

Basic Pneumatics

Course 309: Basic Pneumatics

Covers how work, force, and energy are applied to principles of pneumatics. Shows operating principles of reciprocating, positive displacement, rotary, and dynamic air compressors. Covers primary and secondary air treatment. Includes valves, logic devices, cylinders, and air motors.

TPC Training is accredited by IACET to offer **1.0 CEU** for this program.



Lesson 1: Pneumatic Principles

Topics

Fluid Power Systems; Pneumatic Systems; Force, Weight, and Mass; Pressure; Work and Energy; Diffusion and Dispersion; Separation of Gases and Liquids; Compressibility; Laws of Pneumatics; Transmission of Pneumatic Fluid Power; Pneumatic Leverage; Air Properties; Air Flow in Pipes; Viscosity of Air; Bernoulli's Law; Components of Pneumatic Power Systems

Objectives

- Explain how force is transmitted in a pneumatic system.
- Calculate force and work.
- List two factors that affect the results of pressure calculations.
- Explain pneumatic leverage.
- Briefly explain the physical laws affecting the behavior of a confined gas.

Lesson 2: Reciprocating Compressors

Topics

Compressor Operation; Compressor Classification; Positive-Displacement Compressors; Reciprocating Compressor Operation; Single- and Double-Acting Compressors; Compressor Construction; Horsepower Cooling Requirements; Compressor Lubrication; Nonlubricated Compressors; Compressor Controls; Compressor Accessories; Advantages of Reciprocating Compressors

Objectives

- Differentiate between a positive-displacement compressor and a dynamic compressor.
- Describe the operation of a reciprocating compressor.
- List one advantage of using a multistage compressor.
- Identify the cooling arrangements for reciprocating compressors.
- Compare the operation of compressor controls in large and small units.

Lesson 3: Rotary Compressors

Topics

Compressor Classification; Vane Compressors; Rotary-Screw Compressors; Low-Pressure High-Volume Compressors; Diaphragm Compressors; Dynamic Compressors; Centrifugal Compressors; Axial-Flow Compressors; Compressor Selection; System Capacity Requirements; Compressor Capacity; Checking Compressor Capacity; Accessories; Packaged Compressors

Objectives

- Compare the power output of a single-stage vs a two-stage vane compressor.
- Describe the main types of positive-displacement rotary air compressors.
- Explain the advantages and disadvantages of both types of dynamic compressors.
- Describe four methods of controlling centrifugal compressor output.
- Tell how to compensate for a low-speed drive in rotary screw compressors.

Lesson 4: Primary Air Treatment

Topics

Air Treatment; Preliminary Filtering; Relative Humidity; Effects of Moisture; Water Removal; Dew Point; Moisture Separators; Oil Scrubbers; Air Dryers; Air Receivers

Objectives

- Describe techniques for cleaning compressor filters.
- Define relative humidity and dew point.
- Explain the effects of temperature and pressure on the air's ability to hold moisture.
- Describe aftercooler operation.
- Explain the functions of separators, oil scrubbers, and air dryers.

Lesson 5: Secondary Air Treatment

Topics

Methods of Treatment; Contaminant Separation; Contaminant Filtration; Filter Classification and Rating; Types of Media; Surface Filters; Depth Filters; Adsorption Filters; Absorption Filters; Lubricating the Air

Objectives

- Describe the two main methods of contaminant separation.
- Explain how filters are classified.
- List contaminant particle sizes and particle contamination categories as they occur in filters.
- List applications for the most common types of filter media.
- Identify system location for lubrication equipment installation.

Lesson 6: Piping, Hoses, and Fittings

Topics

Piping Requirements; Airflow; Piping; Pipe Applications; Metallic Tubing; Tube Bending; Tube Fittings; Tubing Installation; Nonmetallic Tubing; Hoses; Hose Fittings; Quick-Disconnect Couplings; Hose Installation

Objectives

- State the importance of laminar flow.
- List the factors that affect pressure loss in a pipe.
- State direction and amount of slope for compressor discharge pipes.
- Discuss procedures for pipe, tube, and hose installation.
- Describe safe working procedures for disconnecting air hoses.

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Lesson 7: Directional Control Valves

Topics

Control Valves; Manually Operated Valves; Automatically Operated Valves; Control Valve Elements; Two-Way Valves; Three-Way Valves; Four-Way Valves; Five-Way Valves; Valve Accessories

Objectives

- Describe the four methods of identifying control valves.
- List four basic types of manually operated, two-way valves.
- Describe the operation of a two-position, direct acting, normally closed solenoid valve.
- Explain one major advantage of using a four-way valve.
- Describe the construction of a three-way valve.

Lesson 8: Pressure-Control Valves

Topics

Controlling Pressure; Venting Excess Pressure; Relief Valve Construction; Pressure Regulators; Regulator Modifications; Logic Functions

Objectives

- List two ways a valve can control compressor pressure output.
- Describe construction of two basic types of pressure-relief valves.
- Contrast a pressure regulator with a pressure-relief valve.
- State the limit imposed by Federal Law on the pressure allowed when an air hose is used to blow off chips.

Lesson 9: Pneumatic Cylinders

Topics

Pneumatic Cylinders; Double-Acting Cylinders; Single-Acting Cylinders; Two-Piston Cylinders; Cylinder Construction; Rod Packings; Cylinder Mounting; Selecting a Cylinder; Cushioning

Objectives

- Tell the difference between pneumatic and hydraulic cylinders.
- Describe the construction and operation of a single-acting cylinder.
- State the purpose of an exhaust flow control metering valve.
- Describe the action of a pivoted cylinder.
- Explain the size relationship between a cylinder port and a valve port.

Lesson 10: Pneumatic Motors and Rotary Actuators

Topics

Pneumatic Motors; Motor Classification; Rating and Selection Factors; Pneumatic Motor Construction; Rotary Vane Motors; Piston Motors; Rotary Actuators; Portable Air Tools; Air Boosters

Objectives

- Explain pneumatic motor classification.
- Define torque.
- Describe pneumatic motor construction.
- Calculate a motor's horsepower, given its torque and speed.
- Differentiate between a pneumatic motor and a rotary actuator.