

Heat Exchangers

General Objectives:

To enable the participants to understand technology, performance and operation of heat exchangers.

Specific Objectives:

At the end of training the trainees will be able:

- ✓ To have a better knowledge os shell and tube heat exchangers types;
- ✓ To know the heat exchange principles applied to heat exchangers;
- ✓ To be aware of how operating conditions impact on heat exchanger performance;
- ✓ To be able to estimate fouling resistance values and to ptimize the heat exchanger cleaning interval;
- ✓ To manage routine operation safety and know the main steps of start-up, cleaning and testing.

Audience:

Engineers and operators from the technical and process department of refinery, petrochemical and chemical companies involved in heat exchanger operation, performance monitoring or maintenance.

Workload: 24 hours

CONTENTS:

Module I – TEMA standard shell and tube heat exchangers

- ✓ TEMA standard heat exchanger nomenclature. Types of shells, front and rear head ends;
- ✓ Fluid circulation and bypass flows;
- ✓ Application: study of different heat exchanger types.

Module II – Heat Exchanger Performance

- ✓ Heat exchange conditions: convection coefficients, resistance caused by tubes and fouling;
- ✓ Overall transfer coefficient;
- ✓ Mean thermal potential in a heat exchanger, number of transfer unit efficiency;

- ✓ Heat flow rate exchanged: influence of circulation mode and fouling;
- ✓ Application;
- ✓ Convection coefficient calculation;
- ✓ Overall heat transfer coefficient estimate and mean thermal potential calculation.

Module III – Operation and monitoring

- ✓ Routine operation: influence of operating conditions (inlet temperature – fluid flow rate ...) on heat exchanger performance;
- ✓ Heat transfer coefficient calculation and monitoring: impact on heat exchanger performance and energy consumption. Performance prediction;
- ✓ Troubleshooting: overall heat transfer coefficient comparison between clean and dirty conditions. Fouling resistance calculation.

Module IV – Start-up – Test and cleaning procedure

- ✓ Optimum cleaning interval estimate, preparation, safe procedure;
- ✓ Inspection of exchanger bundles, extended plate type and air coolers;
- ✓ Hydraulic water pressure test: case of U tube bundle and floating head heat exchangers;
- ✓ Application;
- ✓ Thermal performance prediction;
- ✓ Determination of optimum cleaning frequency;
- ✓ Study of safe start-up, test and cleaning procedure.