Remember volumes

Four volumes 🔴

Make your own valves using variable orifices

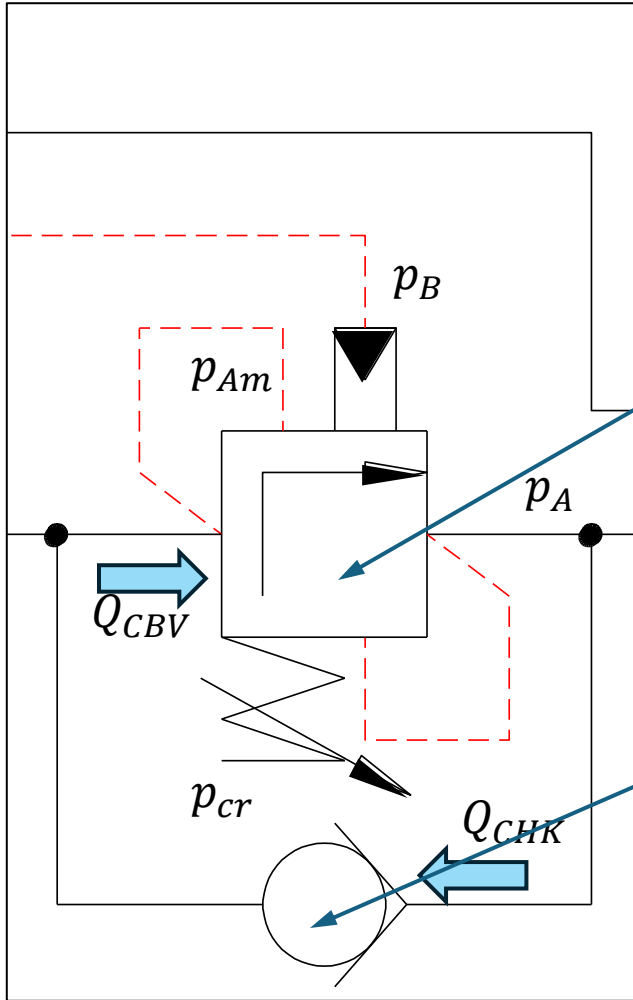Sun Hydraulics, model as 2 orifices:
- Check valve
- Shock/Counterbalance valve

CVG (Control Valve Group), model as 5 orifices
- P->A
- P->B
- A->T
- B->T
- Compensator

Model LS pressure identification as logic

Model as pressure source

Use orifice equation and dimensionless openings, u

$$Q_{CBV} = C_d \cdot A_d(u_{CBV}) \cdot \sqrt{\frac{2}{\rho} \cdot (p_{Am} - p_A)}$$

$$u_{CBV}^* = \frac{\alpha \cdot p_B + p_{Am} - p_{cr} - (1 + \alpha) \cdot p_A}{\Delta p_{O,CBV}}$$
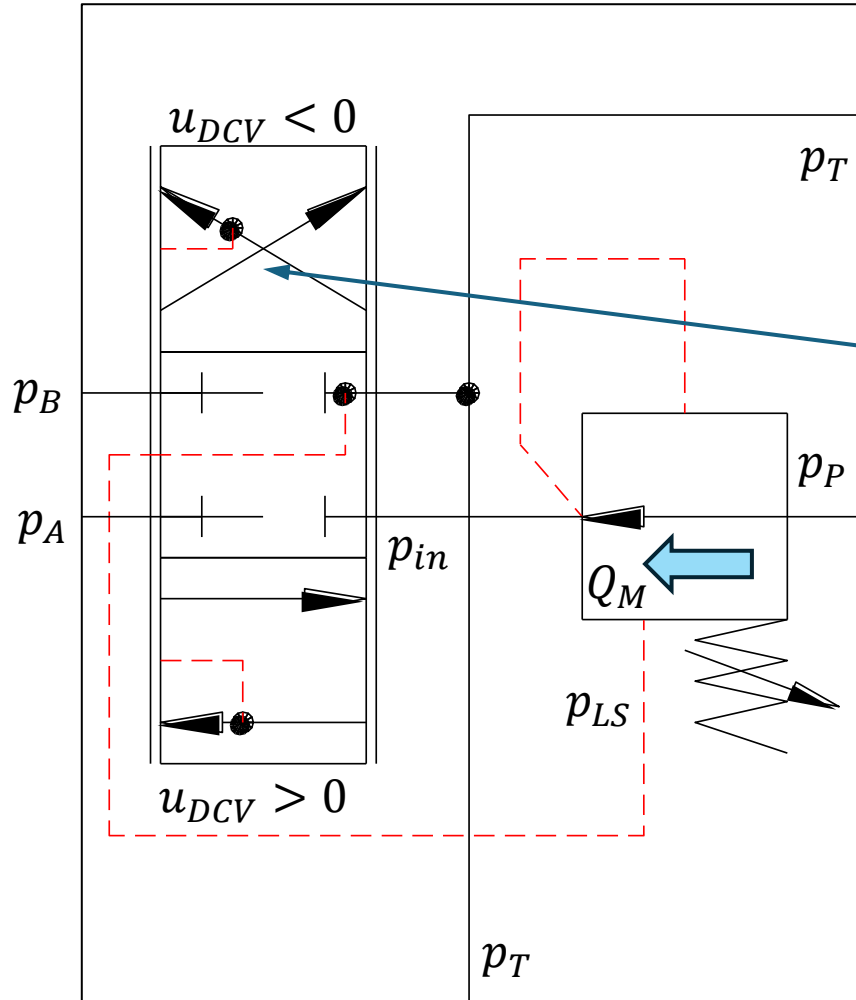
$$Q_{CHK} = C_d \cdot A_d(u_{CHK}) \cdot \sqrt{\frac{2}{\rho} \cdot (p_A - p_{Am})}$$

$$u_{CHK}^* = \frac{p_A - p_{cr} - p_{Am}}{\Delta p_{O,CHK}}$$

Filter dimensionless openings, u

$$\frac{u}{u^*} = \frac{1}{\frac{s}{\omega_{CO}} + 1}$$

Use orifice equation and dimensionless openings, u

$u_{DCV} < 0$

$$Q_M = Q_{P \to B} = C_d \cdot A_d(u_{DCV}) \cdot \sqrt{\frac{2}{\rho} \cdot (p_{in} - p_B)} \qquad Q_{P \to A} = 0$$

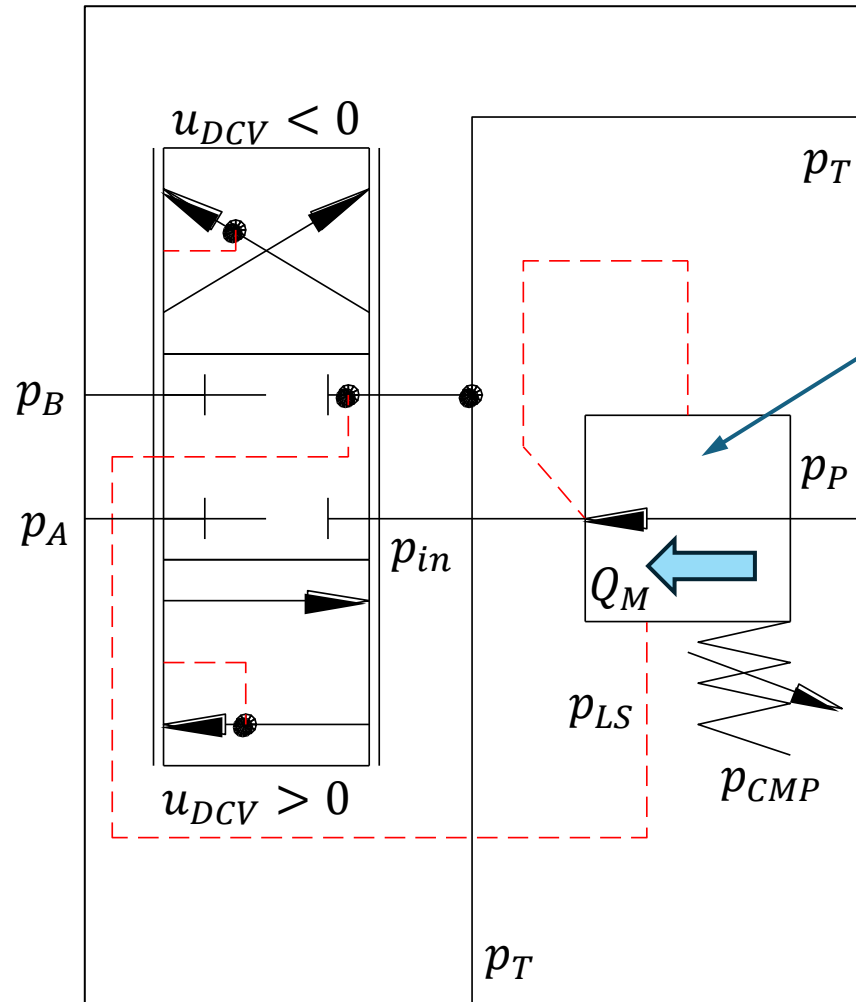$$Q_M = Q_{A \to T} = C_d \cdot A_d(u_{DCV}) \cdot \sqrt{\frac{2}{\rho} \cdot (p_A - p_T)} \qquad Q_{B \to T} = 0$$

$$p_{LS} = p_B$$

$u_{DCV} > 0$

$$Q_M = Q_{P \to A} = C_d \cdot A_d(u_{DCV}) \cdot \sqrt{\frac{2}{\rho} \cdot (p_{in} - p_A)} \qquad Q_{P \to B} = 0$$

$$Q_M = Q_{B \to T} = C_d \cdot A_d(u_{DCV}) \cdot \sqrt{\frac{2}{\rho} \cdot (p_B - p_T)} \qquad Q_{A \to T} = 0$$

$$p_{LS} = p_A$$

Use orifice equation and dimensionless openings, u

$$Q_{CMP} = C_d \cdot A_d(u_{CMP}) \cdot \sqrt{\frac{2}{\rho} \cdot (p_P - p_{in})}$$

$$u_{CMP}^* = \frac{p_{LS} + p_{CMP} - p_{in}}{\Delta p_{O,CMP}}$$

Filter dimensionless openings, u

$$\frac{u}{u^*} = \frac{1}{\frac{s}{\omega_{CO}} + 1}$$

Figure labels: $u_{DCV} < 0$, p_B, p_A, p_{in}, $u_{DCV} > 0$, p_T, p_P, Q_M, p_{LS}, p_{CMP}, p_T