

# CENTRIFUGAL COMPRESSOR SYSTEM: DESIGN, SELECTION, INSTALLATION AND OPERATION

## Introduction

- **Production Executives** and Operating Staff from Oil & Gas Processing Plants, Gas Transportation and Distribution companies, Refinery and Petrochemical plants, where large compression facility is used.
- **Engineers from EPC** companies who specify and select compressors.



## Objectives

Upon successful completion of this course, the participant will be able to:

- **Understand** the **operating principles** of centrifugal compressors, types of compressors and selection criteria.
- **Understand** the **functions** and **purpose** of the **components and hardware** in centrifugal compressor.
- **Determine** if the **compressor** is **operating efficiently**, for the given operating conditions and performance requirements.
- **Specify** design criteria, **evaluate** a manufacturer's proposal, and monitor the start up of a compressor package, for the given process conditions.
- Use compressor **performance map** to predict the **head and flow capabilities and Horsepower**.
- Describe the causes and symptoms of **surge** and basic principles of surge control

## Course Content

No.	Topics	Description
1.	<b>System and Hardware Description</b>	<ul style="list-style-type: none"> <li>▪ Centrifugal Compressor Description</li> <li>▪ Centrifugal Compressor Applications</li> <li>▪ Prime Movers – Turbine and Motor</li> <li>▪ Overall System and its Components</li> <li>▪ Casing</li> <li>▪ Rotor Assembly</li> <li>▪ Impellers</li> <li>▪ Diffusers</li> <li>▪ Diaphragms</li> <li>▪ Guide Vanes</li> <li>▪ Bearing and Seal Assemblies</li> <li>▪ Seal Oil and Lube Oil Systems</li> </ul>
2.	<b>Driver Information</b>	<ul style="list-style-type: none"> <li>▪ An Overview of Gas Turbines</li> <li>▪ An Overview of Steam Turbines</li> <li>▪ An Overview of Motor Drives</li> </ul>

No.	Topics	Description
3.	<b>Compressor Characteristics</b>	<ul style="list-style-type: none"> <li>▪ System and Operating Curves</li> <li>▪ Efficiency</li> <li>▪ Performance Curves</li> <li>▪ Surge Phenomenon</li> <li>▪ Stonewall Phenomenon</li> <li>▪ Gas Density</li> <li>▪ Critical Speed</li> </ul>
4.	<b>Compressor Control System</b>	<ul style="list-style-type: none"> <li>▪ Principles of Capacity Control</li> <li>▪ Constant Speed Capacity Control               <ul style="list-style-type: none"> <li>• Single Unit</li> <li>• Compressors In Series</li> <li>• Compressors In Parallel</li> </ul> </li> <li>▪ Variable Speed Capacity Control               <ul style="list-style-type: none"> <li>• Single Unit</li> <li>• Compressors In Series</li> <li>• Compressors In Parallel</li> </ul> </li> <li>▪ Speed Control Limitation</li> <li>▪ Surge Control</li> </ul>
5.	<b>Safety Protection Systems</b>	<ul style="list-style-type: none"> <li>▪ Monitoring and Protection of Compressors</li> <li>▪ Monitoring Instruments and Points of Measurement</li> <li>▪ Alarm and Shutdown Protection</li> <li>▪ Startup/Shutdown Alarms</li> <li>▪ Process Alarm and Shutdown</li> <li>▪ Mechanical Failure Alarm and Shutdown</li> <li>▪ Lube Oil and Seal Oil Alarm and Shutdown</li> <li>▪ Condition Monitoring</li> </ul>
6.	<b>Design and Engineering Aspects</b>	<ul style="list-style-type: none"> <li>▪ Compressor Performance Specification</li> <li>▪ Selection of Compressors</li> <li>▪ Mechanical Specifications</li> <li>▪ Aspects of Safety Specifications</li> <li>▪ Summary of API 617 Requirements</li> <li>▪ Compressor Testing</li> </ul>
7.	<b>Startup and Shutdown Procedures</b>	<ul style="list-style-type: none"> <li>▪ Typical Compressor Installations</li> <li>▪ Manual Startup &amp; Shutdown Procedure</li> <li>▪ Automatic Start and Stop</li> <li>▪ Routine Operating Checks</li> <li>▪ Lube Oil System Operation</li> <li>▪ Seal Oil System Operation</li> <li>▪ Compressor Operating Principles</li> <li>▪ Performance Maps</li> <li>▪ Factors Affecting Compressor Performance</li> </ul>
8.	<b>Case Studies</b>	<ul style="list-style-type: none"> <li>▪ Example of Pipeline Compressors</li> <li>▪ Example of Process Compressors</li> </ul>

### Methodology of Training

- Interactive with Power Point Presentation
- Real Life Experiences
- Case Studies
- Quizzes and Q&A.