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: 7 hours
◆ 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