

# Power Transmission Equipment

## Course 303.1: Power Transmission Equipment

Covers belt drives, chain drives, gears and gear drives, adjustable-speed drives, shaft alignment, shaft coupling devices, and clutches and brakes.

TPC Training is accredited by IACET to offer **0.8 CEU** for this program.



### Lesson 1: Belt Drives

#### Topics

Uses of Belt Drives; V-Belts; Special V-Belts; Timing Belts; Flat Belts; V-Belt Sheaves; Timing-Belt Pulleys; Flat-Belt Pulleys; Variable-Speed Sheaves; Manually Adjustable Sheaves; Spring-Loaded Sheaves; V-Belt Installation

#### Objectives

- List the factors that affect the power transmitted by a belt drive.
- Name the main components of a belt drive.
- List the standard V-belt designations.
- Explain the reason for using group belts.
- Describe installation and replacement procedures for V-belts.

### Lesson 2: Chain Drives

#### Topics

Chain Drives Compared to Belt Drives; Chain Drive Terminology; Roller Chains; Double-Pitch Chains; Leaf Chains; Silent Chains; Engineering-Class Chains; Cast Drive Chains; Sprockets; Chain Drive Installation

#### Objectives

- Explain the differences between chain drives and belt drives in transmitting power.
- Explain how a roller chain drive works.
- Describe the construction of offset roller chain.
- Explain the differences between sprocket types A, B, and C.
- List the steps in installing a chain drive.

### Lesson 3: Gears

#### Topics

Gear Drives; Gear Definitions; Tooth Contour and Diametral Pitch; Spur Gears; Helical Gears; Single- and Double-Cut Gears; Herringbone Gears; Bevel Gears; Worm Gears; Maintenance

#### Objectives

- Define the following terms used to describe gear drives: pitch circle, pitch diameter, working depth, tooth face, tooth flank.
- Calculate the diametral pitch of a gear.
- List advantages and disadvantages of helical gears.
- Explain the differences between herringbone gears and double-cut helical gears.
- Define the following terms used in discussing worm gears: worm lead, worm lead angle, normal worm pitch, worm axial pitch.

### Lesson 4: Gear Drives

#### Topics

Types of Gear Drives; Shaft-Mounted Gear Drives; Worm-Gear Drives; Miter-Gear Boxes; Gear Drive Installation; Gear Drive Maintenance; Gear Drive Definitions; Concentric-Shaft Gear Drives; Parallel-Shaft Gear Drives; Right-Angle-Shaft Gear Drives; Vertical-Shaft Gear Drives

#### Objectives

- Explain how additional speed reduction can be obtained with shaft-mounted gear drives.
- Describe a worm-gear drive and a miter-gear box.
- Give a general explanation of gear drive installation and maintenance.
- Define mechanical power, thermal power, and overload capacity.
- Explain what determines the service factor of a gear drive.
- Describe a concentric-shaft gear drive and a right-angle-shaft gear drive.
- Explain how parallel-shaft gear drives are lubricated.

### Lesson 5: Adjustable-Speed Drives

#### Topics

Adjustable-Speed Drives; Belt-Type Adjustable-Speed Drives; Disk-Type Adjustable-Speed Drives; Roller-Type Adjustable-Speed Drives; Hydraulic Adjustable-Speed Drives; Electric Adjustable-Speed Drives

#### Objectives

- Identify the main criteria for selecting adjustable-speed drives for industrial plants.
- Explain the operation of a variable-speed belt drive.
- Describe how to control variable-speed drives.
- Describe the belts and chains used for variable-speed drives.
- Explain the operation of a roller-type variable-speed drive.

### Lesson 6: Shaft Alignment

#### Topics

Need for Shaft Alignment; Geometry of Shaft Alignment; Preparing for Alignment; Reverse-Indicator Method; Aligning Multiple Machines; Face-Rim Alignment; Long-Span Alignment; Laser Alignment

#### Objectives

- Determine the corrections needed to align two machines, using the reverse-indicator method.
- Determine the corrections needed to align two machines, using the face-rim indicator method.
- Determine the corrections needed to align three machines on a common centerline.
- Determine the corrections needed to align two machines separated by a long floating shaft.
- State at least three advantages of using laser alignment equipment over using dial indicators.

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## Lesson 7: Shaft Coupling Devices

### Topics

Couplings in Industry; Coupling Characteristics; Solid Couplings; Jaw Couplings; Molded Rubber Couplings; Chain Couplings; Gear Couplings; Metal Disk Couplings; Metal Grid Couplings; Special Couplings; Shear-Pin Couplings; Torque-Limiting Couplings; Brake-Wheel Couplings; Floating-Shaft Couplings; Limited-End-Float Couplings; Spacer Couplings; Electrically Insulated Couplings; Torsionally Soft Couplings; Sheave-Mounted Couplings; Continuously Lubricated Couplings

### Objectives

- List three functions usually performed by a coupling.
- Describe two types of jaw couplings.
- Name an application for molded rubber couplings.
- State an advantage of chain couplings.
- Explain the operation of a shear pin coupling.
- Describe a torque limiting coupling.
- Name an application that involves a floating shaft.
- Describe a limited end float coupling.
- List advantages and disadvantages of spacer couplings.

## Lesson 8: Clutches and Brakes

### Topics

Clutches as Couplings; Clutch Operating Methods; Jaw Clutches; Friction Clutches; Torque-Limiting Clutches; Tooth-Type Clutches; Centrifugal-Type Friction Clutches; Overrunning Clutches; Electric Clutches; Fluid Clutches; Dry-Charged Fluid Clutches; Brakes; Friction Shoe Brakes; Friction Disk Brakes; Electric Brakes

### Objectives

- Explain the purposes of a clutch.
- Describe the operation of a friction clutch.
- Explain the need for overrunning clutches.
- Name at least one application for an electric clutch.
- Explain how a fluid clutch works.