$$V = 0 \rightarrow y = \sqrt[3]{h_0^3} - h_0 = 0 \rightarrow \text{Ok}$$

check

$$(y+h_0)^3 = \frac{3V + \pi r^2 h_0}{\pi r^2 / h_0^2}$$

$$y + h_0 = \sqrt[3]{\frac{3V + \pi r^2 h_0}{\pi r^2 / h_0^2}}$$

$$y = \sqrt[3]{\frac{3V + \pi r^2 h_0}{\pi r^2 / h_0^2}} - h_0$$

$$y = \sqrt[3]{\frac{3V + \pi r^2 h_0}{\pi r^2 / h_0^2}} - h_0$$

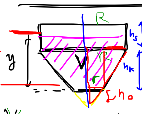
$$\boxed{\frac{h_0}{h_k} = \frac{r}{R-r} \qquad h_k = \frac{R-r}{r} h_0}$$

$$V = V_k = \frac{1}{3}\pi\left(R^2 + Rr + r^2\right)h_k$$

$$y = \sqrt[3]{\frac{\cancel{\pi}R^2h_k + \cancel{\pi}Rrh_k + \cancel{\pi}r^2h_k + \cancel{\pi}r^2h_0}{\cancel{\pi}r^2/h_0^2}} - h_0$$

$$= \sqrt[3]{\frac{R^2h_kh_0^2 + Rrh_kh_0^2 + r^2h_kh_0^2 + r^2h_0^3}{r^2}} - h_0$$

Volume to Le el



$V = V_k + V_s$

$y > h_k$

R = jari² silinder

r = jari² katup

Volume matrial pada silinder : V_s

$$V_s = \pi R^2 (y - _k) \qquad y - h_k \le h_s$$

Volume matrial pada kerucut :

$$V_k = V_b - V_o \qquad \frac{R-r}{r} = \frac{h_k}{h_0} \rightarrow h_0 = \frac{rh_k}{R-r}$$

$$= \frac{1}{3}\pi R^2(h + h_0) - \frac{1}{3}\pi r^2(h_0)$$

$$= \frac{1}{3}\pi R^2 h_k + \frac{1}{3}\pi R^2 h_0 - \frac{1}{3}\pi r^2 h_0$$

$$= \frac{1}{3}\pi R^2 h_k + \frac{1}{3}\pi (R^2 - r^2)\left(\frac{rh_k}{R-r}\right)$$

$$= \frac{1}{3}\pi R^2 h_k + \frac{1}{3}\pi (R+r)\cancel{(R-r)} \cdot \frac{rh_k}{\cancel{R-r}}$$

$$= \frac{1}{3}\pi R^2 h_k + \frac{1}{3}\pi (R+r) r h_k$$

$$= \frac{1}{3}\pi (R^2 + Rr + r^2) h_k$$

$$V = V_s + V_k \longrightarrow V_s = V - V_k$$

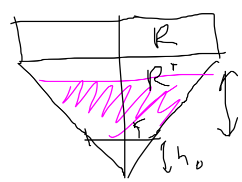
$$\pi R^2 (y - h_k) = V - V_k$$

$$\pi R^2 y - \pi R^2 h_k = V - V_k$$

$$\pi R^2 y = V - V_k + \pi R^2 h_k$$

$$y = \frac{V - V_k + \pi R^2 h_k}{\pi R^2}$$

* $V > V_k$
  $y > h_k$
* $V = V_k \longrightarrow y = h_k$
* $V < V_k \longrightarrow y = ???$



$$h_0 = \frac{rh_k}{R-r}$$

$$\frac{R}{R'} = \frac{h_k + h_0}{y + h_0}$$

$$\frac{r}{R'} = \frac{h_0}{y + h_0} \rightarrow R' = \frac{r(y + h_0)}{h_0}$$

$$V = \frac{1}{3}\pi R'^2 (y + h_0) - \frac{1}{3}\pi r^2 (h_0)$$

$$= \frac{1}{3}\pi \left[\frac{r(y+h_0)}{h_0}\right]^2 (y + h_0) - \frac{1}{3}\pi r^2 h_0$$

$$= \frac{1}{3}\pi \left(\frac{r}{h_0}\right)^2 \left[y + h_0\right]^3 - \frac{1}{3}\pi r^2 h_0$$

$$V + \frac{1}{3}\pi r^2 h_0 = \frac{1}{3}\pi \left(\frac{r}{h_0}\right)^2 \left[y + h_0\right]^3$$

$$3V + \pi r^2 h_0 = \pi \left(\frac{r}{h_0}\right)^2 (y + h_0)^3$$