DISEÑO DE COLUMNAS DE PISOS

Calculados previamente → V_n, L_n, V_m, L_m, M, N

Faltan por calcular → D, H

Eficacias de pisos: $(M+N)_{real}$

Capacidad de los pisos: D**, espaciado entre pisos,** H

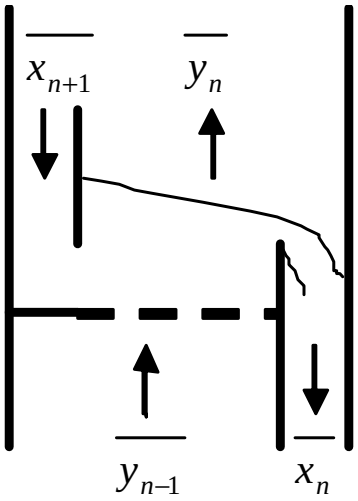
EFICACIAS DE PISOS

Eficacia global E_T

$$E_T = \frac{N_{teóricos}}{N_{reales}}$$

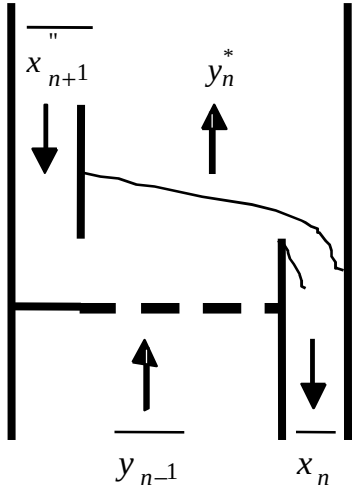
EFICACIAS DE PISOS

Eficacia individual de Murphree E_{MV}



Piso real

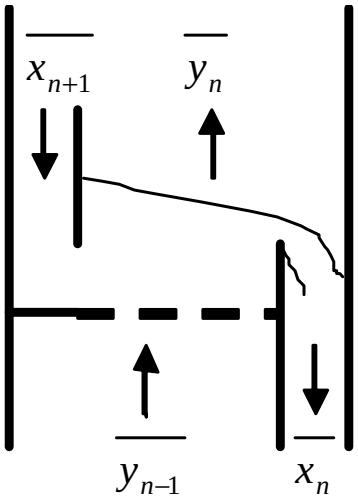
$$E_{MV} = \frac{\overline{y_n} - \overline{y_{n-1}}}{\overline{\overline{y_n^*}} - \overline{y_{n-1}}}$$



Piso ideal

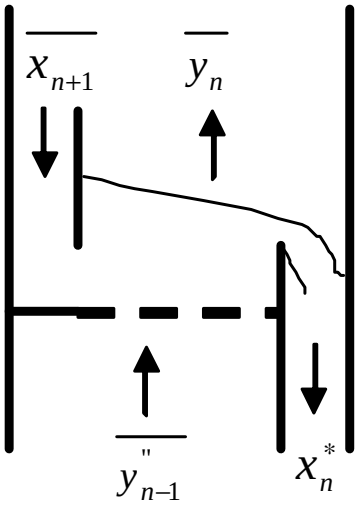
EFICACIAS DE PISOS

Eficacia individual de Murphree E_{ML}



Piso real

$$E_{ML} = \frac{\overline{x}_{n+1} - \overline{x}_n}{\overline{x}_{n+1} - x_n^*}$$



Piso ideal

EFICACIAS DE PISOS

Eficacias individuales de Murphree E_{MV}, E_{ML}

$$y_n^* = m\,\overline{x_n} + b$$

$$\overline{y_n} = m\,x_n^* + b$$

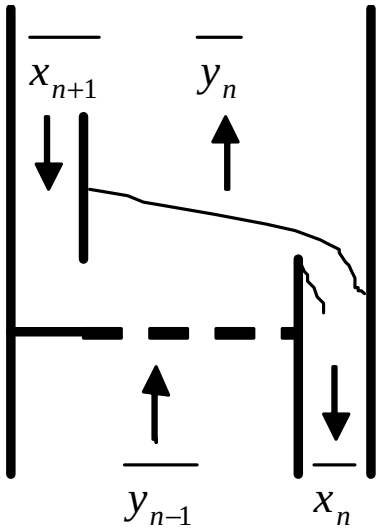
$$\lambda = \frac{mV}{L}$$

$$E_{MV} = \frac{E_{ML}}{E_{ML} + \lambda\left(1 - E_{ML}\right)}$$

$$E_{ML} = \frac{\lambda\,E_{MV}}{\lambda\,E_{MV} + \left(1 - E_{MV}\right)}$$

EFICACIAS DE PISOS

Eficacia de Hausen E_{HV}, E_{HL}

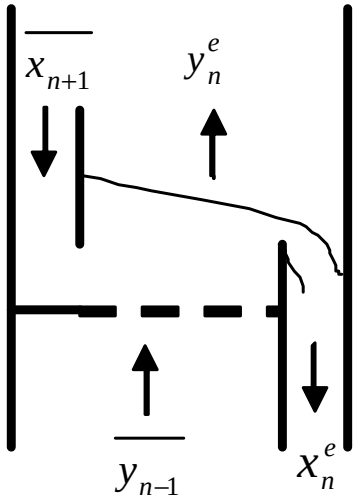


Piso real

$$E_{HV} = \frac{\overline{y_n} - \overline{y_{n-1}}}{y_n^e - \overline{y_{n-1}}}$$

$$E_{HL} = \frac{\overline{x_{n+1}} - \overline{x_n}}{\overline{x_{n+1}} - x_n^e}$$

$$E_{HV} = E_{HL} = E_H$$



Piso ideal

EFICACIAS DE PISOS

Eficacias de Standard E_S , E_{Si} , E_{SH}

Materia total

$$E_S = \frac{V_n - V_{n-1}}{V_n^e - V_{n-1}} = \frac{L_{n+1} - L_n}{L_{n+1} - L_n^e}$$

Componente

$$E_{Si} = \frac{V_n \overline{y_n} - V_{n-1} \overline{y_{n-1}}}{V_n^e \overline{y_n^e} - V_{n-1} \overline{y_{n-1}}} = \frac{L_{n+1} \overline{x_{n+1}} - L_n \overline{x_n}}{L_{n+1} x_{n+1} - L_n^e x_n^e}$$

Entalpía

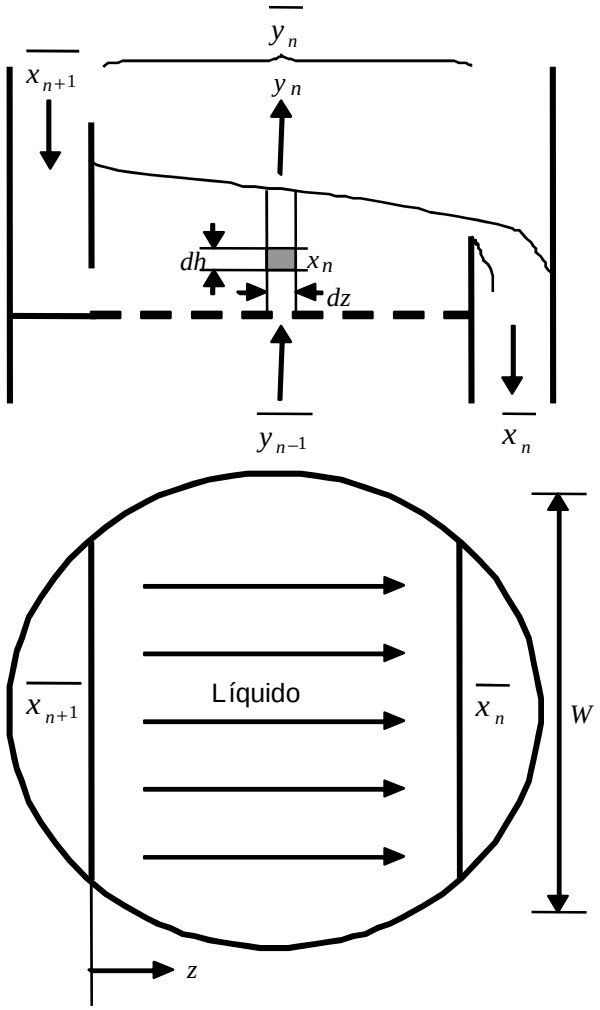
$$E_{SH} = \frac{V_n H_n - V_{n-1} H_{n-1} + r_n Q_n}{V_n^e H_n^e - V_{n-1} H_{n-1} + r_n Q_n} = \frac{L_{n+1} h_{n+1} - L_n h_n + (1 - r_n) Q_n}{L_{n+1} h_{n+1} - L_n^e h_n^e + (1 - r_n) Q_n}$$

EFICACIAS DE PISOS

Eficacia puntual E_{OV}, E_{OL}

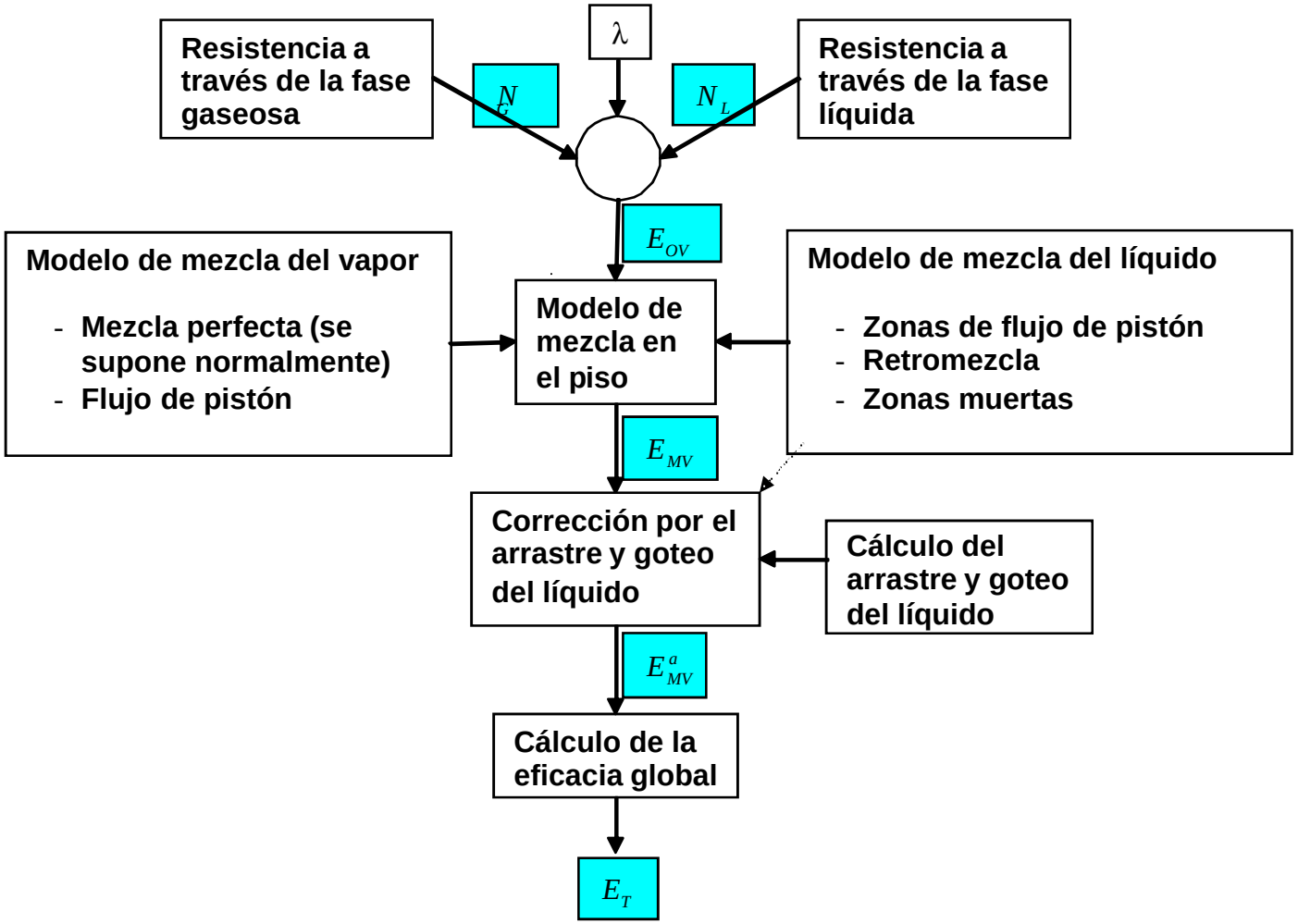
$$E_{OV} = \frac{y_n - \overline{y_{n-1}}}{y^* - \overline{y_{n-1}}}$$

$$E_{OL} = \frac{\overline{x_{n+1}} - x_n}{\overline{x_{n+1}} - x^*}$$



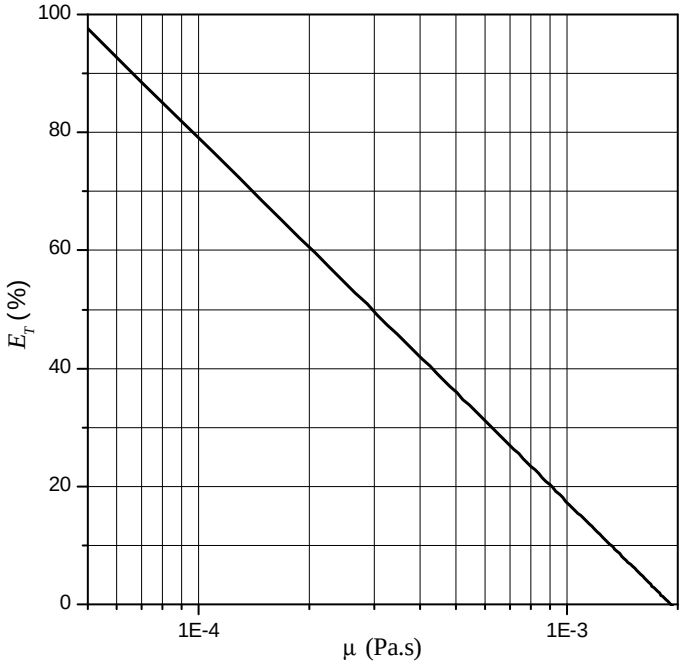
EFICACIAS DE PISOS

Predicción teórica



EFICACIAS DE PISOS

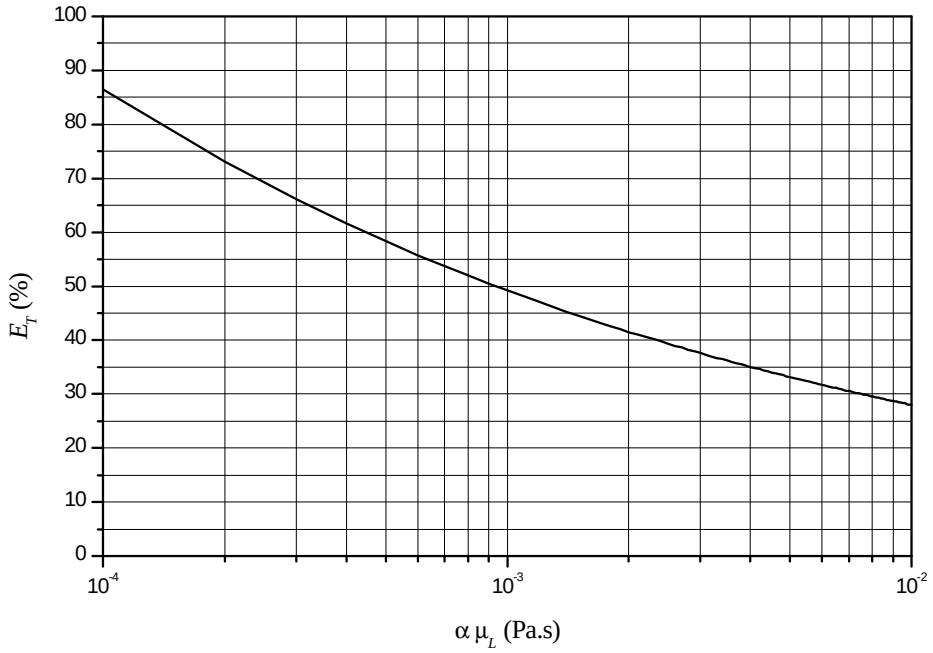
Correlación de Drickramer - Bradford



$$E_T = -167{,}668 - 61{,}6855 \log(\mu_L)$$

EFICACIAS DE PISOS

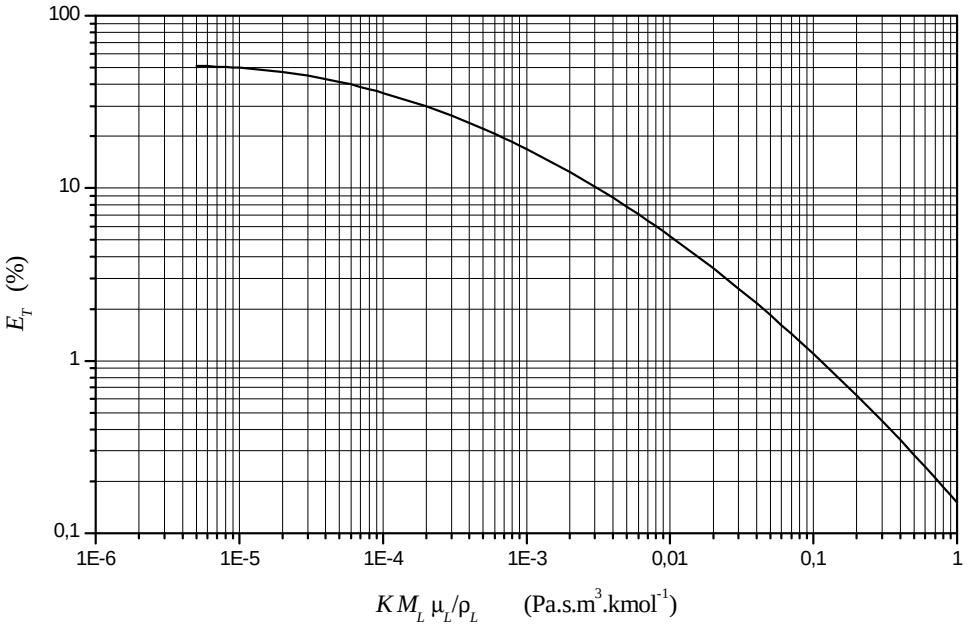
Correlación de O'Connell



$$E_T = 9{,}06\,(\alpha\,\mu_L)^{-0{,}245}$$

EFICACIAS DE PISOS

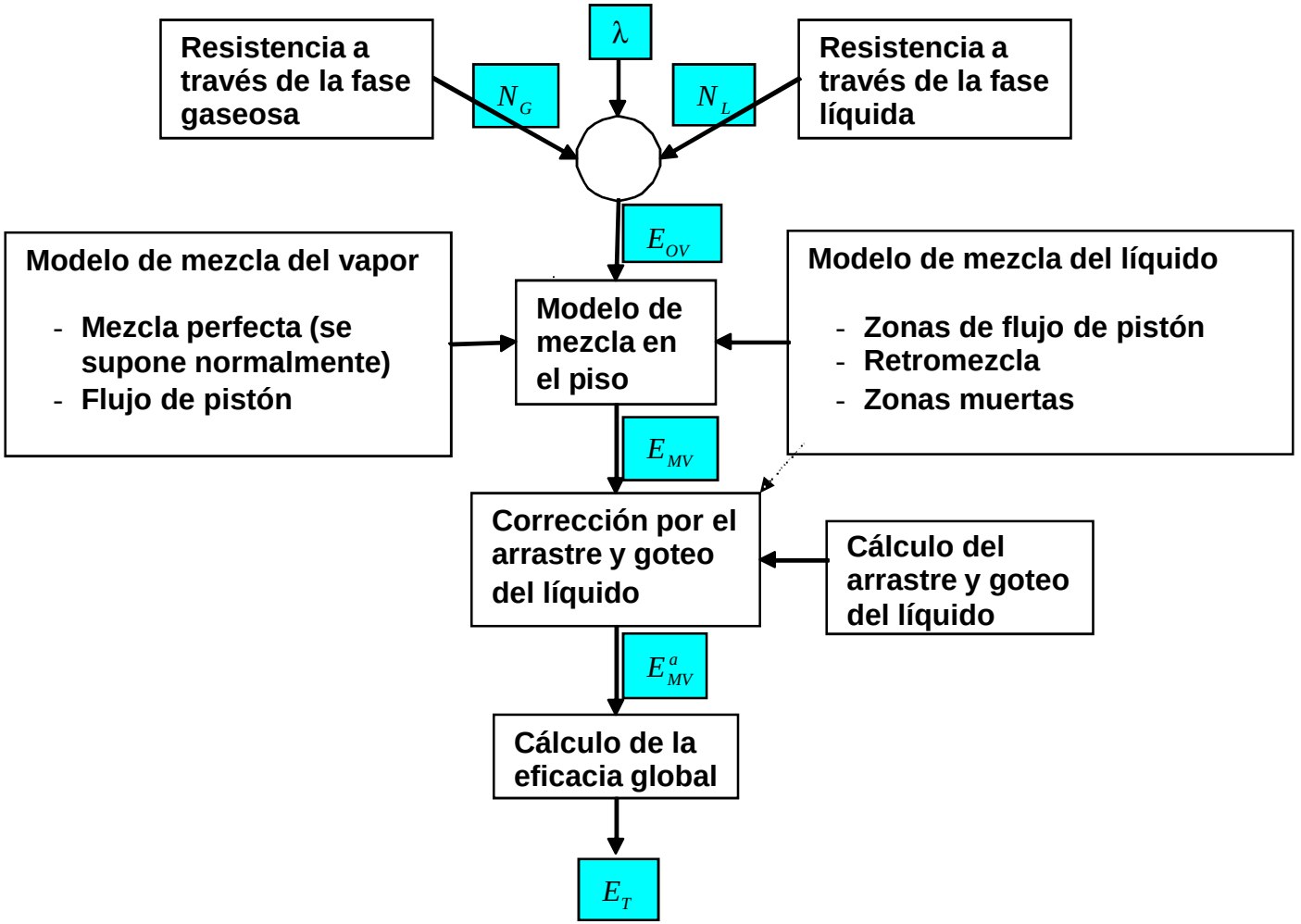
Correlación de O'Connell



$$\log E_T = -0{,}82375 - 0{,}95247 \log\left(\frac{K\ M_L\ \mu_L}{\rho_L}\right) - 0{,}0896\left[\log\left(\frac{K\ M_L\ \mu_L}{\rho_L}\right)\right]^2$$

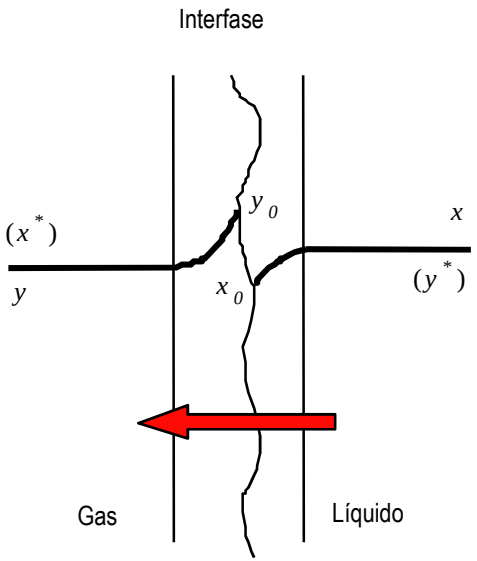
EFICACIAS DE PISOS

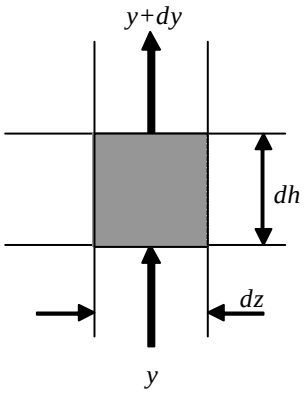
Predicción teórica

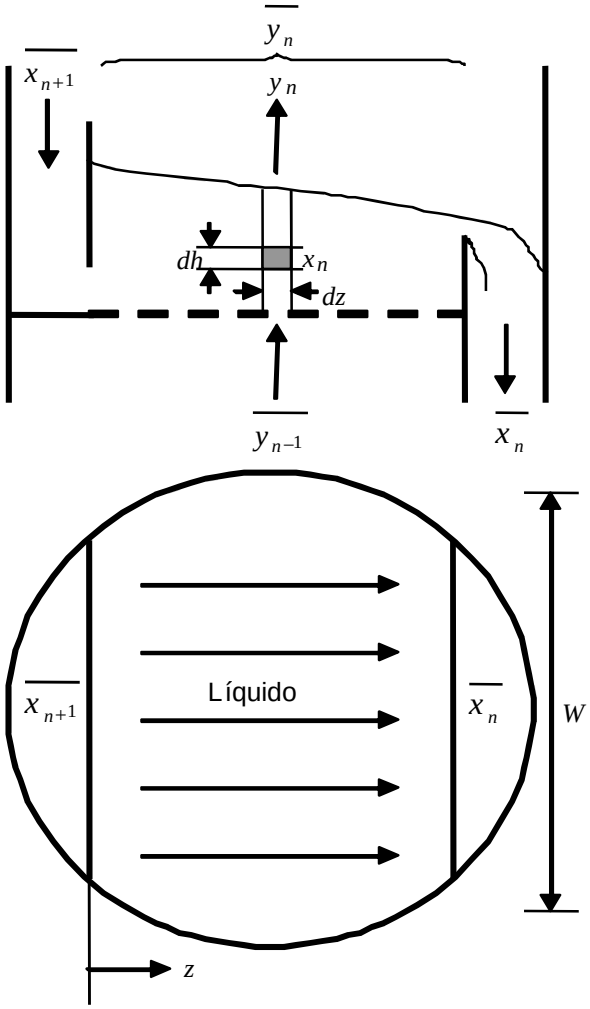


EFICACIAS DE PISOS

Eficacia puntual







EFICACIAS DE PISOS

Eficacia puntual

$$h = H_{GT}\, N_{GT} = \frac{(V/S)}{K_G\, a\, P} \int_{y_{n-1}}^{y_n} \frac{dy}{y^* - y}$$

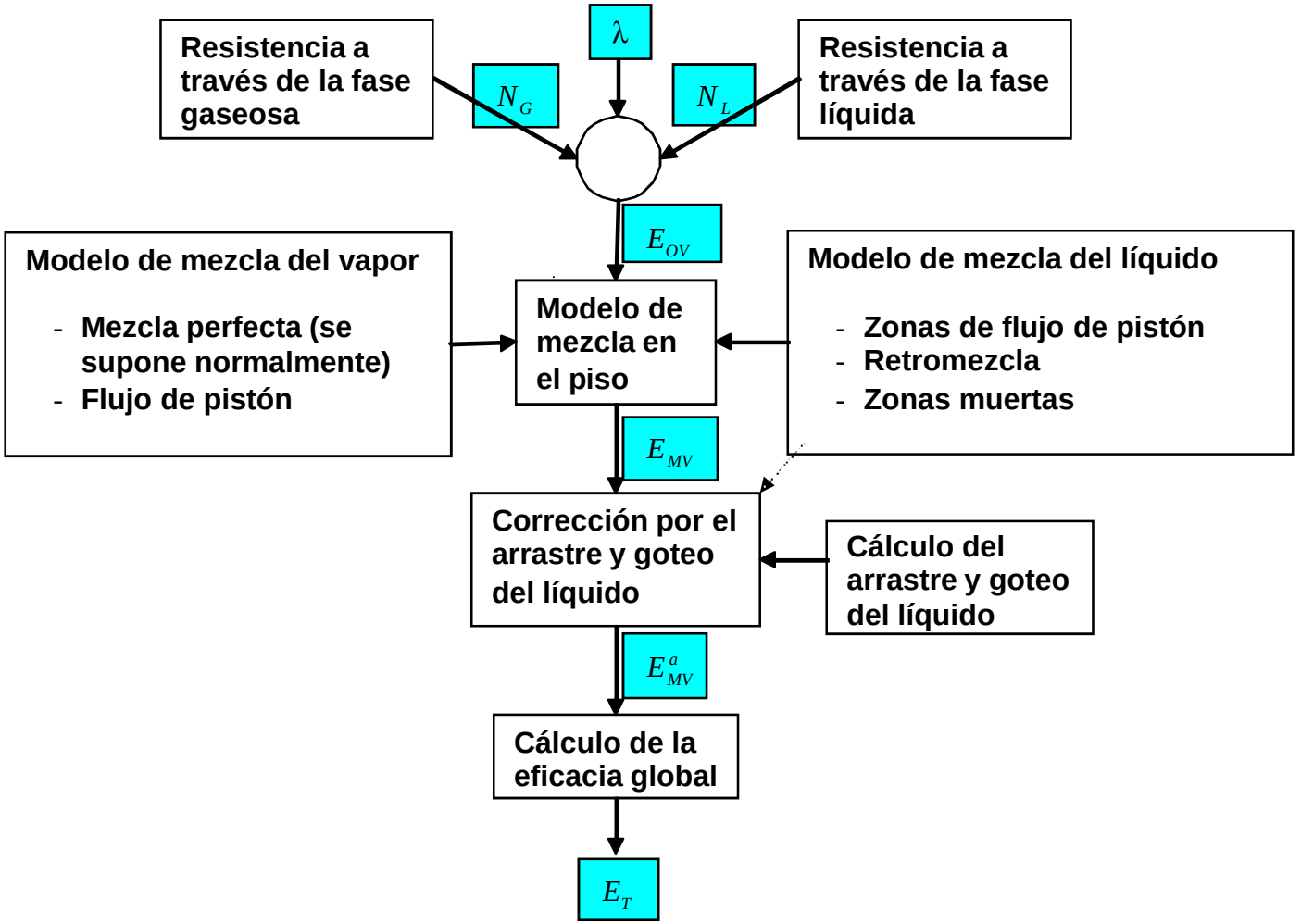
$$E_{OV} = 1 - \exp(-N_{GT})$$

$$N_{GT} = -\ln \frac{y^* - y_n}{y^* - y_{n-1}} = h\, \frac{K_G\, a\, P}{(V/S)}$$

$$E_{OL} = 1 - \exp(-N_{LT})$$

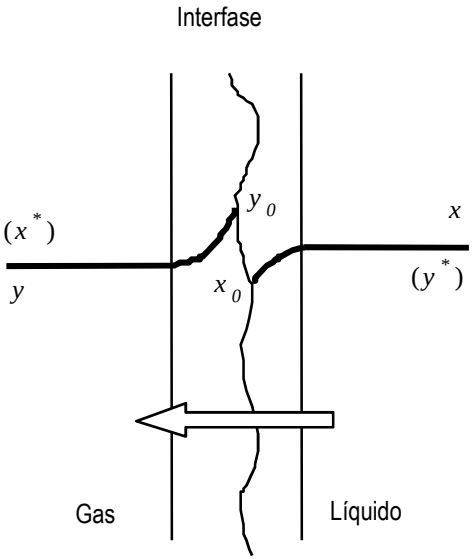
EFICACIAS DE PISOS

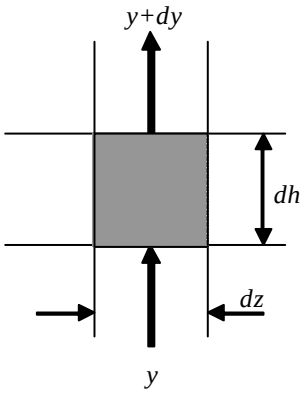
Predicción teórica

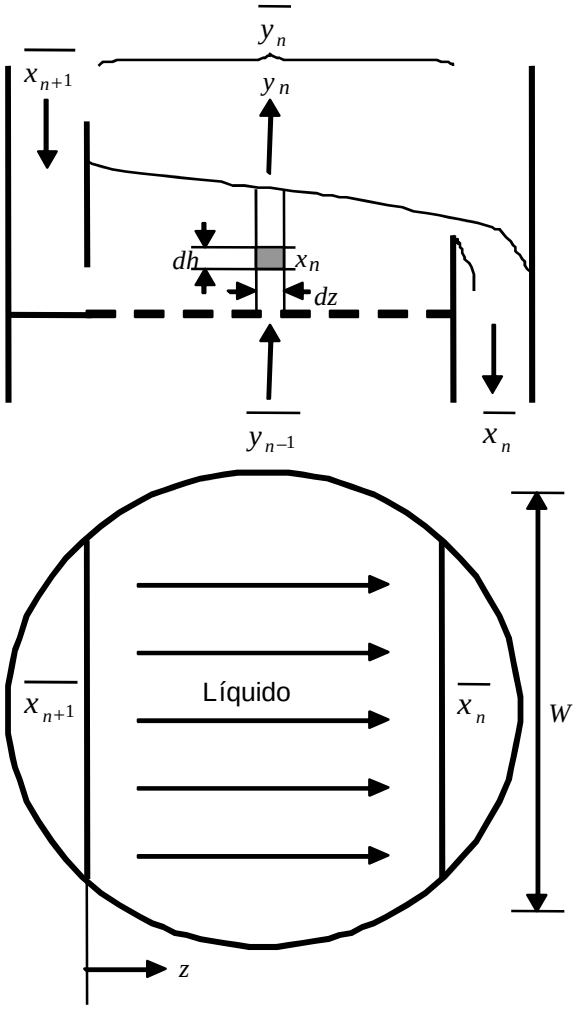


EFICACIAS DE PISOS

Eficacia individual de Murphree







EFICACIAS DE PISOS

Eficacia individual de Murphree

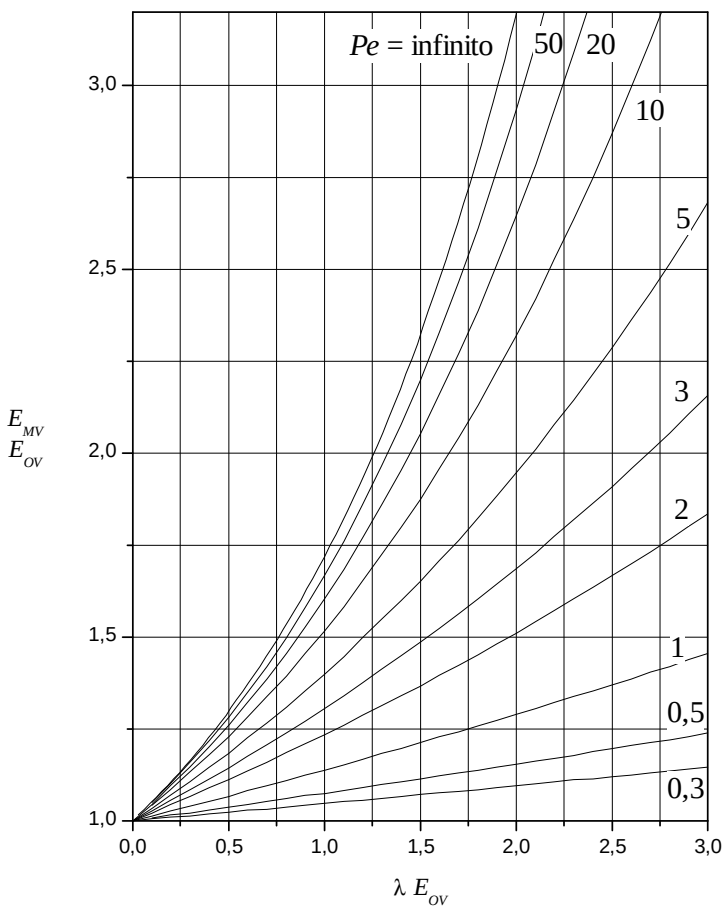
$$\frac{E_{MV}}{E_{OV}} = \frac{1-\exp\left[-(\eta+\mathrm{Pe})\right]}{(\eta+\mathrm{Pe})\left\{1+\left[\frac{(\eta+\mathrm{Pe}}{\eta}\right]\right\}} + \frac{\exp(\eta)-1}{\eta\left\{1+\left[\frac{\eta}{(\eta+\mathrm{Pe}}\right]\right\}}$$

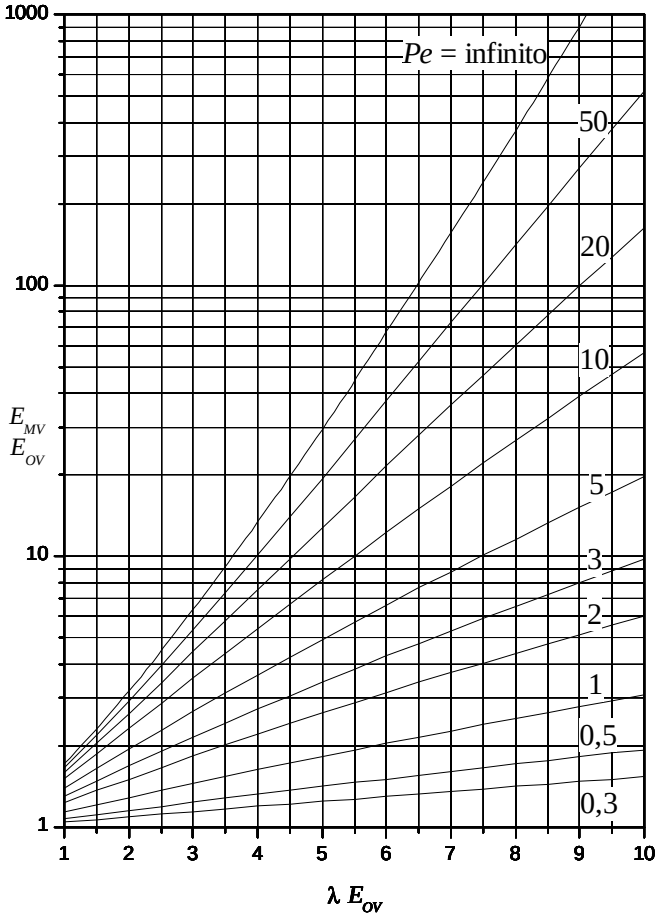
$$\eta = \frac{\mathrm{Pe}}{2}\left[\left(1+\frac{4\lambda E_{OV}}{\mathrm{Pe}}\right)^{0,5} - 1\right] \qquad \lambda = \frac{mV}{L}$$

$$\mathrm{Pe} = \mathrm{Re}\,\mathrm{Sc} = \left[\frac{u_L\,\rho_L\,Z_L}{\mu_L}\right]\left[\frac{\mu_L}{\rho_L\,D_L}\right] = \frac{Z_L^2}{t_L\,D_L} \qquad t_L = \frac{Z_L\,Z_C}{L_W}$$

EFICACIAS DE PISOS

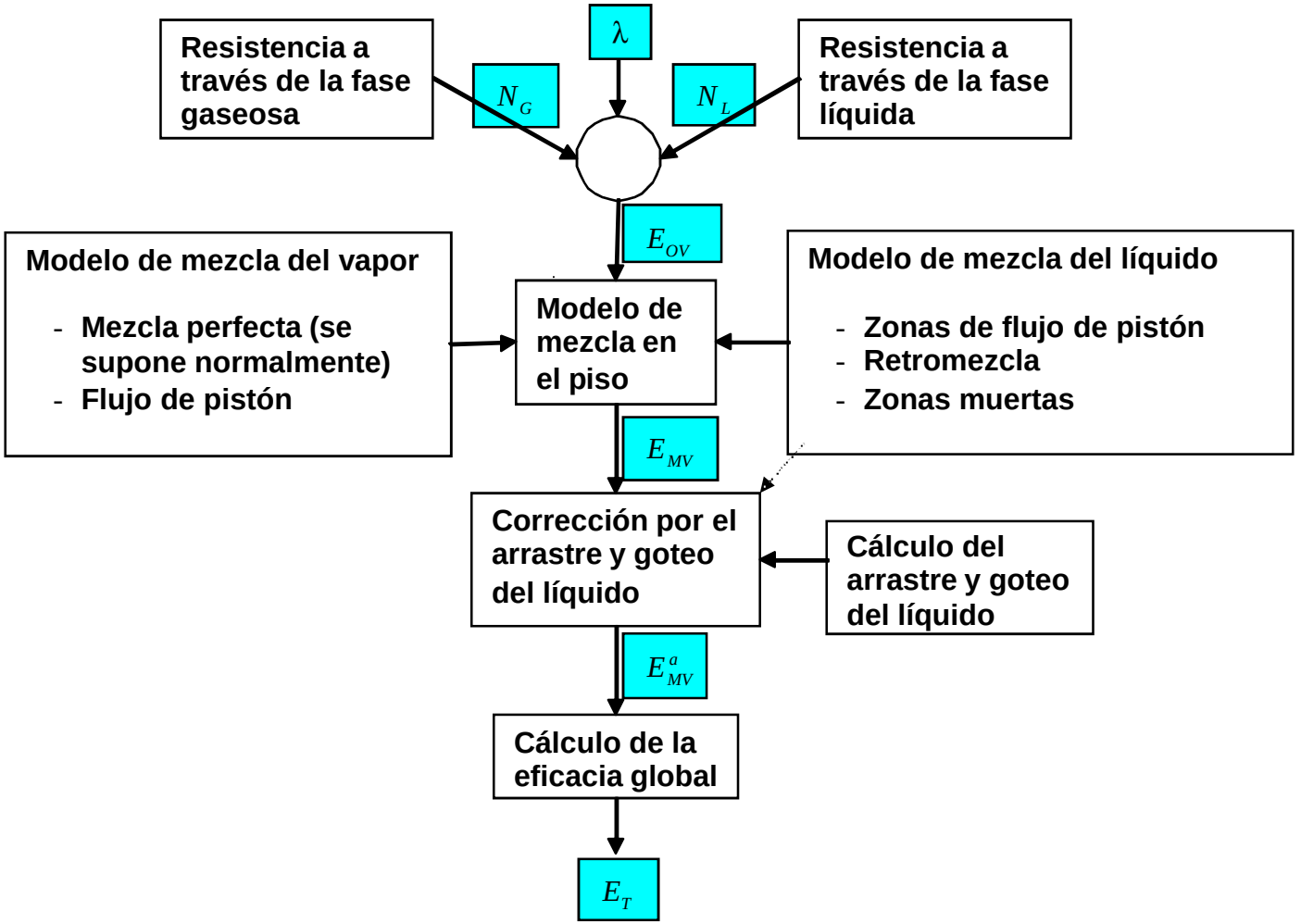
Eficacia individual de Murphree





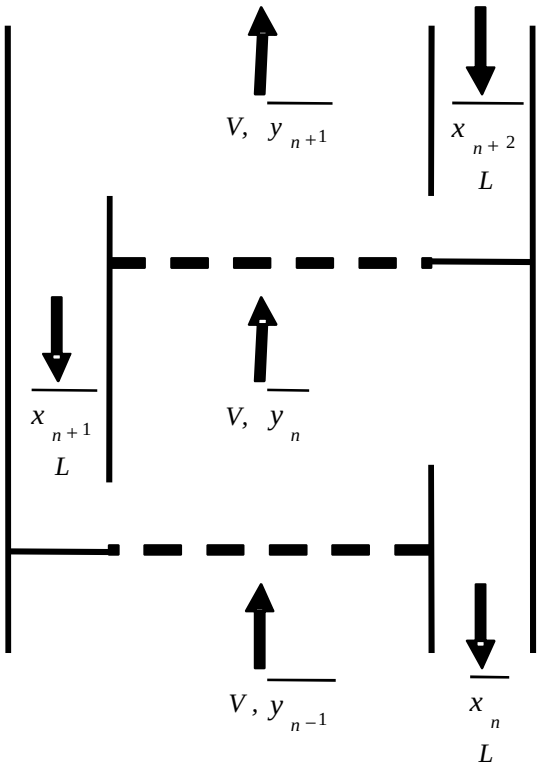
EFICACIAS DE PISOS

Predicción teórica



EFICACIAS DE PISOS

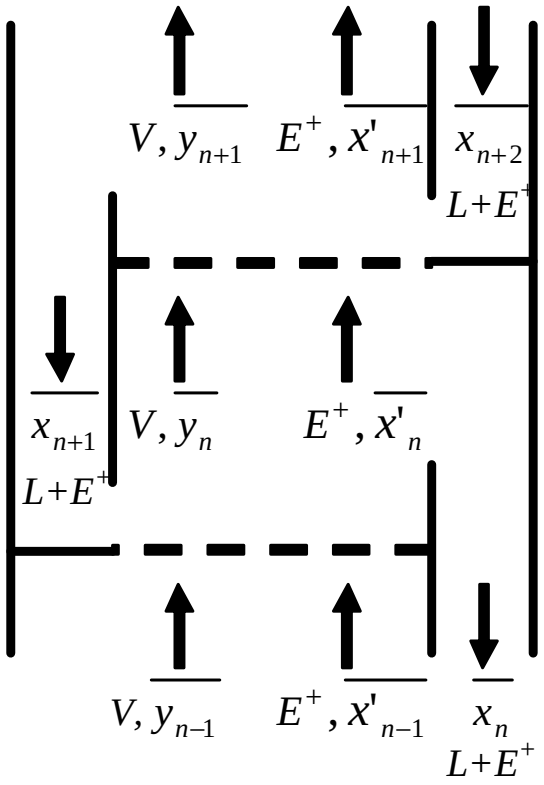
Eficacia individual de Murphree corregida por el arrastre



$$\overline{Y_n} = \overline{y_n} - \frac{E^+}{V}\left(\overline{x_{n-1}} - \overline{x'_n}\right)$$

$$\overline{Y_{n-1}} = \overline{y_{n-1}} - \frac{E^+}{V}\left(\overline{x_n} - \overline{x'_{n-1}}\right)$$

$$E^a_{MV} = \frac{\overline{Y_n} - \overline{Y_{n-1}}}{y^*_n - \overline{Y_{n-1}}}$$



EFICACIAS DE PISOS

Eficacia individual de Murphree corregida por el arrastre

$$\mathrm{Pe} = 0; \quad \lambda = 1$$

$$E_{MV}^{a} = \frac{E_{OV}}{1 + E_{OV}\left[\frac{E^{+}}{L}\right]}$$

$$E_{MV}^{a} = \frac{E_{MV}}{1 + E_{MV}\left[\frac{E^{+}}{L}\right]}$$

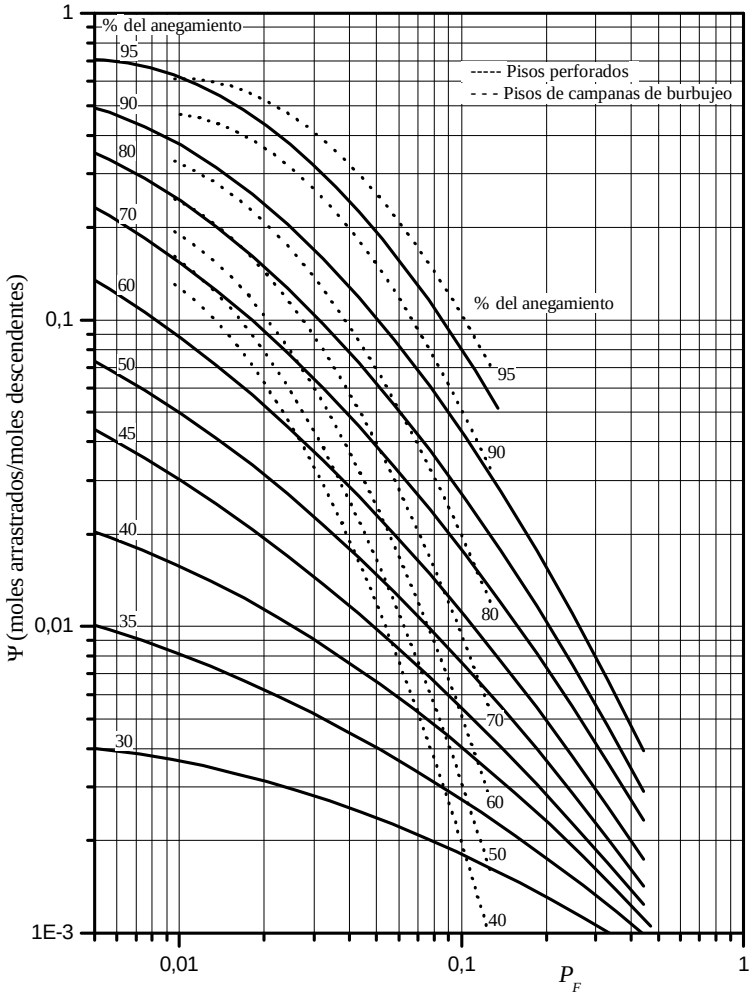
$$\psi = \frac{E^{+}}{L + E^{+}}$$

$$E_{MV}^{a} = \frac{E_{OV}}{1 + E_{OV}\left[\frac{\psi}{1-\psi}\right]}$$

$$E_{MV}^{a} = \frac{E_{MV}}{1 + E_{MV}\left[\frac{\psi}{1-\psi}\right]}$$

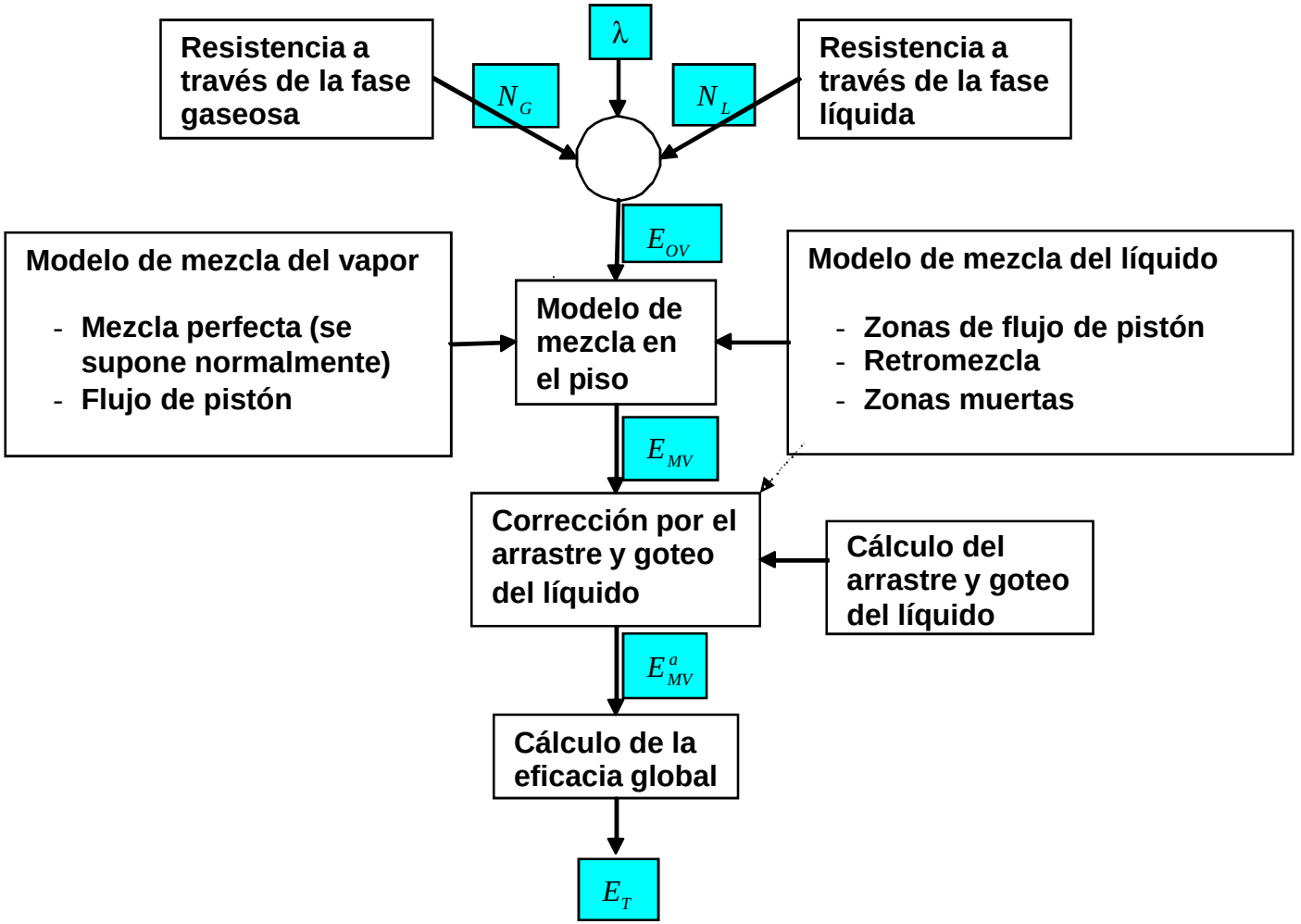
EFICACIAS DE PISOS

Eficacia individual de Murphree corregida por el arrastre



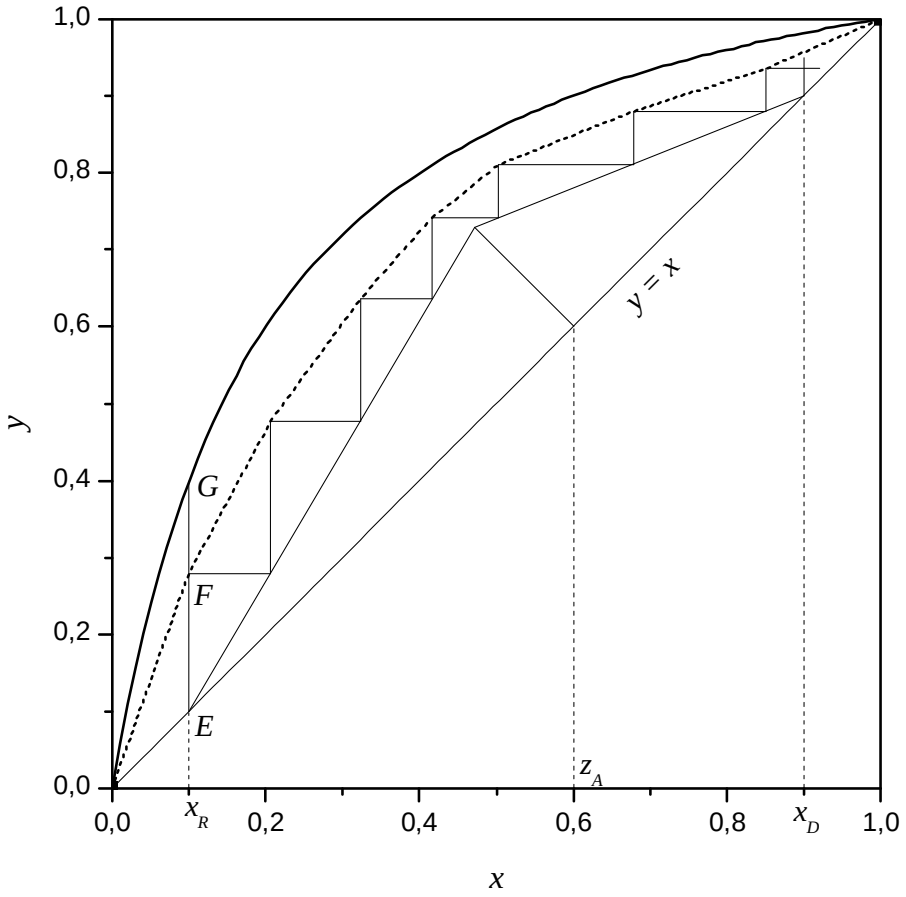
EFICACIAS DE PISOS

Predicción teórica



EFICACIAS DE PISOS

Eficacia global



$$E_T = \frac{\ln\left[1 + E_{MV}^{a}\,(\lambda - 1)\right]}{\ln \lambda}$$