



تبادل حراري: تصميم، تشغيل، صيانة وتحسين الأداء في العربية

Duration: 5 Days

Language: ar

Course Code: IND04 - 134

Objective

:By the end of this course, participants will be able to

- Identify and compare the major types of heat exchangers and their industrial applications •
- Understand the principles of heat transfer and their influence on exchanger design •
- Apply key design parameters to size and evaluate thermal and hydraulic performance •
- Diagnose operational issues such as fouling, corrosion, and vibration •
- Conduct inspections and apply effective maintenance and cleaning techniques •
- Use performance monitoring tools to assess and enhance exchanger efficiency •
- Apply international standards and best practices in exchanger design and operation •

Audience

:This course is ideal for

- Maintenance and reliability engineers •
- Mechanical and process engineers •
- Inspection and QA/QC personnel •
- Operations supervisors and plant operators •
- Engineering consultants and technical managers •
- Anyone involved in design, operation, or troubleshooting of thermal systems •

Training Methodology

The course follows a workshop-based approach that combines technical presentations, real-world case studies, calculation examples, and interactive problem-solving exercises. Practical scenarios are used to reinforce understanding, and participants are encouraged to bring operational challenges for group discussion and expert feedback.

Summary

Heat exchangers are vital components in energy-intensive industries such as power generation, oil & gas, chemical processing, and HVAC. Their performance directly impacts process efficiency, safety, and equipment longevity. This training course provides a comprehensive overview of the types, working principles, design considerations, operational behaviour, and maintenance practices of industrial heat exchangers.

Focusing on widely used designs—including shell-and-tube (STHE), air-cooled (ACHE), and plate heat exchangers (PHE)—this course equips engineers, technicians, and plant professionals with the knowledge to select, operate, inspect, and troubleshoot heat exchangers effectively. Special attention is given to thermal and hydraulic design, international standards, fouling mitigation, mechanical integrity, and performance optimisation.

Course Content & Outline

Section 1: Types, Components, and Industrial Applications

- :Classification and function of heat exchangers •
 - (Shell-and-Tube (STHE .1
 - (Air-Cooled (ACHE .2
 - (Plate Heat Exchangers (PHE .3
 - Condensers, reboilers, evaporators .4

Heat exchanger components: tube bundles, baffles, nozzles, tube sheets •

Heat transfer fundamentals: conduction, convection, and flow arrangements •

TEMA standards and exchanger nomenclature •

Selection criteria based on application, fluids, and performance requirements •

Industry-specific case studies •

Section 2: Thermal and Hydraulic Design Principles

- Relationship between temperature difference, flow rate, and heat duty •
- :Sizing and rating calculations •
- LMTD and NTU methods .1
- Overall heat transfer coefficient .2
- Hydraulic performance: pressure drop, fluid velocity, pumping power •
- Design of air-cooled exchangers: fan sizing, airflow, energy efficiency •
- Compact design considerations for PHE and spiral units •
- Workshop: sample design calculations and sizing exercises •

Section 3: Mechanical Design, Materials, and Fabrication

- Mechanical loading on exchanger components •
- Material selection for tubes, shells, gaskets, and plates •
- Nozzle loads and allowable stresses •
- (Mechanical design standards and fabrication codes (ASME, API, TEMA •
- Welding, expansion, and joining technologies •
- Common design failures and how to prevent them •
- Workshop: evaluating construction methods and mechanical design constraints •

Section 4: Operation, Maintenance, and Troubleshooting

- Operational challenges: fouling, scaling, vibration, flow maldistribution •
- Monitoring and control of tube-side and shell-side conditions •
- Inspection methods: visual, ultrasonic, IR thermography, borescope •
- Corrosion and erosion mechanisms and mitigation strategies •
- Fitness-for-service assessments and mechanical integrity evaluations •
- Maintenance practices: mechanical cleaning, chemical descaling, re-tubing •
- Tube plugging criteria and vibration control solutions •
- Workshop: troubleshooting scenarios and field failure investigations •

Section 5: Performance Monitoring and Enhancement Techniques

- Key performance indicators: thermal efficiency, pressure drop, flow distribution •
- Testing procedures and performance benchmarking •
- :Heat transfer enhancement techniques •

Fin-tube designs .1

Surface treatments and turbulator inserts .2

Basics of heat integration and energy recovery •

Introduction to Pinch Analysis for process optimisation •

Strategies for extending equipment life and reducing downtime •

Workshop: performance analysis using real operating data •

Certificate Description

Holistique Training. عند إتمام هذه الدورة التدريبية بنجاح، سيحصل المشاركون على شهادة إتمام التدريب من (e-Certificate) ويحصلون على شهادة إلكترونية (Holistique Training) وبالنسبة للذين يحضرون ويكملون الدورة التدريبية عبر الإنترنت، سيتم تزويدهم

من Holistique Training.

وخدمة اعتماد التطوير المهني (BAC) معتمدة من المجلس البريطاني للتقييم Holistique Training شهادات ISO 29993 أو ISO 9001 كما أنها معتمدة وفق معايير (CPD) المستمر.

لهذه الدورة من خلال شهادتنا، وستظهر هذه النقاط على شهادة إتمام (CPD) يتم منح نقاط التطوير المهني المستمر واحدة عن كل ساعة CPD يتم منح نقطة CPD، ووفقاً لمعايير خدمة اعتماد Holistique Training التدريب من لأي دورة واحدة نقدمها حالياً CPD حضور في الدورة. ويمكن المطالبة بحد أقصى قدره 50 نقطة.

Categories

الطاقة والنفط والغاز، الهندسة، الصحة والسلامة والبيئة

Related Articles



ما هي أهمية التعاطف في القيادة؟

في عالم القيادة الحديث، يتزايد الاهتمام بأهمية صفات القائد، ومن بين هذه الصفات الرئيسية تبرز بشكل لافت صفة التعاطف. فالتعاطف لا يقتصر على مجرد مظهر إنساني، بل يمتد ليكون أحد العوامل الحيوية في تحقيق القيادة الفعالة.