MEC-E5003 Fluid Power Basics
Calculation Exercises 3
Spring 2017

EXERCISE 7

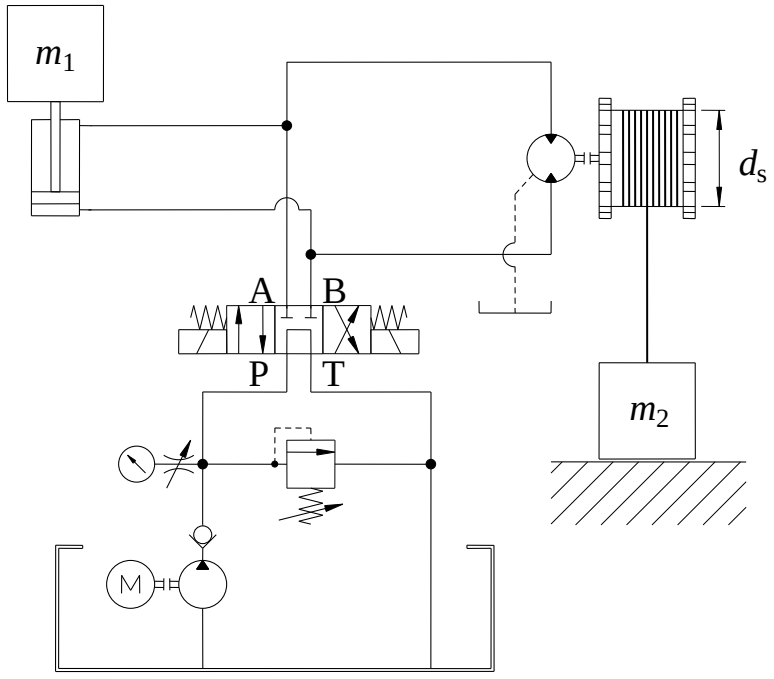
The hydraulic system in underlying figure is used for lifting masses using both a cylinder and a hydraulic motor operated winch. When the valve is set to the "right" switching position the lifting phase commences
Explain the operation of the system at lifting phase and calculate the following:
a) Reading of the pressure gauge
b) Maximum power needed at the axle of the pump.

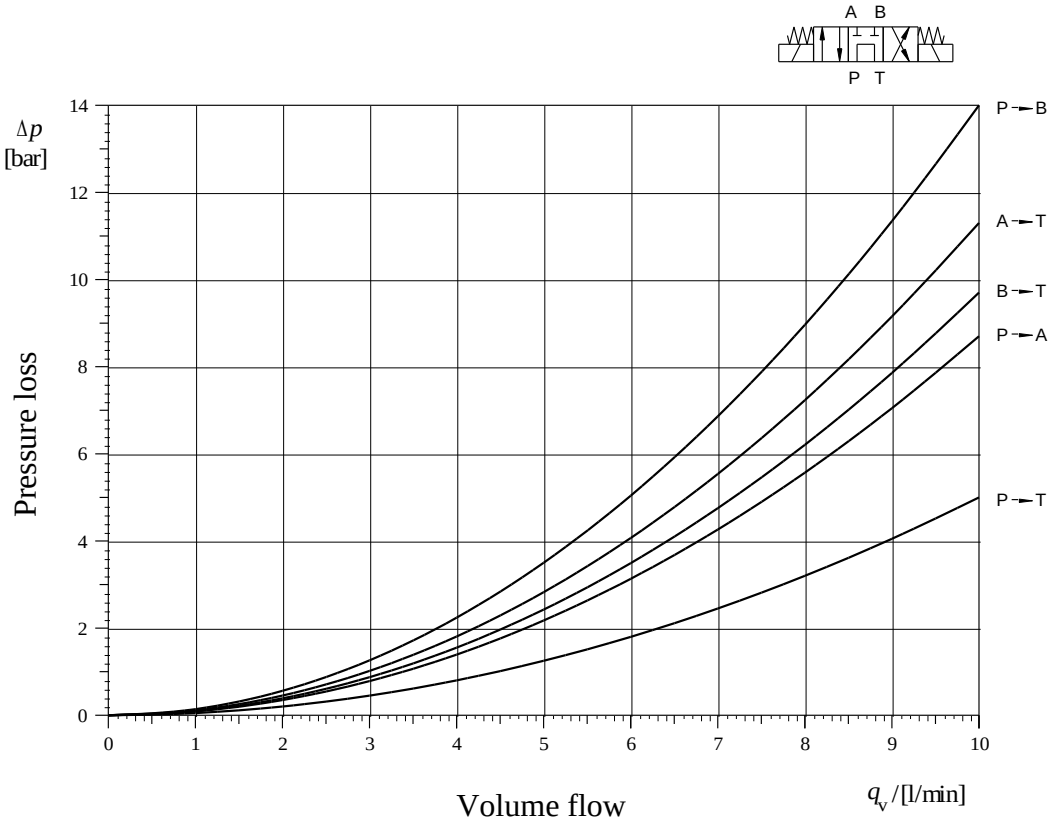
Cylinder data: Piston diameter d_1 = 100 mm, rod diameter d_2 = 50 mm
$\eta_{hm,c}$ = 0.9, $\eta_{v,c}$ = 1.0
Mass to be lifted m_1 = 8000 kg

Motor data: $V_{g,m}$ = 160 cm^3/r
$\eta_{hm,m}$ = 0.85, $\eta_{t,m}$ = 0.81
Leakage of motor: external
Mass to be lifted m_2 = 150 kg, diameter of spool d_s = 0,5 m

Pump data: $V_{g,p}$ = 5 cm^3/r
$\eta_{hm,p}$ = 0.9, $\eta_{v,p}$ = 0.8
Rotational speed of the electric drive motor n = 1500 r/min

The pressure loss chart of flow control valve on the next page.





EXERCISE 8

The underlying system is used in studying the division of flows in hydraulic systems. All the throttles are circular in cross-section and all their characteristics are identical except the diameters. The throttles 1, 2, 4 are of fixed size: ϕd_{t1} = 4 mm, ϕd_{t2} = 8 mm and ϕd_{t4} = 5 mm.

Calculate what the diameter setting of throttle 3 should be to achieve the situation where the pump flow is divided into two pipe flows of equal size at the pipe branching (in figure marked as "Intersection 1")?