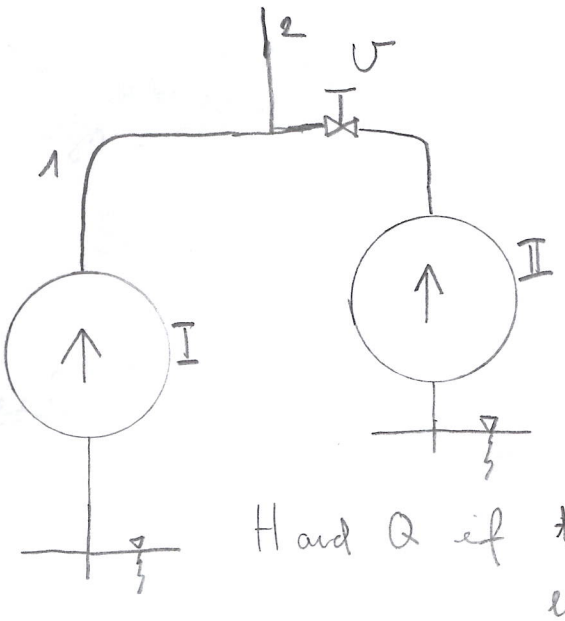
4.1.31.



$H_I = 45 - 24900\ Q^2$

$H_{II} = 35 - 32200\ Q^2$

$H_1 = 10 + 4730\ Q^2$

$H_2 = 15 + 8000\ Q^2$

H and Q if the valve is closed and when it is opened

① if the valve is closed

$H_1 + H_2$ in serial connection

$H_1 + H_2 = H_I$ $\quad 10 + 4730\,Q^2 + 15 + 8000\,Q^2 = 45 - 24900\,Q^2$

$\Rightarrow Q = \sqrt{\frac{45-25}{37630}} = 0{,}02305\ \frac{m^3}{s} \rightarrow H = 31{,}77\ m$

② if the valve is open

Reduction of H_I and H_1

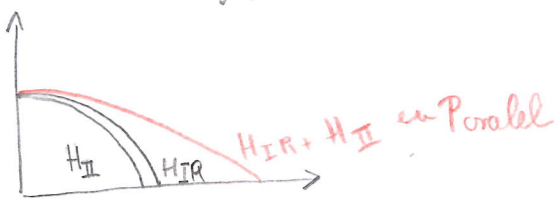
$H_{IR} = H_I - H_1 = 45 - 24900\,Q^2 - (10 + 4730\,Q^2) = 35 - 29630$

Now H_{IR} and H_{II} in Parallel connection

$Q = Q_{IR} + Q_{II}$ /

Q if $H = 0$

$Q_{IR\,max} = \sqrt{\frac{35}{29630}} = 0{,}03437\ \frac{m^3}{s}$; $Q_{II\,max} = \sqrt{\frac{35}{32200}} = 0{,}03297\ \frac{m^3}{s}$



$H_{Par} = 35 - \frac{35}{(0{,}03437 + 0{,}03297)^2}\,Q^2 = 35 - 7718\,Q^2$

Head in working operation $H_{Par}(Q) = H_2(Q)$ $\quad 35 - 7718\,Q^2 = 15 + 8000\,Q^2$

$Q = \sqrt{\frac{35-15}{8000+7718}} = 0{,}03567\ \frac{m^3}{s} \rightarrow H = 25{,}18\ m$

Find Q_{IR} and Q_{II}

$$Q = Q_{IR} + Q_{II} = \sqrt{\frac{35-H}{29630}} + \sqrt{\frac{35-H}{32200}} = 0{,}0182 \frac{m^3}{s} + 0{,}01746 \frac{m^3}{s}$$

H_{II}, H_I and H_1

$$H_{II} = 35 - 32200 \cdot (0{,}01746)^2 = 25{,}18 \text{ [m]}$$

$$H_{IR} = H_I - H_1 \Rightarrow H_I = H_{1R} + H_1 = *$$

$$* = 35 - 29630 \cdot (0{,}0182)^2 + 10 \cdot 47{,}30 \cdot (0{,}0182)^2 =$$

$$= 25{,}18 \text{ m} + 11{,}57 \text{ m} = 36{,}75 \text{ m}$$