ProTherm Systems (Pty) Ltd.

Registration No.: 68/07524/07

Process Engineering & Equipment for the Chemical, Food & Metallurgical Industries
P.O. Box 1109, Bramley 2018 Tel: (011) 786-0652/3/4 Fax: (011) 786-1301
No. 8, 4th Street, Wynberg Sandton Email:sales@protherm.co.za

HEAT EXCHANGERS
DESIGN PRINCIPLES AND PRACTICE

Overview

The understanding of heat transfer theory is crucial to almost all engineers but it is of more importance to process / chemical and mechanical engineers, because these engineers are at the forefront in the design, operation and maintenance of heat exchangers. It is a common practice in mining, steel, chemical, pulp and paper industries to use heat exchangers to transfer energy from one fluid to another. They are very useful in mining and chemical industries especially where direct heating and electrical heating is not permitted due to the dangers of explosion and the presence volatile gases.

There are three types of heat exchangers that are commonly used world-wide i.e. shell & tube heat exchangers, plate heat exchangers and finned tubes or cross-flow heat exchangers. The fundamentals of heat transfer to be covered in this course will go beyond the conductive heat transfer theory to include convective and radiant heat transfer principles. The heat transfer subject is wide and vast, therefore it is not possible to cover every heat exchanger configuration or subject in day. Moreover the emphasis of the course is more on the sizing, operation and maintenance of gasketted plate heat exchangers, shell and tube heat exchangers, cross-flow heat exchangers and the like. TEMA and API 661 will be discussed including implications of these codes in the design and supply of the related heat exchangers.

Benefits of Attending

- Understanding of the fundamental principles behind the design and workings of heat exchangers.
- Refresher course regarding the core principles of heat exchanger sizing and operation.
- Appreciation of the no one size fit-all when it comes to heat exchanger as each heat exchanger is custom design for a specific application.
- Exposure to wide range of practical lessons and cases that will position you as specialist in the heat exchanger selection, operation and maintenance.
- Getting introductory exposure to TEMA and API 661 including how these codes governs the design of heat exchangers.
- Understand heat exchanger working principles.

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How will this benefit your company

- Assist the employer with the selection of an appropriate heat exchanger for the job i.e. “right tool for the job”
- Understanding of the working principles of heat exchangers will enable engineers / technicians to extend the life-time of the equipment
- Specify heat exchangers correctly for price evaluation.

Your Facilitator

Dr Leon Koekemoer graduated from North-West University in 1994 with a B.Eng in Chemical Engineering. He continued to complete his M.Eng and Ph.D. at the same University, where he was also appointed as a Senior Lecturer in 1998. During this time Leon received the Gencor bronze medal (1997) for the best Masters degree in the Faculties of Natural Sciences, Engineering and Pharmacy. He also received the Verka-award (1999 & 2002) for teaching excellence. During this time he was responsible for the revision of the Process Control course to use dynamic simulations instead of Laplace transforms and to move the focus of the course from mathematics to industrial applications. In 2005 Leon joined Mass and Heat Transfer Technology, where he was involved in the design and construction of distillation and heat exchange equipment and plants that focuses on distillation and heat exchange. During this time he was involved in process design, mechanical design
(ASME VIII div 1), project management, procurement, instrumentation, process control, commissioning and investigative studies.

In 2012 Leon joined Protherm Systems as Senior Process Engineer and since been instrumental in the upgrade of internal systems and implementation of product standards within the company as well as technical training of personnel and business development.

Who should attend

- Process or Chemical Engineers
- Mechanical Engineers
- Technical Engineers
- Metallurgical Engineers
- Technicians
- Maintenance Engineers
- Operations Managers
- Maintenance Engineers
- Plant Manager / Superintendents
- Project Engineers

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Program / Schedule

8:00-8:30: **Registration & morning refreshments**

8:30-9:10: **Session 1:**

- Mass Balance Over Close System
- Energy Balance Over Close System
- Difference Between Mass & Volume
- Phase Change – Energy Release / Absorption During Phase Change
- Temperature Log-mean for Parallel vs Counter-Flow
- Dimensionless Quantities

9:15-10:00: **Session 2:**

- Conduction
- Radiant transfer
- Electrical transfer
- Cooling

10:00-10:15 **Mid-morning refreshments**

10:15-11:00 **Session 3:**

- Convection heat transfer
- Fouling
- Heat Transfer in Heat Exchangers

11:00-11:45 **Session 4:**

- Plate Heat exchangers
- Gap Types
- Gasket types
- Advantages/Disadvantages
- Fouling in PHE
- Components
- Variant

11:50-12:30 **Session 5:**

- Shell & Tube exchangers
- Principles
- TEMA Types
- Parts that has Effect on Thermal Performance
- Other Parts
- Vibration
- Fouling

12:35-13:40 **Lunch-time refreshments**

14:15-15:00 **Session 6**

- Cross flow heat exchangers (AKA Fin-fan)
- Principles: Why Fin tubes
- Fin Types & Temperatures
- API 661
- Parts that has effect on thermal performance
- Other Parts
- Air Side Design

15:00-15:15 **Mid-afternoon tea**

15:15-16:00 **Session 7**

- Specifying Heat Exchangers
  - Considerations
  - Overdesign
  - Batch Heating / Cooling
- Evaluating Design

16:00-16:45 **Session 8**

- Other Heat Exchangers at Glance
- Protherm at Glance
- Possible Other Courses
- Evaluation

16:50-17:00 **Close of workshop**