

# Centrifugal Compressor & Steam Turbine

## INTRODUCTION

- A complete understanding of design, functioning and maintenance of centrifugal compressors and steam turbines is a prerequisite for successful operation of process plants. This is especially important nowadays when the demand for minimum and continuous production is vital for competitiveness of organizations
- This Centrifugal Compressors & Steam Turbines training seminar will feature the importance of proper design, operation and maintenance of centrifugal compressors and steam turbines of various designs and applications, which are encountered throughout chemical and process industries, including oil refineries, gas production facilities, power generation and other fields of engineering.
- This training seminar is intended to familiarize engineers, technicians and operators with the guidelines and best practices employed in utilizing this equipment, including design, operation, maintenance and repair. The emphasis in the training seminar will be on physical understanding of the problems in operation and the best way of troubleshooting them.

This training seminar will feature:

- Principles of selection of right centrifugal compressor and steam turbine for the given application
- Practical issues related to trouble-free functioning of centrifugal compressors and steam turbines
- Explanation of aerodynamic instabilities of centrifugal compressors and thermal instabilities of steam turbines
- Guidelines for design, operation, maintenance and troubleshooting
- Maintenance and repair economic issues: cost and benefit analysis

## OBJECTIVES

By the end of this training seminar, participants will be able to:

- Understand technical features of centrifugal compressors and steam turbines
- Select optimal type and size of equipment for a given industrial application
- Use methods of estimating the degree of deterioration and inefficiency of equipment
- Apply best practices and techniques of pinpointing the root cause of problems
- Choose the most efficient remedies and troubleshooting techniques in operation

## TRAINING METHODOLOGY

- This Centrifugal Compressors & Steam Turbines training seminar will be conducted along workshop principles with formal lectures and interactive worked examples included in several workshops. Presented also will be several illustrative and instructive videos.
- The emphasis in this training seminar will be on the explanation of all technical points and providing answers to problems that are encountered in everyday industrial practice related to installation, operation and maintenance, as well as repair and alterations of pipeline systems.
- Each learning point will be reinforced with practical examples. There will be ample opportunities for active discussion and sharing professional experiences and exchange that will help solidify the gained knowledge. All training seminar materials will be provided.

## ORGANISATIONAL IMPACT

- Centrifugal compressors and Steam Turbines are critical machinery in any plant their selection using design standards, operation at best efficiency points and maintenance at required interval and with the appropriate spare parts at optimum clearances delivers the organization target for maximum production at minimum OPEX and CAPEX.

On completion of this Centrifugal Compressor & Steam Turbine training seminar, the delegate will be able to:

- Specify compressors / turbines for purchase / upgrading according to API / ASME / ISO codes
- Operate compressors / turbines at their best efficiency point
- Select specify construct through reverse engineering the critical spare parts
- Optimize critical clearances for maximum time at BEP

## PERSONAL IMPACT

- Technical knowledge is key to effective control and peer respect within any technical organisation; when this is achieved personal satisfaction follows.

This Centrifugal Compressor & Steam Turbine training seminar will give the delegate the required level of knowledge for:

- Proper selection of compressors / turbines
- Navigate through operating curves at optimum conditions
- Align and balance machines for minimum vibration
- Apply reverse engineering techniques for spare parts manufacturing / repair
- Assembly disassembly with the usage of appropriate protocols
- Troubleshoot any problem that may occur

## WHO SHOULD ATTEND?

- This Centrifugal Compressors & Steam Turbines training seminar is designed to benefit all levels of Technical Personnel in the oil and gas industry as well as in chemical and process industries but will greatly benefit:
- Chemical, Process and Mechanical Engineers
- Product Engineers and Technologists
- Operation, Technical Service and Maintenance Professionals
- Engineers, Consultants and Sales Professionals
- Technical Professionals responsible for interdisciplinary energy projects

## Course Outline

### Gas Thermodynamics

- Gas Properties and Laws
- Centrifugal Compressor Aerodynamics - Thermodynamics
- Changes in Gas Velocity and Pressure in a Centrifugal Compressor
- Mass and Volume Flow Rate as a Function of Pressure, Temperature and Gas Composition
- Molecular Weight of Gas and its Effect on Performance
- Discharge Temperature, Power Absorbed as a Function of the Gas Composition and the Operating Conditions
- Investigating and Controlling Surge and Choke

### Centrifugal Compressors – Design – Operation

- Overview of the Main Features of Various Types of Compressors
- Classification of Compressors based on Design and Application
- World Standards and Codes related to Compressor Design
- Main Elements of Centrifugal Compressor Construction
- Analysis of Centrifugal Compressor Efficiency

## Steam Thermodynamics

- Steam Properties and the Mollier Charts
- The Rankine Cycle
- Steam Requirement per KWH Production
- Ultra-supercritical Conditions

## Steam Turbines – Design -Operation

- Main Elements and Technical Characteristics of Steam Turbine Design
- The Rotating and Stationary Blades
- The Internal and External Seals
- Radial and Thrust Journal Bearings
- Stop – Control – Non Return Turbine Valves
- Turbine Controls and Interlocks

## Maintenance of Rotating Machines

- Machines Piping and Ground Regulations
- Alignment of Thermal Machines
- Balancing of Rotating Machines
- Surface Treatments of Sealing Interfaces
- Online Washing
- Troubleshooting through Vibration Analysis, Oil Analysis and Thermography