozzles Calculation: Case Study

Lesson 10: Design of Body Flanges

Non-standard flanges
Design criteria, Load definition

Flange types
Bolts & Gaskets
Gaskets

Design of Non-standard flanges
Flange design steps
Sound engineering practices

Proposed Case Studies
- Key Concepts in Non-Std Flange design: Quiz
- Flange geometry design
- Joint selection / characteristics
- Non-standard flange verification

Lesson 11: Wind & Seismic Loads

Loads acting on Heat Exchangers

Wind Pressure
Shear force
Overturning moment

Seismic Loads
Period of Vibration (POV)
Shear force at the base
Overturning moment

Proposed Case Studies
- Key Concepts in External Loading: Quiz
- Wind Pressure & Seismic Profile: Case Study
- Base shear calc: Case Study
- Overturning moment calc: Case Study

Lesson 12: Design of Saddles

Saddles design
Location of saddles
Components

Saddles standard
Geometry definition
Verification of saddles

Anchor bolts
Thermal expansion

Proposed Case Studies
- Key Concepts in Saddles design: Quiz
- Design and Calculation of Saddles: Case Study
- Shell Verification against over stress: Case Study
- Design and Calculation of Anchor Bolts: Case Study
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 de-signed 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.