Accumulator size calculation

1 - step (1)

Find pump flow rate (Q_p)
by claculating flow required by the stem.
and then $Q_p = \frac{\text{Flow per cycle}}{\text{cycle time}}$

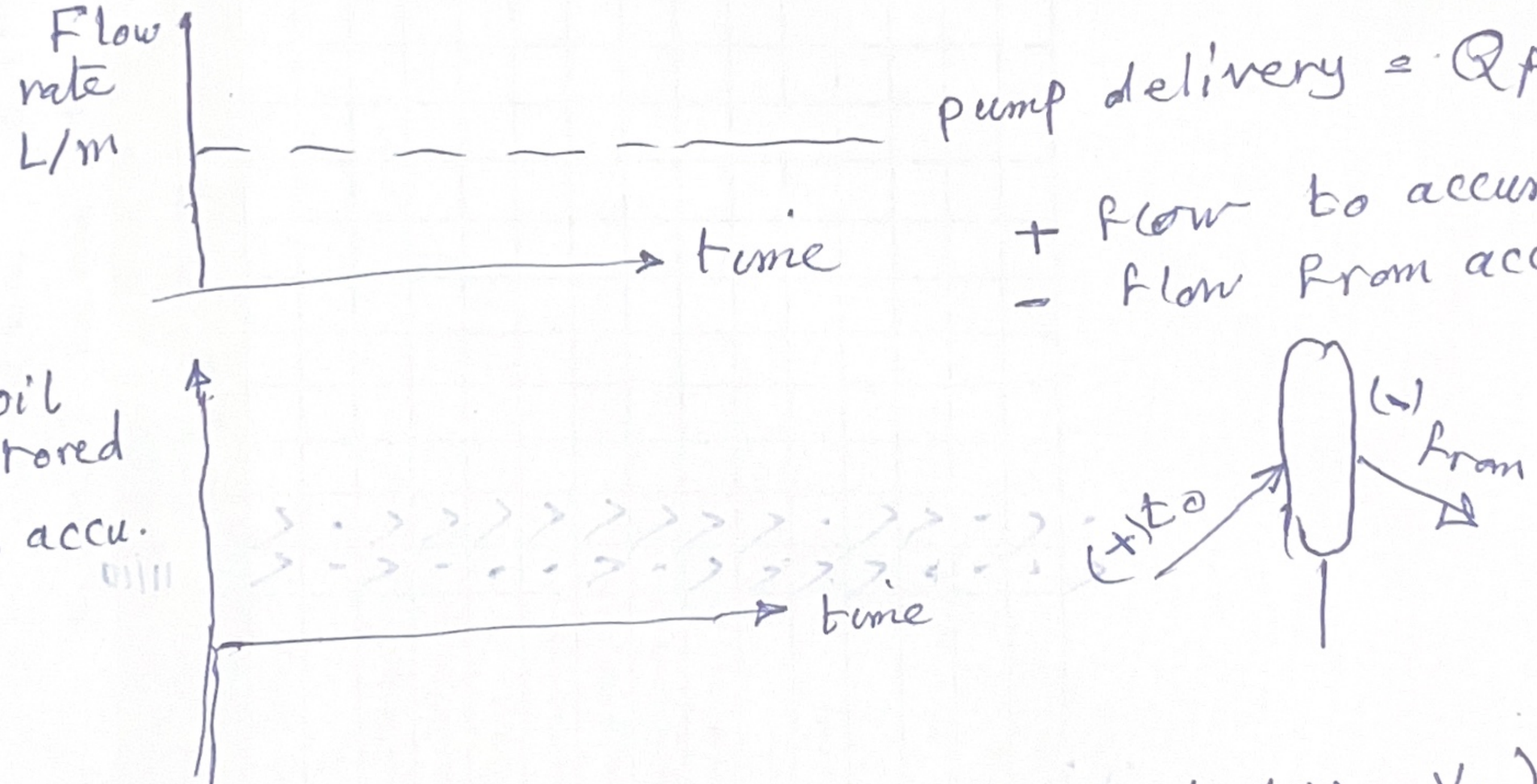
2 - step (2)

Find the flow rate from and into accumulator during cycle time

IF $Q_R > Q_p$ ∴ flow from accumulator $(Q_R - Q_p)$
IF $Q_p > Q_R$ ∴ into accumulator $(Q_p - Q_R)$

3 - step (3)

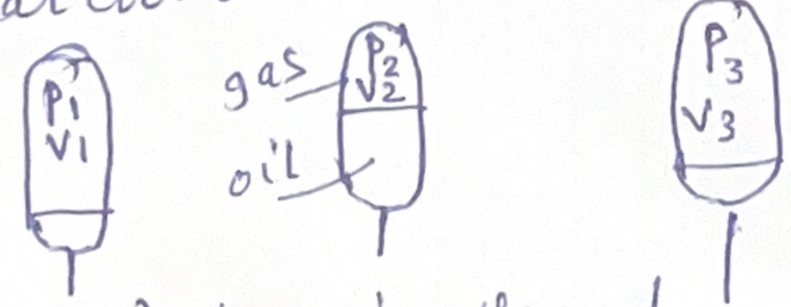
Draw the fluid to and from accumulator



From Figure find the max. amplitude $(V_3 - V_2)$ where $(V_3 - V_2)$ = min. volume of oil stored in the accum.

4 - step (4)

calculate (V_1) = accumulator capacity



P_1 = Precharge P. (abs) = 0.7 - 0.9 of min. sys. P by the design
P_2 = Max. sys. P. (abs)
P_3 = Min. sys. P. (abs.)

$P_1 V_1 = P_2 V_2$ isothermal or $P_1 V_1^n = P_2 V_2^n$

If Total flow into accum. ≠ Total flow out of acc.

This means pump should be off for certain time

$$\text{pump off load time} = \frac{\text{Excess flow from into and out of acc.}}{\text{pump flow rate}}$$

$$= \frac{\text{Total into} - \text{Total out (accum)}}{\text{Pump flow rate.}}$$

- when the accumulator is fully charged, the pressure will increase and unload the pump.