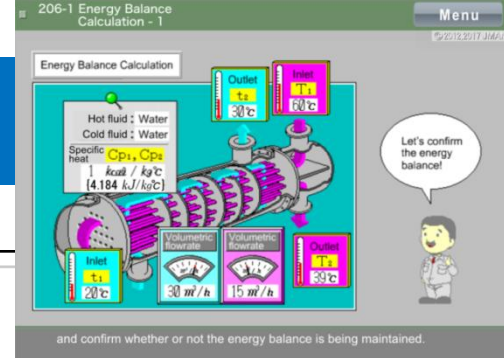


# Heat Transfer Basics Course



## Purpose

To acquire the necessary knowledge to manage the effective operation of heat exchangers.

## Characteristics

- ★Types, structures and features of heat exchangers used in petroleum plants, flow of the fluids inside heat exchangers, and other topics are realistically explained through a combination of computer graphics, narration, and video.
- ★Basic knowledge regarding heat and flow is taught through simple experiments, while the equation to calculate the heat duty is derived using the basic laws of heat transfers.
- ★From data on heat exchangers, participants consider the fouling in heat exchangers, to learn about the influence of fouling on the overall heat transfer coefficient and heat duty.

## Curriculum

- (1) Types and Features of Heat Exchangers
- (2) Basic Principles of Heat Transfer
- (3) Basic Laws of Heat Transfer
- (4) Heat Transfer in Heat Exchangers
- (5) Overall Heat Transfer Coefficient of Heat Exchangers
- (6) Heat Duty of Heat Exchangers
- (7) The Effect of Heat Exchangers Fouling

## Who should take this course

Plant operators and engineers

## Course material outline

- ◆Expected learning time : 7hours
- ◆Shortest duration : 137 minutes
- ◆Number of tests:4

## Supervised by

Idemitsu Kosan Co.,Ltd. Technical Training Center

## Curriculum

### (1) Types and Features of Heat Exchangers

- 101 Heat Exchanger
- 102 Types of Heat Exchangers
- 103-1 Structure of Heat Exchangers – 1
- 103-2 Structure of Heat Exchangers – 2
- 103-3 Structure of Heat Exchangers – 3

### (2) Basic Principles of Heat Transfer

- 201-1 Basic Principles of Heat Transfer in Heat Exchangers – 1
- 201-2 Basic Principles for Heat Transfer in Heat Exchangers – 2
- 202-1 Forms of Heat Transfer – 1
- 202-2 Forms of Heat Transfer – 2
- 203 Forms of Heat Transfer in Heat Exchangers
- 204-1 Flow Direction of Two Fluids – 1
- 204-2 Flow Direction of Two Fluids – 2
- 205-1 Energy Balance in Heat Exchangers – 1
- 205-2 Energy Balance in Heat Exchangers – 2
- 206-1 Energy Balance Calculation – 1
- 206-2 Energy Balance Calculation – 2

### (3) Basic Laws of Heat Transfer

- 301 Transfer of Heat
- 302 States of Fluid Flow
- 303 Velocity Boundary Layer
- 304 Thermal Boundary Layer
- 305 Heat Duty of Forced Convection Heat Transfer (Hot Side)
- 306 Heat Duty Due to Thermal Conduction
- 307 Heat Duty of Forced Convection Heat Transfer (Cold Side)
- 308-1 Heat Duty in Thermal Transmission – 1
- 308-2 Heat Duty in Thermal Transmission – 2
- 308-3 Heat Duty in Thermal Transmission - 3

### (4) Heat Transfer in Heat Exchangers

- 401-1 Heat Transfer Area – 1
- 401-2 Heat Transfer Area – 2
- 402-1 Logarithmic Mean Temperature Difference – 1
- 402-2 Logarithmic Mean Temperature Difference – 2
- 403-1 LMTD Correction Factor – 1
- 403-2 LMTD Correction Factor - 2

### (5) Overall Heat Transfer Coefficient of Heat Exchangers

- 501-1 Configuration Factors of the Heat Transfer Coefficient (hi) (1) – 1
- 501-2 Configuration Factors of the Heat Transfer Coefficient (hi) (1) - 2
- 502-1 Configuration Factors of the Heat Transfer Coefficient (hi) (2) – 1
- 502-2 Configuration Factors of the Heat Transfer Coefficient (hi) (2) – 2
- 503 Heat Transfer Coefficient (hi) in Heat Exchangers
- 504 Overall Heat Transfer Coefficient in Heat Exchangers

### (6) Heat Duty of Heat Exchangers

- 601 Heat Exchanger Specifications Used to Calculate Heat Duty
- 602 Calculation of the Heat Duty Using the Energy Balance Equation (1)
- 603 Calculation of the Heat Duty Using the Energy Balance Equation (2)
- 604 Calculation of Temperature Difference
- 605 Calculation of the Heat Transfer Coefficient (hi) on the Shell Side (1)
- 606 Calculation of the Heat Transfer Coefficient (hi) on the Shell Side (2)
- 607 Calculation of the Heat Transfer Coefficient (hi) on the Shell Side (3)
- 608 Calculation of the Heat Transfer Coefficient (hi) on the Tube Side
- 609 Calculation of the Overall Heat Transfer Coefficient
- 610 Calculation of the Heat Duty Using Fourier's Equation
- 611 Units of Heat Transfer Calculation

### (7) The Effect of Heat Exchangers Fouling

- 701-1 The Effect of Fouling – 1
- 701-2 The Effect of Fouling – 2
- 701-3 The Effect of Fouling – 3
- 702 Tube Side Heat-Transfer Resistance and Overall Heat Transfer Coefficient
- 703-1 Management of the Overall Heat Transfer Coefficient – 1
- 703-2 Management of the Overall Heat Transfer Coefficient - 2