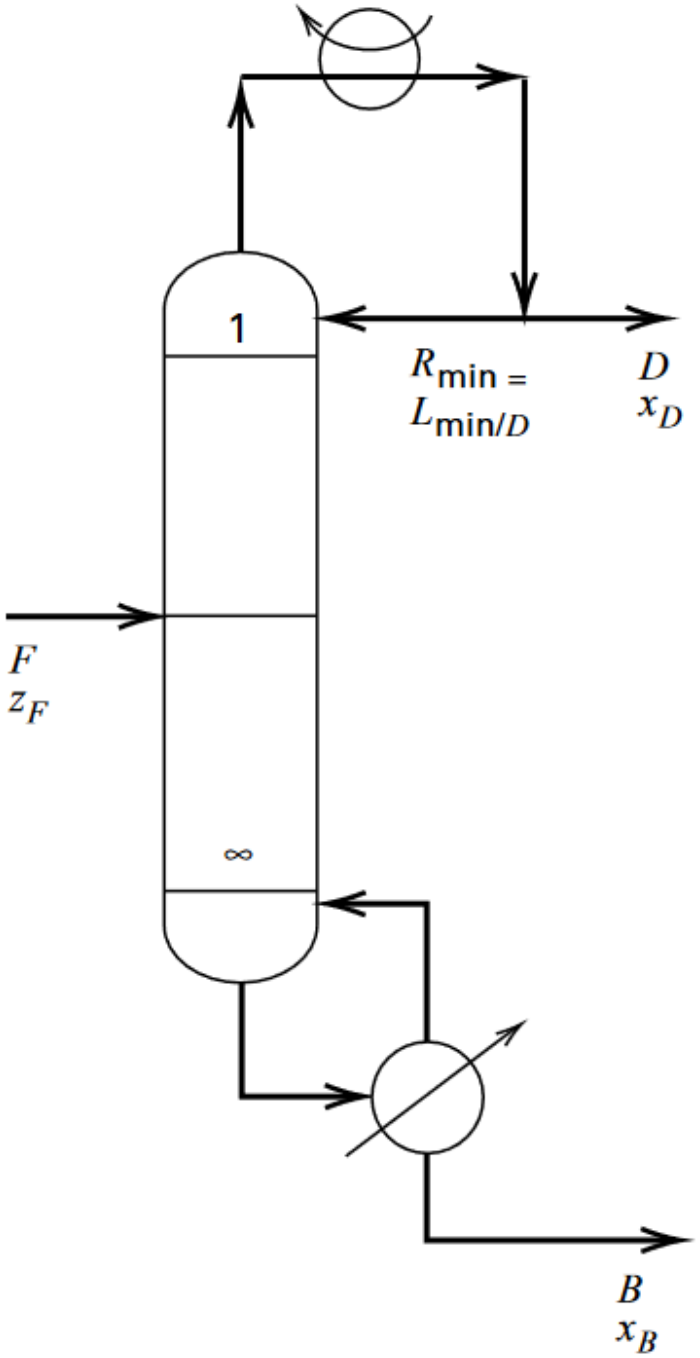
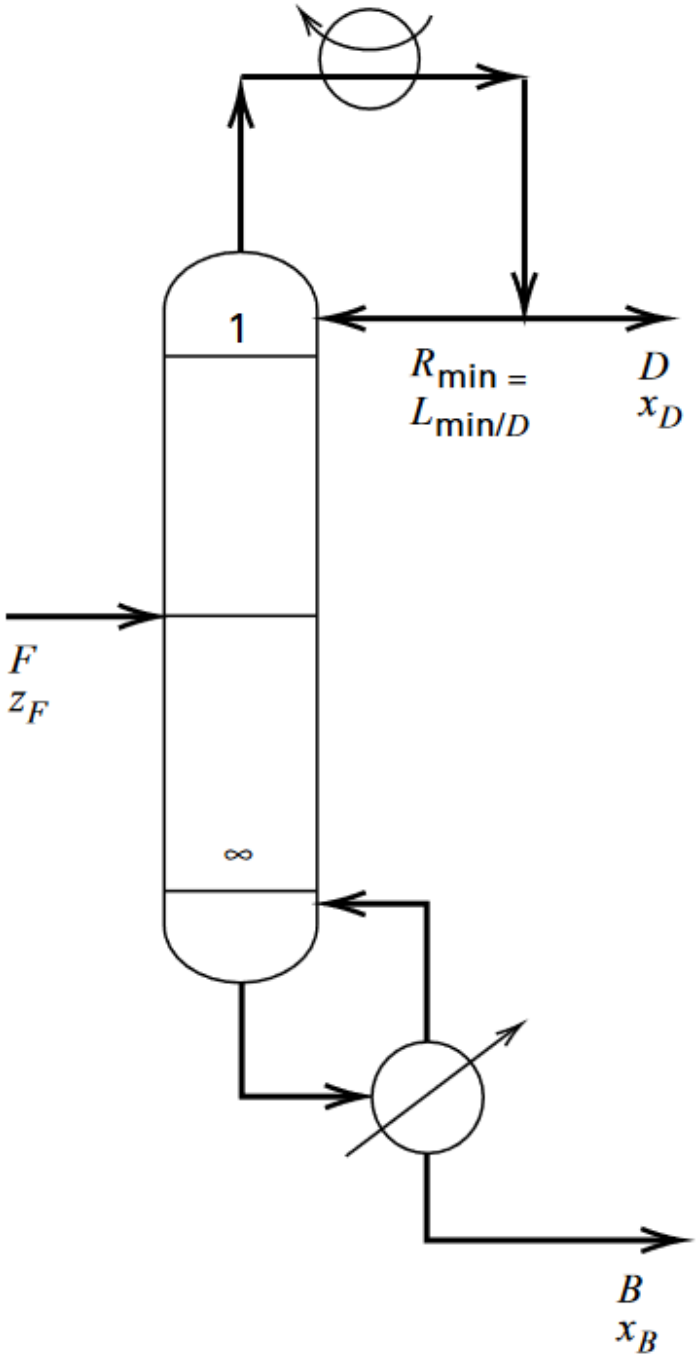
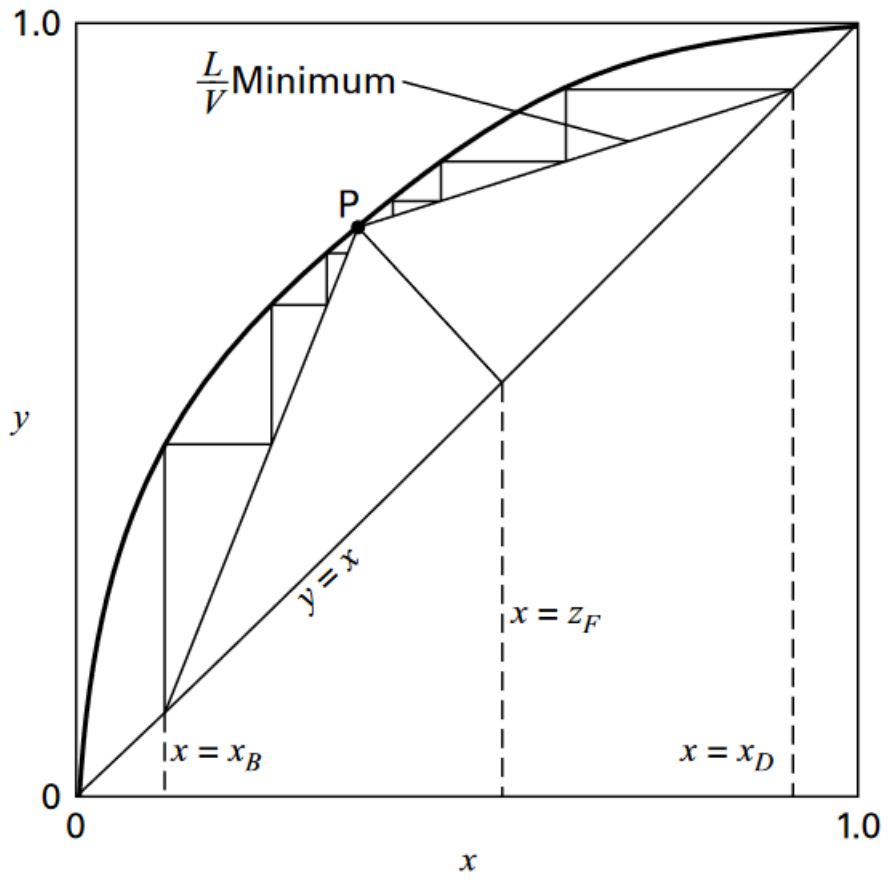
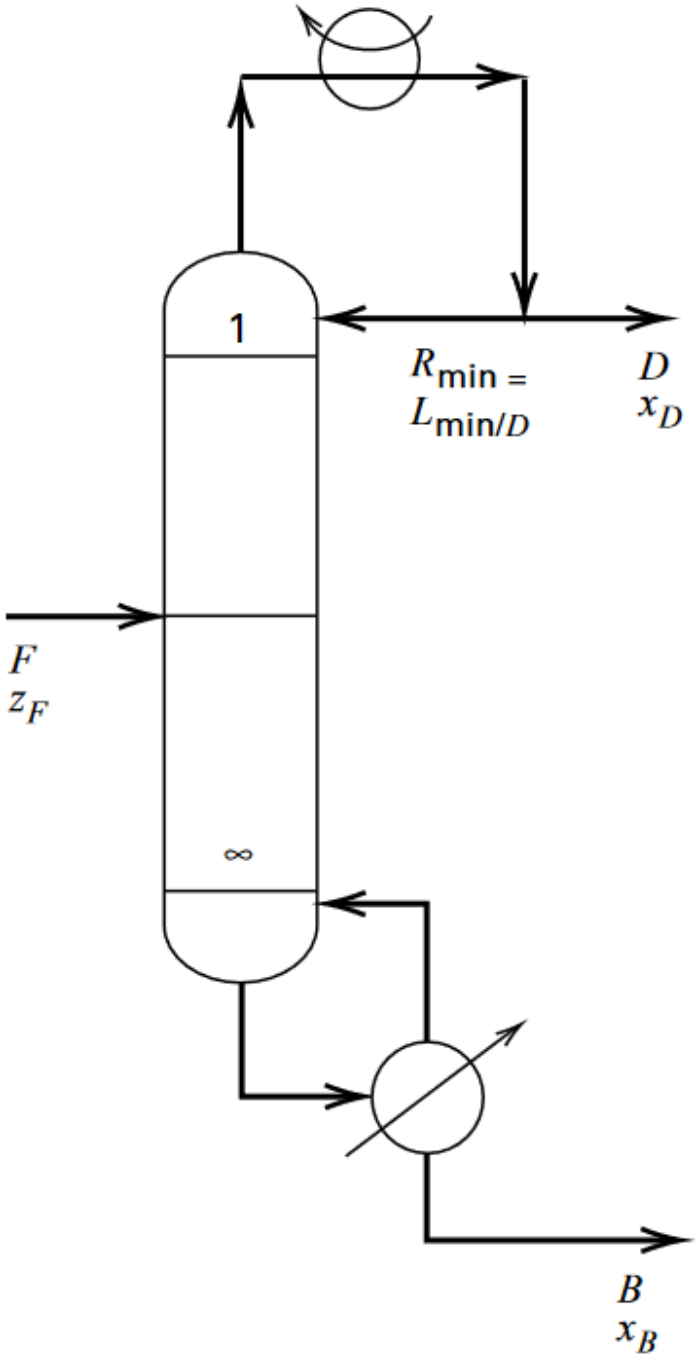


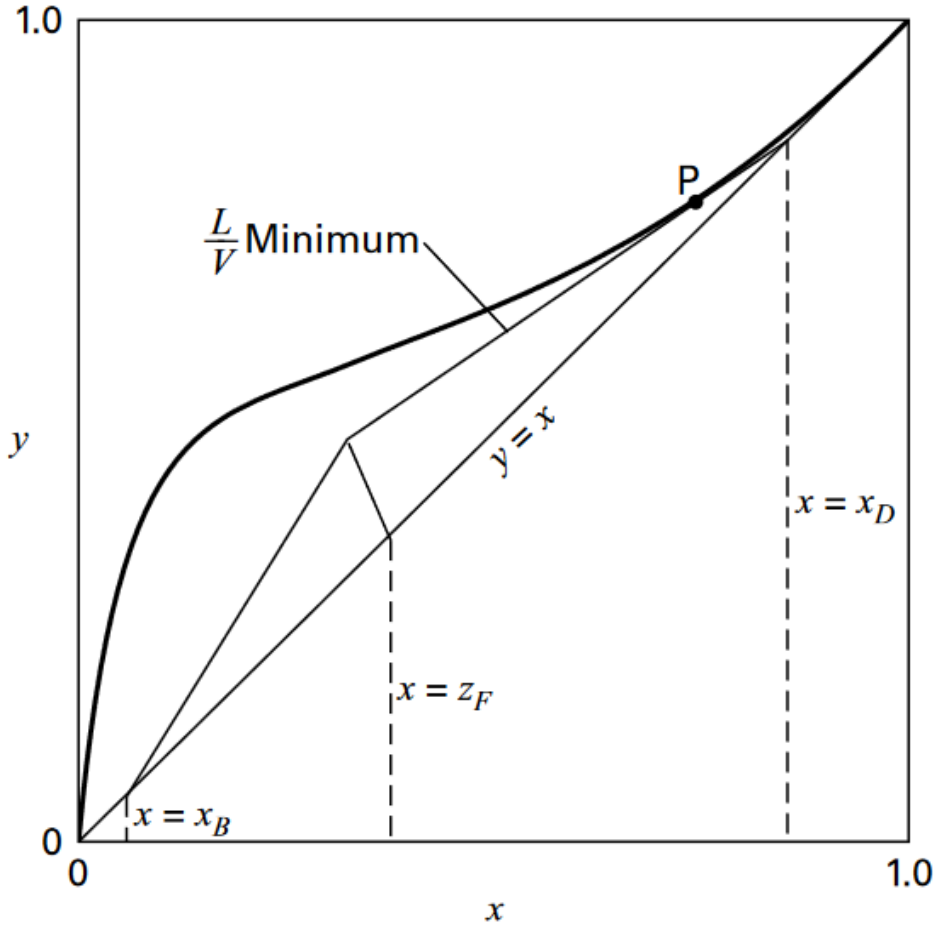
Refluxo mínimo / infinitos estágios



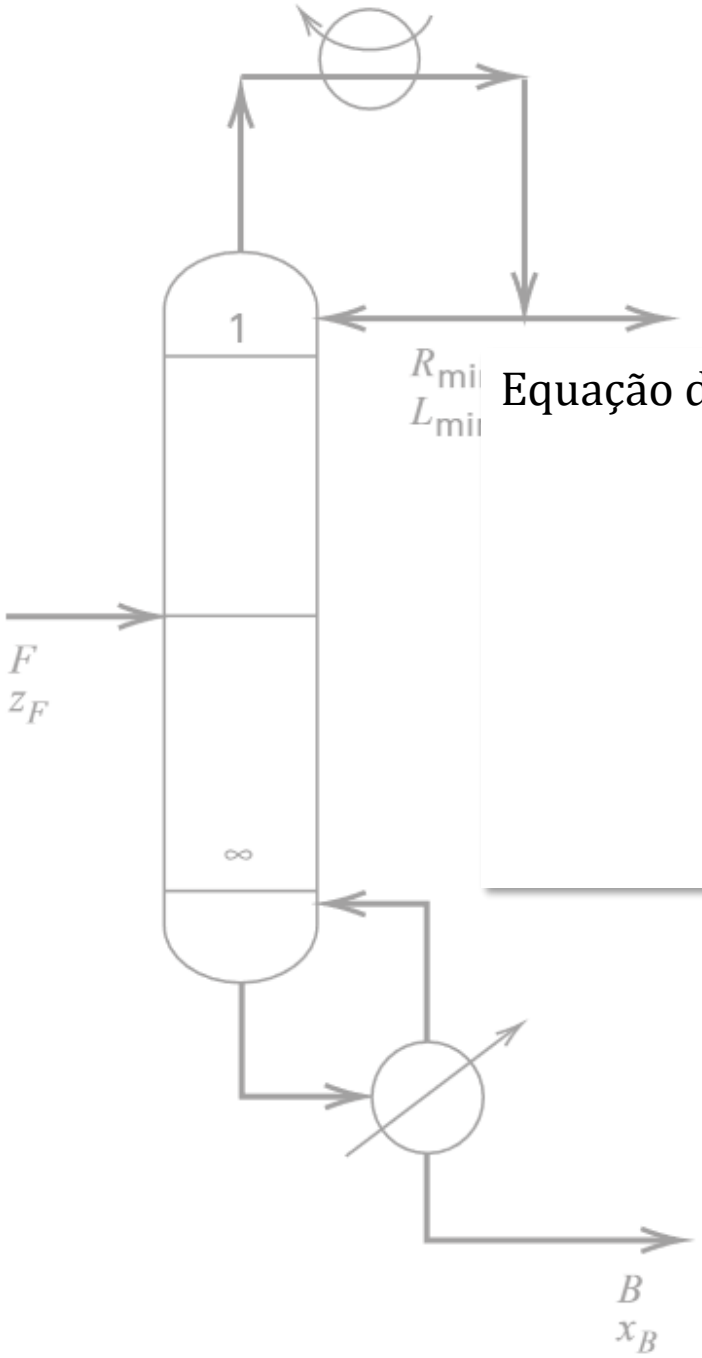


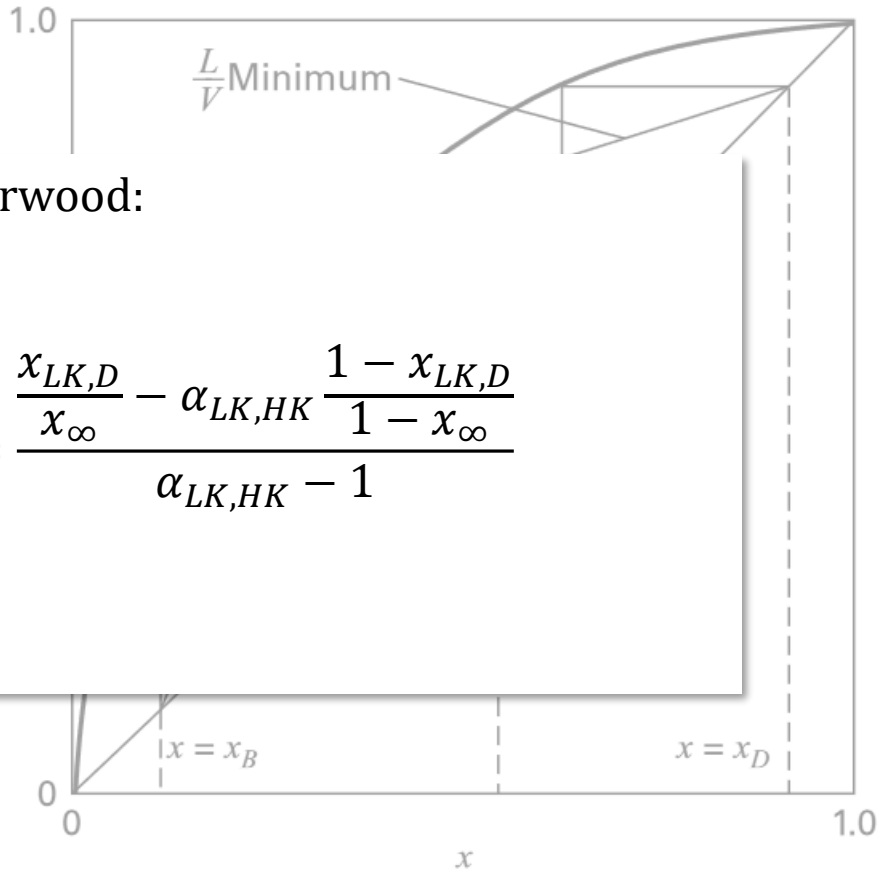
Refluxo mínimo / infinitos estágios





Refluxo mínimo / infinitos estágios

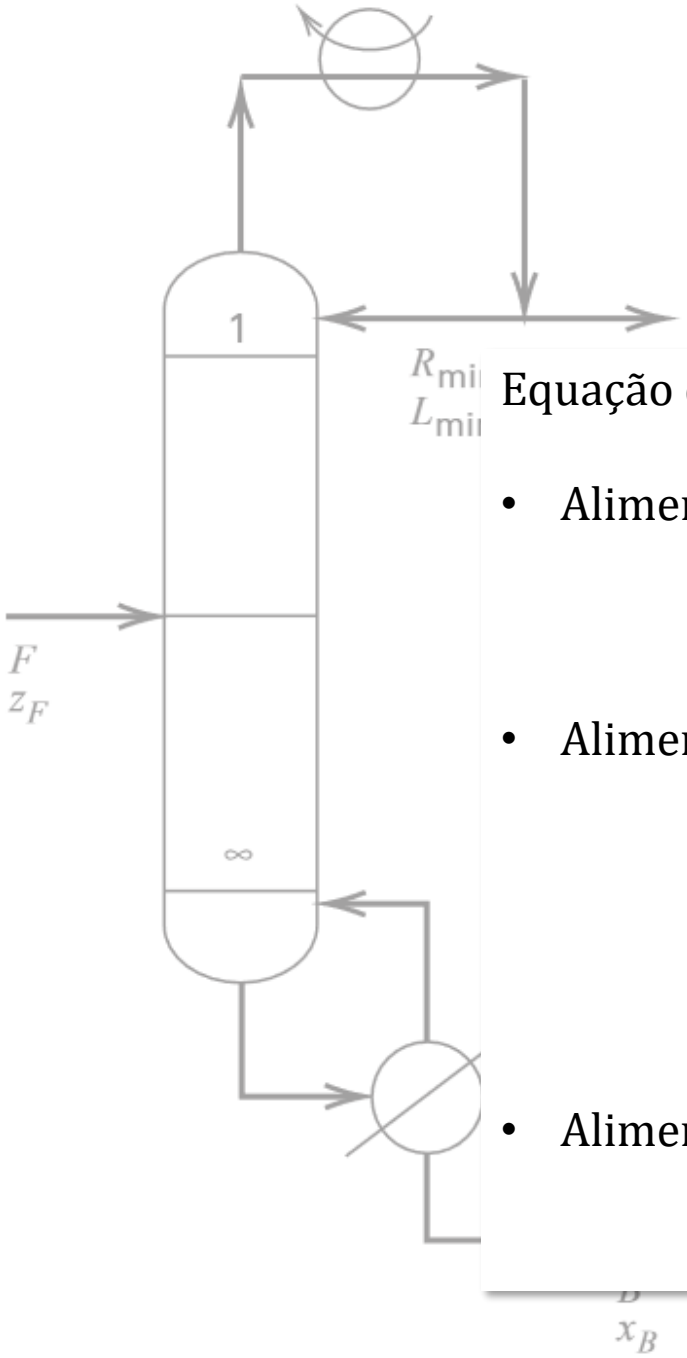


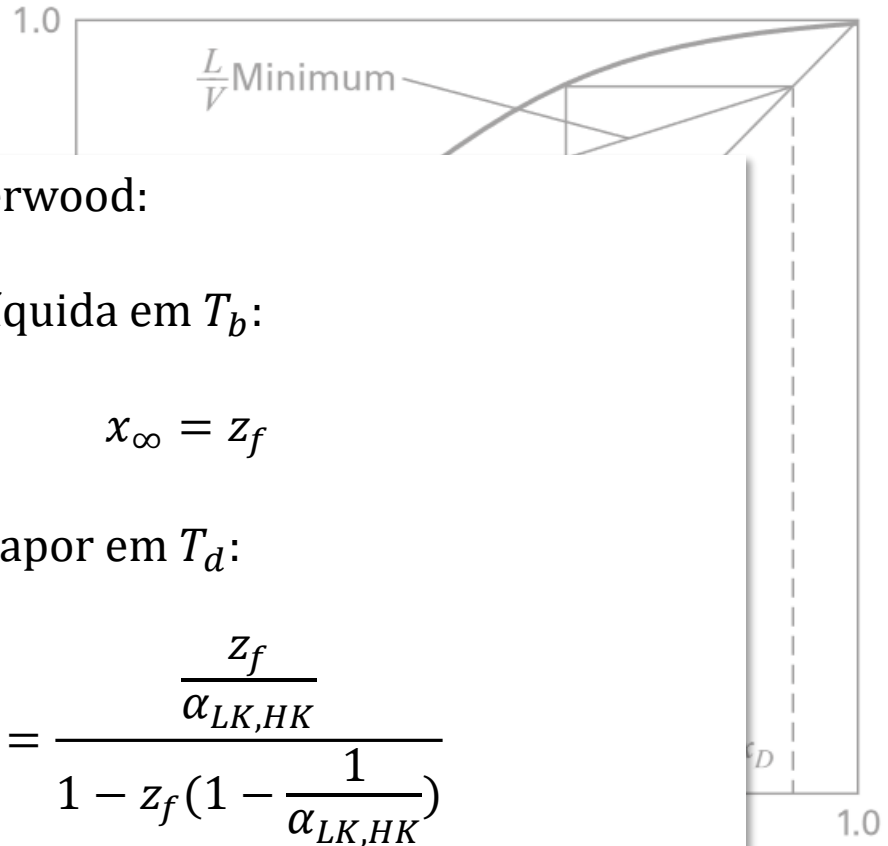


Equação de Underwood:

$$R_{min} = \frac{\frac{x_{LK,D}}{x_\infty} - \alpha_{LK,HK}\frac{1 - x_{LK,D}}{1 - x_\infty}}{\alpha_{LK,HK} - 1}$$

Refluxo mínimo / infinitos estágios





Equação de Underwood:

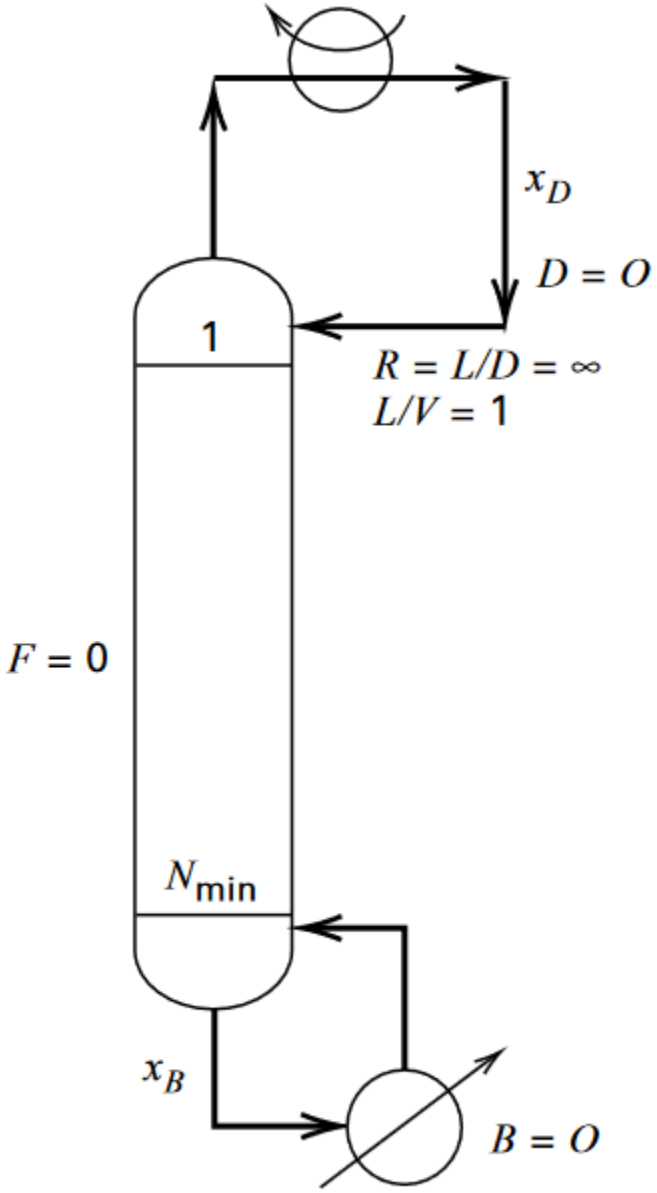
- Alimentação líquida em T_b:

$$x_\infty = z_f$$

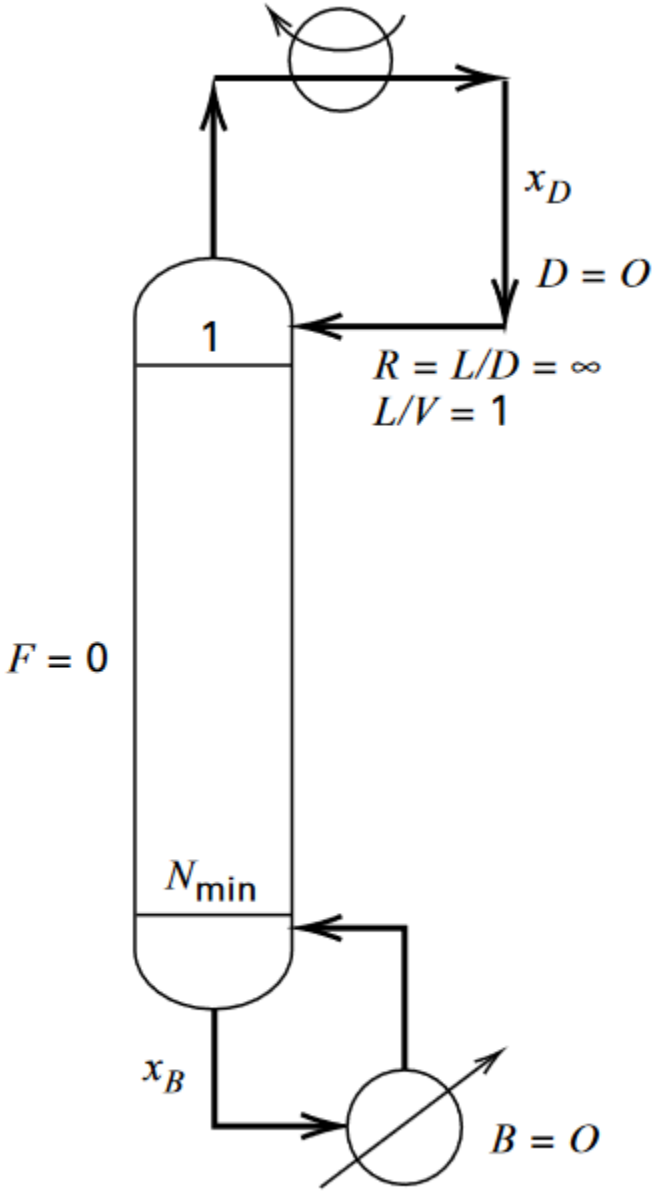
- Alimentação vapor em T_d:

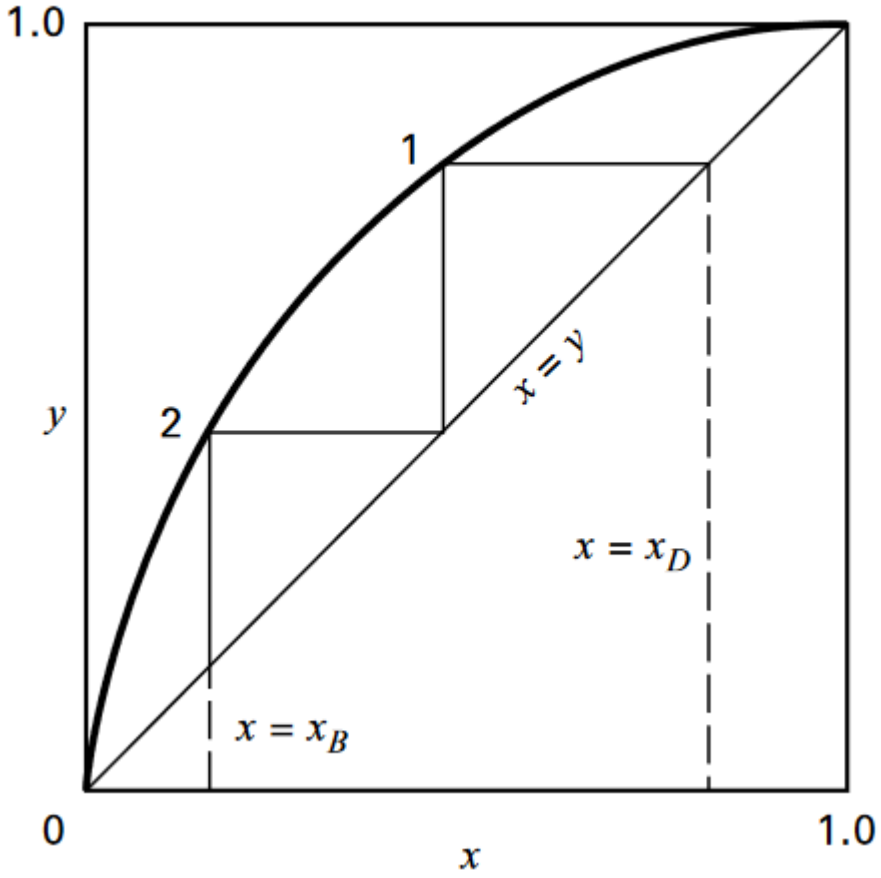
$$x_\infty = \frac{\frac{z_f}{\alpha_{LK,HK}}}{1 - z_f(1 - \frac{1}{\alpha_{LK,HK}})}$$

- Alimentação em outras condições: flash

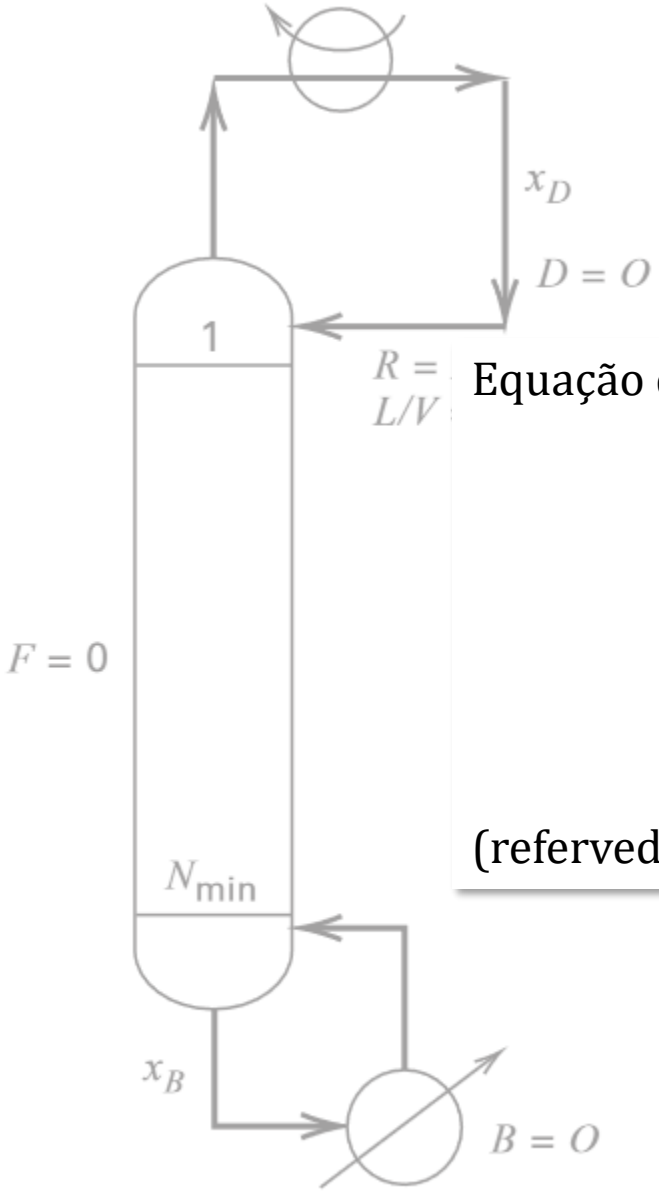


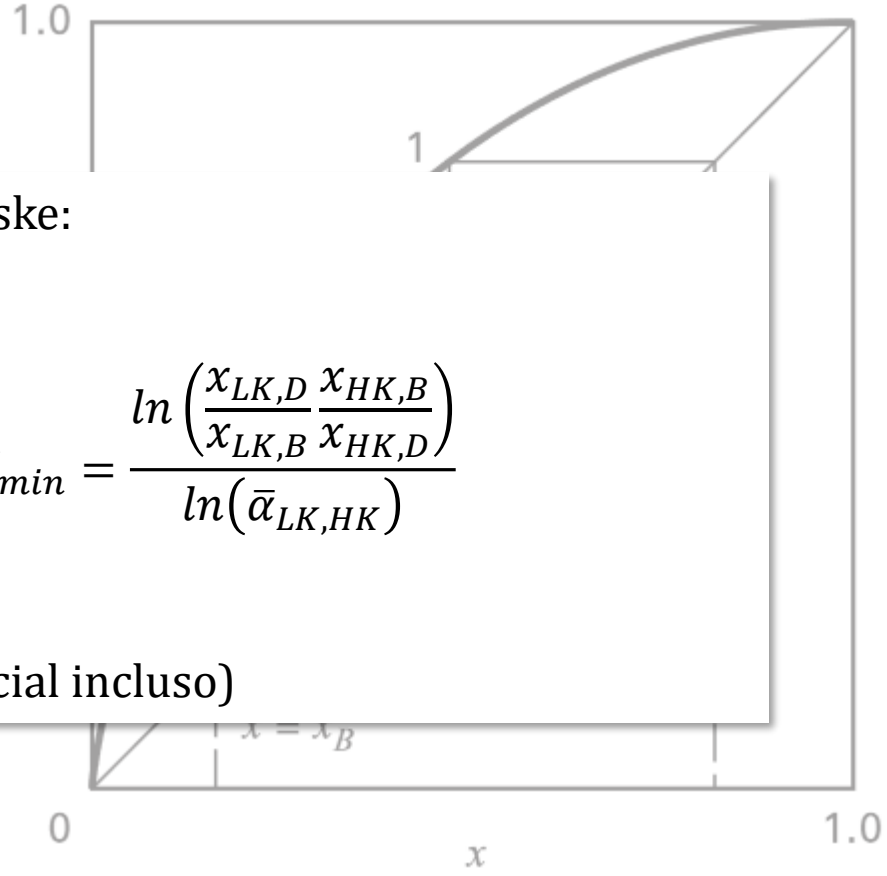
Refluxo infinito / número mínimo de estágios





Refluxo infinito / número mínimo de estágios

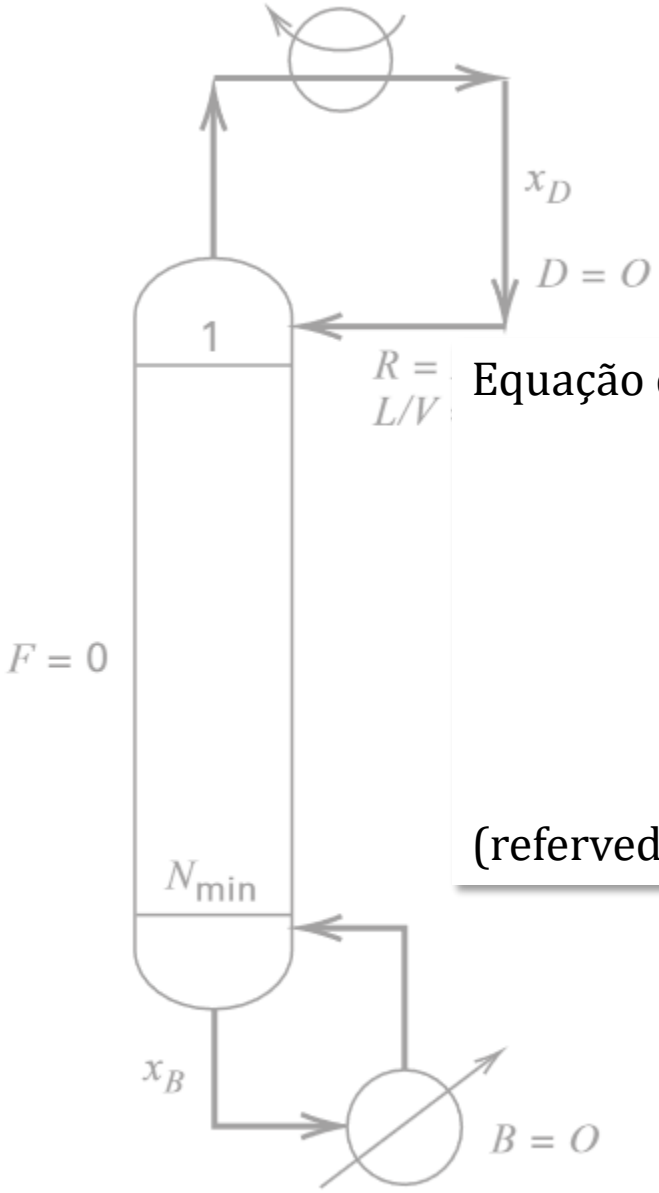


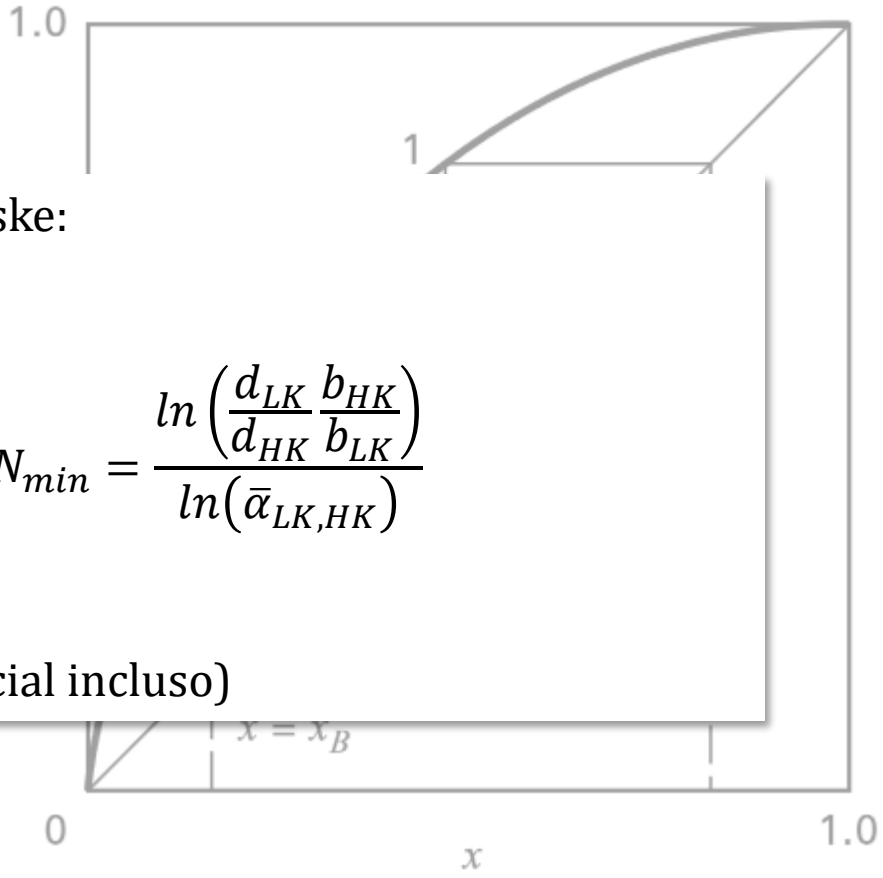


Equação de Fenske:

$$N_{min} = \frac{ln\left(\frac{x_{LK,D}}{x_{LK,B}}\frac{x_{HK,B}}{x_{HK,D}}\right)}{ln\left(\bar{\alpha}_{LK,HK}\right)}$$

(refervedor parcial incluso)

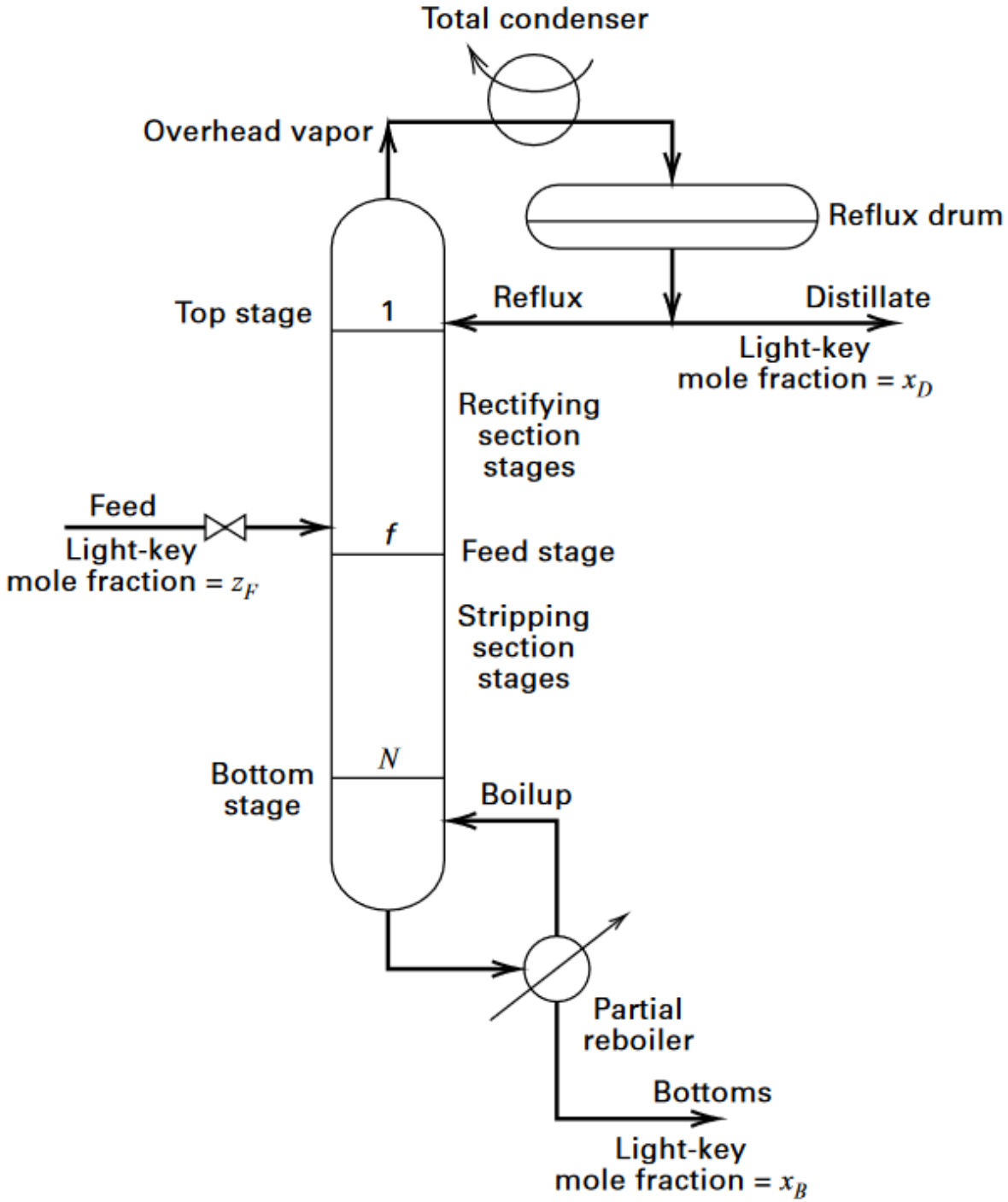




Equação de Fenske:

$$N_{min} = \frac{ln\left(\frac{d_{LK}}{d_{HK}}\frac{b_{HK}}{b_{LK}}\right)}{ln\left(\bar{\alpha}_{LK,HK}\right)}$$

(refervedor parcial incluso)


Total condenser
Overhead vapor
Reflux drum
Top stage
1
Reflux
Distillate
Light-key
mole fraction = x_D
Rectifying
section
stages
Feed
Light-key
mole fraction = z_F
f
Feed stage
Stripping
section
stages
Bottom
stage
N
Boilup
Partial
reboiler
Bottoms
Light-key
mole fraction = x_B

Coluna real

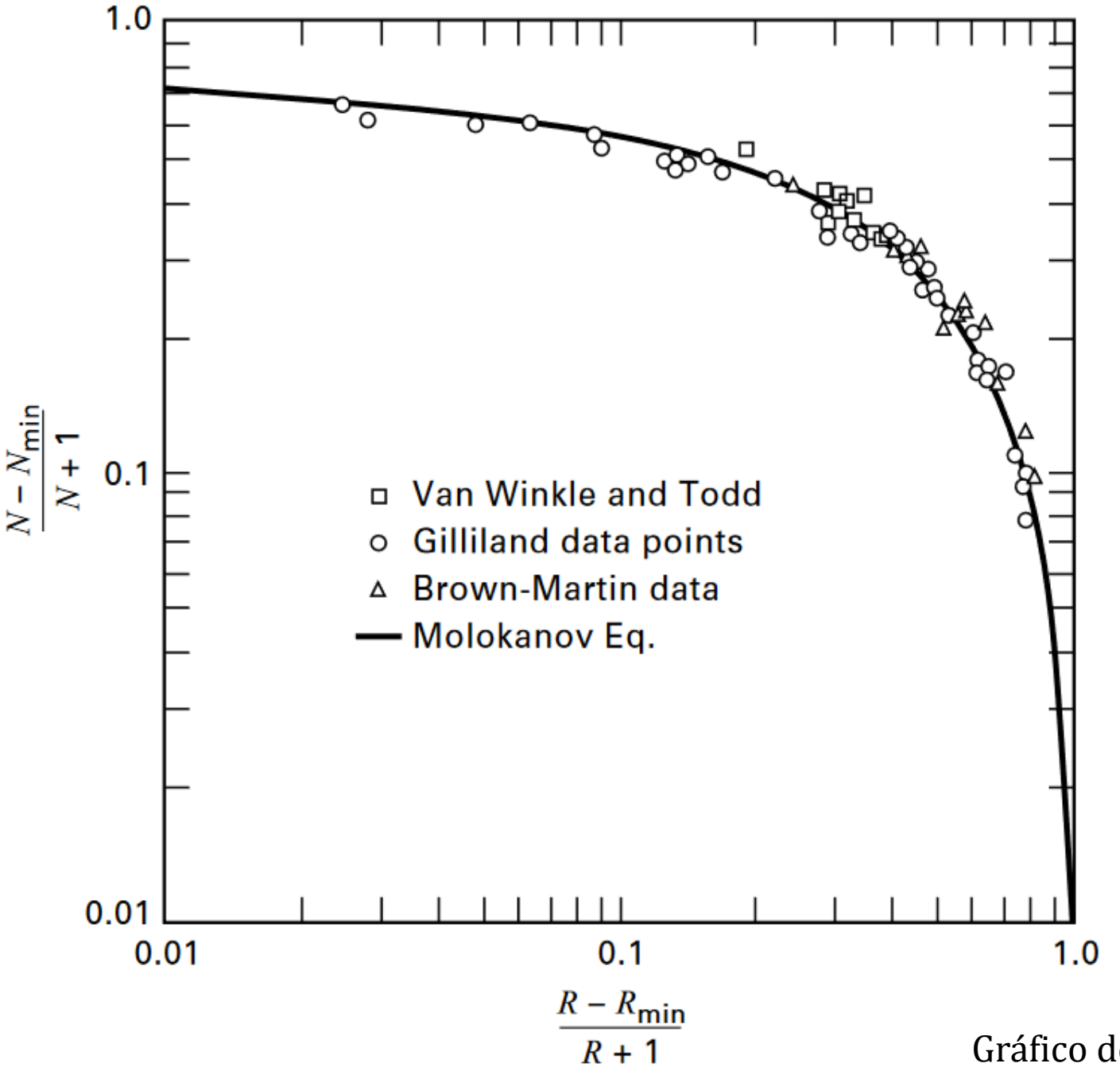
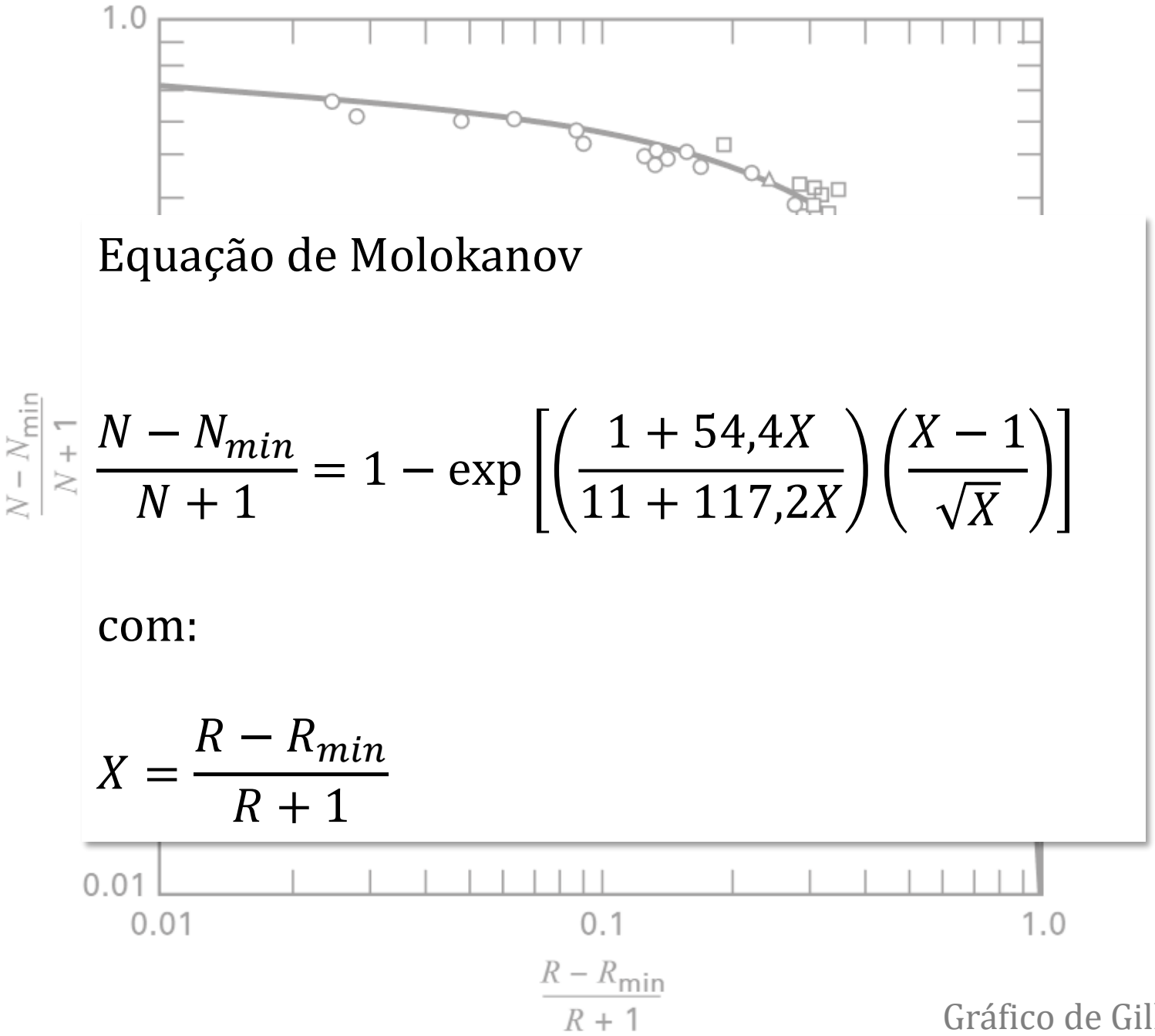


Gráfico de Gilliland



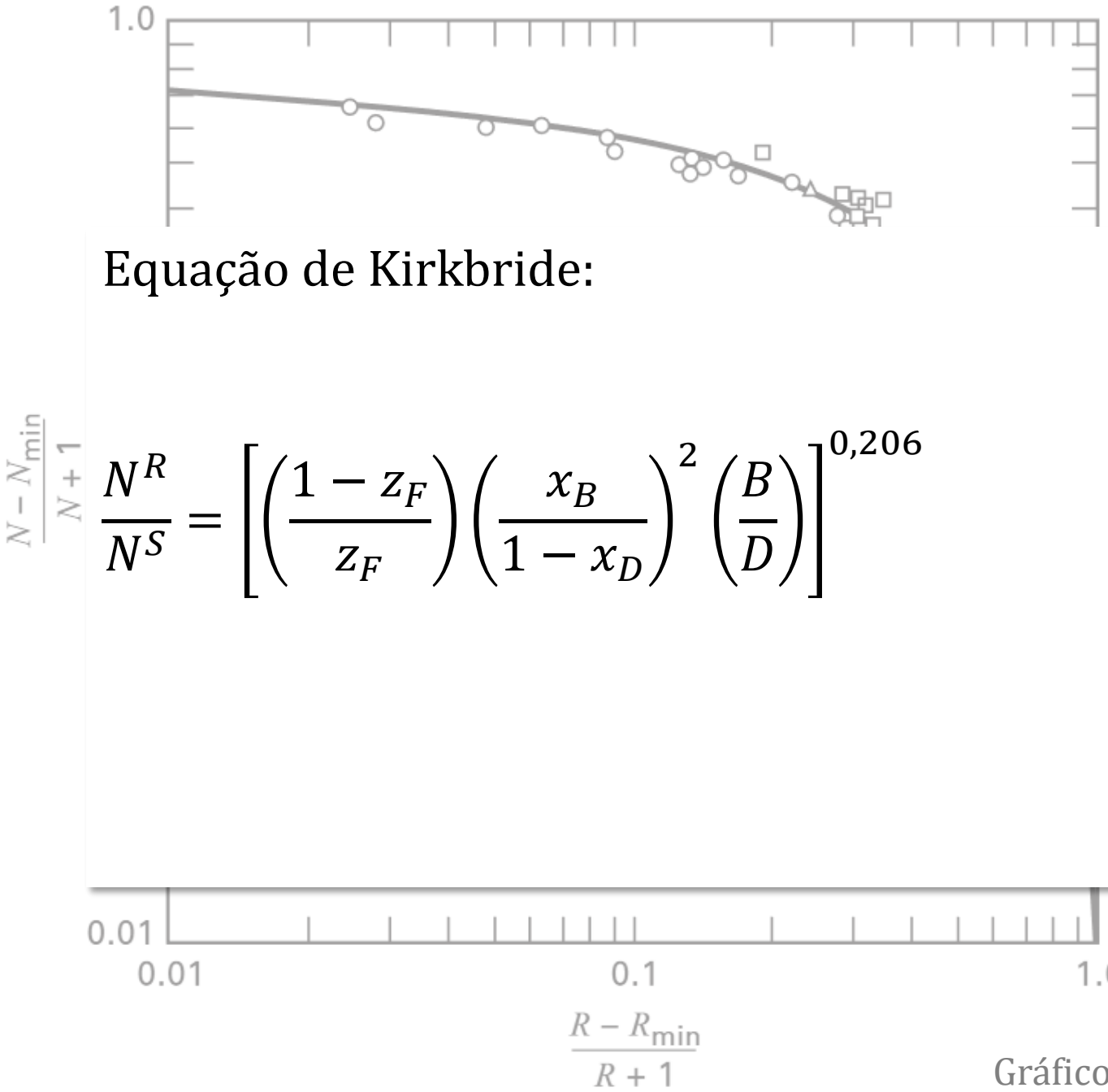
Equação de Molokanov

$$\frac{N - N_{min}}{N + 1} = 1 - \exp\left[\left(\frac{1 + 54{,}4X}{11 + 117{,}2X}\right)\left(\frac{X - 1}{\sqrt{X}}\right)\right]$$

com:

$$X = \frac{R - R_{min}}{R + 1}$$

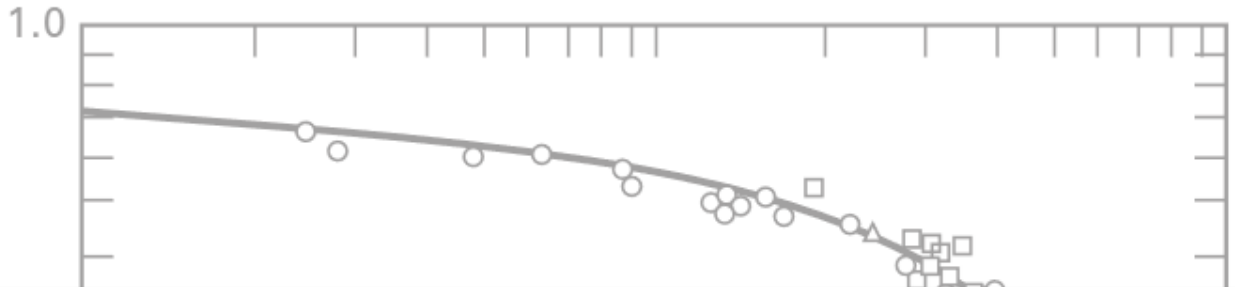
Gráfico de Gilliland



Equação de Kirkbride:

$$\frac{N^R}{N^S} = \left[\left(\frac{1 - z_F}{z_F}\right)\left(\frac{x_B}{1 - x_D}\right)^2\left(\frac{B}{D}\right)\right]^{0,206}$$

Gráfico de Gilliland



Equação de Fenske adaptada:

$$N_{min}^{R} = \frac{ln\left(\left(\frac{x_D}{1-x_D}\right)\left(\frac{1-z_F}{z_F}\right)\right)}{ln\left(\bar{\alpha}_{LK,HK}\right)}$$

$$N_{min}^{S} = \frac{ln\left(\left(\frac{1-x_B}{x_B}\right)\left(\frac{z_F}{1-z_F}\right)\right)}{ln\left(\bar{\alpha}_{LK,HK}\right)}$$

$$\frac{N^R}{N^S} = \frac{N_{min}^{R}}{N_{min}^{S}}$$

$\frac{N - N_{min}}{N+1}$

Gráfico de Gilliland