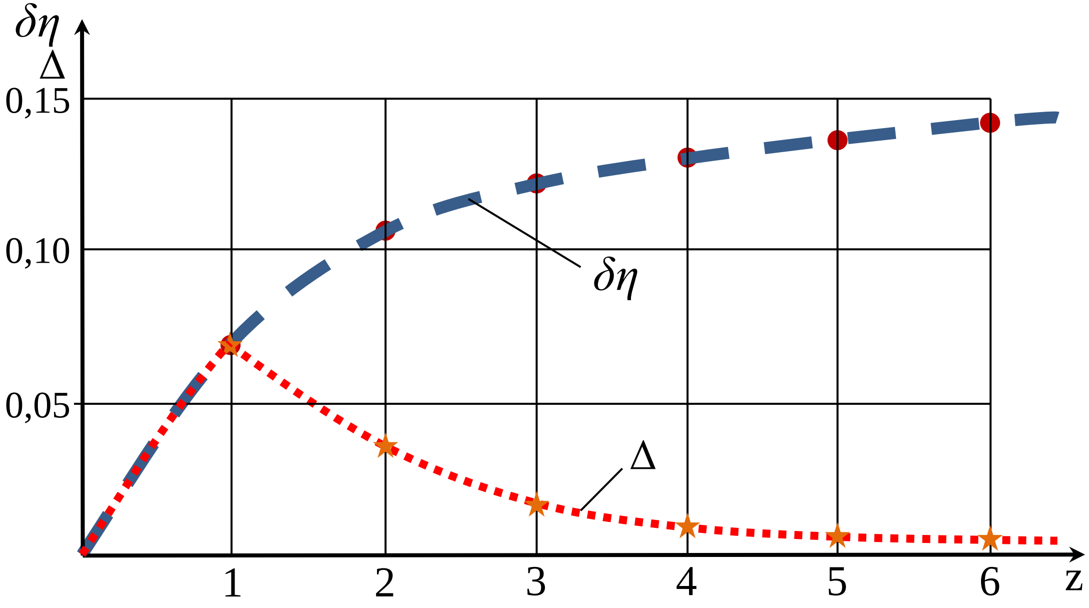
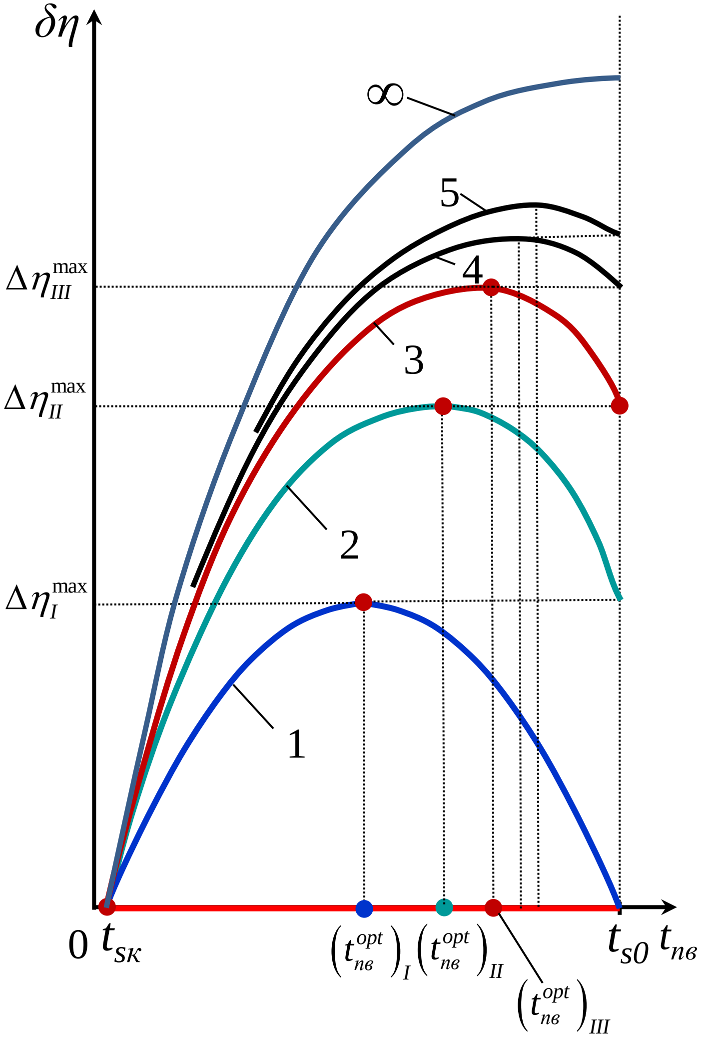
Generalizing conclusions



$$\Delta = \delta\eta_j - \delta\eta_{(j-1)}$$



(≈) Feed water optimal temperature

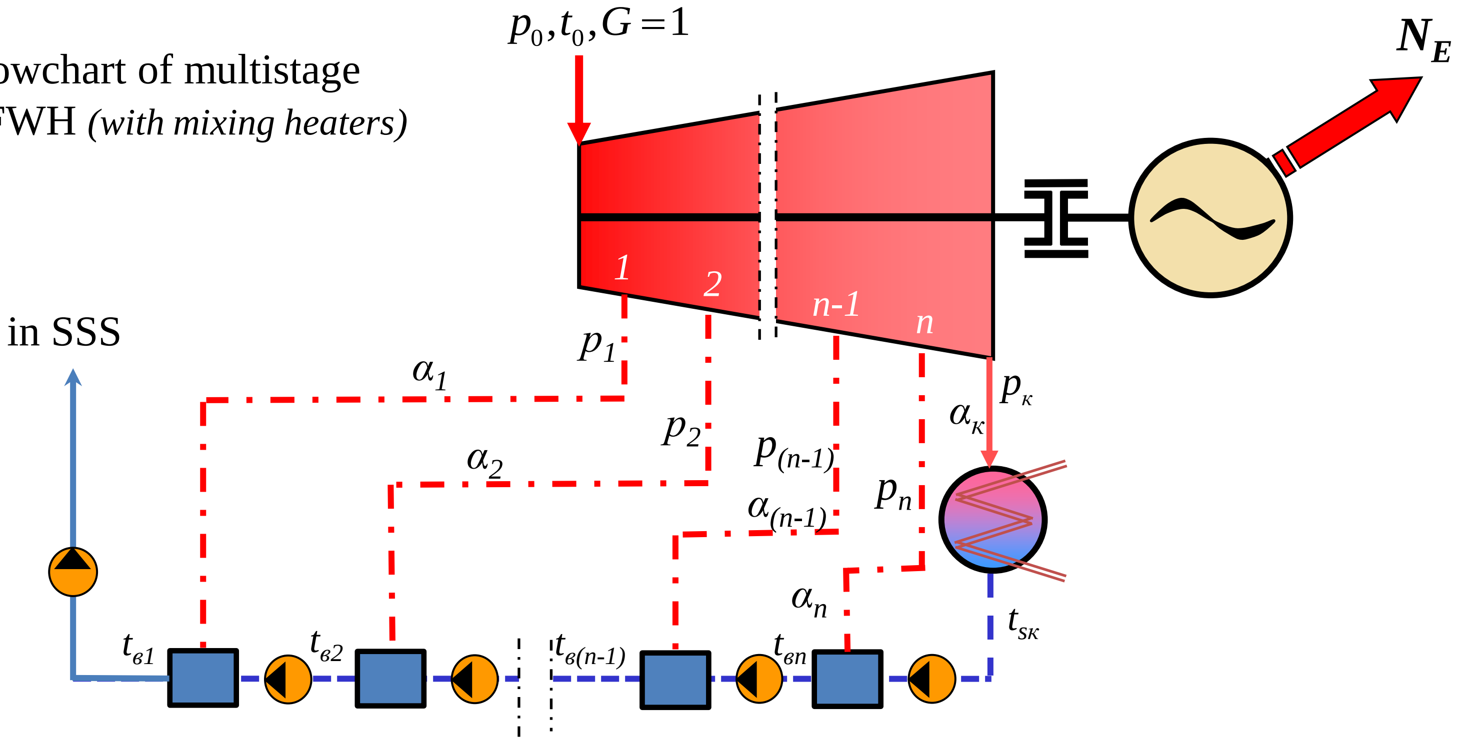
$$\left(t_{пв}^{opt}\right)_Z = t_{sк} + \frac{z}{z+1}\left(t_{s0} - t_{sк}\right)$$

(≈) Optimal water heating of the regenerative feed water heating stage

$$\left(\Delta t_{в}\right)_j^{opt} = t_{вj} - t_{в(j+1)} = \frac{\left(t_{пв} - t_{sк}\right)}{z}$$

2.5.3. Determination of steam flow for the turbine with RFWH

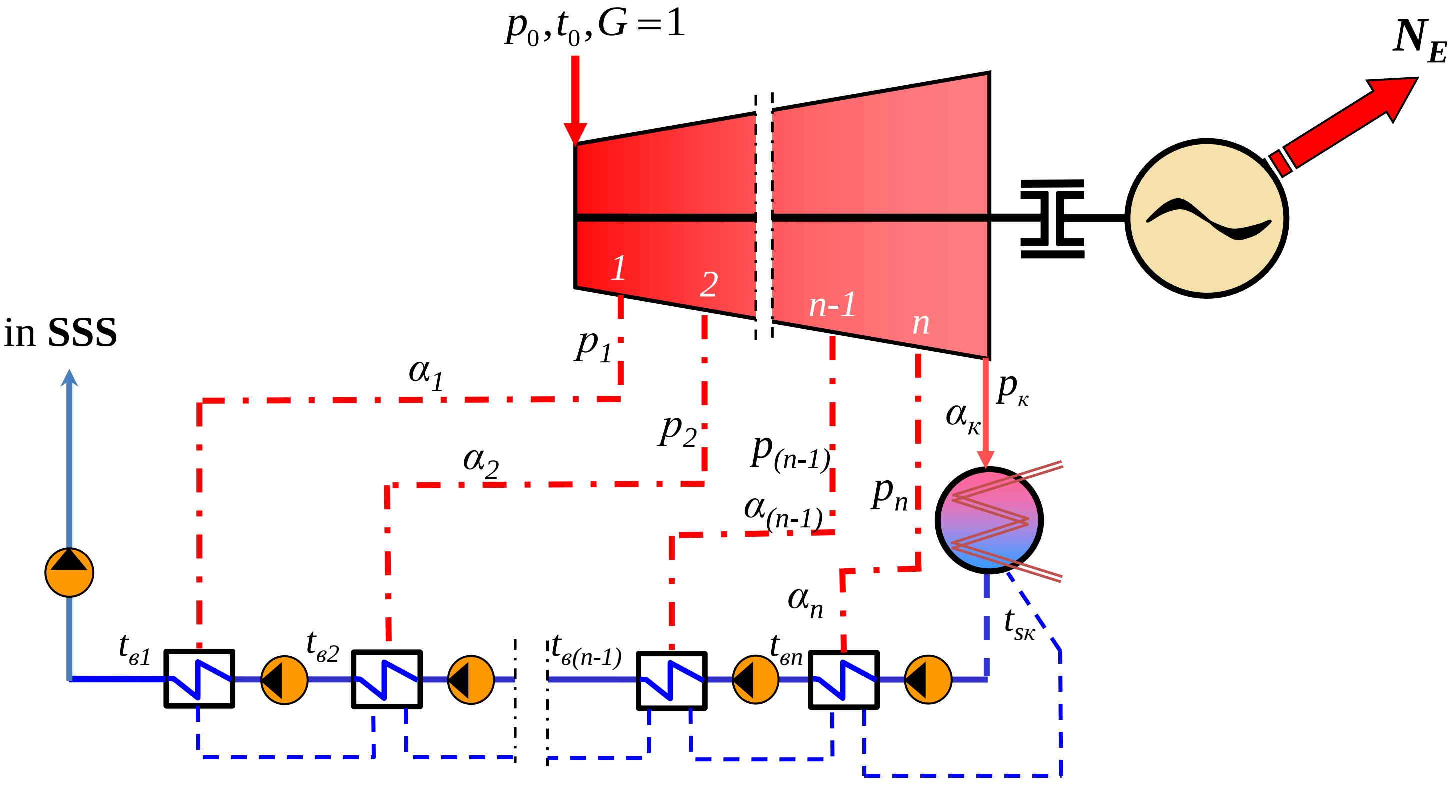
Flowchart of multistage
RFWH *(with mixing heaters)*



Heaters used in RFWH flowcharts:

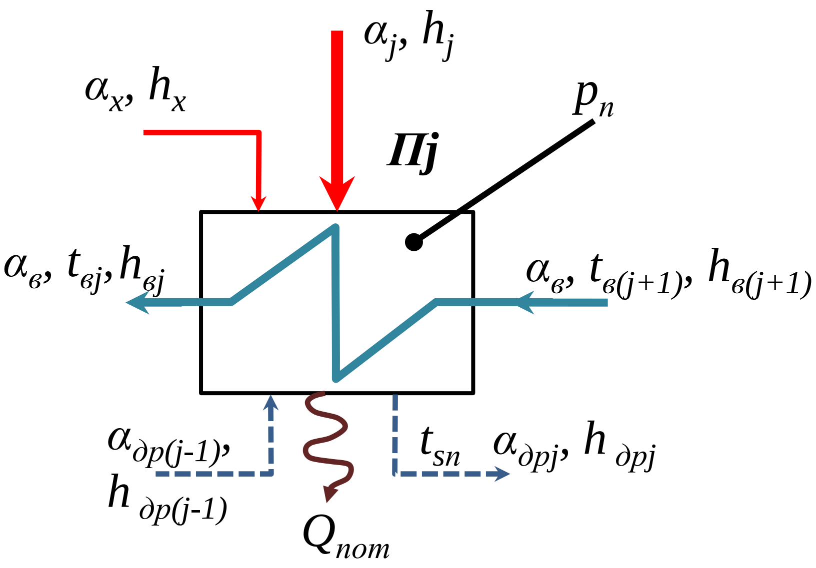
- closed heaters
- mixing heaters

Cycle arrangement of the multistage RFWH *(with closed heaters)*



Cascaded drain is used in the cycle with closed heaters

Closed heater



$$\alpha_{\partial pj} = \alpha_j + \alpha_x + \alpha_{\partial p(j-1)}$$

$$h_{\partial pj} = h'_j = f(p_n)$$

$$t_{\text{в}j} = t_{sn} - \Theta_n$$

$$\Theta_n = (2 \div 7)^\circ C$$

$$h_{\text{в}} = f\left(t_{\text{в}}, p_{\text{в}}\right)$$

Heat balance equation for the heater *(conservation of energy)*

For a closed heater, it can be formulated as

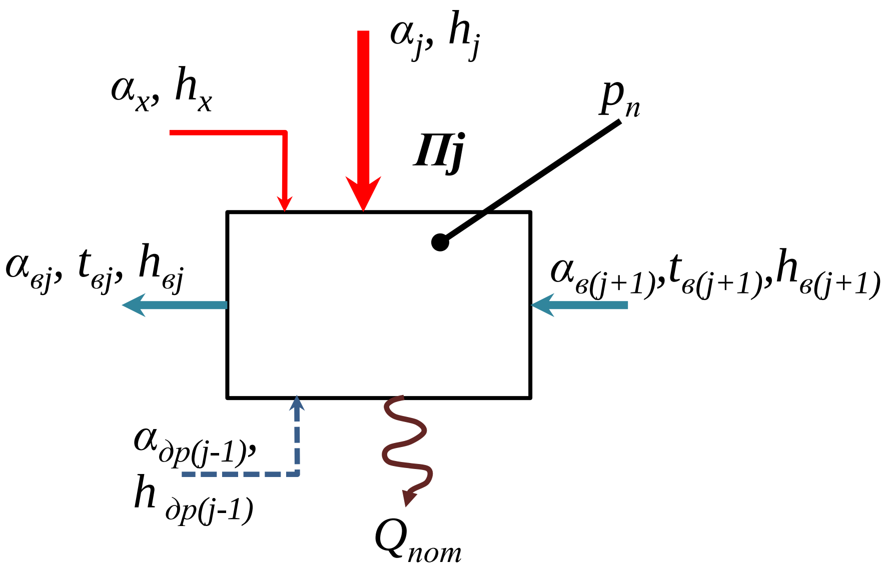
- *the amount of heat released is equal to the amount of heat absorbed*

$$\alpha_j\left(h_j - h_{\partial pj}\right) + \alpha_x\left(h_x - h_{\partial pj}\right) + \alpha_{\partial p(\mathrm{j}-1)}\left(h_{\partial p(j-1)} - h_{\partial pj}\right) = \alpha_{\text{в}}\left(h_{\text{в}j} - h_{\text{в}(j+1)}\right)\frac{1}{\eta_n}$$

$$\eta_n = \left(0{,}98 \div 0{,}99\right)$$

$$\alpha_j = \frac{\alpha_{\text{в}}\left(h_{\text{в}j} - h_{\text{в}(j+1)}\right)\frac{1}{\eta_n} - \alpha_x\left(h_x - h_{\partial pj}\right) - \alpha_{\partial p(\mathrm{j}-1)}\left(h_{\partial p(j-1)} - h_{\partial pj}\right)}{\left(h_j - h_{\partial pj}\right)}$$

Mixing heater



$$t_{вj} = t_{sn} - \Theta_{см} = t_{sn}, \qquad \text{т.к.} \quad \Theta_{см} \approx 0$$

$$h_в = h'_в = f\left(p_n\right)$$

Material balance equation for the heater:

$$\boxed{\alpha_{вj} = \alpha_{в(j+1)} + \alpha_j + \alpha_x + \alpha_{\partial p(j-1)}}$$

Heat balance equation for the heater *(conservation of energy)*

For a mixing heater, it can be formulated as:

-the amount of heat absorbed is equal to the amount of heat released

$$\boxed{\alpha_{в(j+1)} h_{в(j+1)} + \alpha_j h_j + \alpha_x h_x + \alpha_{\partial p(j-1)} h_{\partial p(j-1)} = \alpha_в h_{вj} \frac{1}{\eta_n}}$$

$$\eta_n = \left(0{,}98 \div 0{,}99\right)$$

$$\alpha_j = \frac{\alpha_{в(j+1)}\left(\dfrac{h_{вj}}{\eta_n} - h_{в(j+1)}\right) + \alpha_x\left(\dfrac{h_{вj}}{\eta_n} - h_x\right) + \alpha_{\partial p(j-1)}\left(\dfrac{h_{вj}}{\eta_n} - h_{\partial pj}\right)}{\left(h_j - \dfrac{h_{вj}}{\eta_n}\right)}$$