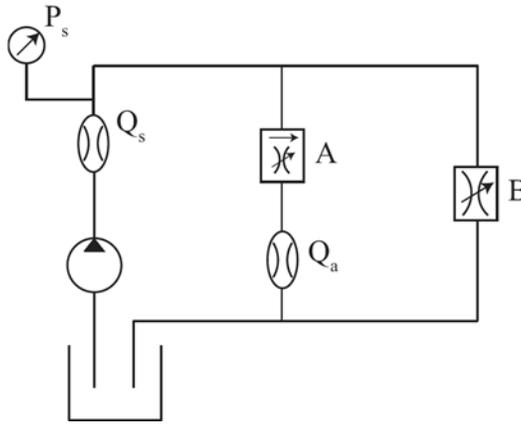


E 4232: Fluid Power Control Lab
University of Minnesota
Prof. Perry Y. Li

Lab 4: Pressure compensated flow control valve

Objective

Pressure compensated flow control valves are used to maintain constant flow rates in parts of the circuit irrespective of the pressure drop across the valve. In this experiment, you will investigate the effectiveness of two types of flow control valves: needle valves (studied in the previous lab) and **pressure compensated flow control (PCFC)** valves. To be specific, the pressure sensitivity of these valves will be studied.



Pre-lab – Due as a hardcopy at the beginning of lab

Study the construction of a restrictor type PCFC in your textbook. Draw the pressure vs. flow relationship of an ideal PCFC and describe, in a paragraph, how you expect the physical valve to behave compared to the ideal PCFC valve.

Procedure

- With the circuit connected, adjust the needle valve B and the PCFC settings. Determine their qualitative effects.
- Using the method similar to the previous lab (lab 3), obtain the pressure-flow relationship of valve A (PCFC) for 3 different settings of the PCFC. Choose the settings so that a whole range of behaviors can be tested.
- Determine the flow sensitivities to pressure variation (i.e. $\frac{dQ}{dP}$) of the PCFC (at a certain setting) at different nominal pressures. Compare with those for the needle valve in lab 3 at the same nominal pressures and flows. You may need to adjust valve A and B together to obtain this particular setting.
- Design an experiment in which you compare the use of the PCFC and the needle valve to control the extension speed of the actuator in the presence of some disturbance.

Report

Your report should include the following

- Detailed explanation of the working principle for the PCFC.
- Brief description of the experiment
- Concise presentation of the results, including representative graphs showing your flow-pressure relationships.
- Are your data consistent with the expected flow-pressure relationship for the PCFC that you predicted in the pre-lab exercise?
- What can you say about the internal parameters of the valve?
- Based on your data, comment on the pros & cons for using either the PCFC or needle valve for flow control.
- Describe your actuator speed control experiment. Comment on the results.