

ME 4232: Fluid Power Control Lab

University of Minnesota

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Lab. 1: Fluid Power Control Lab. Orientation

Objectives

To be acquainted with the fluid power test bench and its components. Review of safety procedures and ensure they are adhered to at all times. Introduction to Matlab/Simulink and some commonly used functions.

(Part 1) Introduction to Hydraulic Circuits

Demonstration

You will be shown a typical fluid power circuit consisting of

- A pump / reservoir / filter assembly
- An analog pressure gauge
- An analog flow meter
- Two digital pressure sensors (Not in book, ask TA)
- A digital flow sensor (Not in book, ask TA)
- Various hoses and connectors
- A cylinder actuator with a linear potentiometer
- A three position four way directional valve

The first 4 items are fixed to the test bench and cannot be changed. The T.A. will explain the operation of the circuit.

Procedure

- Identify the fluidic symbol for each of the items listed above. You will need a separate symbol for the pump, reservoir and filter. Draw the fluid circuit diagram for the demonstrated circuit. (Feel free to look on the back side of the test bench)
- Disassemble the circuit. Walk outside the lab, stretch your legs, use the restroom, send a text, forget about the circuit you just disassembled. Reassemble the circuit according to your diagram.
- What aspect (variables) of fluid flow most *directly* affects the velocity of the cylinder? In light of this, discuss what must happen in order to vary the velocity of the cylinder. What is the role of the directional valve in this?
- Ask the TA to check your circuit. After you have approval run your circuit. Extend and retract the hydraulic cylinder a few times. Does it behave as you expected?
- What aspect (variables) of fluid flow most *directly* affects the velocity of the cylinder? In light of this, discuss what must happen in order to vary the velocity of the cylinder. What is the role of the directional valve in this?

(Part 2) Introduction to Matlab/Simulink

- Assume you wanted to characterize the flow across your directional valve, connect a pressure transducer and a flow meter upstream of your valve and a pressure transducer downstream of your valve. Then ask the TA to check your circuit.
- Open Simulink and your TA will give you a brief introduction to Simulink.
- Collect data while extending and retracting the hydraulic cylinder.
- As a group write a Matlab script that uses the common functions (find, mean, plot, legend, xlabel, ylabel, title)

Report

Turn in a one-page memo containing the following items

- Your circuit diagram with the correct fluidic symbols
- A concise description of the operation of the circuit, i.e. how fluid flows in the circuit, its effects on the actuator and what each component does to the fluid
- Describe briefly the possibility of controlling the speed of the cylinder
- Show an example plot with proper convention and labeling

The report should be typewritten. Either hand draw (neat and tidy, use a ruler) or use Visio (CSE Labs) to create your diagrams. In either case your diagrams must be clear.