1046210300 Hydraulic Components and Schematics

Course Outcome Summary

Course Information

Description:
Students will learn to operate the Basic Hydraulic Trainer and draw the schematic symbols in a circuit.

Total Credits: 1
Total Hours: 27

Course History

Status: Active
Active Date: 1/6/2021
Last Revision Date: 10/19/2023
Revised By: Steven Boogren (SBoogren)
Last Approval Date: 12/18/2020
Approved By: Di Wu (DWu)

Textbooks

Basic Hydraulics Student Reference VB831, Amatrol

Course Competencies

1. **Introduction to Hydraulic Power Systems**

   Assessment Strategies
   Skill Demonstration

   Criteria
   Hydraulic Trainer Component Identification
   Read a Hydraulic Pressure Gauge
   Identification of 850 Power Unit Components

Read the Liquid Level and Temperature in the Reservoir
Operate a Hydraulic Power Unit
Connect and Disconnect a Hydraulic Hose That Uses Quick-Connect Fittings
Use a Tee to Connect Two Circuit Branches
Basic Operation of a Double-Acting Cylinder
Flow Paths of a 4-Way, 3-Position DCV
Connect and Operate a Double-Acting Hydraulic Cylinder Using a 3-position, Manually-Operated DCV
Design a Dual Cylinder Hydraulic Circuit

Learning Objectives

Define Hydraulics and Give an Application
Describe the Function of the Five Basic Components of a Hydraulic System
Define Hydraulic Pressure and Give Its Units of Measurement
Describe How to Read a Pressure Gauge
Describe the Operation of a Hydraulic Power Unit
Describe the Function of a Hydraulic Schematic
Describe the Function of a Hydraulic Quick-Connect Fitting and Give Its Schematic Symbol
Describe the Function of a Tee and Give Its Schematic Symbol
Describe the Operation of a Pressure Gauge and Give Its Schematic Symbol
Describe the Function of a Hydraulic Cylinder and Give an Application
Describe the Operation of a Double-Acting Cylinder and Give Its Schematic Symbol
Describe the Function of a 4-Way, 3-Position DCV and Give an Application
Describe the Operation of a 4-Way, 3-Position DCV and Give Its Schematic Symbol

2. Introduction to Basic Hydraulic Circuits

Assessment Strategies
Skill Demonstration

Criteria

Connect and Read a Flow Meter
Verify Flow Meter Accuracy
Observe Fixed-Displacement Pump Operation
Confirm Needle Valve Operation
Connect and Operate a Needle Valve to Control the Speed of an Actuator
Control the Speed of an Actuator Using a Manually-Operated DCV
Connect and Operate a Bi-Directional Hydraulic Motor Using a 3-position, Manually-Operated DCV
Draw a Hydraulic Schematic from the Actual Circuit Connections on a Pictorial
Draw a Hydraulic Circuit Given a Schematic
Design a Multiple Actuator Hydraulic Circuit

Learning Objectives

Define Flow Rate and Explain How It Can Be Measured
Describe the Operation of Two Types of Flow Meters and Give Their Schematic Symbol
Describe the Operation of a Fixed-Displacement Pump and Give Its Schematic Symbol
Describe the Operation of Four Types of Fixed-Displacement Pumps and Give an Application of Each

Describe the Main Function of a Needle Valve

Describe the Operation of a Needle Valve and Give Its Schematic Symbol

Describe the Function of a Hydraulic Motor and Give an Application

Describe the Operation of a Hydraulic Motor and Give Its Schematic Symbol

List Three Types of Hydraulic Motors and Give an Application of Each Describe the Eight Basic Rules for Drawing Hydraulic Schematics

3. Introduction to the Principles of Hydraulic Pressure and Flow

Assessment Strategies

Skill Demonstration

Criteria

Calculate the Extension Force of a Cylinder Given Its Size and Pressure

Measure the Force Output of an Extending Cylinder

Calculate the Retraction Force of a Cylinder Given Its Size and Pressure

Measure the Force Output of a Retracting Cylinder

Verification of Pascal's Law for Hydraulics

Demonstrate How Distance Is Sacrificed to Obtain Force Multiplication

Measure Delta P across a Hydraulic Component

Effect of Flow and Orifice Size on Delta P

Characteristics of Circuit Pressure Drops

Convert between Absolute Pressure and Gauge Hydraulic Pressure

Learning Objectives

Describe How to Calculate the Force Output of an Extending Cylinder

Describe How to Calculate the Force Output of a Hydraulic Cylinder in Retraction (Pull)

State Pascal's Law and Explain Its Significance in Hydraulics

Explain How Force Is Multiplied Using Pascal's Law

Describe Two Types of Resistance in a Hydraulic System

Explain How ΔP Describes Hydraulic Resistance

Explain How Pressure Is Distributed in a Hydraulic System

Describe Two Methods of Representing Hydraulic Pressure

Describe How Oil Flows on the Suction Side of the Pump