6 Dynamic model

6.0.2 MESH equations

$$\frac{\mathrm{d}m_{ij}}{\mathrm{d}t} = \left(1+s_j^V\right)\cdot V_j \cdot y_{i,j} + \left(1+s_j^L\right)\cdot L_j \cdot x_{i,j} - V_{j+1}\cdot y_{i,j+1} - L_{j-1}\cdot x_{i,j-1} - \sum_{k=1}^{F^V}\zeta_{kj}\cdot F_j^V \cdot z_{i,j}^V - \sum_{l=1}^{F^L}\zeta_{lj}\cdot F_j^L\cdot z_{i,j}^L - \zeta_j^R\cdot V_N\cdot y_{iN}, \quad i=1\ldots C,\quad j=1\ldots N,\quad k=1\ldots F^V,\quad l=1\ldots F^L. \tag{6.1}$$

$$y_{ij} = K_{ij}\cdot x_{ij}, \qquad i=1\ldots C,\quad j=1\ldots N. \tag{6.2}$$

$$\frac{\mathrm{d}H_j}{\mathrm{d}t} = \left(1+s_j^V\right)\cdot V_j \cdot h_j^V + \left(1+s_j^L\right)\cdot L_j \cdot h_j^L - V_{j+1}\cdot h_{j+1}^V - L_{j-1}\cdot h_{j-1}^L - \sum_{k=1}^{F^V}\zeta_{kj}\cdot F_k^V \cdot h_j^{FV} - \sum_{l=1}^{F^L}\zeta_{lj}\cdot F_j^L\cdot h_j^{FL} - \zeta_j^R\cdot V_N\cdot h_N^V, \quad i=1\ldots C,\quad j=1\ldots N,\quad k=1\ldots F^V,\quad l=1\ldots F^L. \tag{6.3}$$

6.0.3 Liquid holdup & pressure drop

Structured packings

equation for dimensionless holdup

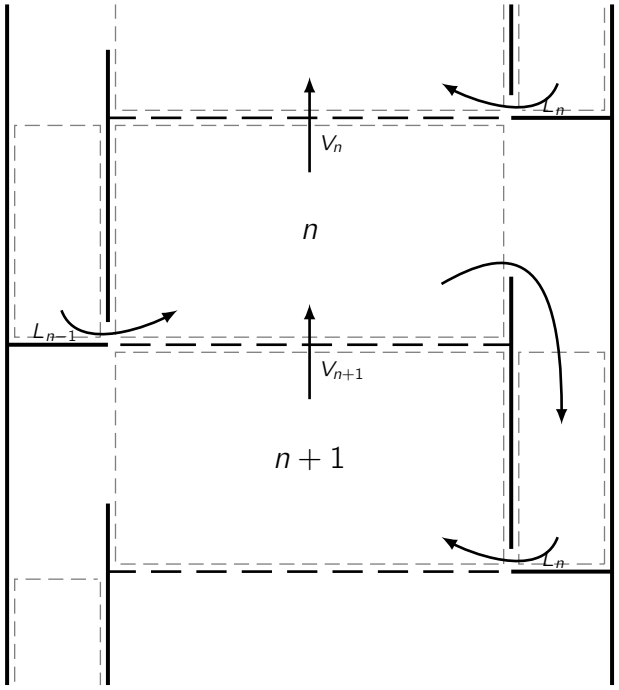
$$h_t = \left(\frac{4F_t}{S}\right)^{\frac{2}{3}}\sqrt[3]{\frac{3\mu_L v_{LS}}{\varrho_L \sin(\theta)\varepsilon g_{eff}}} \tag{6.4}$$

correction factor for liquid holdup calculated ba Shi/Mersmann equation

$$F_{t,S-M} = \frac{29.12\,(We_L\,Fr_L)^{0.15}S^{0.359}}{Re_L^{0.2}\varepsilon^{0.6}(1-0.93\cos\gamma)(\sin\theta)^{0.3}} \tag{6.5}$$

$$g_{eff} = g\left(\frac{\varrho_L-\varrho_g}{\varrho_L}\right)\left[1-\left(\frac{\Delta p/\Delta Z}{(\Delta p/\Delta Z)_{flood}}\right)\right] \tag{6.6}$$

$$\cos\gamma = \begin{cases} 0.9 & \text{if} \quad \sigma \le 0.055\frac{N}{m} \\ 5.211\cdot 10^{-16.835\sigma} & \text{if} \quad \sigma > 0.055\frac{N}{m} \end{cases} \tag{6.7}$$



$$Re_L = \frac{\varrho_L v_L D}{\mu_L} \tag{6.8}$$

$$We_L = \frac{\varrho_L v_L^2 D}{\sigma} \tag{6.9}$$

$$Fr_L = \tag{6.10}$$

dry pressure drop with correlated friction factor funktion...

$$\frac{\Delta p}{\Delta Z} = \underbrace{\frac{0.177\varrho_g}{S\varepsilon^2(\sin\theta)^2}}_{A} \cdot v_{gS}^2 + \underbrace{\frac{88.774\mu_g}{S^2\varrho\sin\theta}}_{A} \cdot v_{gS} = Av_{gS}^2 + Bv_{gS} \tag{6.11}$$

Todo list