

Hydraulic Component Sizing

(Formerly Analyzing Hydraulic Systems)

I. Program Description

A practical approach to calculating, hydraulic flow pressure, and component sizes to meet system performance requirements.

A. Aims/Objectives

In this course we:

- teach a practical approach to design, beginning with the actuator sizing and ending with power unit requirements.
- emphasize the proper selection of components and how this affects other components in the system.

B. Major Topics Covered

- A practical and logical approach to component selection
- Determining cylinder rod, bore stop tube and cushion sizes
- Explanation and use of velocity profiles to meet cycle time requirements
- Sizing of hydraulic accumulators
- Sizing and selection of hydraulic pumps
- Determining electric motor requirements
- Determining heat exchange requirements

II. Who Should Participate

This course is designed to assist anyone who designs, builds, or sells hydraulic systems. Participants should be familiar with basic hydraulic symbols and principles.

III. Session Information

Classes are conducted several times per year. For scheduled dates, contact our offices.

SNO-Motion Solutions
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To Apply for Training Class on Line:
<http://www.sno-motion/trainingsignup.html>
and choose the appropriate class title.

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Course Outline

I. Monday, Tuesday, Wednesday

- A. Discussion of units of measure and calculation of efficiency
- B. Power conversion
 - 1. Linear power transmission
 - a. cylinders with no motion
 - b. cylinders with velocity and back pressure
 - 1. meter-in and meter-out
 - 2. regeneration
 - c. cylinders with velocity, friction and acceleration
 - d. calculating stop tube, rod and cushion sizes
 - 2. Rotary actuators
 - a. calculating velocity profile
 - b. calculating friction and acceleration torques
 - c. calculating cushion torque
 - 3. Hydraulic Motors
 - a. starting and stall torque
 - b. using charts to predict performance
- C. The Prime Mover (Electrical Motor)
 - 1. Maximum output
 - 2. NEMA classifications and frame sizes
 - 3. Horsepower calculations

II. Thursday

- A. Sources of Power
 - 1. Hydraulic pump
 - a. volumetric and mechanical efficiency
 - b. types of pumps
 - c. the suction side of the pump
 - d. calculations of inlet characteristics
 - e. the pressure side
 - 1. efficiency and heat generation
 - 2. The accumulator
 - a. operating types
 - b. typical circuits
 - c. sizing
- B. Power Distribution
 - 1. Directional control valves
 - a. pressure drop through passages
 - b. minimum shifting pressures
 - c. typical applications
 - 2. Check valves
 - 3. Unloading valves
 - 4. Pressure reducing valves
- C. Power Regulation
 - 1. Relief valves
 - a. direct and pilot operated
 - 2. Sequence valves
 - 3. Counterbalance valves
 - 4. Brake valves
 - 5. Flow control valves
- D. Conditioning (Maintainability)
 - 1. Filters, reservoirs, oils, heat generation
- E. The Hydraulic System - a review exercise where students perform sizing calculations for major components in a hydraulic circuit

III. Friday

- A. Review