ERQ II – P1 Modelo 3

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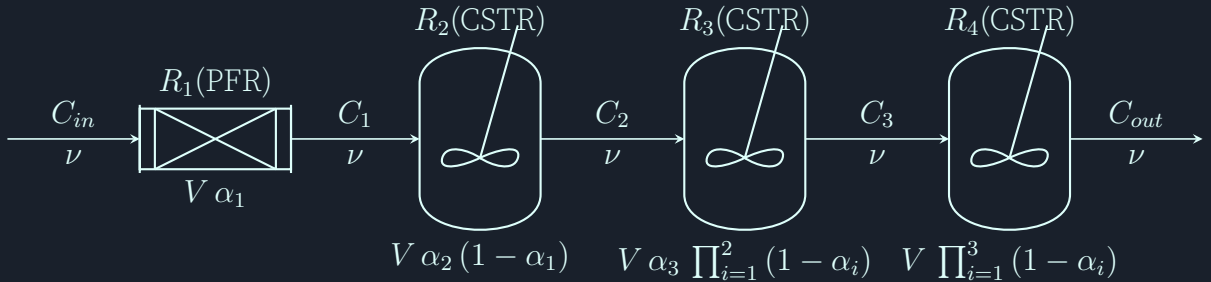
Conteúdo

1 Modelo


R_1(PFR)
R_2(CSTR)
R_3(CSTR)
R_4(CSTR)
C_{in}
ν
C_1
ν
C_2
ν
C_3
ν
C_{out}
ν
$V\,\alpha_1$
$V\,\alpha_2\,(1-\alpha_1)$
$V\,\alpha_3\,\prod_{i=1}^{2}(1-\alpha_i)$
$V\,\prod_{i=1}^{3}(1-\alpha_i)$

Calculos

1.1 C2

$$\boldsymbol{C_{2,i+1} = C_{2,i} + \frac{C_{1,i} - C_{2,i}}{(1-\alpha_1)\,\alpha_2\,\tau}\,\Delta t}$$

$$\begin{aligned}
&\nu\, C_1 = \nu\, C_2 + (1-\alpha_1)\,\alpha_2\, V\, \frac{\mathrm{d}C_2}{\mathrm{d}t} \implies \\
&\implies C_1 = C_2 + (1-\alpha_1)\,\alpha_2\,\tau\, \frac{\mathrm{d}C_2}{\mathrm{d}t} \implies \\
&\implies \frac{\mathrm{d}C_2}{\mathrm{d}t} = \frac{C_1 - C_2}{(1-\alpha_1)\,\alpha_2\,\tau} \implies \\
&\implies \frac{\Delta C_2}{\Delta t} = \frac{C_{2,i+1} - C_{2,i}}{\Delta t} = \frac{C_{1,i} - C_{2,i}}{(1-\alpha_1)\,\alpha_2\,\tau} \implies \\
&\implies C_{2,i+1} = C_{2,i} + \frac{C_{1,i} - C_{2,i}}{(1-\alpha_1)\,\alpha_2\,\tau}\,\Delta t
\end{aligned}$$

1.2 C3

$$\boldsymbol{C_{3,i+1} = C_{3,i} + \frac{C_{2,i} - C_{3,i}}{\tau\,\alpha_3\,\prod_{i=1}^{2}(1-\alpha_i)}\,\Delta t}$$

$$\nu\,C_2 = \nu\,C_3 + \frac{\mathrm{d}C_2}{\mathrm{d}t}\,V\,\alpha_3\,\prod_{i=1}^{2}(1-\alpha_i) \implies$$

$$\implies C_2 = C_3 + \frac{\mathrm{d}C_3}{\mathrm{d}t}\,\tau\,\alpha_3\,\prod_{i=1}^{2}(1-\alpha_i) \implies$$

$$\implies \frac{\mathrm{d}C_3}{\mathrm{d}t} = \frac{C_2 - C_3}{\tau\,\alpha_3\,\prod_{i=1}^{2}(1-\alpha_i)} \implies$$

$$\implies \frac{\Delta C_3}{\Delta t} = \frac{C_{3,i+1} - C_{3,i}}{\Delta t} = \frac{C_{2,i} - C_{3,i}}{\tau\,\alpha_3\,\prod_{i=1}^{2}(1-\alpha_i)} \implies$$

$$\implies C_{3,i+1} = C_{3,i} + \frac{C_{2,i} - C_{3,i}}{\tau\,\alpha_3\,\prod_{i=1}^{2}(1-\alpha_i)}\,\Delta t$$

1.3 C out

$$\boldsymbol{C_{out,i+1} = C_{out,i} + \frac{C_{3,i} - C_{out,i}}{\tau \prod_{i=1}^{3} (1 - \alpha_i)} \, \Delta t}$$

$$\nu \, C_3 = \nu \, C_{out} + \frac{\mathrm{d}C_{out}}{\mathrm{d}t} \, V \prod_{i=1}^{3} (1 - \alpha_i) \implies$$

$$\implies C_3 = C_{out} + \frac{\mathrm{d}C_{out}}{\mathrm{d}t} \, \tau \prod_{i=1}^{3} (1 - \alpha_i) \implies$$

$$\implies \frac{\mathrm{d}C_{out}}{\mathrm{d}t} = \frac{C_3 - C_{out}}{\tau \prod_{i=1}^{3} (1 - \alpha_i)} \implies$$

$$\implies \frac{\Delta C_{out}}{\Delta t} = \frac{C_{out,i+1} - C_{out,i}}{\Delta t} = \frac{C_{3,i} - C_{out,i}}{\tau \prod_{i=1}^{3} (1 - \alpha_i)} \implies$$

$$\implies C_{out,i+1} = C_{out,i} + \frac{C_{3,i} - C_{out,i}}{\tau \prod_{i=1}^{3} (1 - \alpha_i)} \, \Delta t$$