Data Transmission

Course 283: Data Transmission

Covers mechanical, hydraulic, pneumatic, telemetric, and wireless data transmission methods. Discusses indicators, other devices, and methods used for electrical/electronic data transmission in detail. Compares methods and standards for parallel and serial digital data transmission. Describes optical isolation and the operation of optical data transmission systems in detail. Provides specific methods for preventing common kinds of data transmission interference.

TPC Training is accredited by IACET to offer **0.5 CEU** for this program.

Lesson 1: Process Data Transmission Methods

Topics

Data Handling; Open-Loop and Closed-Loop Control; Local Indicators; Remote Indicators; Analog, Digital, and Discrete Control; Environmental Conditions; Process Transmission Methods; Mechanical Data Transmission; Hydraulic Data Transmission; Pneumatic Data Transmission; Electronic Data Transmission; Optical Data Transmission; Telemetric Data Transmission

Objectives

- Describe the differences between data transmission in open- and closed-loop systems and with local and remote indicators.
- Discuss the differences among analog, digital, and discrete control.
- Discuss the use of intrinsically safe and explosion-proof equipment.
- List the advantages and disadvantages of mechanical, hydraulic, and pneumatic data transmission.
- Compare voltage-loop and current-loop transmission for analog data and explain the importance of resolution for digital data transmission.
- List the advantages and disadvantages of optical and telemetric data transmission.

Lesson 2: Electrical Data Transmission

Topics

Analog and Digital Data; Electronic PV Indicators; Recorders and Data Loggers; Sensors and Transducers; Strain Gauge; Signal Conditioning; Signal Conversion; Compensation; Span and Zero Adjustment; Linearization; Conversion to Engineering Units

Objectives

- Compare analog and digital data representation.
- Discuss uses for bar graph displays, CRT displays, recorders, and data loggers.
- Describe the characteristics of the electrical output signals from analog sensors and transducers, using a strain gauge as an example.
- Discuss the significance of the common-mode rejection ratio in signal conditioning.
- Describe the processes of signal conversion, compensation, zero and span adjustment, linearization, and conversion to engineering units.

Lesson 3: Digital Data Transmission

Topics

Digital Data; Number Systems; Data Formats; ASCII; Error Correction; Analog-to-Digital Conversion; Distributed Process Control; Parallel Data Transmission; Parallel Transmission Standard; Serial Data Transmission; Serial Transmission Standards

Objectives

- Discuss the differences between analog and digital data forms.
- Discuss several reasons for using digital data.
- Describe methods used to interface process control data signals to a communications network.
- Explain how analog data are converted to digital form for transmission and display.
- Discuss the differences between parallel and serial data transmission systems.

Lesson 4: Optical Data Transmission

Topics

Optical Data Transmission; Optical Isolation; Fiber Optic Transmission; Fiber Optic Transmission Advantages; Fiber Optic Cable; Optical Propagation; Fiber Optic Connections; Installation of Fiber Optic Cables; Light Sources; Detectors; Fiber Optic Standards

Objectives

- Name the basic elements in a data transmission system based on light energy.
- Explain how optoisolators work and why they are used.
- Describe the advantages and disadvantages of optical data transmission.
- Explain how light rays are propagated down glass fibers.
- Discuss connection and installation methods for fiber optic cables.
- Discuss the selection of light sources and detectors.

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Lesson 5: Data Transmission Interference

Topics

Electrical Noise; Process Noise; Signal-to-Noise Ratio; Noise Sources; Alternating Current Power Line Noise; Electromagnetic Interference; Capacitive Coupling; Ground Loops; Noise Reduction Techniques; Filters; Reducing Alternating Current Power Line Noise; Reducing Electromagnetic Coupling; Electrostatic Shielding; Differential Measurements; Reducing Ground Loop Noise; Reducing RFI; Nonelectrical Coupling

Objectives

- Define electrical noise, process noise, and the signal-to-noise ratio.
- Explain how ac power lines, EMI, capacitive coupling, and ground loops cause electrical noise.
- Describe two kinds of noise filters and explain three methods of reducing ac power line noise.
- Compare methods for reducing electromagnetic and electrostatic coupling.
- Discuss the use of differential measurements and the CMRR.
- Describe ways of reducing ground loop noise and RFI and explain when optical coupling might be used.