LECTURE 38 – PNEUMATIC VALVES

SELF EVALUATION QUESTIONS AND ANSWERS

Problem 1:

A process engineer needs to calculate the flow rate of Fluorine at 605 K, flowing through flow control valve, with inlet and outlet pressure of 99 bar (guage) 96.5 bar (gauge) respectively. Take $C_v = flow\ coefficent = 1.1$

Problem 2:

A semiconductor process engineer in wafer fabrication units is replacing a diaphragm shut off valve in the existing computer chip manufacturing facility. The process uses phosphine (PH3) gas at 550 K. The gas runs in 7 mm tube line, supplying an inlet pressure of 30 bar to the shut-off valve. He selects a diaphragm valve of 55 LPM. Verify whether his selection is correct. Take flow coefficient as 0.01

Q1 Solution: Remember to use the absolute pressure for calculation of critical pressure ratio.

$$Check\ p_2 > \frac{p_1}{2}, \qquad 96.5 > \frac{90}{2}$$

Since the condition for low pressure drop is satisfied, we can use nomogram for the low pressure drop
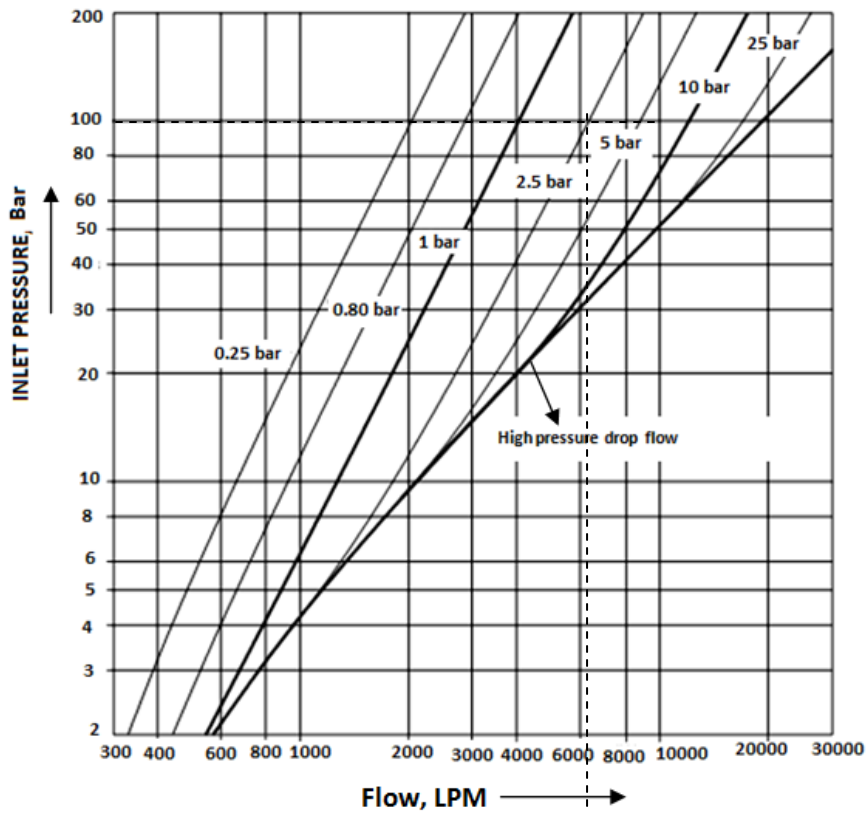
From the nomogram we get flow as q = 6200 LPM.

Since $C_v = 1.1$, actual flow is 6200 x 1.1 = 6820 LPM

Q2 Solution:

Since the outlet pressure is unknown, we can assume the high pressure drop condition

From the nomogram we get flow as 60 LPM, Therefore his selection is correct.