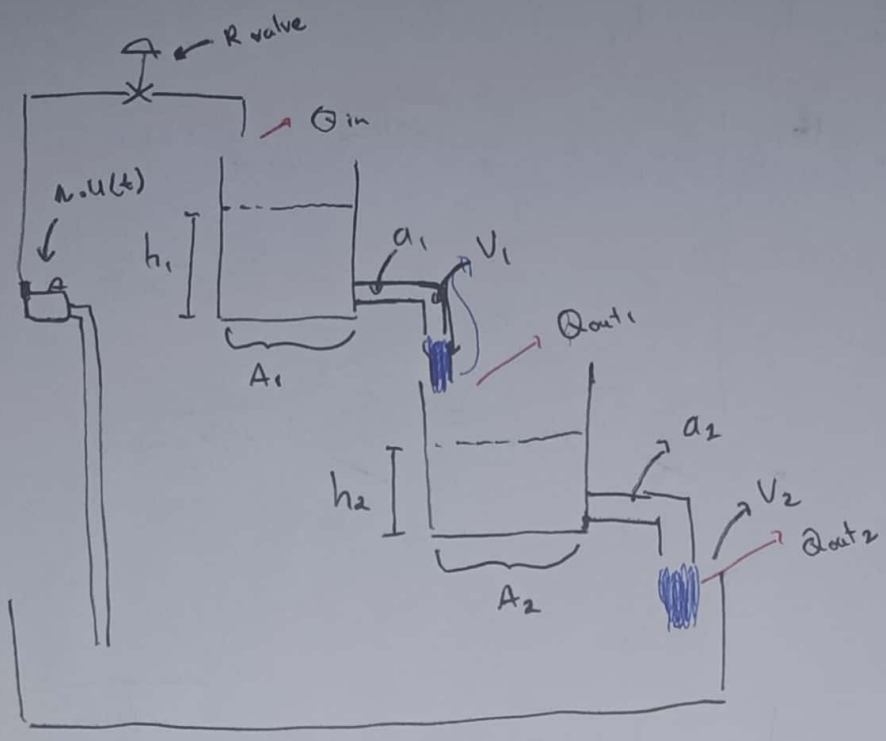

η = konstanta ▼ kontrol / gain

$u(t)$ = tegangan ke pompa / tegangan atur laju aliran

h_0 = tinggi permukaan air (m)

A_0 = Luas penampang (m^2)

a_1 = Luas pipa (m^2)

V = kecepatan fluida (m/s)

Q = debit / laju fluida (m^3/s)

* Penampang tangki 1 = tangki 2 → $A_1 = A_2 = A$

H/k. Bernoulli

$$Q_{out_1} = a_1 V_1 = a_1 \cdot \sqrt{2gh_1}$$
$$Q_{out_2} = a_2 V_2 = a_2 \cdot \sqrt{2gh_2}$$

} $Q_1 = Q_2 = Q$ jika $a_1 = a_2$ & $h_1 = h_2$

K/k. kesetimbangan massa

Tank 1

$$A_0 \frac{dh_1}{dt} = Q_{in} - Q_{out\,1}$$

$$A \frac{dh}{dt} = \eta . u(t) - a_1 \sqrt{2gh_1}$$

$$\frac{dh}{dt} = -\frac{a_1}{A}\sqrt{2gh_1} + \frac{\eta . u(t)}{A}$$

(A) → harusnya ada, dimana ?

Tank 2

$$A \cdot \frac{dh_2}{dt} = Q_{out_1} - Q_{out_2}$$

$$A \frac{dh_2}{dt} = a_1\sqrt{2gh_1} - a_2\sqrt{2gh_2}$$

$$\frac{dh_1}{dt} = \frac{a_1}{A}\sqrt{2gh_1} - \frac{a_2}{A}\sqrt{2gh_2}$$

Jika tdk ada perubahan ketinggian h_1 & h_2

$$\frac{dh_1}{dt} = -\frac{a_1}{A}\sqrt{2gh_{1,0}} + \eta . u(t)$$

$$0 = -\frac{a_1}{A}\sqrt{2gh_{1,0}} + \eta . u(t)$$

$$\frac{a_1}{A}\sqrt{2gh_{1,0}} = \eta . u(t)$$

$$\frac{dh_2}{dt} = \frac{a_1}{A}\sqrt{2gh_{1,0}} - \frac{a_2}{A}\sqrt{2gh_{2,0}}$$

$$0 = \frac{a_1}{A}\sqrt{2gh_{1,0}} - \frac{a_2}{A}\sqrt{2gh_{2,0}}$$

$$\frac{a_1}{A}\sqrt{2gh_{1,0}} = \frac{a_2}{A}\sqrt{2gh_{2,0}}$$

Jika

$$\sqrt{2gh_{1,0}} = \eta . u(t) . \frac{A}{a_1}$$

$$2gh_{1,0} = \left(\frac{\eta u(t) . A}{a_1}\right)^2$$

$$h_{1,0} = \frac{1}{2g}\left(\frac{\eta . u(t) . A}{a_1}\right)^2$$

$$\sqrt{2gh_{2,0}} = \frac{a_1}{a_2}\sqrt{2gh_{1,0}}$$

$$2gh_{2,0} = \left(\frac{a_1}{a_2}\right)^2 2gh_{1,0}$$

$$h_{2,0} = \left(\frac{a_1}{a_2}\right)^2 . h_{1,0}$$

Maka

$$\frac{dh}{dt} = \frac{-a_1}{A}\sqrt{2gh_1} + \eta . u(t)$$

$$\Delta h_1(t) = -\left(\frac{a_1}{A}\right)^2 \frac{1}{\eta . u_0} \Delta h_1(t) + \eta \Delta u(t)$$

Belum tau cara agar Orde 2 = - - ?

Multi input single output

↓ q, h, u(t) ↓ h

Penggunaan matlab bagaimana ?