Fluid Flow and Heat Transfer in Industrial Applications

Course Description

INTRODUCTION

This training course will provide an overview of basic aspects of fluid flow and heat transfer as encountered in various engineering applications. Principles of calculation of flow in piping systems and oil and gas pipelines will be demonstrated and illustrated with examples from everyday engineering practice The flow in various types of pumps, compressors, turbines and other types of turbo-machines will be explained.

This Pioneers training course will also cover problems of heat transfer as found in heat exchangers, boilers and condensers. Radiation heat transfer discussion will also include solar radiation and various similar applications. The heat transfer augmentation techniques and modern measurement techniques of flow and heat transfer will be presented in the course. Numerous practical examples of heat transfer problems will be selected and solved to illustrate the calculation methods of heat transfer as encountered in everyday engineering practice.

Course Objectives

- Comprehensive understanding of different aspects of fluid flow and heat transfer as encountered in various industrial applications
- Ability to analyze the problems and to use the basic physical explanation of the phenomenon related to operation of process equipment
- Knowledge on the principles of flow and heat transfer in process equipment
- Familiarity with various methods of analysis and calculation tool

Course Methods

This training course will be conducted along workshop principles with formal lectures and interactive examples, which will result in the active participation of all delegates in discussions and teamwork. Real life examples will be selected to provide physical understanding of the problem and to illustrate the efficient application of calculation tools. There will be ample opportunities for active, open discussions and sharing professional experiences on various industrial applications. All course materials will be provided.

ORGANISATIONAL IMPACT

On completion of this training course the delegate will be able to critically analyze the operating methodologies of various types of equipment employed within the organization and instigate improvements where required.

The knowledge gained in this training course will:

- Enable the delegate to optimize the operation of various components of equipment while maintaining safety of the plant
- Give the delegate confidence to carry out analyses on efficiency of process equipment thereby improving overall positive outcome
- Enable measures to enhance equipment operation for the given operating conditions
- Give better handling of rotating machinery and stationary thermal equipment

PERSONAL IMPACT

- Improved confidence when solving problems of equipment related to flow and heat transfer
- Better understanding of how the functioning of process equipment impacts efficiency of the plant
- Better grasp of equipment operation and instrumentation on incident prevention
- Improved personal knowledge of thermal equipment analysis
- Better ability to troubleshoot difficult situations

WHO SHOULD ATTEND?

- Engineers and technicians in oil & gas, chemical and process industries
- Process, mechanical and chemical engineers
- Engineers and technicians who deal with reactors and piping systems
- Design engineers, project engineers
- Control, automation and instrumentation engineers

Course Outline

DAY 1

- Fluid properties and their transport characteristics
- Fluid at rest: hydrostatic pressure, buoyancy and stability.
- Fluid in motion: velocity and pressure variation
- Oil and gas flow in process piping and long-distance pipelines
- Calculation of pressure losses and required flow power
- Consideration of pipe networks
- Workshop: Examples and problem solutions

DAY 2

- Drag and lift force on 3D bodies in turbulent flow
- Centrifugal pumps and hydro-turbines
- Centrifugal and axial compressors
- Gas and steam turbines
- Wind turbines
- Hydraulics and pneumatics applications
- Workshop: Examples and problem solutions

Course Outline

DAY 3

- Flow control and measurement techniques: Custody transfer
- Advanced measurements: LDA; Ultrasound and visualization techniques
- Heat transfer mechanisms: conduction, convection and radiation
- Forced and free convection heat transfer
- Shell and tube heat exchangers and their effectiveness
- Plate heat exchangers
- Workshop: Examples and problem solutions

DAY 4

- Radiation heat transfer characteristics
- Solar radiation applications
- Combined heat transfer processes: combustion in industrial boilers
- Phase change: boiling and condensation, melting and solidification
- Steam generators, reboilers and condensers
- Cooling towers
- Workshop: Examples and problem solutions

Course Outline

DAY 5

- Thermal insulation materials and technologies
- Heat transfer in efficient buildings and HVAC
- Heat transfer augmentation techniques: examples of engineering applications
- Measurement techniques and visualization technique
- Summary and wrap up