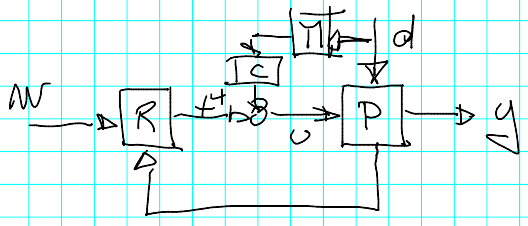
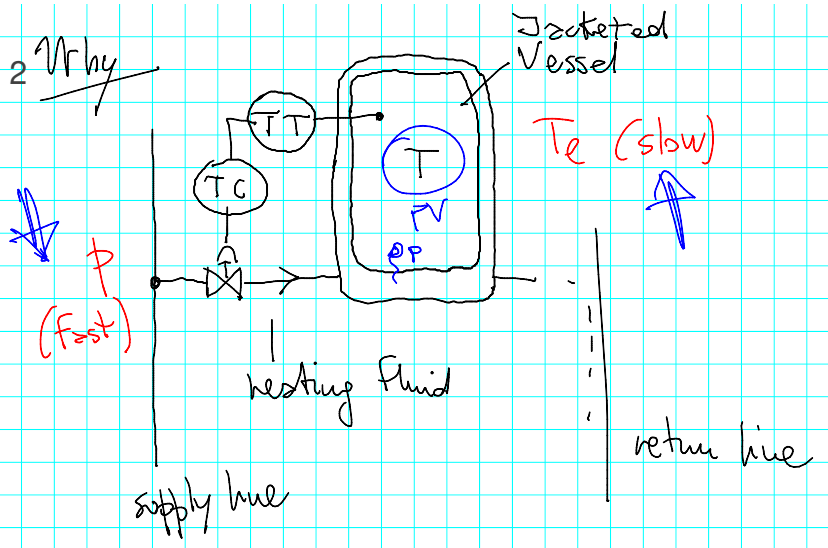
20/03/2019

1

① Feed Forward disturbance compensation



2 Why



P&ID

disturb.

Exercice 3

Φ thermal conductance

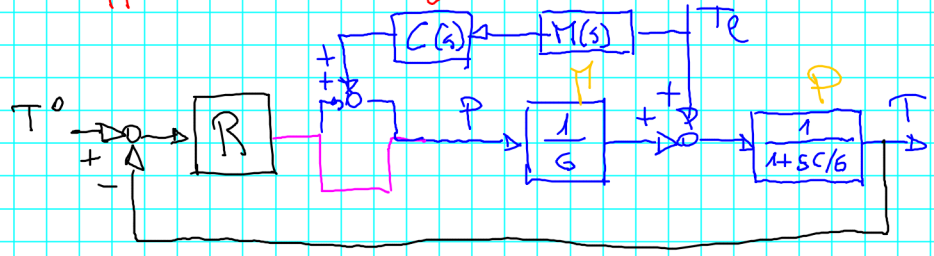
$$C\dot{T} = P - G(T - T_e)$$

$\mathcal{L} \Rightarrow$ $(sC + G)T = GT_e + P$

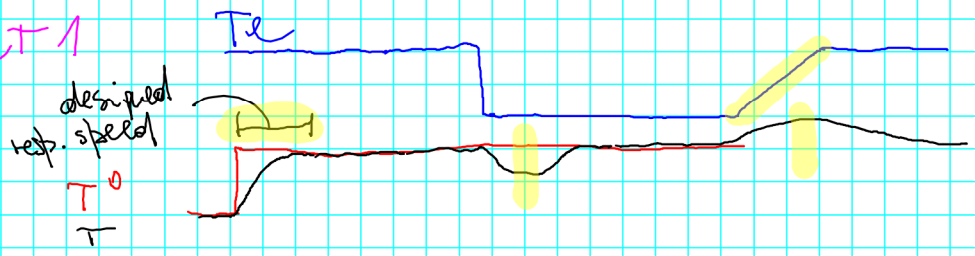
$$T = \frac{1/G}{1 + s\frac{C}{G}} (GT_e + P)$$

$$T = \frac{1}{1 + s\frac{C}{G}} \left(T_e + \frac{1}{G}P\right)$$

4 Suppose Φ is the CS (in reality it is valve opening)



ALT 1



5 Without T & C

$R = 1$

$$\frac{T}{T_e} = \frac{\frac{1}{1+sC/G}}{1+\frac{1}{1+sC/G}} = \frac{1}{1+s\frac{C}{G}} \cdot \frac{1+sC/G}{2+sC/G}$$

$$= \frac{0.5}{1+s\frac{C}{2G}}$$

complete loop

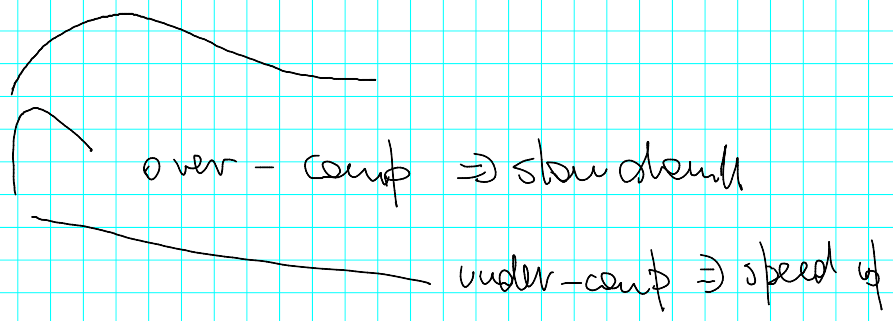
$$\frac{P}{1+PRP}$$

Reactive time depends on R_1 but to reject the effect of dist. must be zero

To compute C, set $\frac{I}{T_2} = 0$ in the presence of compensation

$\Rightarrow$ slide 258

$5 \left(\text{dominant time constant} \right)$ in C


over - comp ⇒ slow down
under-comp ⇒ speed up

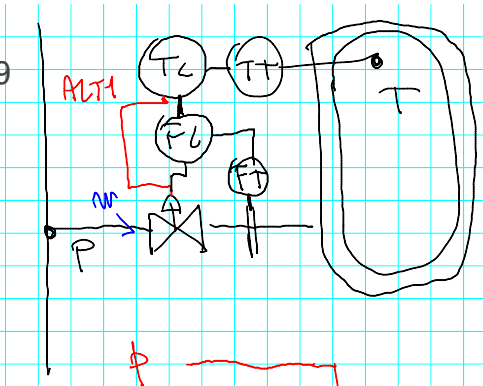
BUT our input is not P, it is the valve opening ϑ

$\vartheta \rightarrow P$?

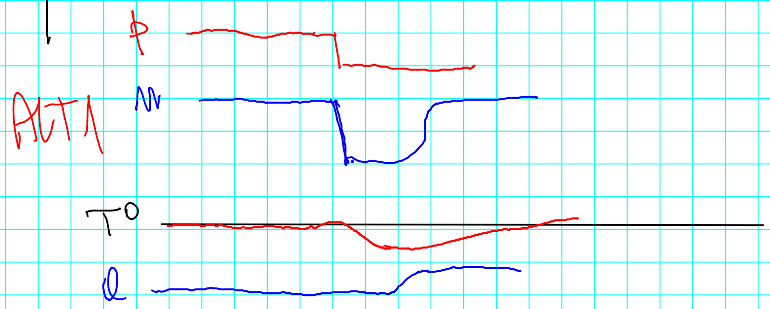
$\vartheta \rightarrow$ Flow $\rightarrow$ Power

↑ pressure

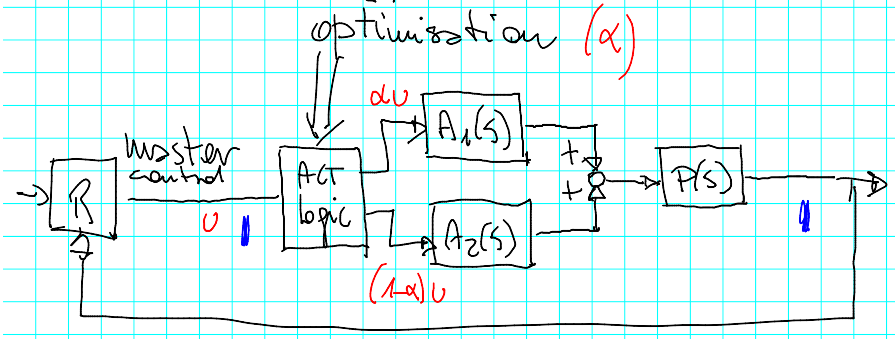
9



Cascade control

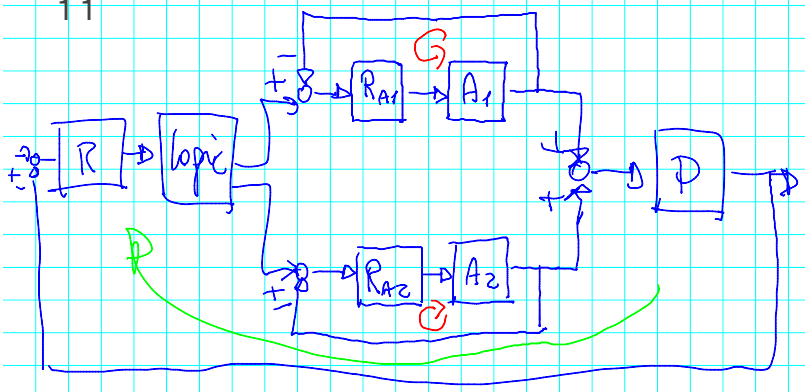


Another energy-related cascade example



Dynamics seen by R: $(\alpha A_1 + (1-\alpha) A_2) P$

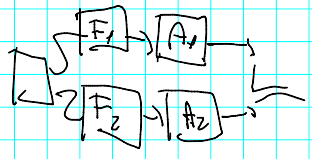
$\alpha = \alpha(t)$ ≈ ||



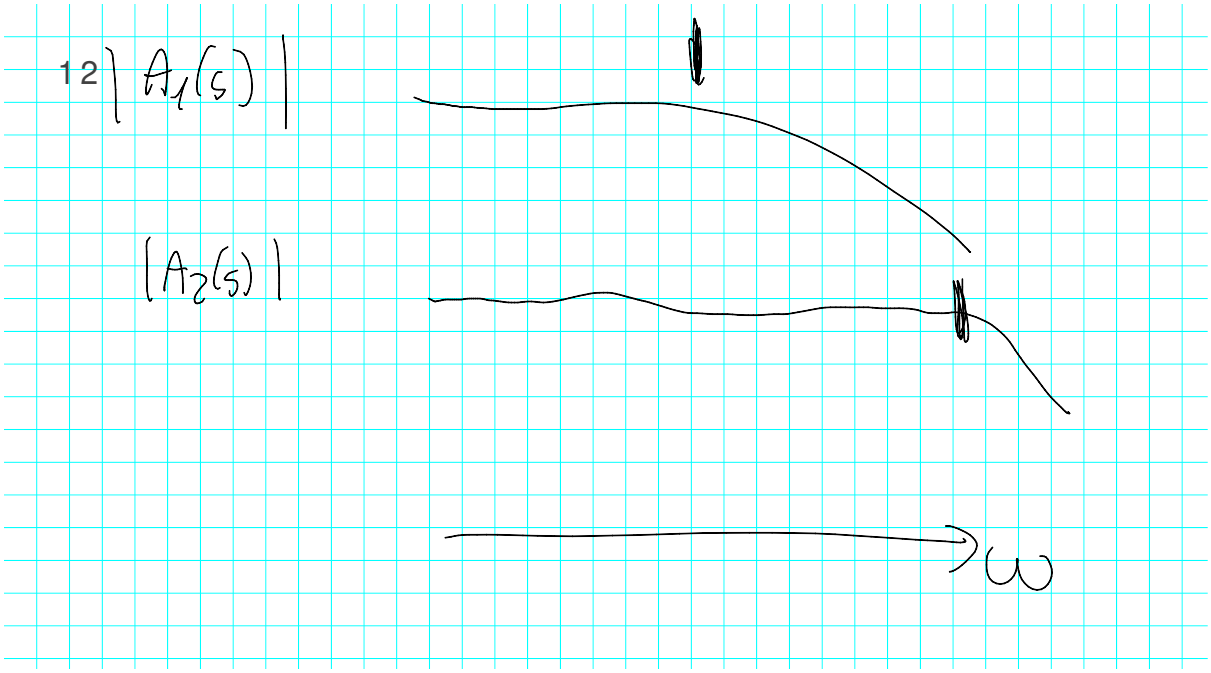
$\frac{R_{A1}A_1}{1+R_{A1}A_1}$ ≈ $\frac{R_{A2}A_2}{1+R_{A2}A_2}$

No TV system anymore seen by R

Alternative:

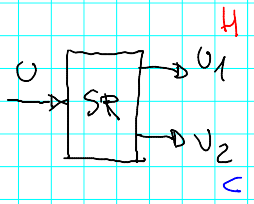


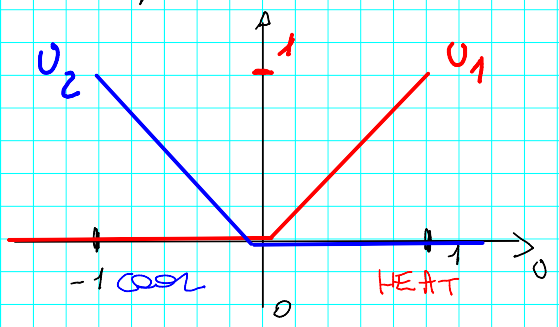
Open-loop explanation


12
$|A_1(s)|$
$|A_2(s)|$
ω

Cascade control is frequently used in combination with split-range or daisy-chain actuation

Split-range





typical example: heat - cool