

Course 433: Compressors

Explains the function of the compressor in a refrigeration system. Introduces information on the construction and use of reciprocating, rotary, helical, scroll, and centrifugal compressors. Covers compressor motors, control, and protection. Concludes with a lesson on preventive maintenance for compressors as well as troubleshooting and repair.

TPC Training is accredited by IACET to offer **0.7 CEU** for this program.



Lesson 1: Introduction to Compressors

Topics

Function of the Compressor; Types of Compressors; Open Compressors; Hermetic Compressors; Reciprocating Compressors; Rotary Compressors; Helical (Screw) Compressors; Scroll Compressors; Centrifugal Compressors; Multiple Compressor Applications; Compressor Replacement Considerations

Objectives

- List the five kinds of air conditioning and refrigeration compressors.
- Contrast the operation of positive-displacement and kinetic-displacement compressors.
- Explain how each kind of the five kinds of compressor raises the pressure of the refrigerant vapor.
- Define staging and cascading and explain why each is used.
- List important considerations in compressor replacement.

Lesson 2: Reciprocating Compressors

Topics

Reciprocating Compressor Construction; Compressor Housings; Pistons; Connecting Rods; Crankshafts; Main Bearings; Open-Compressor Shaft Seals; Oil Pumps and Sight Glasses; Cylinder Heads; Types of Valves; Cylinder Unloaders; Vibration Control and Isolation; Noise Control

Objectives

- Describe the general construction of open, semi-hermetic, and full-hermetic reciprocating compressors.
- Explain how the basic parts of a reciprocating compressor are assembled.
- Identify common designs of housings, pistons, connecting rods, crankshafts, bearings, seals, cylinder heads, and valves used in reciprocating compressors.
- Explain how a cylinder unloader controls the capacity of a reciprocating compressor.
- Explain how compressors are lubricated.
- Explain how compressor vibration and noise are controlled.

Lesson 3: Rotary, Helical, and Scroll Compressors

Topics

Rotary Compressors; Rotary Compressor Advantages; Rotary Vanes; Rotary Compressor Bearings and Lubrication; Hermetic Motor Cooling; Accumulators; Helical Compressors; Twin-Screw Helical Compressors; Single-Screw Helical Compressors; Helical Compressor Bearings and Lubrication; Helical Compressor Capacity Control; Scroll Compressors

Objectives

- Describe the operation of single-vane and multiple-vane rotary compressors, including how each raises refrigerant pressure.
- List several advantages of rotary compressors over reciprocating compressors.
- Define slugging and cavitation.
- Tell the two functions of an accumulator in a rotary compressor.
- Compare and contrast rotary and helical compressors.
- Describe the operation of the single-screw and twin-screw helical compressor.
- Describe the operation of a scroll compressor.

Lesson 4: Centrifugal Compressors

Topics

Centrifugal Compressor Characteristics; Construction; Bearings; Lubrication; Purging Noncondensables; Capacity Control; Compressor Repair

Objectives

- Describe the operating principle of a kinetic-displacement compressor.
- List advantages and disadvantages of centrifugal compressors as compared to positive-displacement types.
- Explain reverse hydrostatic sealing.
- Explain how centrifugal compressors deal with thrust forces.
- Trace the operation of a typical centrifugal compressor lubrication system.
- Tell the purpose of a purge system.
- Describe the capacity control methods used in centrifugal compressors.

Lesson 5: Compressor Motors

Topics

Basic Compressor Motor Requirements; Basic Motor Types; Single-Phase Motors; Split-Phase Induction Motors; Capacitor Motors; Direction of Motor Rotation; Dual-Voltage Motors; Starting Switches for Hermetic Motors; Repulsion Motors; Three-Phase Motors Repair

Objectives

- Explain the basic requirements of a compressor motor.
- Name the different types of single-phase and three-phase motors used to power compressors and tell which ones can be used in hermetic compressors.
- Explain how to reverse the direction of rotation of a motor.
- Explain how to change voltages on a dual-voltage motor.
- Describe the operation of the current and potential relays used for starting single-phase hermetic compressor motors.

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Lesson 6: Compressor Control and Protection

Topics

The Need for Motor Control and Protection; Motor-Starting Devices; Part-Winding Starters; Wye-Delta Starters; Autotransformer Starters; Primary Resistance Starters; Multipoint Resistance Starters; Motor Overload Protection; High-Pressure Protection; Low-Pressure Protection; Oil-Pressure Safety Switches; Crankcase Heaters; Compressor-Related Accessories

Objectives

- Name the two basic categories of motor-starting devices and tell how each operates.
- Explain the function of a reduced-voltage starter and name the five kinds used with compressor motors.
- Describe the three kinds of motor overload protection commonly used with compressor motors.
- Discuss the causes of, effects of, and solutions for high discharge pressure, low suction pressure, and low oil pressure.
- Explain the function of a suction-line accumulator.
- Explain why crankcase heaters are sometimes necessary.
- Explain how heat exchangers improve the performance of a compressor.

Lesson 7: Compressor Maintenance, Troubleshooting, and Repair

Topics

PREVENTIVE MAINTENANCE: The Importance of PM; COMPRESSOR TROUBLESHOOTING: Common Mechanical Problems; Other Mechanical Problems; Troubleshooting Tips by Compressor Type; Electrical Problems COMPRESSOR REPAIR: Repair Basics; Disassembling Compressors; Cleaning and Inspection; Reassembling Compressors; Compressor Motor Burnout; System Cleanup

Objectives

- State the first rule of preventive maintenance for compressors and related components.
- List preventive maintenance procedures common to most compressors.
- Explain how to calculate voltage imbalance in a three-phase motor.
- Name at least three possible causes of a low compressor oil level.
- Name at least three possible causes of compressor overheating.
- Explain how electrical problems can cause various system malfunctions
- Explain how to pump down a compressor for repairs.
- Describe compressor disassembly, cleaning, inspection, and reassembly procedures.
- Describe motor spot burnouts and cookouts, list their possible causes, and explain how to determine the severity of a burnout.
- Explain how to clean up a system after a motor burnout.