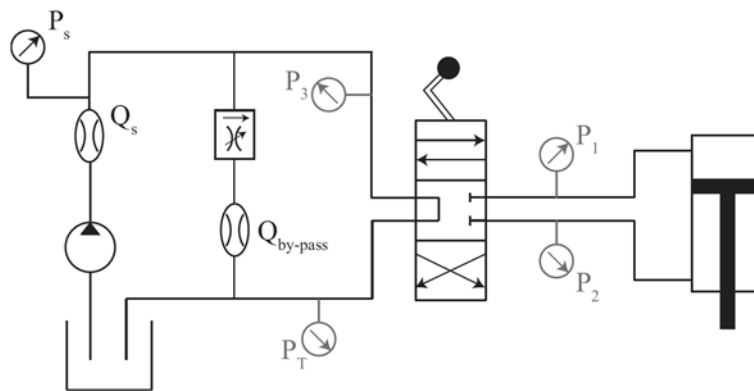


ME 4232: Fluid Power Control Lab
University of Minnesota
Prof. Perry Y. Li

Lab 7: Bleed off circuit

Objective

A bleed off circuit is an alternate way for controlling actuator speed to meter in/out circuits. It is generally more energy efficient than a meter in/out circuit. In this lab you will analyze the bleed off circuit, compute its power efficiency and compare it to a meter-in/out circuit.



Bleed off circuit

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

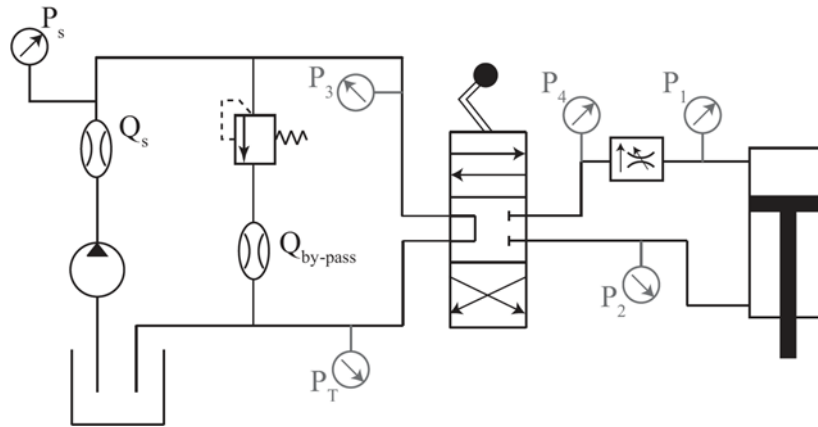
Suppose that you have all the flow and pressure measurements (highlighted in the above figure) in the circuit during extension of the cylinder. We can also measure the actuator velocity (v) and the major and minor areas (A_1 and A_2) of the cylinder are known. Obtain formulae for (using the same terminology in the above figure):

1. Pump power
2. Power loss in the flow control valve (PCFC)
3. Power loss in each branch of the directional valve
4. Actuator power output
5. Friction force in the cylinder

Write down similar set of expressions for all the above quantities corresponding to the setup shown in the next page i.e., a meter-in/out circuit.

Procedure:

- Construct the circuit above, take all the flow and pressure measurements when the cylinder is extending.
- Calculate all the quantities you obtained formulae for in your pre-lab.
- Compute the power efficiency of your circuit (power used to overcome friction in the cylinder / power provided by the pump).
- Construct a meter-in circuit (see figure on next page) and adjust the flow control valve such that the actuator velocity is comparable to the bleed-off case.
- Compute the efficiency of this circuit by measuring all the required quantities.



Meter in circuit with the same actuator velocity

Report

Your report should include the following

- Brief description of the experiment
- All the expressions derived in the pre-lab portion
- The data collected in both the experiments and all the calculations to obtain the efficiencies.
- An explanation of why one circuit performs better than the other.