

## Hydraulic Component Sizing

(Formerly Analyzing Hydraulic Systems)

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### 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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Fax: 801.263.6404

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

# Hydraulic Component Sizing

## 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