Gas Compressors: Selection and Design

Course general description:

This comprehensive training program focuses on the fundamental principles, selection criteria, and design considerations for gas compressors in industrial applications. The course covers various types of compressors, their operating principles, performance characteristics, and selection methodology. Participants will gain in-depth knowledge of compressor systems, including sizing, specification development, performance evaluation, and troubleshooting techniques. The program combines theoretical concepts with practical applications to provide a complete understanding of gas compression technology.

Audience:

This course is designed for:

1. Mechanical Engineers
2. Process Engineers
3. Project Engineers
4. Operations Engineers
5. Maintenance Engineers
6. Engineering Consultants
7. Plant Design Engineers

Course objectives:

1. Understand the fundamental principles of gas compression
2. Evaluate and select appropriate compressor types for specific applications
3. Analyze compressor performance characteristics and curves
4. Calculate compression power requirements and efficiency
5. Develop comprehensive compressor specifications
6. Assess auxiliary systems and controls
7. Troubleshoot common operational issues
8. Apply best practices in compressor selection and design
9. Evaluate life cycle costs and reliability factors

Course duration:

5 days

Course location:

Cairo-Dubai-Istanbul

Course contents:

Day 1: Fundamentals of Gas Compression

- Basic Principles & Thermodynamics – Gas compression fundamentals, thermodynamic principles, gas laws, and equations.
- Compression Stages & Gas Behavior – Compression ratio, multi-stage compression, real vs. ideal gas behavior.
- Compressor Types & Operations – Positive displacement, dynamic, centrifugal, and axial compressors with operating principles.
- Practical Applications – Gas calculations and case study on compressor type selection.
- Assessment – Daily quiz to reinforce learning.

Day 2: Centrifugal Compressors

- Design Principles & Components – Impeller design, diffuser types, aerodynamic considerations.
- Performance Characteristics – Performance maps, surge and stonewall phenomena, efficiency optimization.

- Material & Standards – Shaft seals, bearings, material selection, API standards, and testing.
- Practical Applications – Case study on centrifugal compressor selection and performance curve analysis.
- Assessment – Daily quiz for concept validation.

Day 3: Reciprocating Compressors

- Compressor Components & Design – Cylinder design, valve selection, pulsation, and vibration control.
- Mechanical Considerations – Rod load calculations, lubrication systems, cooling requirements.
- Installation & Maintenance – Setup considerations, maintenance best practices, and reliability improvement.
- Practical Applications – Case study on reciprocating compressor sizing and problem-solving exercises.
- Assessment – Daily quiz to test comprehension.

Day 4: Auxiliary Systems and Controls

- Supporting Systems – Driver selection, coupling, lubrication, and cooling systems.
- Control & Protection – Anti-surge systems, control instrumentation, protection mechanisms.
- Performance Monitoring & Optimization – Diagnostics, energy efficiency, and performance enhancement.
- Practical Applications – Case study on system integration and troubleshooting exercises.
- Assessment – Daily quiz for concept retention.

Day 5: Selection Methodology and Final Assessment

- Selection Criteria & Cost Analysis – Compressor selection methodologies and life cycle cost evaluation.
- Reliability & Specifications – Reliability factors, bid evaluation, and specification writing.
- Final Review & Q&A – Course summary, key topic discussions, and clarification.
- Final Examination – Comprehensive assessment covering all modules.
- Certification – Exam results discussion and certificate distribution.

Methodology:

- 50% lectures & concepts
- 10% Videos
- 15% Case studies
- 15% Exercises & Quizes.
- 10% Discussions

Course code: (TPR0015)