JUPITER PRIME
Consulting • Training • Advisory
جوبيتر برايم للاستشارات والتدريب

COURSE BROCHURE

Advanced TEMA Heat Exchangers and Technologies Training Course

3 – 14 October 2027
Muscat

jupiterprime.uk
info@jupiterprime.uk
Registered in the United Kingdom and Saudi Arabia

Advanced TEMA Heat Exchangers and Technologies Training Course

Ref: 547_20279 **Date:** 3 – 14 October 2027 **Location:** Muscat **Fees:** 11700 GBP

Advanced TEMA Heat Exchangers and Technologies is a 2-week training course for mechanical and process engineers, thermal design and maintenance engineers, ending with an exchanger fleet reliability dossier for one unit's shell and tube, plate and air-cooled equipment. Fouling, tube failures and heat recovery shortfalls now cost plants energy and run length, so exchanger choices carry real operating weight. Jupiter Prime Training delivers this course for heat transfer specialists.

Why TEMA Heat Exchangers and Technologies Matter Now

Three pressures now shape exchanger engineering. Energy efficiency targets push plants to recover more heat through tighter temperature approaches, which raises fouling sensitivity and pressure drop. Ageing exchanger fleets suffer tube leaks, vibration damage and gasket failures that shorten run length between turnarounds. Process changes such as heavier feeds or debottlenecking often push old designs beyond their rated duty. The course rests on the standards of the Tubular Exchanger Manufacturers Association TEMA, including its Class R, C and B construction definitions. Sites that rate, specify and maintain exchangers coherently keep heat recovery and reliability; those that treat each failure separately repeat the same tube bundle replacements.

Who Gains Most from TEMA Heat Exchangers and Technologies

- Engineers who rate exchangers and check thermal performance against process duty
- Mechanical engineers responsible for exchanger specification sheets, construction and repairs
- Maintenance engineers who plan bundle pulls, cleaning and retubing at turnarounds
- Inspection engineers who assess tube wall loss, leaks and corrosion in exchanger fleets
- Energy engineers who own heat recovery networks and fouling mitigation

A process unit gains most when its thermal design engineer, maintenance engineer and inspection engineer attend together and judge the same exchanger fleet against one set of rating, inspection and repair evidence.

TEMA Heat Exchangers and Technologies Capabilities

Participants leave able to move from a TEMA designation on a specification sheet to the operating, fouling and repair decisions that follow from it.

- Specify TEMA class, head and shell types for a service — purchase specification sign-off with process engineers
- Calculate thermal rating and overdesign with fouling resistances — debottlenecking and reuse of existing units
- Assess flow-induced vibration risk in tube bundles — baffle and support changes before failures
- Weigh plate, air-cooled and compact alternatives to shell and tube — technology selection for new duties
- Apply inspection results to retube, plug or replace choices — turnaround scope and budget
- Design a fouling monitoring and cleaning schedule — run length planning with operations

Key TEMA Heat Exchangers and Technologies Terms

- TEMA designation — a three-letter code naming the front head, shell and rear head types of a shell and tube exchanger.
- TEMA Class R, C and B — construction classes for petroleum, general commercial and chemical process services with differing minimum requirements.
- Fouling resistance — an allowance added to heat transfer calculations for deposits that build up on tube surfaces in service.
- Overdesign — the margin by which an exchanger's available area exceeds the area required for the rated duty.
- Flow-induced vibration — tube motion caused by shell-side flow that can lead to fretting, baffle cutting and tube rupture.
- Retubing — replacing some or all tubes of a bundle while reusing tubesheets, baffles and shell.

TEMA Heat Exchangers and Technologies Day by Day

Day 1: Exchanger Fleet Context and Selection

- Heat Exchanger Families and Typical Duties — Technology Screening
- Energy Recovery Targets and Approach Temperatures — Heat Integration Trade-Offs
- Exchanger Failure Patterns Across Refining and Chemicals — Reliability Priorities
- Life Cycle Cost of Exchanger Options — Capital Versus Operating Spend
- Specification Sheet Structure — Information Owners and Data Gaps

Day 2: TEMA Standards and Construction Classes

- TEMA Class R, C and B Requirements — Service-Based Class Selection
- Front Head, Shell and Rear Head Type Letters — Designation Choices
- Fixed Tubesheet, U-Tube and Floating Head Designs — Thermal Expansion Handling
- Tube Pitch, Layout and Pass Arrangements — Cleaning Access and Area
- Tubesheet Thickness and Tube Joint Types — Leak Resistance Decisions

Day 3: Thermal Rating of Shell and Tube Units

- Log Mean Temperature Difference and Correction Factors — Pass Configuration
- Shell-Side Flow Streams and Bypassing — Baffle Design Effects
- Tube-Side Coefficients and Velocity Limits — Erosion and Fouling Balance
- Pressure Drop Allocation Between Sides — Pump and Compressor Limits
- Rating Software Output Interpretation — Checking Results Against Hand Methods

Day 4: Fouling Allowances and Mitigation

- Fouling Mechanisms in Crude, Cooling Water and Polymer Services — Cause Diagnosis
- Fouling Resistance Selection and Overdesign — Avoiding Oversized Units
- Velocity, Wall Temperature and Additive Controls — Mitigation Choices
- Tube Inserts and Enhanced Surfaces — Retrofit Performance Gains
- Fouling Monitoring from Plant Data — Cleaning Trigger Points

Day 5: Mechanical Design and Vibration Checks

- Flow-Induced Vibration Mechanisms — Vortex Shedding and Fluid-Elastic Instability
- Baffle Spacing, Unsupported Span and Impingement Plates — Bundle Protection
- Thermal Stress and Differential Expansion — Expansion Joint Need
- Gaskets, Bolting and Closure Design — Joint Tightness in Service
- Materials Selection and Corrosion Allowance — Service Life Expectations

Day 6: Plate and Compact Exchanger Technologies

- Gasketed, Welded and Brazed Plate Exchangers — Pressure and Temperature Limits
- Plate Pattern, Chevron Angle and Pass Arrangement — Thermal Performance
- Printed Circuit and Plate-Fin Exchangers — Compact High-Pressure Duties
- Spiral and Shell-and-Plate Designs — Fouling-Prone and Viscous Services
- Compact Exchanger Cleaning and Gasket Replacement — Maintenance Burden

Day 7: Air-Cooled Exchangers and Cooling Systems

- Forced and Induced Draught Configurations — Recirculation and Hot Air Effects
- Finned Tube Types and Bundle Layout — Ambient Temperature Sensitivity
- Fan, Louvre and Variable Speed Control — Process Outlet Temperature
- Header Box Designs and Plug Access — Leak Repair Options
- Air Cooler Versus Cooling Water Selection — Water Scarcity and Energy

Day 8: Inspection, Testing and Condition Assessment

- Eddy Current and Remote Field Tube Testing — Wall Loss Mapping
- Internal Rotary Inspection and Visual Checks — Tube Sampling Strategy
- Hydrostatic and Leak Testing After Repair — Return to Service Criteria
- Tube Failure Root Cause Analysis — Corrosion, Erosion or Vibration
- Remaining Life Estimation for Bundles — Inspection Interval Setting

Day 9: Cleaning, Repair and Retubing Decisions

- Hydroblasting, Chemical and Online Cleaning Methods — Downtime and Effectiveness
- Tube Plugging Limits and Area Loss — Thermal Margin Remaining
- Retube Versus New Bundle Economics — Turnaround Scope Choices
- Bundle Pulling, Handling and Reassembly — Damage Prevention Practice
- Spare Bundle Strategy for Critical Services — Inventory Decisions

Day 10: Practising the Exchanger Fleet Reliability Dossier

- Fleet Criticality Ranking for a Chosen Unit — Attention Priorities
- Rating Check of a Problem Exchanger — Fouling and Overdesign Findings
- Vibration and Inspection Review — Repair or Redesign Choices
- Technology Replacement Screening — Plate, Air-Cooled or Shell and Tube
- Exchanger Fleet Reliability Dossier — Rating, Inspection and Repair Actions

Applying TEMA Heat Exchangers and Technologies After the Course

- Rerate one fouling-prone exchanger with current plant data, compare required and available area, and present a cleaning interval or redesign proposal to operations.
- Lead a criticality ranking of the unit's exchanger fleet, combining duty, failure history and inspection findings to set bundle inspection priorities for the next turnaround.

TEMA Heat Exchangers and Technologies Questions FAQ

What are advanced TEMA heat exchangers and technologies, and why do they matter now?

Advanced TEMA heat exchangers and technologies covers the rating, construction, inspection and repair of shell and tube units built to TEMA standards, plus plate, air-cooled and compact alternatives. It matters now because energy targets, ageing bundles and changed feeds strain exchanger fleets.

Which roles gain most from advanced TEMA heat exchangers and technologies training?

Mechanical and process engineers, thermal design engineers and maintenance engineers gain most. They specify exchangers, check thermal performance and decide when bundles are cleaned, retubed or replaced.

How does advanced TEMA heat exchangers and technologies differ from a general heat transfer course?

It applies heat transfer to real exchanger equipment. Participants work with TEMA designations and classes, rating outputs, vibration checks, inspection data and retubing economics rather than deriving heat transfer theory.

What do you bring back from advanced TEMA heat exchangers and technologies training?

You bring back a reliability dossier for exchangers in a unit you know. It ranks the fleet, records rating and vibration findings and sets inspection, cleaning and repair actions.

TEMA Heat Exchangers and Technologies: The Way Forward

The exchanger fleet reliability dossier first informs which bundles enter the next turnaround scope and which are left in service. Thermal design, maintenance and inspection engineers use it to agree repair and redesign actions with operations. After the first turnaround, revisit the fouling resistances behind it, because measured cleaning intervals will show whether the allowances were realistic.