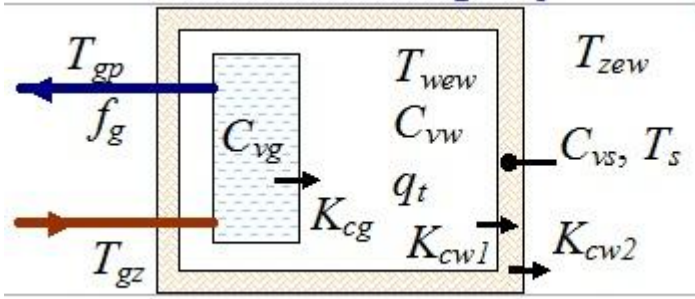
1. Pomieszczenie z grzejnikiem c.o. (wersja dokładniejsza)



Założenia:

C_{vw}, C_{vg}, C_{vs}

$T_{gśr} = T_{gp}$ (doskonałe mieszanie)

$f_{mg} = \rho_w f_g$ (przepływ masowy [kg/s])

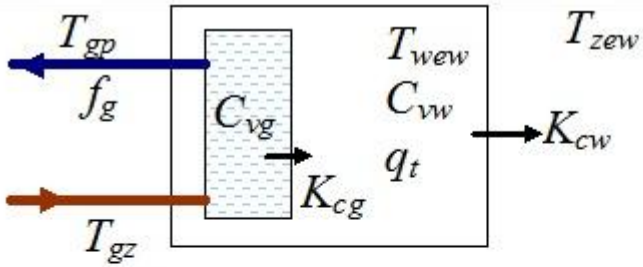
1) Model

$$\begin{cases} C_{vw}\dot{T}_{wew} = K_{cg}\left(T_{gp} - T_{wew}\right) - K_{cw1}\left(T_{wew} - T_s\right) + q_t \\ C_{vg}\dot{T}_{gp} = c_{pw} f_{mg}\left(T_{gz} - T_{gp}\right) - K_{cg}\left(T_{gp} - T_{wew}\right) \\ C_{vs}\dot{T}_s = K_{cw1}\left(T_{wew} - T_s\right) - K_{cw2}\left(T_s - T_{zew}\right) \end{cases}$$

wy: T_{wew}, T_{gp}, T_s

we: T_{gz}, T_{zew}, f_{mg}, q_t

2. Pomieszczenie z grzejnikiem c.o. (wersja uproszczona)



Założenia:

$C_{vw} \approx C_{vg}$, $C_{vw} >> C_{vs}$ (C_{vw} z korektą)

$T_{gśr} = T_{gp}$ (doskonałe mieszanie)

$f_{mg} = \rho_w f_g$ (przepływ masowy [kg/s])

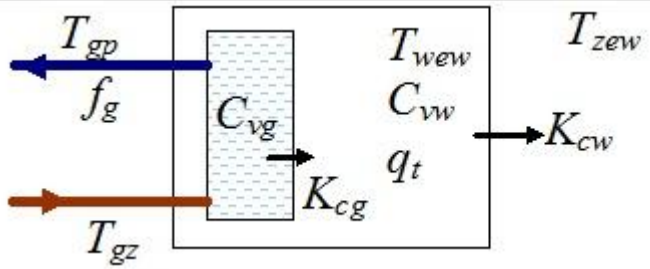
1) Model[1]

$$\begin{cases} C_{vw}\dot{T}_{wew} = K_{cg}\left(T_{gp} - T_{wew}\right) - K_{cw}\left(T_{wew} - T_{zew}\right) + q_t \\ C_{vg}\dot{T}_{gp} = c_{pw} f_{mg}\left(T_{gz} - T_{gp}\right) - K_{cg}\left(T_{gp} - T_{wew}\right) \end{cases}$$

wy: T_{wew}, T_{gp}

we: T_{gz}, T_{zew}, f_{mg}, q_t

2. Pomieszczenie z grzejnikiem c.o. (wersja uproszczona) - identyfikacja



Założenia:

$C_{vw} \approx C_{vg}$, $C_{vw} >> C_{vs}$ (C_{vw} z korektą)

$T_{gśr} = T_{gp}$ (doskonałe mieszanie)

$f_{mg} = \rho_w f_g$ (przepływ masowy [kg/s])

1) Model[1]

$$\begin{cases} C_{vw}\dot{T}_{wew} = K_{cg}\left(T_{gp} - T_{wew}\right) - K_{cw}\left(T_{wew} - T_{zew}\right) + q_t \\ C_{vg}\dot{T}_{gp} = c_{pw} f_{mg}\left(T_{gz} - T_{gp}\right) - K_{cg}\left(T_{gp} - T_{wew}\right) \end{cases}$$

wy: T_{wew}, T_{gp}

we: T_{gz}, T_{zew}, f_{mg}, q_t

Równania statyczne: (założenie: q_t=0)

$$\begin{cases} 0 = K_{cg}\left(T_{gp} - T_{wew}\right) - K_{cw}\left(T_{wew} - T_{zew}\right) \\ 0 = c_{pw} f_{mg}\left(T_{gz} - T_{gp}\right) - K_{cg}\left(T_{gp} - T_{wew}\right) \end{cases}$$

stąd: $$c_{pw} f_{mg}\left(T_{gz} - T_{gp}\right) = K_{cg}\left(T_{gp} - T_{wew}\right) = K_{cw}\left(T_{wew} - T_{zew}\right) \quad [=q_g]$$

Identyfikacja wartości parametrów

Dane: T_{zewN} = -20°C, T_{wewN} = 20°C,

T_{gzN} = 90°C, T_{gpN} = 70°C

q_{gN} = 10 kW (zapotrzebowanie pomieszczenia na ciepło)

q_{tN} = 0 (bez dodatkowych źródeł i strat ciepła)

Do wyznaczenia: K_{cw}, K_{cg}, f_{mgN}

Podstawa:

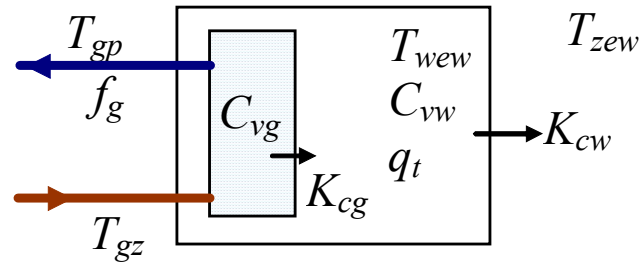
$$c_{pw} f_{mgN}\left(T_{gzN} - T_{gpN}\right) = K_{cg}\left(T_{gpN} - T_{wewN}\right) = K_{cw}\left(T_{wewN} - T_{zewN}\right) = q_{gN}$$

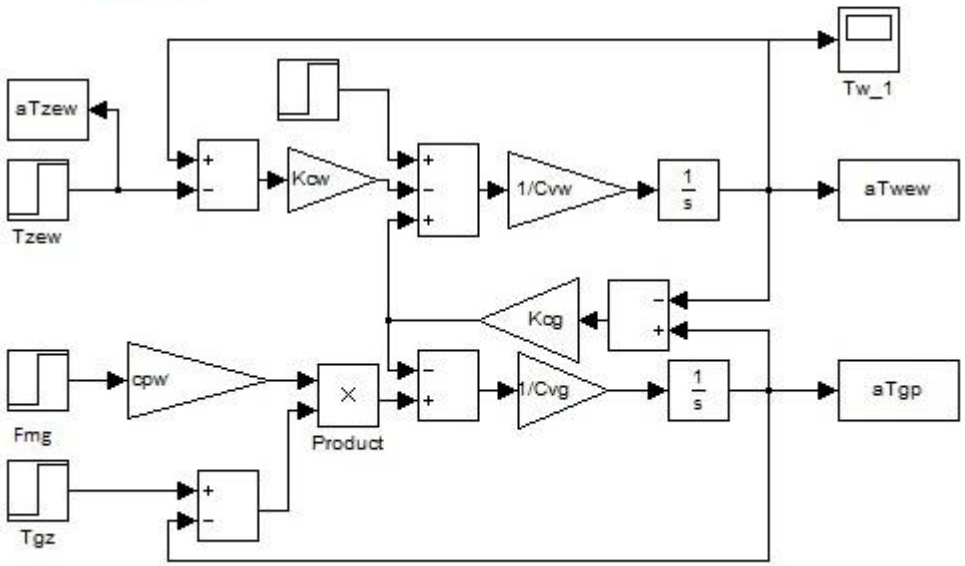
2. Pomieszczenie z grzejnikiem c.o. (wersja uproszczona) – schemat, punkt pracy

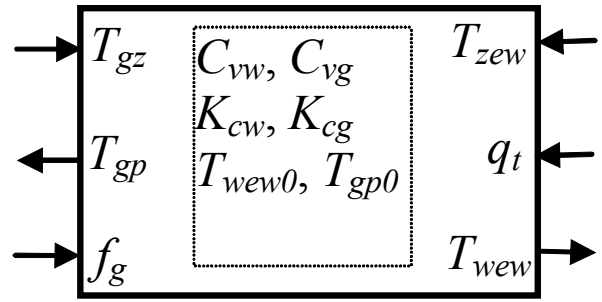
$$\begin{cases} C_{vw}\dot{T}_{wew} = K_{cg}\left(T_{gp} - T_{wew}\right) - K_{cw}\left(T_{wew} - T_{zew}\right) + q_t \\ C_{vg}\dot{T}_{gp} = c_{pw} f_{mg}\left(T_{gz} - T_{gp}\right) - K_{cg}\left(T_{gp} - T_{wew}\right) \end{cases}$$

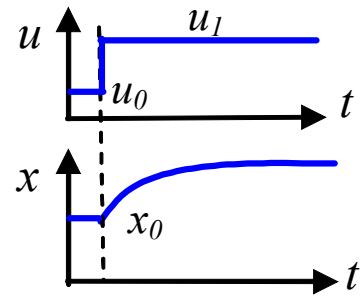
wy: T_{wew}, T_{gp}

we: T_{gz}, T_{zew}, f_{mg}, q_t









Punkt równowagi:

$$c_{pw} f_{mg}\left(T_{gz} - T_{gp}\right) = K_{cg}\left(T_{gp} - T_{wew}\right) = K_{cw}\left(T_{wew} - T_{zew}\right)$$

$$T_{wew} = \frac{c_{pw} f_{mg} K_{cg} T_{gz} + K_{cw}\left(K_{cg} + c_{pw} f_{mg}\right) T_{zew}}{K_{cg} K_{cw} + c_{pw} f_{mg}\left(K_{cg} + K_{cw}\right)}, \quad T_{gp} = \frac{\left(K_{cg} + K_{cw}\right) T_{wew} - K_{cw} T_{zew}}{K_{cg}}$$

2. Pomieszczenie z grzejnikiem c.o. (wersja uproszczona) – równania stanu

1) Model podstawowy (liniowy/nieliniowy)[1]

$$\begin{cases} C_{vw}\dot{T}_{wew} = K_{cg}\left(T_{gp}-T_{wew}\right)-K_{cw}\left(T_{wew}-T_{zew}\right)+q_t \\ C_{vg}\dot{T}_{gp} = c_{pw}f_{mg}\left(T_{gz}-T_{gp}\right)-K_{cg}\left(T_{gp}-T_{wew}\right) \end{cases}$$

wy: T_{wew}, T_{gp} we: T_{gz}, T_{zew}, f_{mg}, q_t (CV=T_{gz} lub f_{mg})

2) **Model liniowy** (dla stałego przepływu f_{mg})

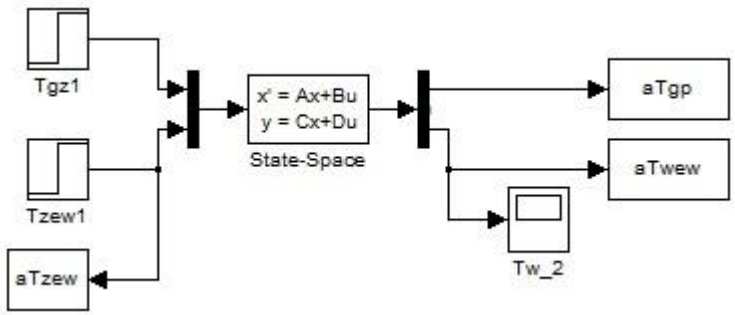
a) Równania stanu ($\dot{\mathbf{x}} = \mathbf{Ax} + \mathbf{Bu}$),

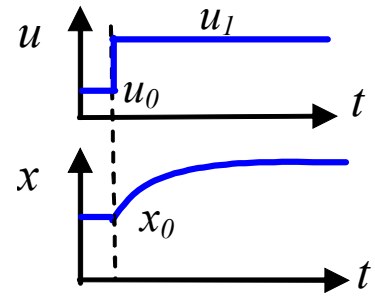
$$\begin{bmatrix} \dot{T}_{wew} \\ \dot{T}_{gp} \end{bmatrix} = \begin{bmatrix} \dfrac{-K_{cg}-K_{cw}}{C_{vw}} & \dfrac{K_{cg}}{C_{vw}} \\ \dfrac{K_{cg}}{C_{vg}} & \dfrac{-c_{pw}f_{mg}-K_{cg}}{C_{vg}} \end{bmatrix} \begin{bmatrix} T_{wew} \\ T_{gp} \end{bmatrix} + \begin{bmatrix} 0 & \dfrac{K_{cw}}{C_{vw}} \\ \dfrac{c_{pw}f_{mg}}{C_{vg}} & 0 \end{bmatrix} \begin{bmatrix} T_{gz} \\ T_{zew} \end{bmatrix}$$

Równania statyczne ($\dot{\mathbf{x}} = 0 \Rightarrow 0 = \mathbf{Ax} + \mathbf{Bu}$) $\Rightarrow \mathbf{Ax} = -\mathbf{Bu} \Rightarrow \mathbf{x} = -\mathbf{A}^{-1}\mathbf{Bu}$

$$\begin{bmatrix} 0 \\ 0 \end{bmatrix} = \begin{bmatrix} \dfrac{-K_{cg}-K_{cw}}{C_{vw}} & \dfrac{K_{cg}}{C_{vw}} \\ \dfrac{K_{cg}}{C_{vg}} & \dfrac{-c_{pw}f_{mg}-K_{cg}}{C_{vg}} \end{bmatrix} \begin{bmatrix} T_{wew} \\ T_{gp} \end{bmatrix} + \begin{bmatrix} 0 & \dfrac{K_{cw}}{C_{vw}} \\ \dfrac{c_{pw}f_{mg}}{C_{vg}} & 0 \end{bmatrix} \begin{bmatrix} T_{gz} \\ T_{zew} \end{bmatrix}$$

Punkt równowagi: $\mathbf{x} = -\mathbf{A}^{-1}\mathbf{Bu}$





2. Pomieszczenie z grzejnikiem c.o. (wersja uproszczona) – transmitancje

1) Model[1]

$$\begin{cases} C_{vw}\dot{T}_{wew} = K_{cg}\left(T_{gp} - T_{wew}\right) - K_{cw}\left(T_{wew} - T_{zew}\right) + q_t \\ C_{vg}\dot{T}_{gp} = c_{pw} f_{mg}\left(T_{gz} - T_{gp}\right) - K_{cg}\left(T_{gp} - T_{wew}\right) \end{cases}$$

wy: T_{wew}, T_{gp}
we: T_{gz}, T_{zew}, f_{mg}, q_t

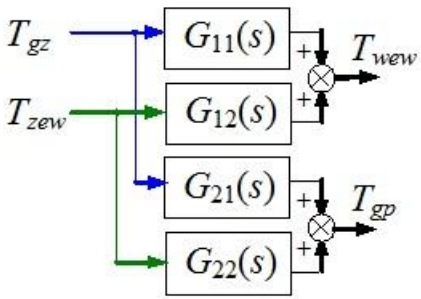
3) Transmitancje obiektu

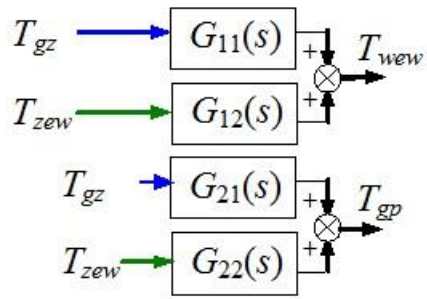
$$T_{wew} = \frac{c_{pw} f_{mg} K_{cg}}{M_1 M_2 - K_{cg}^2} T_{gz} + \frac{K_{cw} M_2}{M_1 M_2 - K_{cg}^2} T_{zew}$$

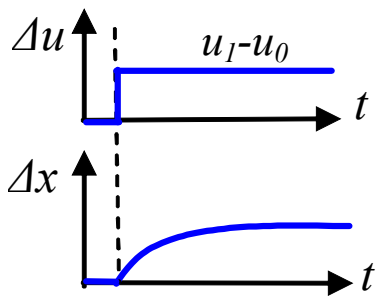
$$T_{gp} = \frac{c_{pw} f_{mg} M_1}{M_1 M_2 - K_{cg}^2} T_{gz} + \frac{K_{cg} K_{cw}}{M_1 M_2 - K_{cg}^2} T_{zew}$$

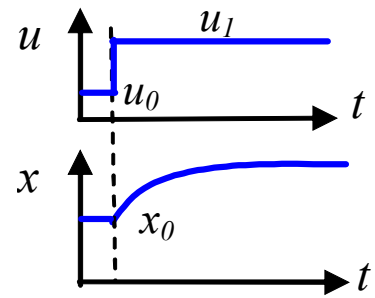
gdzie: $M_1 = C_{vw} s + K_{cg} + K_{cw}$

$M_2 = C_{vg} s + K_{cg} + c_{pw} f_{mg}$

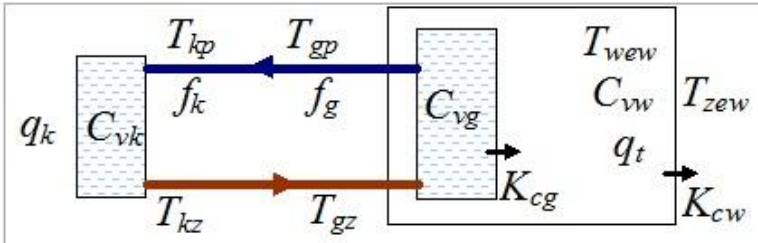








3. Pomieszczenie z grzejnikiem i oddalonym kotłem



Założenia:

$C_{vw} \approx C_{vg}$, $C_{vw} >> C_{vs}$ (C_{vw} z korektą)

$T_{gśr}=T_{gp}$ (doskonałe mieszanie)

$T_{kśr}=T_{kz}$

$f_{mg}=\rho_w f_g$, $f_{mk}=\rho_w f_k$ (przepływ masowy [kg/s])

1) Model[1]

a) nieliniowy z opóźnieniami

$$\begin{cases} C_{vw}\dot{T}_{wew} = K_{cg}\left(T_{gp}-T_{wew}\right)-K_{cw}\left(T_{wew}-T_{zew}\right)+q_t \\ C_{vg}\dot{T}_{gp} = c_{pw}f_{mg}\left(T_{gz}-T_{gp}\right)-K_{cg}\left(T_{gp}-T_{wew}\right) \\ C_{vk}\dot{T}_{kz} = q_k - c_{pw}f_{mk}\left(T_{kz}-T_{kp}\right) \end{cases}$$

oraz $f_{mk}=f_{mg}$, $T_{gz}(t)=T_{kz}(t-T_o)$, $T_{kp}(t)=T_{gp}(t-T_o)$

wy:

T_{wew}, T_{gp}, T_{kz},

we:

q_k, T_{zew}, f_{mg}, q_t

b) nieliniowy bez opóźnień (T_o=0)

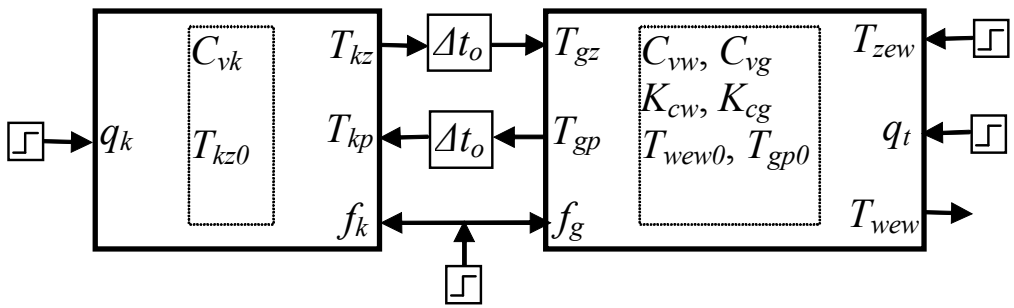
$$\begin{cases} C_{vw}\dot{T}_{wew} = K_{cg}\left(T_{gp}-T_{wew}\right)-K_{cw}\left(T_{wew}-T_{zew}\right)+q_t \\ C_{vg}\dot{T}_{gp} = c_{pw}f_{mg}\left(T_{kz}-T_{gp}\right)-K_{cg}\left(T_{gp}-T_{wew}\right) \\ C_{vk}\dot{T}_{kz} = q_k - c_{pw}f_{mg}\left(T_{kz}-T_{gp}\right) \end{cases}$$

wy:

T_{wew}, T_{gp}, T_{kz},

we:

q_k, T_{zew}, f_{mg}, q_t



3. Pomieszczenie z grzejnikiem i oddalonym kotłem – identyfikacja, punkt pracy

$$\begin{cases} C_{vw}\dot{T}_{wew} = K_{cg}\left(T_{gp} - T_{wew}\right) - K_{cw}\left(T_{wew} - T_{zew}\right) + q_t \\ C_{vg}\dot{T}_{gp} = c_{pw} f_{mg}\left(T_{kz} - T_{gp}\right) - K_{cg}\left(T_{gp} - T_{wew}\right) \\ C_{vk}\dot{T}_{kz} = q_k - c_{pw} f_{mg}\left(T_{kz} - T_{gp}\right) \end{cases}$$

wy:
T_{wew}, T_{gp}, T_{kz},
we:
q_k, T_{zew}, f_{mg}, q_t

Równania statyczne: (założenie: q_t=0 oraz $f_{mk} = f_{mg}$, $T_{kz} = T_{gz}$, $T_{kp} = T_{gp}$)

$$\begin{cases} 0 = K_{cg}\left(T_{gp} - T_{wew}\right) - K_{cw}\left(T_{wew} - T_{zew}\right) \\ 0 = c_{pw} f_{mg}\left(T_{gz} - T_{gp}\right) - K_{cg}\left(T_{gp} - T_{wew}\right) \\ 0 = q_k - c_{pw} f_{mk}\left(T_{kz} - T_{kp}\right) \end{cases}$$

stąd: $$c_{pw} f_{mg}\left(T_{gz} - T_{gp}\right) = K_{cg}\left(T_{gp} - T_{wew}\right) = K_{cw}\left(T_{wew} - T_{zew}\right) = q_k$$

Identyfikacja wartości parametrów:

Dane: T_{zewN} = -20°C, T_{wewN} = 20°C,
T_{gzN} = 90°C, T_{gpN} = 70°C
q_{kN} = 10 kW (zapotrzebowanie pomieszczenia na ciepło)
q_{tN} = 0 (bez dodatkowych źródeł i strat ciepła)

Do wyznaczenia: K_{cw}, K_{cg}, f_{mgN}

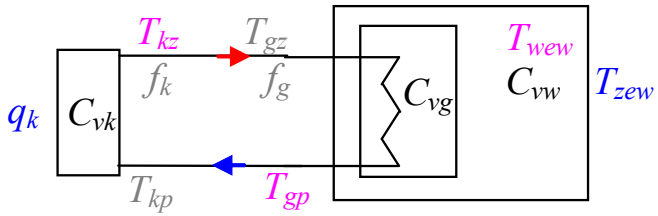
Podstawa:

$$c_{pw} f_{mg}\left(T_{gzN} - T_{gpN}\right) = K_{cg}\left(T_{gpN} - T_{wewN}\right) = K_{cw}\left(T_{wewN} - T_{zewN}\right) = q_{kN}$$

Punkt równowagi:

$$T_{wew} = \frac{q_k}{K_{cw}} + T_{zew}, \quad T_{gp} = \frac{q_k}{K_{cg}} + T_{wew}, \quad T_{gz} = \frac{q_k}{c_{pw} f_{mg}} + T_{gp}$$

3. Pomieszczenie z grzejnikiem i oddalonym kotłem – identyfikacja, punkt pracy



Z1: f_g=f_k= const

we: q_k, T_{zew}; *wy:* T_{wew}, T_{gp}, T_{kz}

$$\begin{cases} C_{vw}\dot{T}_{wew} = K_{cg}\left(T_{gp} - T_{wew}\right) - K_{cw}\left(T_{wew} - T_{zew}\right) \\ C_{vg}\dot{T}_{gp} = c_{pw} f_{mg}\left(T_{gz} - T_{gp}\right) - K_{cg}\left(T_{gp} - T_{wew}\right) \\ C_{vk}\dot{T}_{kz} = q_k - c_{pw} f_{mk}\left(T_{kz} - T_{kp}\right) \end{cases}$$

oraz $T_{gz}(t)=T_{kz}(t-T_o)$, $T_{kp}(t)=T_{gp}(t-To)$

Z2: T_o=0

$$\begin{cases} C_{vw}\dot{T}_{wew} = K_{cg}\left(T_{gp} - T_{wew}\right) - K_{cw}\left(T_{wew} - T_{zew}\right) \\ C_{vg}\dot{T}_{gp} = c_{pw} f_{mg}\left(T_{kz} - T_{gp}\right) - K_{cg}\left(T_{gp} - T_{wew}\right) \\ C_{vk}\dot{T}_{kz} = q_k - c_{pw} f_{mk}\left(T_{kz} - T_{gp}\right) \end{cases}$$

$$c_{pw} f_{gm}\left(T_{kz} - T_{gp}\right) = K_{cg}\left(T_{gp} - T_{wew}\right) = K_{cw}\left(T_{wew} - T_{zew}\right) = q_k$$

Równania stanu: $\dot{\mathbf{x}} = \mathbf{A}\mathbf{x} + \mathbf{B}\mathbf{u}$

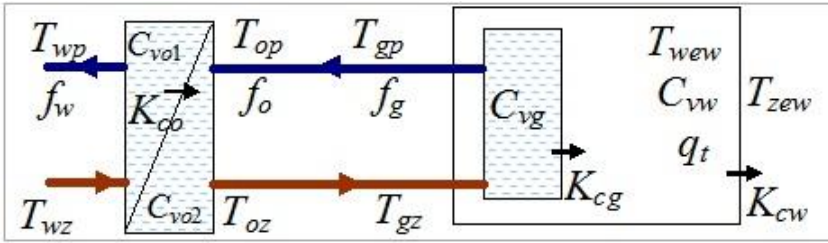
$$\begin{bmatrix} \dot{T}_{wew} \\ \dot{T}_{gp} \\ \dot{T}_{kz} \end{bmatrix} = [\ ] \begin{bmatrix} T_{wew} \\ T_{gz} \\ T_{kz} \end{bmatrix} + [\ ] \begin{bmatrix} q_k \\ T_{zew} \end{bmatrix}$$

Równania statyczne: $0 = \mathbf{A}\mathbf{x} + \mathbf{B}\mathbf{u}$

$$\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} = [\ ] \begin{bmatrix} T_{wew} \\ T_{gz} \\ T_{kz} \end{bmatrix} + [\ ] \begin{bmatrix} q_k \\ T_{zew} \end{bmatrix}$$

Punkt równowagi: $\mathbf{x} = -\mathbf{A}^{-1}\mathbf{B}\mathbf{u}$

4. Pomieszczenie z grzejnikiem i oddalonym węzłem ciepłowniczym



Założenia:

$C_{vw} \approx C_{vg} \approx C_{vo1} \approx C_{vo2}$ (C_{vw} z korektą od C_{vs})

$T_{gśr}=T_{gp}$, $T_{ośr}=T_{oz}$, $T_{wśr}=T_{wp}$

$f_{mg}=\rho_w f_g$, $f_{mo}=\rho_w f_o$, $f_{mw}=\rho_w f_w$

1) Model (nieliniowy z opóźnieniami)[1]

$$\begin{cases} C_{vw}\dot{T}_{wew} = K_{cg}\left(T_{gp}-T_{wew}\right)-K_{cw}\left(T_{wew}-T_{zew}\right)+q_t \\ C_{vg}\dot{T}_{gp} = c_{pw}f_{mg}\left(T_{gz}-T_{gp}\right)-K_{cg}\left(T_{gp}-T_{wew}\right) \\ C_{vo2}\dot{T}_{oz} = K_{co}\left(T_{wp}-T_{oz}\right)-c_{pw}f_{mo}\left(T_{oz}-T_{op}\right) \\ C_{vo1}\dot{T}_{wp} = c_{pw}f_{mw}\left(T_{wz}-T_{wp}\right)-K_{co}\left(T_{wp}-T_{oz}\right) \end{cases}$$

oraz $f_{mo}=f_{mg}$, $T_{gz}(t)=T_{oz}(t-T_o)$, $T_{op}(t)=T_{gp}(t-T_o)$

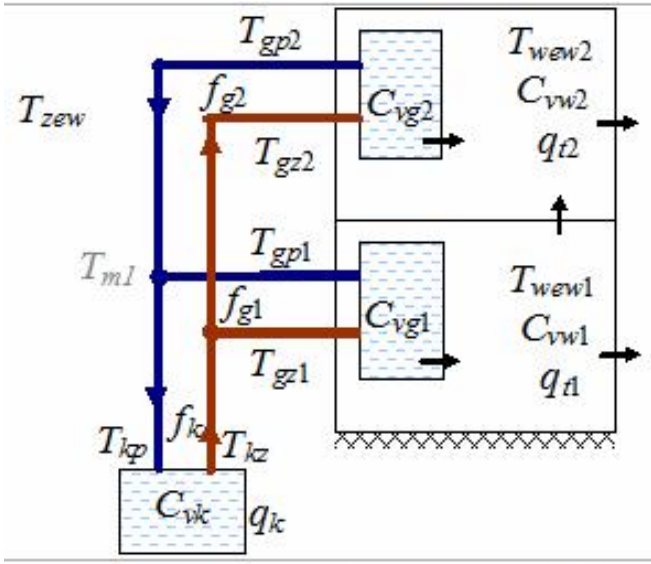
wy:

T_{wew}, T_{gp}, T_{oz}, T_{wp}

we:

T_{wz}, T_{zew},
f_{mg}, f_{mw}, q_t

5. Budynek z kotłownią



Rys. I.41.Budynek (2x2) i kocioł

Założenia:

C_{vw}, C_{vg}, C_{vk} (C_{vw} z korektą $C_{vw}\approx C_{vg}$)

$T_{gśr}=T_{gp}$, $T_{kśr}=T_{kz}$, przepływy masowe $f_{mx}=\rho_w f_x$

Przenikanie ciepła przez:
- zewnętrzne ściany (K_{cw1}, K_{cw2})
- pomiędzy piętrami (K_{cp})
- ściany grzejnika (K_{cg1}, K_{cg2})

T_o - opóźnienie transportowe w pionach

Składniki modelu: budynek (I-6), kocioł (I-10), przewody

1) Model podstawowy (liniowy/nieliniowy)[7]

a) stałe opóźnienia transportowe

$$\begin{cases} C_{vw1}\dot{T}_{wew1} = K_{cg1}\left(T_{gp1}-T_{wew1}\right)-K_{cw1}\left(T_{wew1}-T_{zew}\right)-K_{cp}\left(T_{wew1}-T_{wew2}\right)+q_{t1} \\ C_{vg1}\dot{T}_{gp1} = c_{pw}f_{mg1}\left(T_{gz1}-T_{gp1}\right)-K_{cg1}\left(T_{gp1}-T_{wew1}\right) \\ C_{vw2}\dot{T}_{wew2} = K_{cg2}\left(T_{gp2}-T_{wew2}\right)-K_{cw2}\left(T_{wew2}-T_{zew}\right)+K_{cp}\left(T_{wew1}-T_{wew2}\right)+q_{t2} \\ C_{vg2}\dot{T}_{gp2} = c_{pw}f_{mg2}\left(T_{gz2}-T_{gp2}\right)-K_{cg2}\left(T_{gp2}-T_{wew2}\right) \\ C_{vk}\dot{T}_{kz} = q_k - c_{pw}f_{mk}T_{kz}+c_{pw}f_{mk}T_{kp} \end{cases} \quad \text{(I-27)}$$

oraz $f_{mk}=f_{mg1}+f_{mg2}$, $T_{gz1}(t)=T_{kz}(t\text{-}T_o)$, $T_{gz2}(t)=T_{kz}(t\text{-}2T_o)$,

$T_{m1}(t)=\left(T_{gp1}(t)\,f_{mg1}(t)+T_{gp2}(t\text{-}T_o)\,f_{mg2}(t)\right)/f_{mk}(t)$, $T_{kp}(t)=T_{m1}(t\text{-}T_o)$,

wy: T_{wew1}, T_{gp1}, T_{wew2}, T_{gp2}, T_{kz} we: q_k, T_{zew}, f_{mg1}, f_{mg2}, q_{t1}, q_{t2}, (CV=q_k)

5. Budynek z kotłownią - identyfikacja

Równania statyczne: (założenie $q_{t1}= q_{t2}=0$)

$$\begin{cases} 0 = K_{cg1}\left(T_{gp1} - T_{wew1}\right) - K_{cw1}\left(T_{wew1} - T_{zew}\right) - K_{cp}\left(T_{wew1} - T_{wew2}\right) + q_{t1} \\ 0 = c_{pw} f_{mg1}\left(T_{kz} - T_{gp1}\right) - K_{cg1}\left(T_{gp1} - T_{wew1}\right) \\ 0 = K_{cg2}\left(T_{gp2} - T_{wew2}\right) - K_{cw2}\left(T_{wew2} - T_{zew}\right) + K_{cp}\left(T_{wew1} - T_{wew2}\right) + q_{t2} \\ 0 = c_{pw} f_{mg2}\left(T_{kz} - T_{gp2}\right) - K_{cg2}\left(T_{gp2} - T_{wew2}\right) \\ 0 = q_k - c_{pw}\left(f_{mg1} + f_{mg2}\right)T_{kz} + c_{pw}\left(f_{mg1}T_{gp1} + f_{mg2}T_{gp2}\right) \end{cases}$$

stąd:

$$c_{pw} f_{mg1}\left(T_{kz} - T_{gp1}\right) = K_{cg1}\left(T_{gp1} - T_{wew1}\right) = K_{cw1}\left(T_{wew1} - T_{zew}\right) + K_{cp}\left(T_{wew1} - T_{wew2}\right) \quad [=q_{g1}]$$

$$c_{pw} f_{mg2}\left(T_{kz} - T_{gp2}\right) = K_{cg2}\left(T_{gp2} - T_{wew2}\right) = K_{cw2}\left(T_{wew2} - T_{zew}\right) - K_{cp}\left(T_{wew1} - T_{wew2}\right) \quad [=q_{g2}]$$

$$c_{pw}\left(f_{mg1} + f_{mg2}\right)T_{kz} - c_{pw}\left(f_{mg1}T_{gp1} + f_{mg2}T_{gp2}\right) = q_k \quad [= q_{g1} + q_{g2}]$$

Identyfikacja wartości parametrów

Dane: T_{zewN} = -20°C,

T_{kzN} = 90°C, T_{kpN} = 70°C

q_{kN} = 10 kW (zapotrzebowanie budynku na ciepło)

$q_{t1N} = q_{t2N} = 0$ (bez dodatkowych źródeł i strat ciepła)

a) $T_{wew1N} = T_{wew2N}$ = 20°C, $T_{gp1N} = T_{gp2N} = T_{kpN}$

- zapotrzebowanie pomieszczenia 2 jest o 20% większe (q_{g2N} = 1,2 q_{g1N})
- ściana pomiędzy pomieszczeniami jest o połowę cieńsza niż ściany zewnętrzne

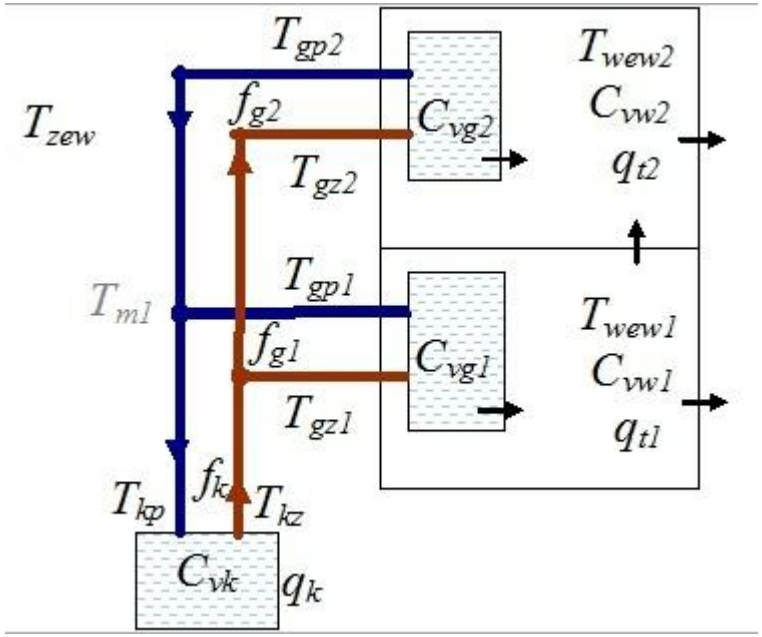
Do wyznaczenia: $K_{cw1}, K_{cg1}, f_{mg1N}, K_{cw2}, K_{cg2}, f_{mg2N}, K_{cp}$,

b) T_{wew1N}=20°C, T_{wew2N} = 18°C, $f_{mg1N} = f_{mg2N}$ = 0,5 f_{mkN}

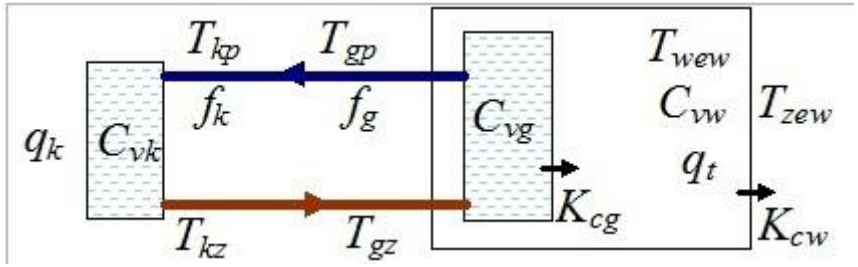
- pomieszczenie 1 traci na zewnątrz 80% ciepła (20% przekazuje do pomieszczenia 2)
- ściana pomiędzy pomieszczeniami jest o połowę cieńsza niż ściany zewnętrzne

Do wyznaczenia: $K_{cw1}, K_{cg1}, T_{gp1N}, K_{cw2}, K_{cg2}, T_{gp2N}, K_{cp}$,

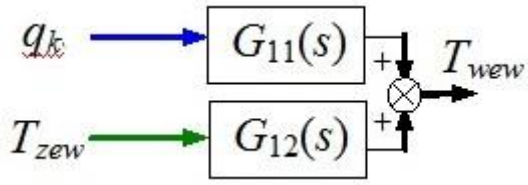
Warunki badań



Obiekt „rzeczywisty”



Opis (model) przybliżony



Model obiektu (zidentyfikowany)

- w.teoretyczne - narzędzie na modelu, wyniki zastosowane na modelu,
- **w.rzeczywiste - narzędzie na modelu, wyniki zastosowane na obiekcie,**
- w.symulacyjne - narzędzie uruchamiane na obiekcie.