

€ TRAINING

Advanced Heat Transfer Techniques for
Process Industries





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Introduction:

This training program provides specialized instruction on methods to enhance heat transfer efficiency within industrial processes. It covers advanced strategies and technologies tailored to the specific needs of the process industry, enabling participants to apply these techniques effectively in their professional roles.

Program Objectives:

At the end of this program, participants will be able to:

- Understand the heat transfer processes and fluid flow in thermal equipment to apply suitable heat augmentation techniques.
- Learn how to be familiar with principles of thermal design of heat exchangers.
- Select the optimal heat transfer augmentation techniques for a given industrial application.
- Gain skill in estimating the degree of deterioration and inefficiency of heat exchangers and the ways to improve it by heat augmentation method.
- Understand how to analyze problems in everyday operation and how to combine heat exchanger alteration technique with heat transfer augmentation.

Targeted Audience:

- Supervisors and Operators.
- Process Plant Shift Leaders.
- Environmental and Safety Technicians.
- Mechanical Technicians.
- Maintenance Engineers.

Program Outlines:

Unit 1:

Overview of Heat Transfer Equipment in the Process Industry:

- Thermal Efficiency of Heat Transfer equipment.

- Performance Indicators.
- Analysis of Costs: Operating and Maintenance costs.
- Need for Heat Transfer Augmentation.
- Classification of Augmentation Techniques.
- Performance Evaluation Criteria PEC.

Unit 2:

Basics of Heat Transfer and Fluid Flow Mechanisms in Thermal Equipment:

- Conduction Heat Transfer - Concept of Thermal Resistance.
- Basics of Fluid Flow in various Geometries.
- Pressure drop calculation and selection of Pumps and Compressors.
- Convection Heat Transfer.
- Heat transfer with phase change: Boiling and Condensation.
- Solutions to various Heat Transfer problems.

Unit 3:

Augmentation Techniques for Single Phase Fluid Flow:

- Most Efficient Passive Techniques.
- Extended Surfaces and Fins.
- Swirl Flow Devices and Fluid Additives.
- Most Efficient Active Techniques.
- Stirring devices and Rotating surfaces.
- Surface and Fluid Vibration.
- Applications of Finned Surfaces in Forced Convection.

Unit 4:

Augmentation Techniques for Fluids with Phase Change:

- Most Efficient Passive Techniques.

- Treated and Rough Surfaces.
- Extended Surfaces and Displaced Enhanced Devices.
- Swirl Flow Devices and Fluid Additives.
- Most Efficient Active Techniques.
- Surface and Fluid Vibration.
- Electromagnetic Field.
- Solutions to problems of Boiling and Condensation.

Unit 5:

Technical and Economical Issues:

- Application of Compound Augmentation.
- Cost-benefit Analysis: Manufacturing Costs vs. Benefits of Augmentation Techniques.
- Problems in Operation.
- Maintenance Issues.
- Future Trends.