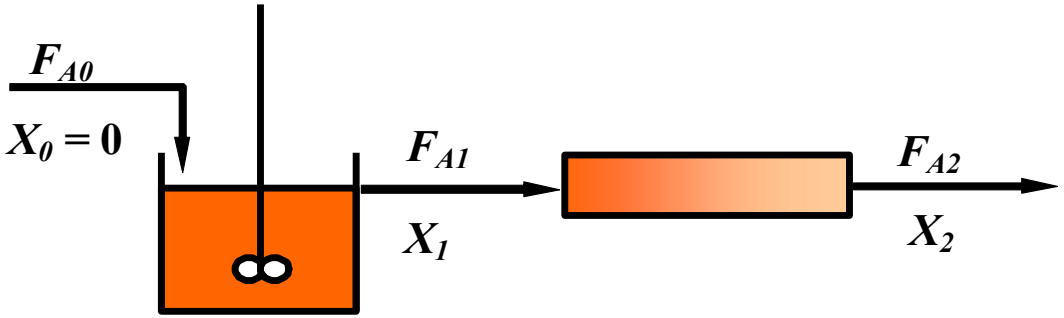
Dimensionamento gráfico de reactores contínuos

Associação em série CSTR-PFR



Balanço ao CSTR

$$F_{A0} - F_{A1} + r_{A1} \cdot V1 = 0$$

$$\therefore \quad F_{A0} - F_{A0}(1 - X_1) + r_{A1} \cdot V_1 = 0$$

$$\therefore \quad \frac{V_1}{F_{A0}} = X_1 \cdot \frac{1}{(-r_{A1})}$$

$$F_A = F_{A0} \cdot (1 - X)$$

$$\Rightarrow \quad dF_A = -F_{A0}\, dX$$

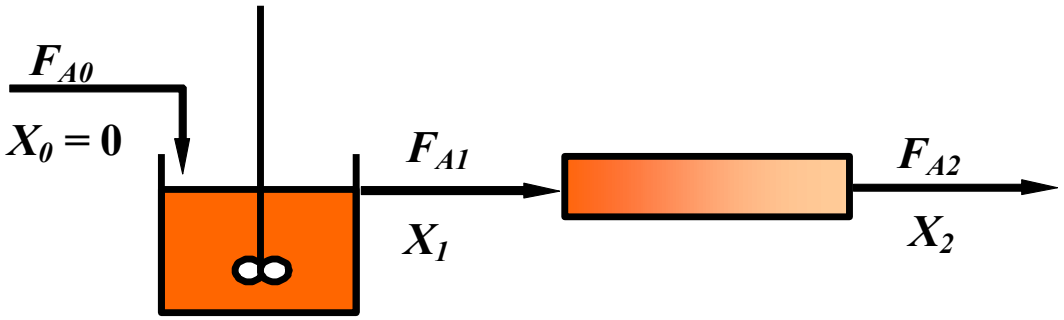
Balanço ao PFR

$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

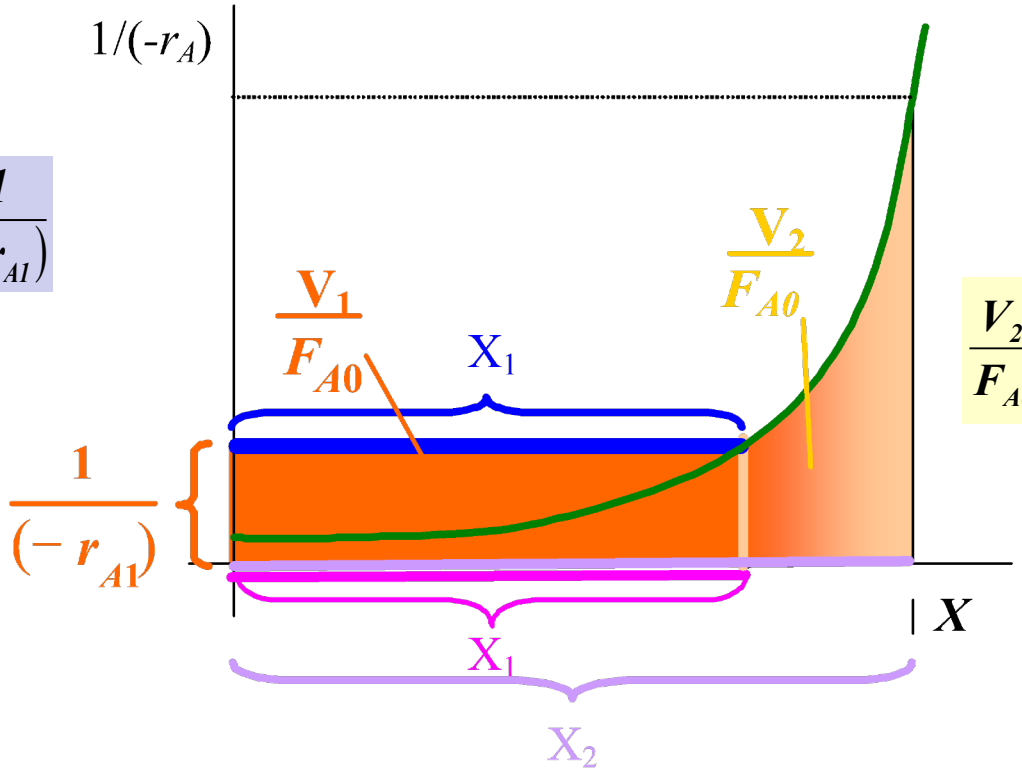
$$\therefore \quad -dF_A + r_A \cdot dV = 0$$

$$\therefore \quad F_{A0}\, dX = (-r_A) \cdot dV \quad \therefore \quad \frac{dV}{F_{A0}} = \frac{dX}{(-r_A)}$$

$$\frac{V_2}{F_{A0}} = \int_0^{V_2} \frac{dV}{F_{A0}} = \int_{X_1}^{X_2} \frac{dX}{(-r_A)}$$

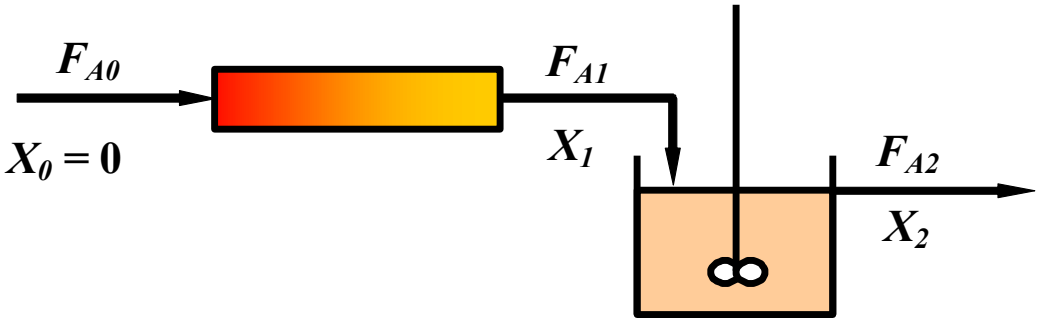


$$\frac{V_1}{F_{A0}} = X_1 \cdot \frac{1}{(-r_{A1})}$$



$$\frac{V_2}{F_{A0}} = \int_{X_1}^{X_2} \frac{dX}{(-r_A)}$$

Associação em série PFR-CSTR



$$F_A = F_{A0} \cdot (1 - X)$$

$$\Rightarrow \quad dF_A = -F_{A0}\, dX$$

Balanço ao PFR

$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

$$\therefore \quad -dF_A + r_A \cdot dV = 0$$

$$\therefore \quad F_{A0}\, dX = (-r_A) \cdot dV$$

$$\therefore \quad \frac{dV}{F_{A0}} = \frac{dX}{(-r_A)}$$

$$\frac{V_1}{F_{A0}} = \int_0^{V_1} \frac{dV}{F_{A0}} = \int_0^{X_1} \frac{dX}{(-r_A)}$$

Balanço ao CSTR

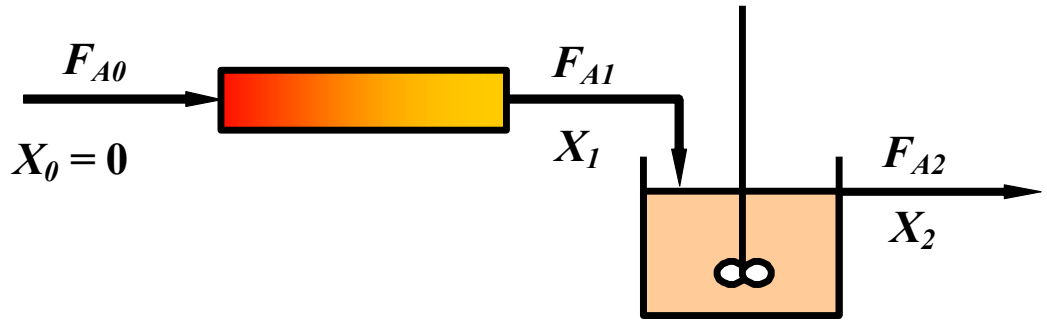
$$F_{A1} = F_{A0}(1 - X_1)$$

$$F_{A2} = F_{A0}(1 - X_2)$$

$$F_{A1} - F_{A2} + r_{A2} \cdot V_2 = 0$$

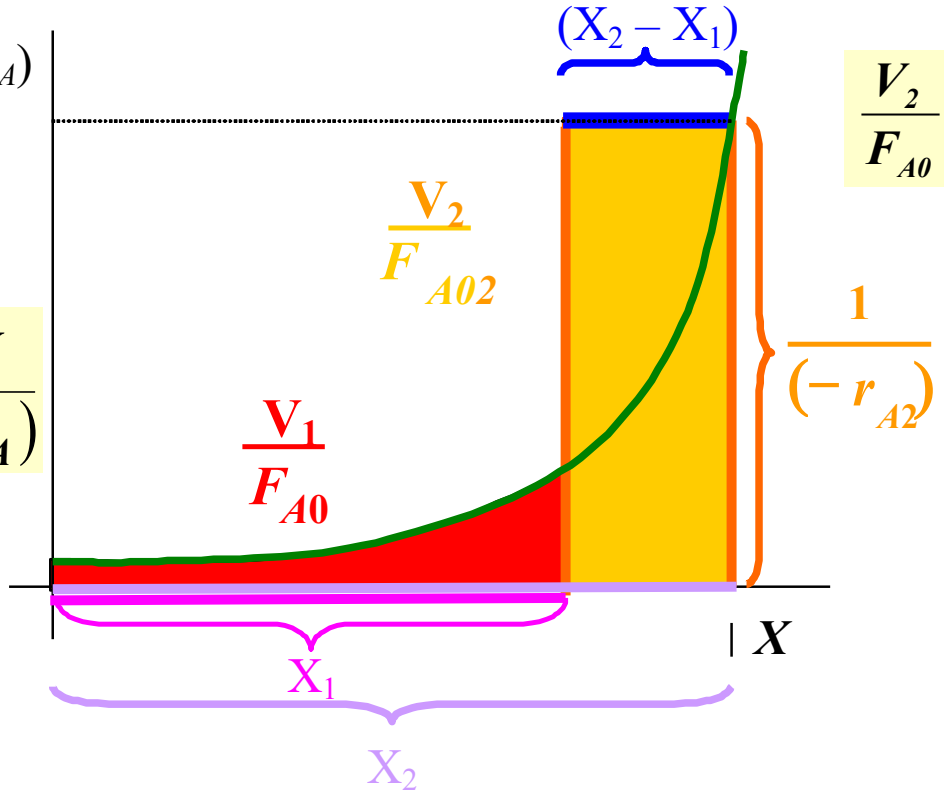
$$\therefore \quad F_{A0}(1 - X_1) - F_{A0}(1 - X2) + r_{A2} \cdot V_2 = 0$$

$$\therefore \quad \frac{V_2}{F_{A0}} = (X_2 - X_1) \cdot \frac{1}{(-r_{A2})}$$

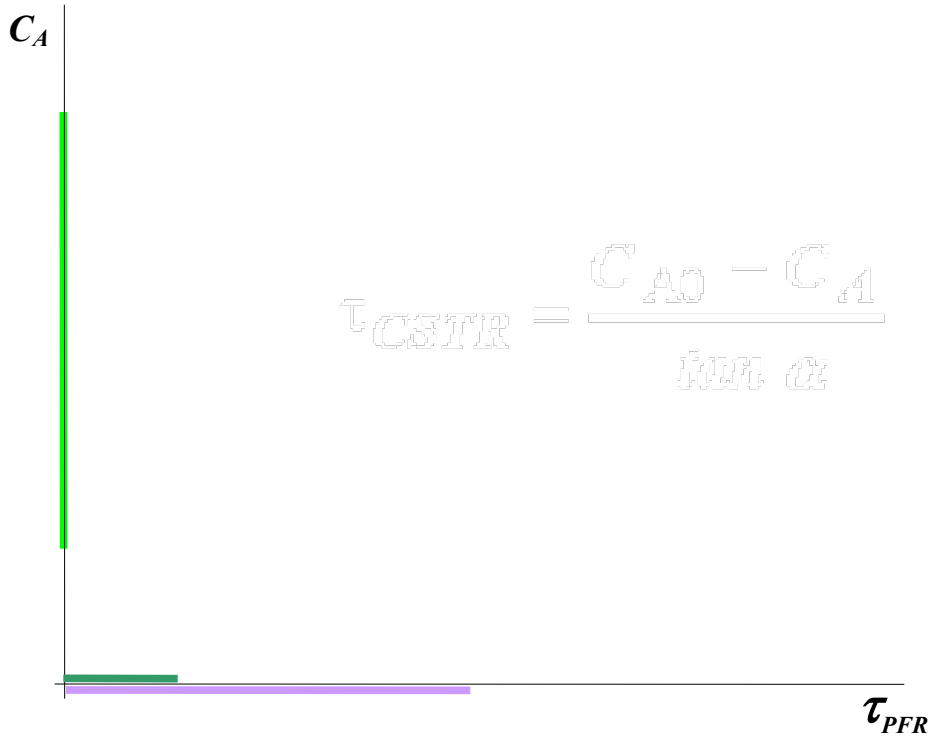


$$\frac{V_1}{F_{A0}} = \int_0^{V_1} \frac{dV}{F_{A0}} = \int_0^{X_1} \frac{dX}{(-r_A)}$$

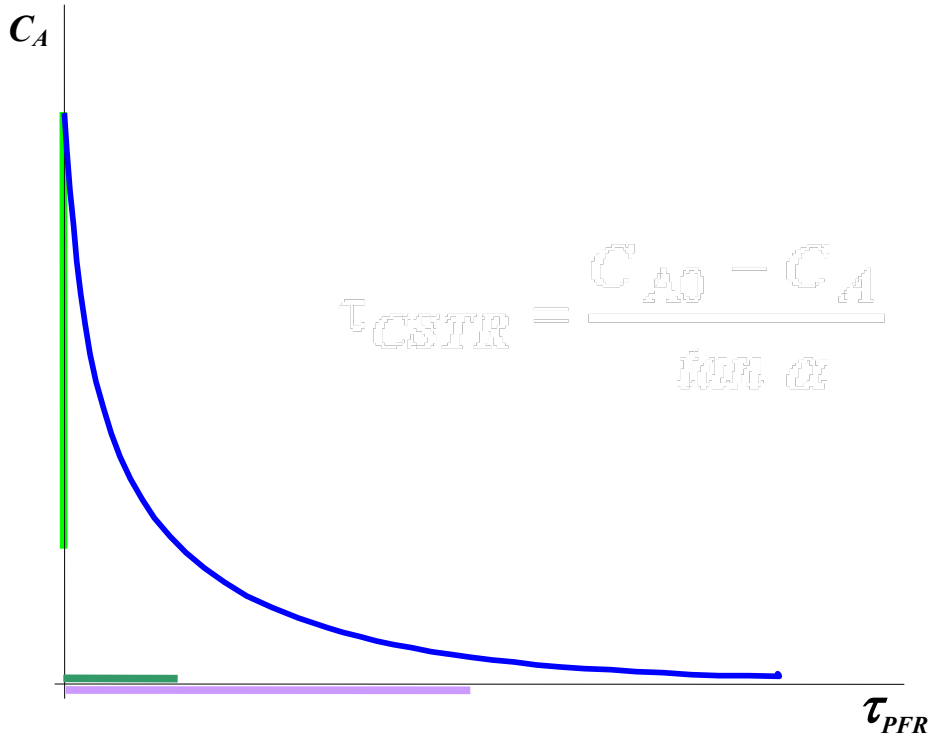
$$\frac{V_2}{F_{A0}} = (X_2 - X_1) \cdot \frac{1}{(-r_{A2})}$$



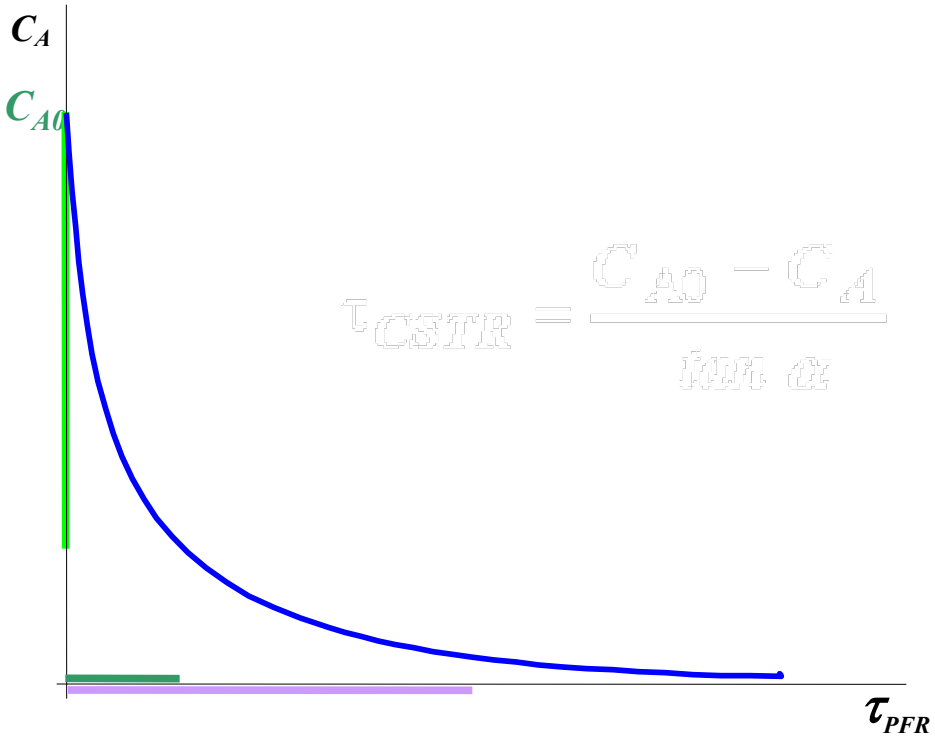
Dimensionamento gráfico a partir da curva C *vs* t



Dimensionamento gráfico a partir da curva C *vs* t

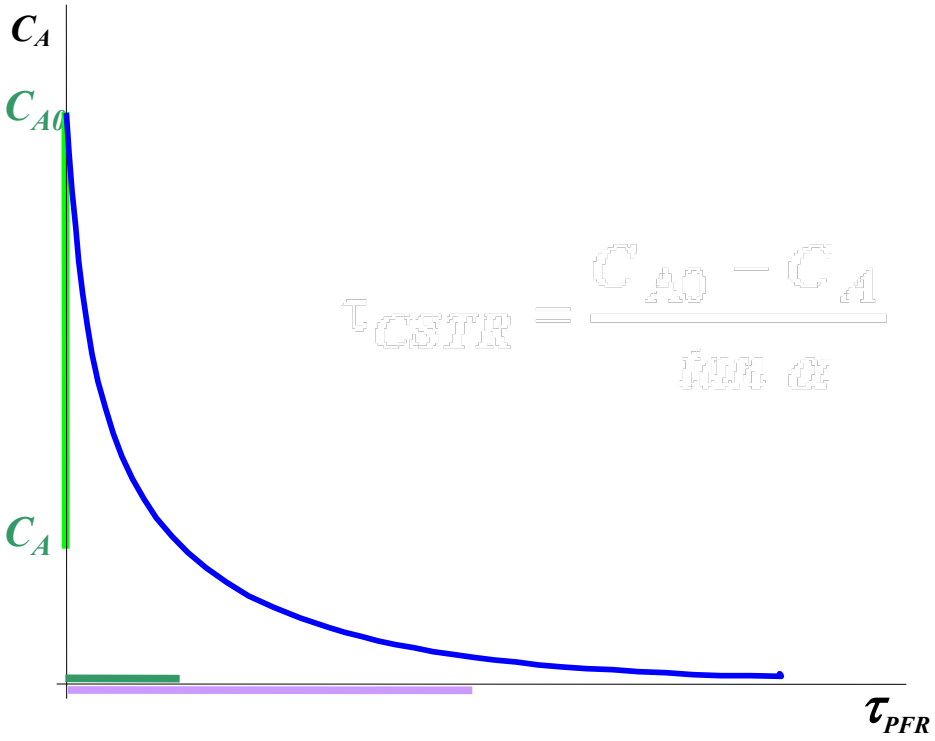


Dimensionamento gráfico a partir da curva C *vs* t



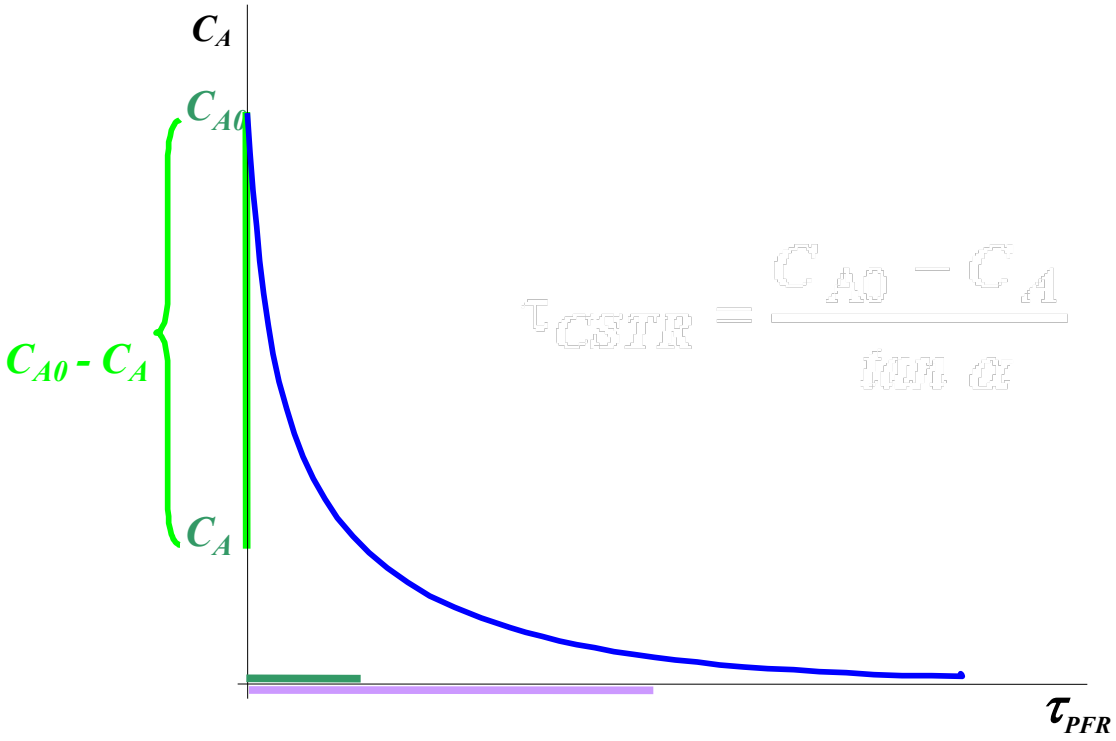
$$\tau_{CSTR} = \frac{C_{A0} - C_A}{-r_A}$$

Dimensionamento gráfico a partir da curva C *vs* t



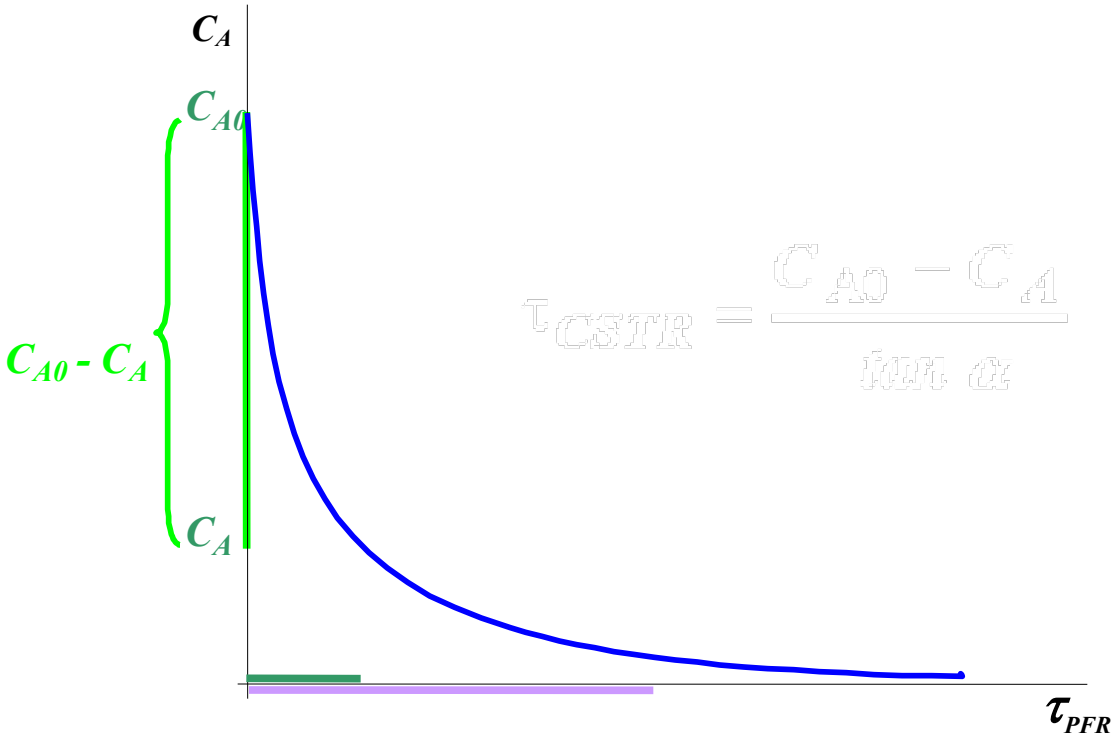
$$\tau_{CSTR} = \frac{C_{A0} - C_A}{-r_A}$$

Dimensionamento gráfico a partir da curva C *vs* t



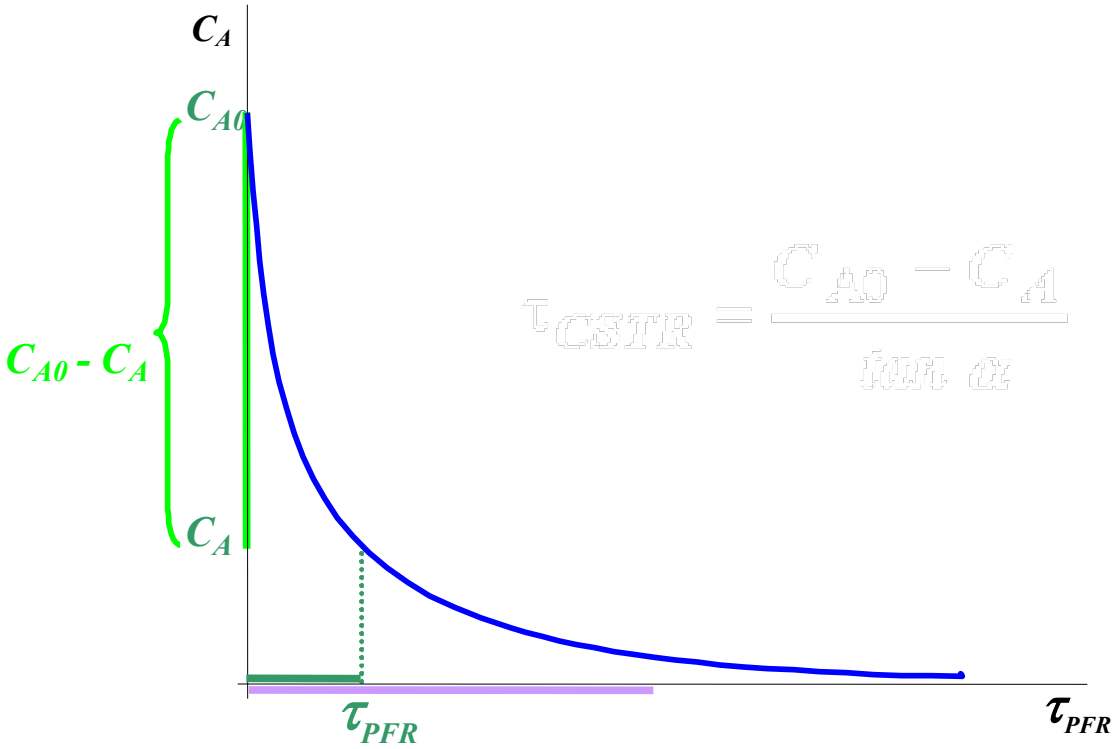
Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa



Dimensionamento gráfico a partir da curva C *vs* t

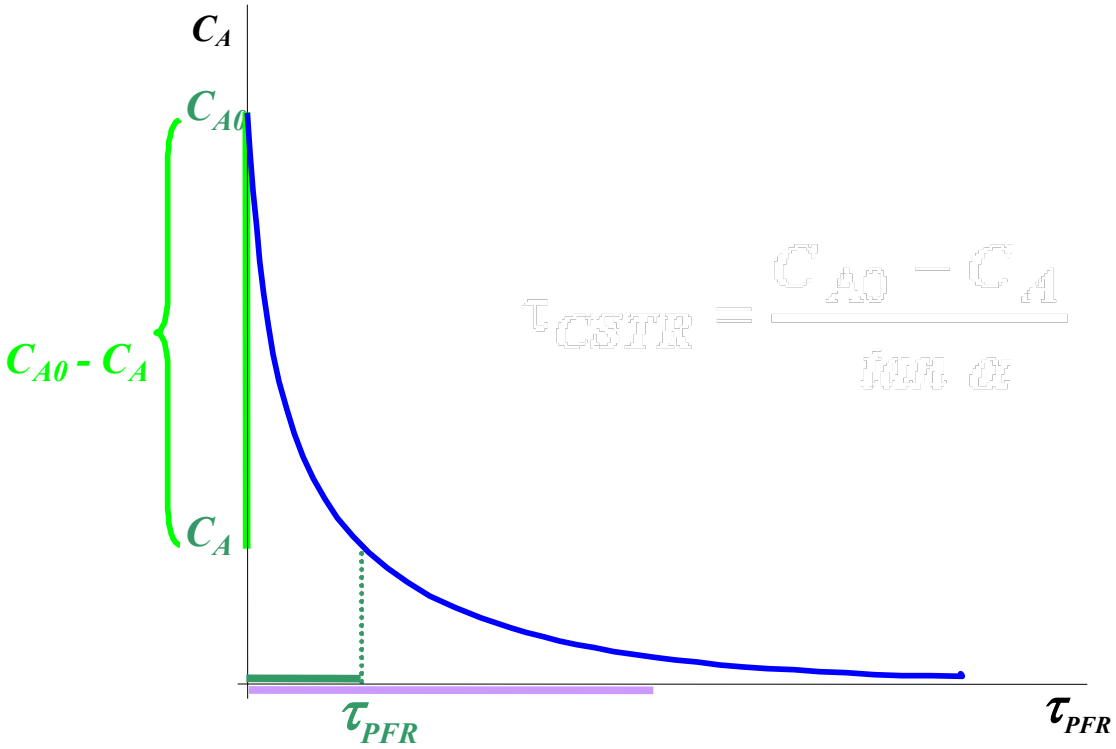
***PFR*:** Leitura directa



Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

***CSTR*:**

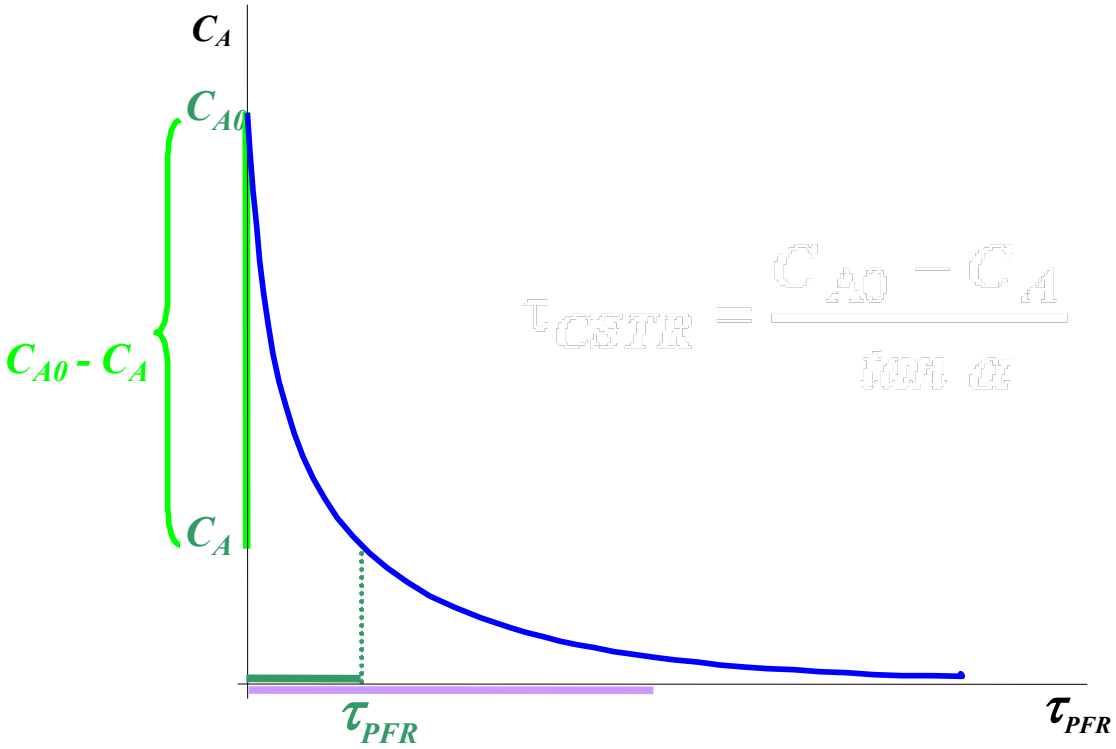


Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

***CSTR*:**

Do balanço ao PFR:



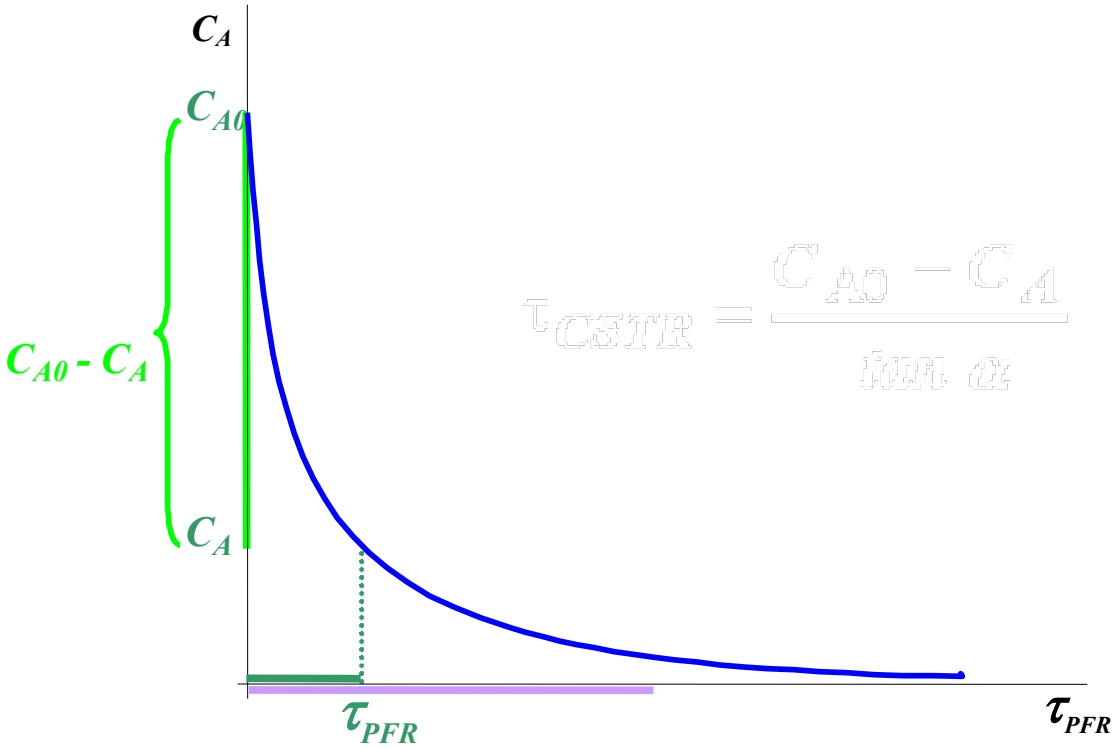
Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

***CSTR*:**

$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

Do balanço ao PFR:



$$\tau_{CSTR} = \frac{C_{A0} - C_A}{-r_A}$$

Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

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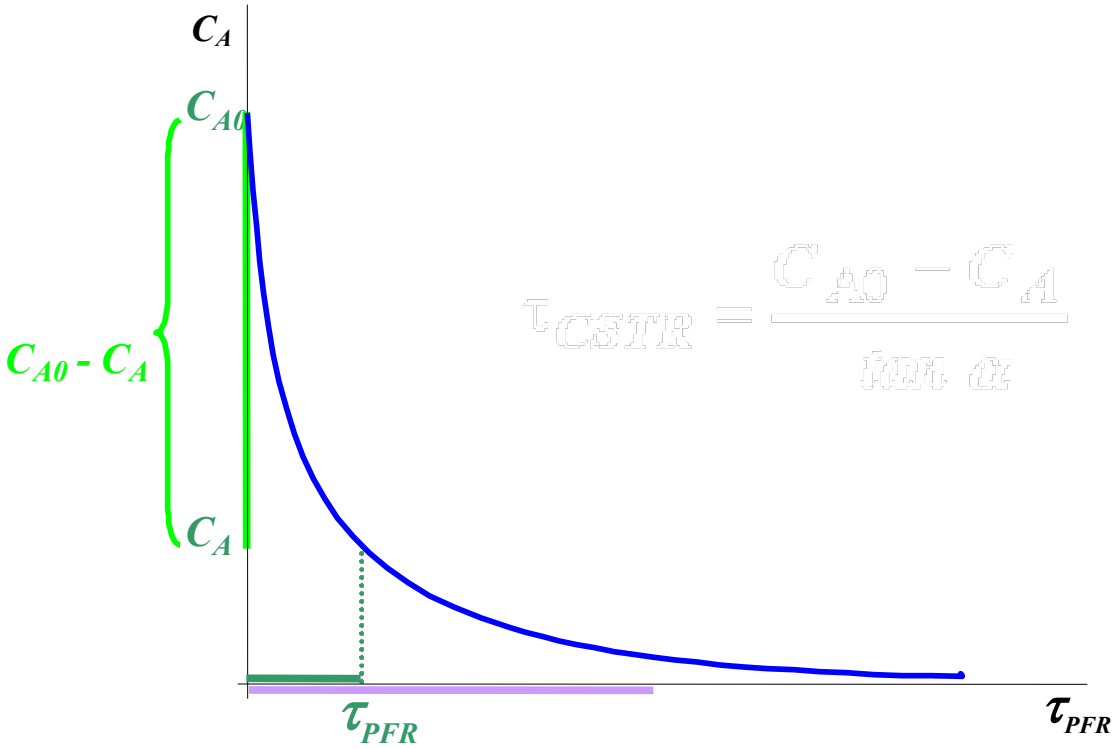
Do balanço ao PFR:

$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

$$\therefore \quad -dF_A + r_A \cdot dV = 0$$



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Dimensionamento gráfico a partir da curva C *vs* t

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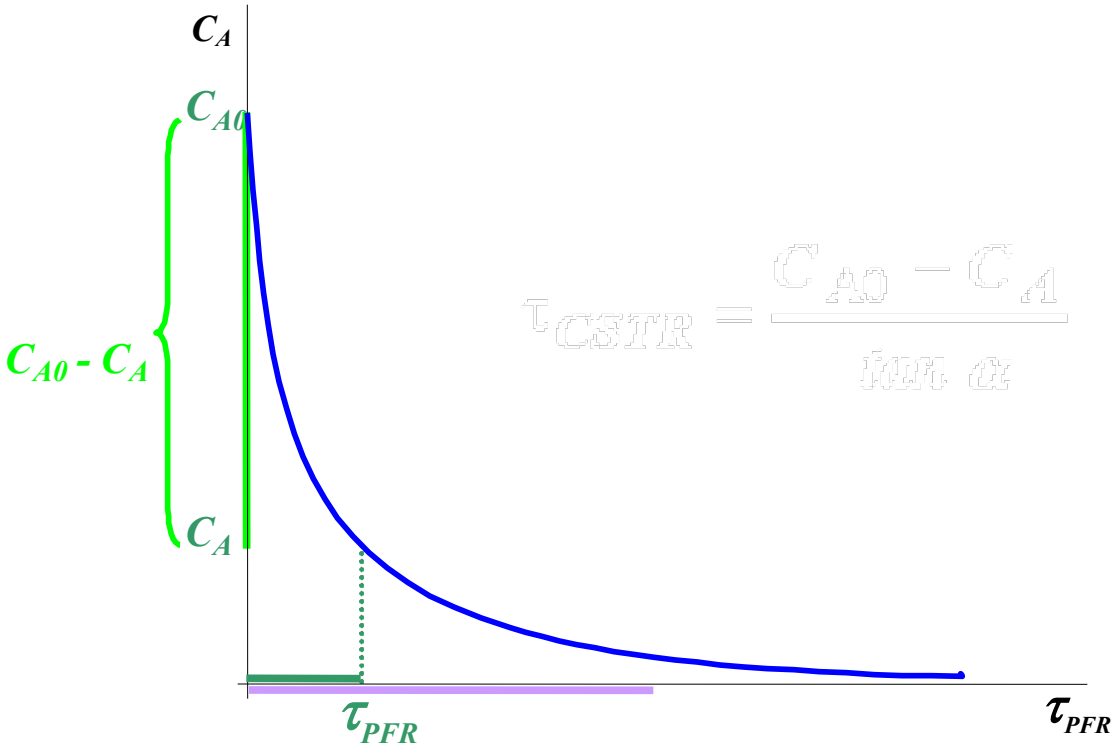
$$dF_A = v_0 \cdot dC_A$$



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Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

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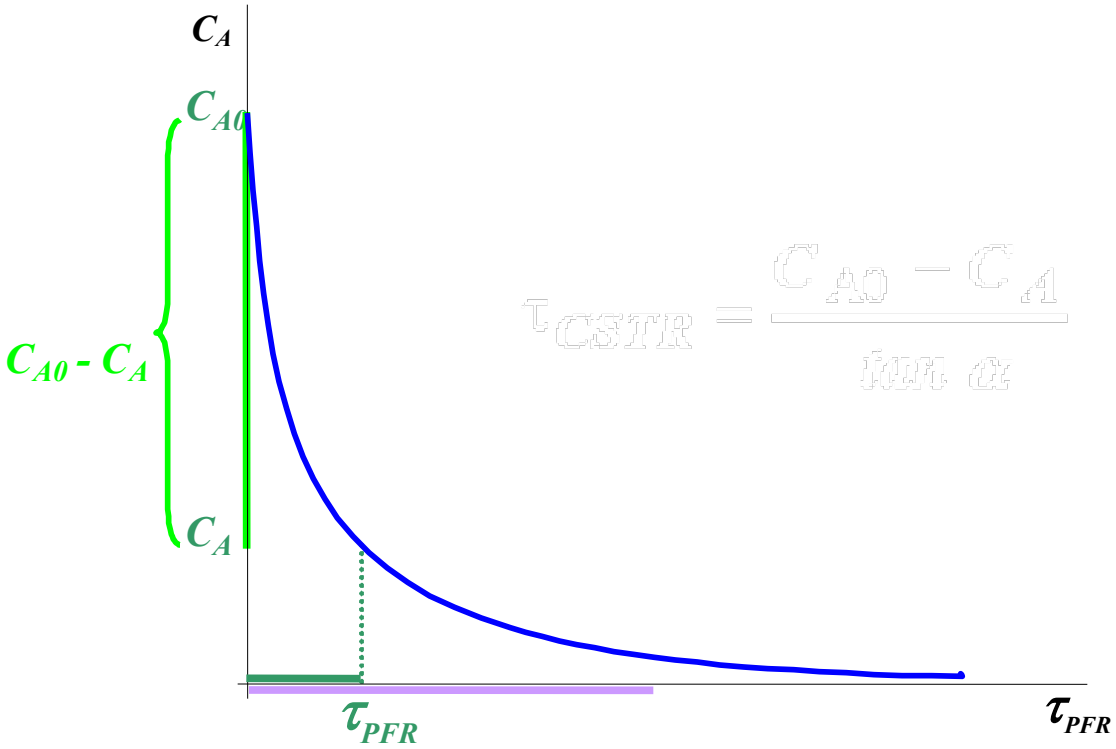
$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

$$\therefore \quad -dF_A + r_A \cdot dV = 0$$

$$dF_A = v_0 \cdot dC_A \quad \therefore \quad -v_0 dC_A + r_A \cdot dV_{PFR} = 0$$



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Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

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$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

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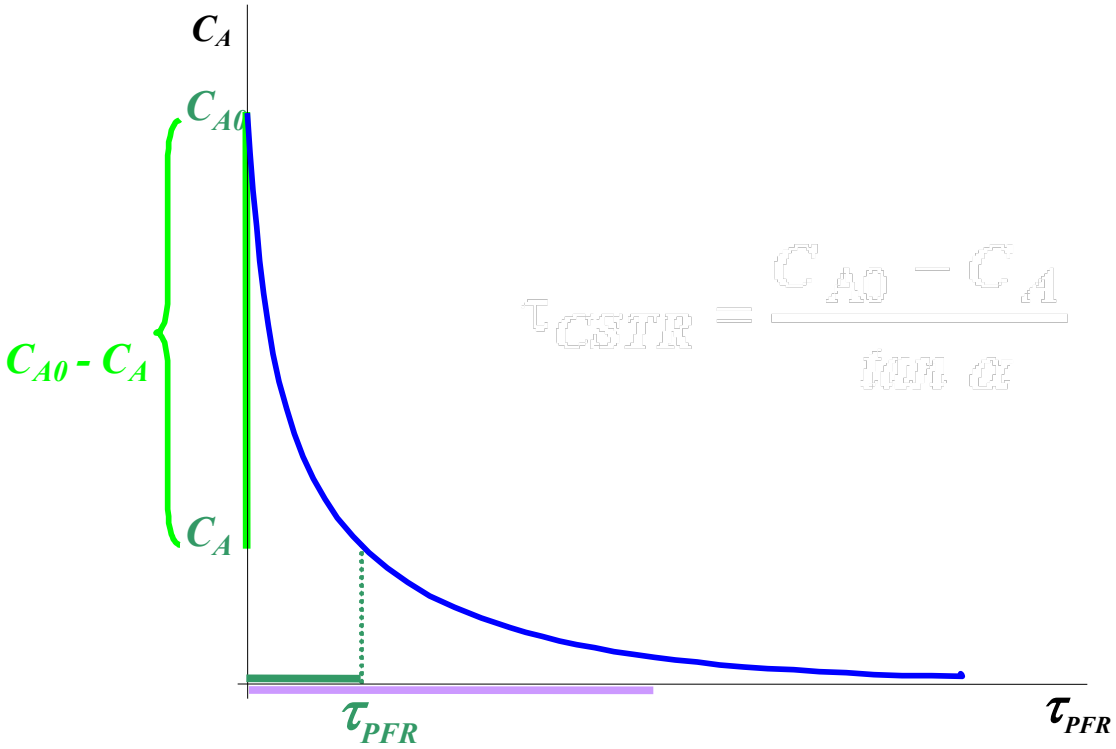
$$dF_A = v_0 \cdot dC_A \quad \therefore \quad -v_0 dC_A + r_A \cdot dV_{PFR} = 0 \quad \therefore \quad -dC_A + r_A \cdot \frac{dV_{PFR}}{v_0} = 0$$



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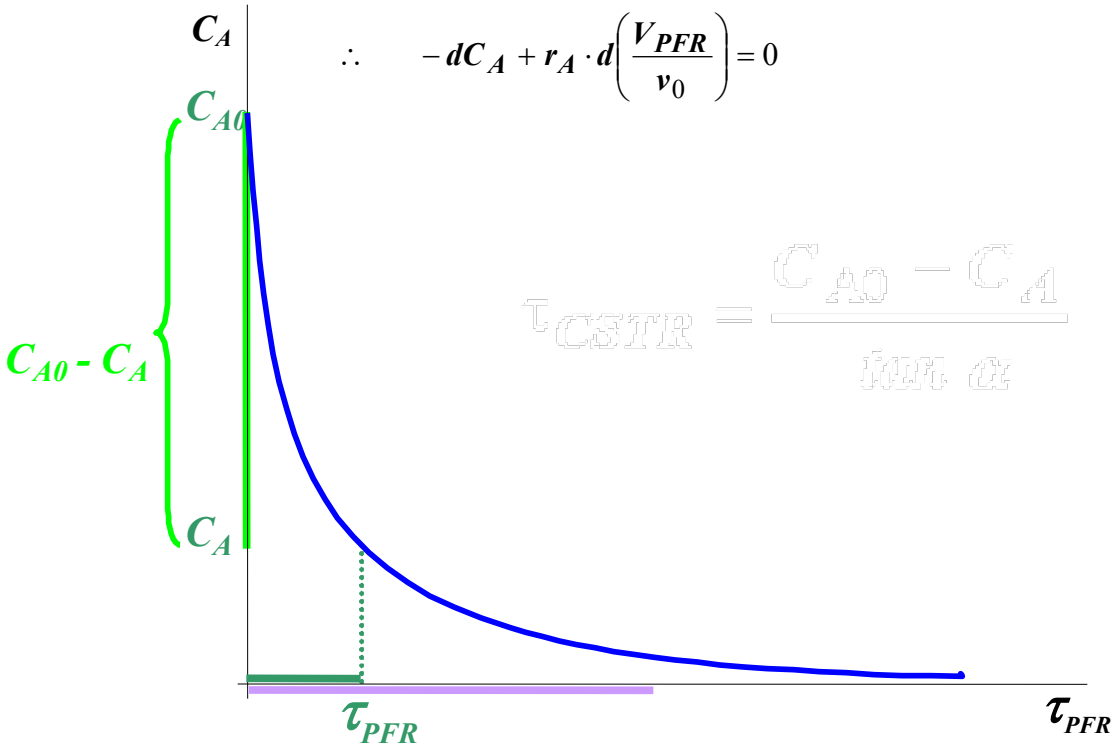
$$\therefore \quad -dC_A + r_A \cdot d\left(\frac{V_{PFR}}{v_0}\right) = 0$$



Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

***CSTR*:**

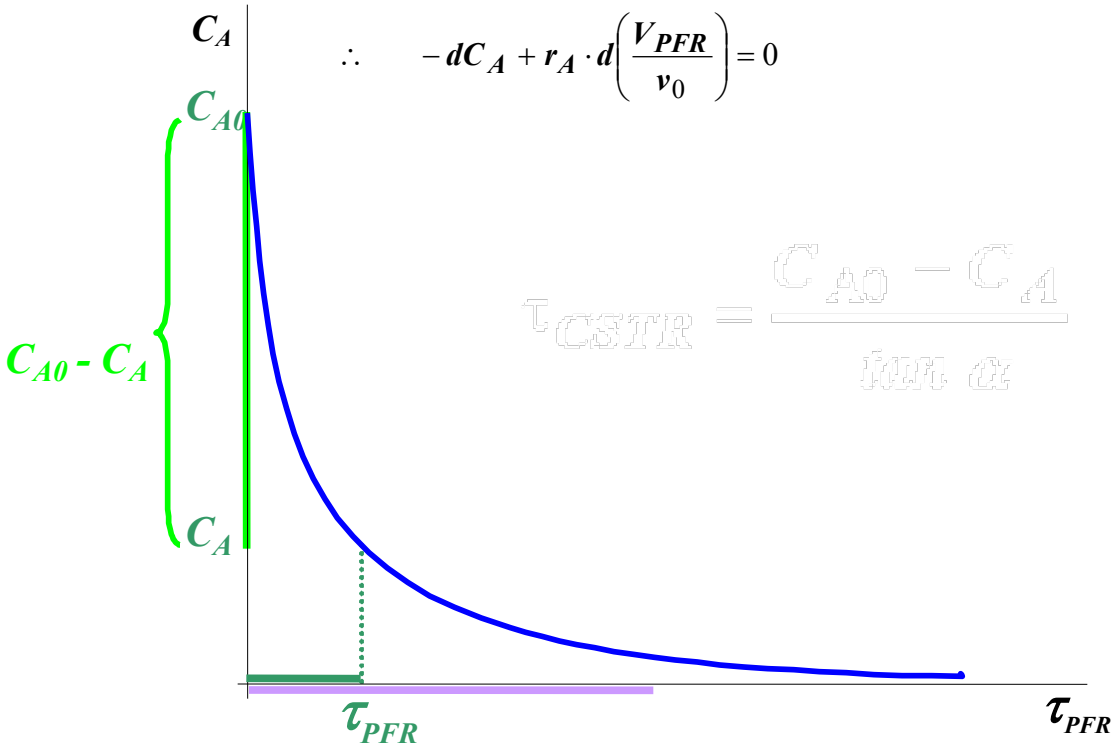
Do balanço ao PFR:

$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

$$\therefore \quad -dF_A + r_A \cdot dV = 0$$

$$dF_A = v_0 \cdot dC_A \quad \therefore \quad -v_0 dC_A + r_A \cdot dV_{PFR} = 0 \quad \therefore \quad -dC_A + r_A \cdot \frac{dV_{PFR}}{v_0} = 0$$

$$\therefore \quad -dC_A + r_A \cdot d\left(\frac{V_{PFR}}{v_0}\right) = 0$$



Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

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$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

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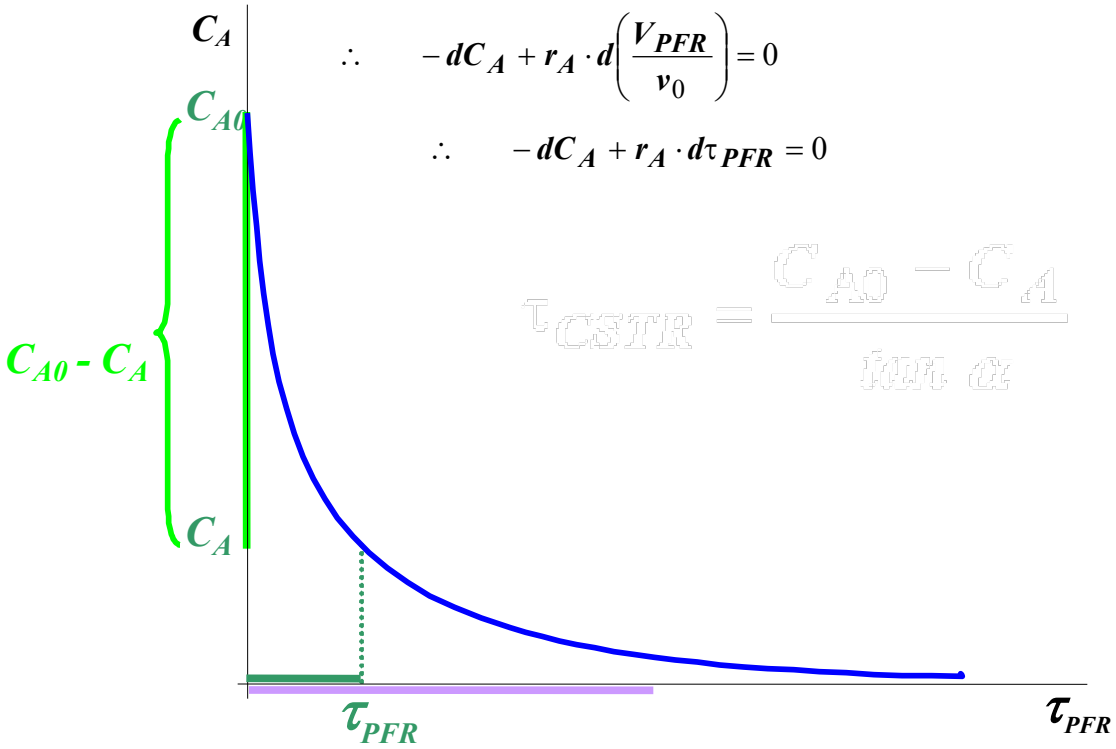
$$dF_A = v_0 \cdot dC_A \quad \therefore \quad -v_0 dC_A + r_A \cdot dV_{PFR} = 0 \quad \therefore \quad -dC_A + r_A \cdot \frac{dV_{PFR}}{v_0} = 0$$

$$\therefore \quad -dC_A + r_A \cdot d\left(\frac{V_{PFR}}{v_0}\right) = 0$$

$$\therefore \quad -dC_A + r_A \cdot d\tau_{PFR} = 0$$

$$\tau_{CSTR} = \frac{C_{A0} - C_A}{-r_A}$$



Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

***CSTR*:**

Do balanço ao PFR:

$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

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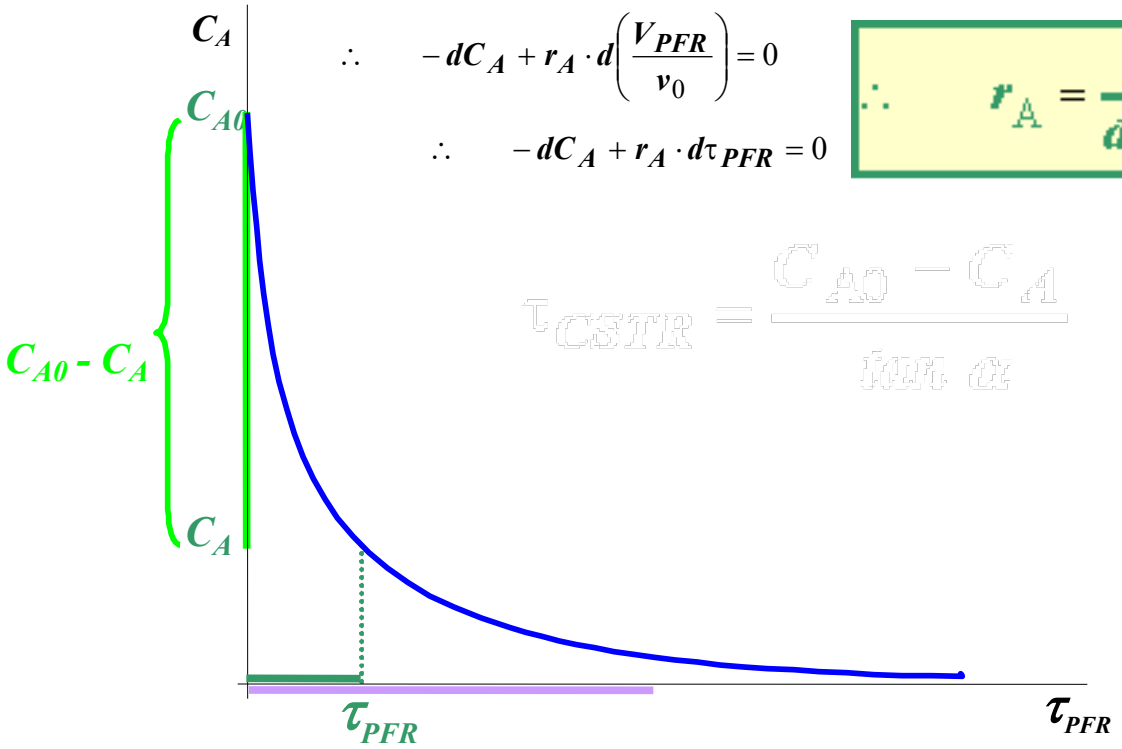
$$dF_A = v_0 \cdot dC_A \quad \therefore \quad -v_0 dC_A + r_A \cdot dV_{PFR} = 0 \quad \therefore \quad -dC_A + r_A \cdot \frac{dV_{PFR}}{v_0} = 0$$

$$\therefore \quad -dC_A + r_A \cdot d\left(\frac{V_{PFR}}{v_0}\right) = 0$$

$$\therefore \quad -dC_A + r_A \cdot d\tau_{PFR} = 0$$

$$\therefore \quad r_A = \frac{dC_A}{d\tau_{PFR}}$$



Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

***CSTR*:**

Do balanço ao PFR:

$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

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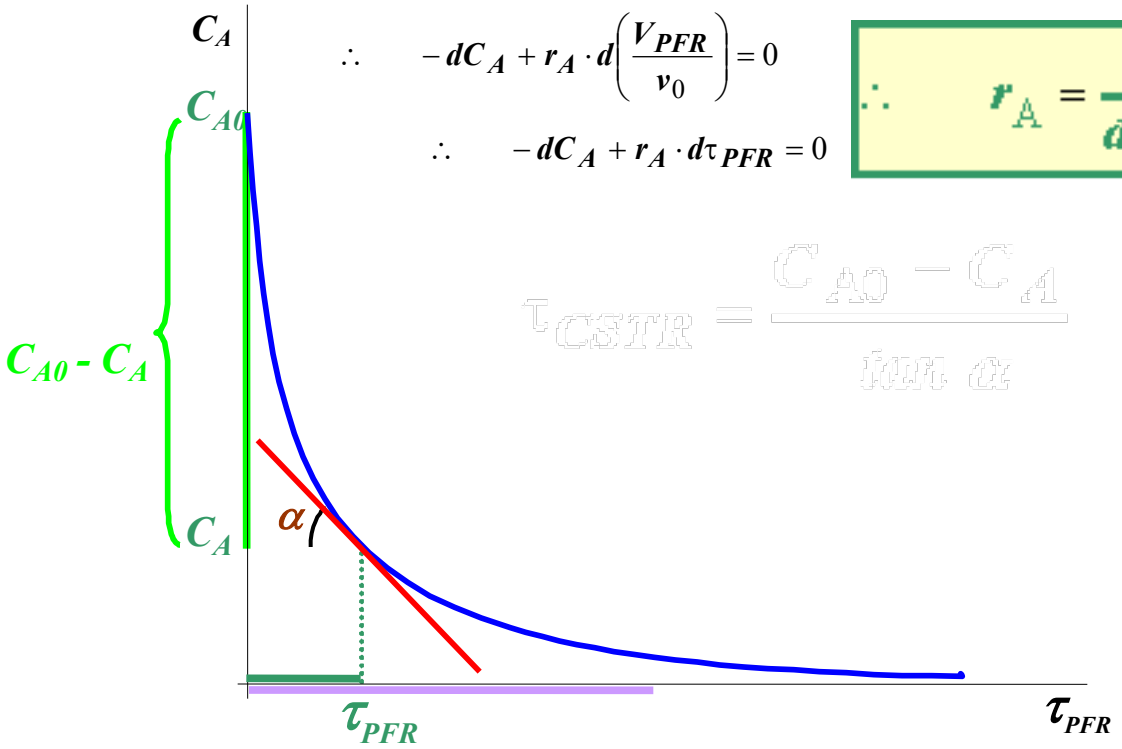
$$\therefore \quad -dC_A + r_A \cdot d\tau_{PFR} = 0$$

$$\therefore \quad r_A = \frac{dC_A}{d\tau_{PFR}}$$



$$\tau_{CSTR} = \frac{C_{A0} - C_A}{-r_A}$$

Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

***CSTR*:**

Do balanço ao PFR:

$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

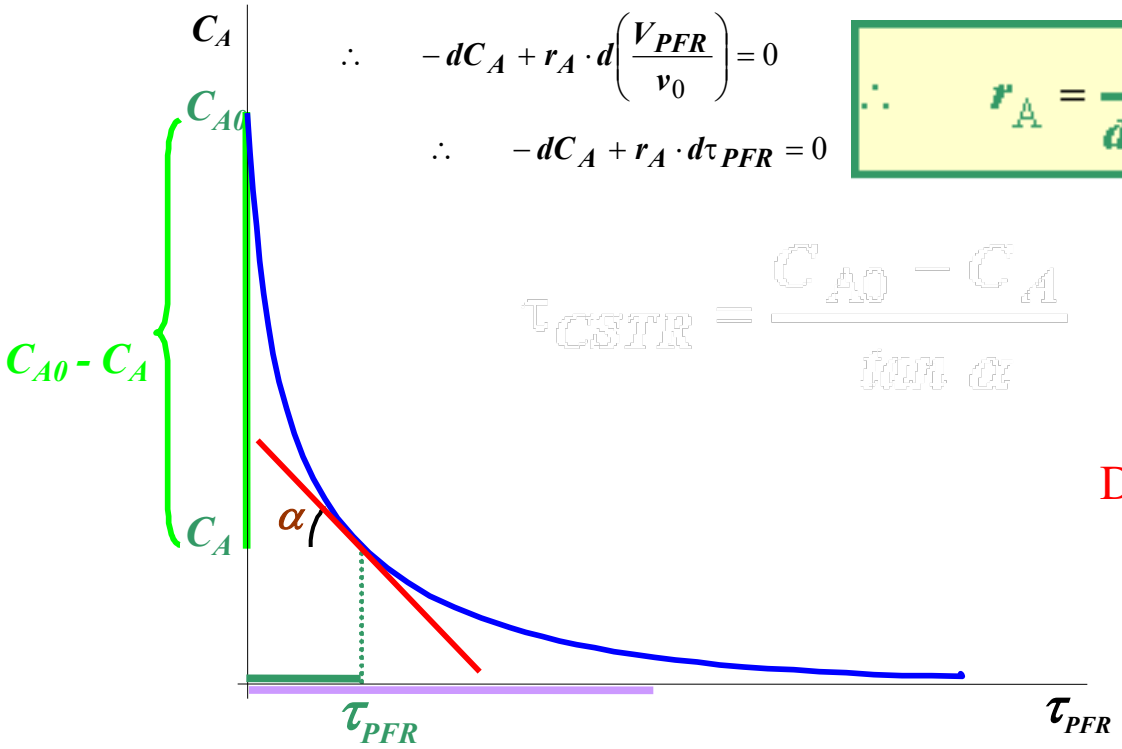
$$\therefore \quad -dF_A + r_A \cdot dV = 0$$

$$dF_A = v_0 \cdot dC_A \quad \therefore \quad -v_0 dC_A + r_A \cdot dV_{PFR} = 0 \quad \therefore \quad -dC_A + r_A \cdot \frac{dV_{PFR}}{v_0} = 0$$

$$\therefore \quad -dC_A + r_A \cdot d\left(\frac{V_{PFR}}{v_0}\right) = 0$$

$$\therefore \quad -dC_A + r_A \cdot d\tau_{PFR} = 0$$

$$\therefore \quad r_A = \frac{dC_A}{d\tau_{PFR}}$$



$$\tau_{CSTR} = \frac{C_{A0} - C_A}{-r_A}$$

Do balanço ao CSTR:

Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

***CSTR*:**

Do balanço ao PFR:

$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

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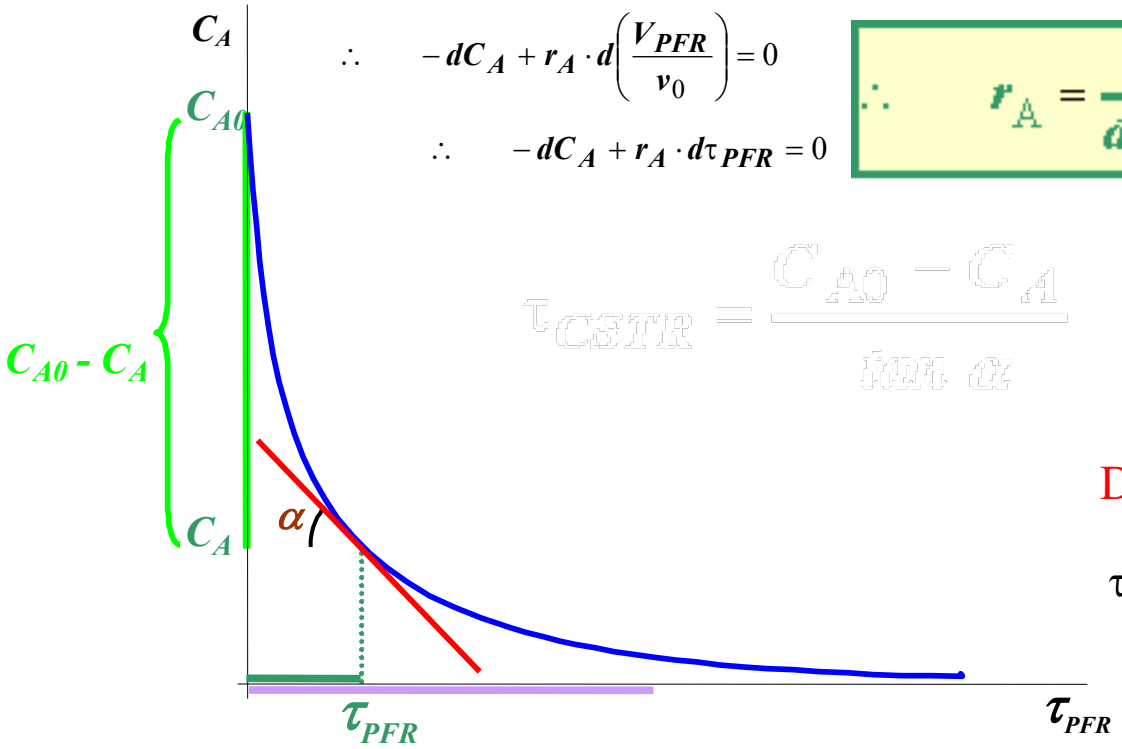
$$\therefore \quad r_A = \frac{dC_A}{d\tau_{PFR}}$$



Do balanço ao CSTR:

$$\tau_{CSTR} = \frac{C_{A0} - C_A}{(-r_A)}$$

Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

***CSTR*:**

Do balanço ao PFR:

$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

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$$dF_A = v_0 \cdot dC_A \quad \therefore \quad -v_0 dC_A + r_A \cdot dV_{PFR} = 0 \quad \therefore \quad -dC_A + r_A \cdot \frac{dV_{PFR}}{v_0} = 0$$

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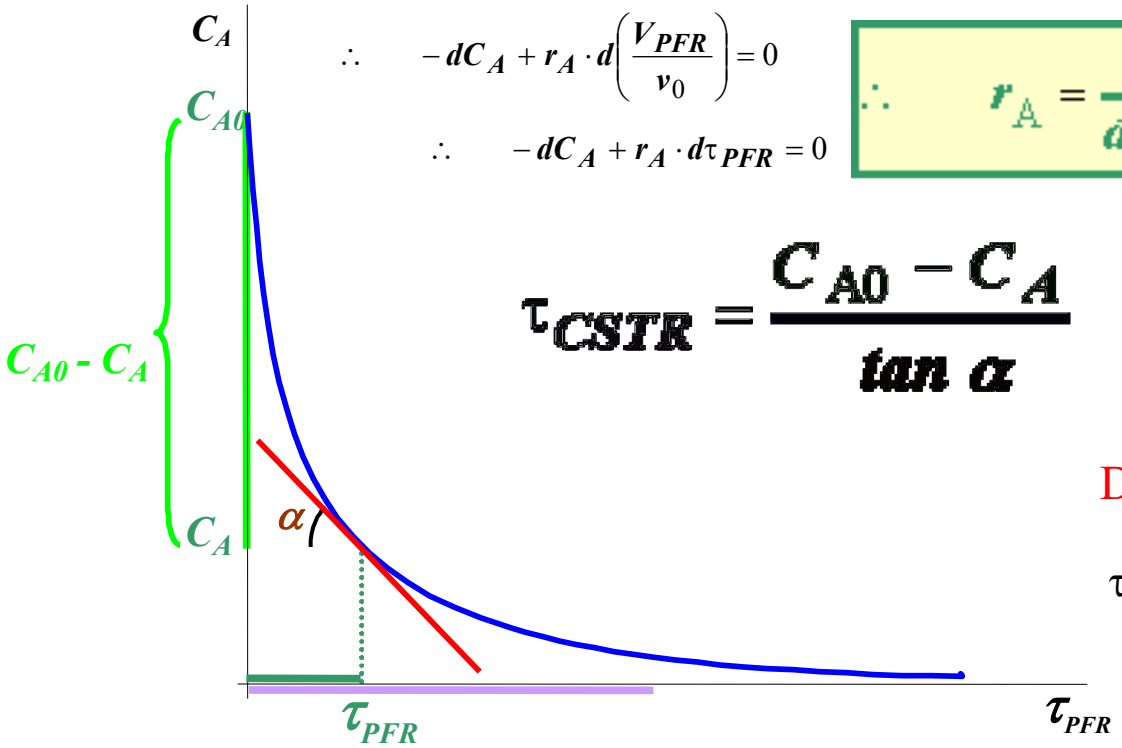
$$\therefore \quad -dC_A + r_A \cdot d\tau_{PFR} = 0$$

$$\therefore \quad r_A = \frac{dC_A}{d\tau_{PFR}}$$



$$\tau_{CSTR} = \frac{C_{A0} - C_A}{\tan \alpha}$$

Do balanço ao CSTR:

$$\tau_{CSTR} = \frac{C_{A0} - C_A}{(-r_A)}$$

Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

***CSTR*:**

Do balanço ao PFR:

$$F_A - (F_A + dF_A) + r_A \cdot dV = 0$$

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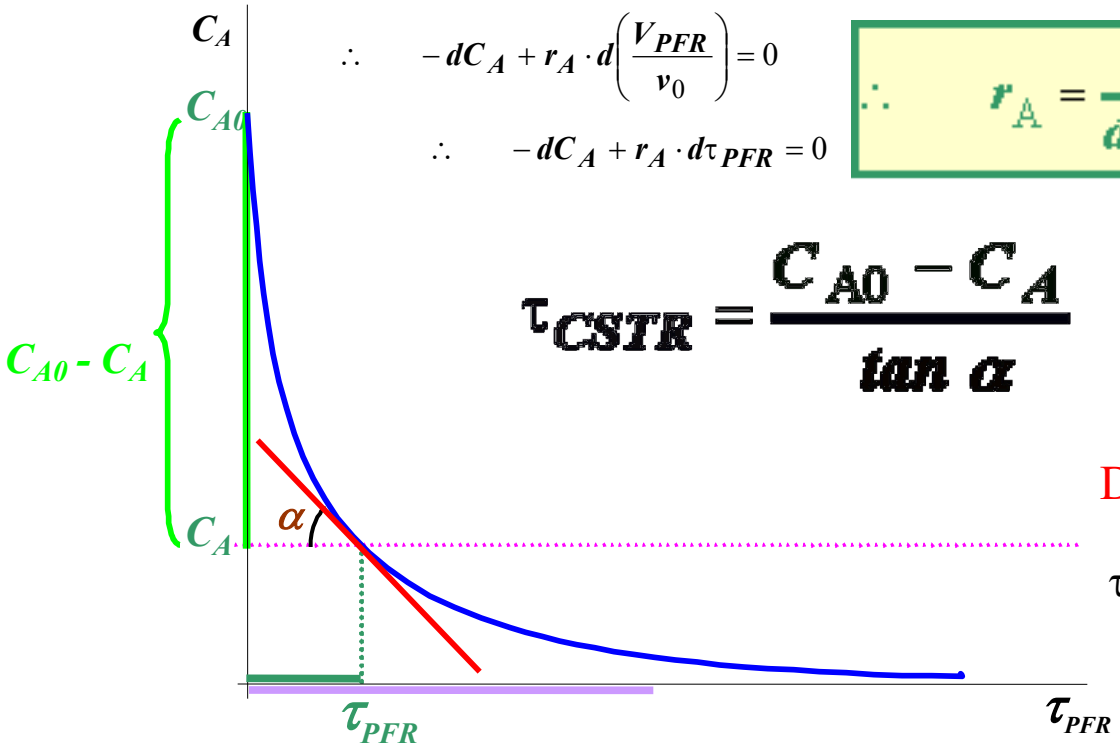

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Dimensionamento gráfico a partir da curva C *vs* t

***PFR*:** Leitura directa

***CSTR*:**

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$$dF_A = v_0 \cdot dC_A \quad \therefore \quad -v_0 dC_A + r_A \cdot dV_{PFR} = 0 \quad \therefore \quad -dC_A + r_A \cdot \frac{dV_{PFR}}{v_0} = 0$$

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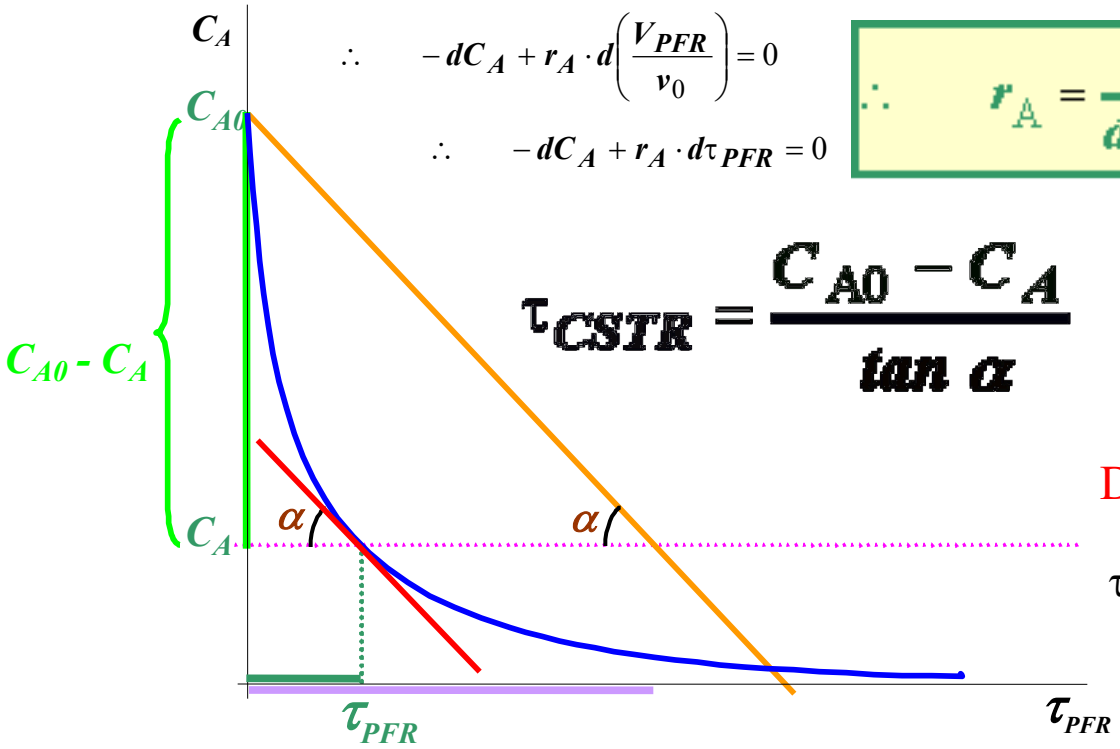

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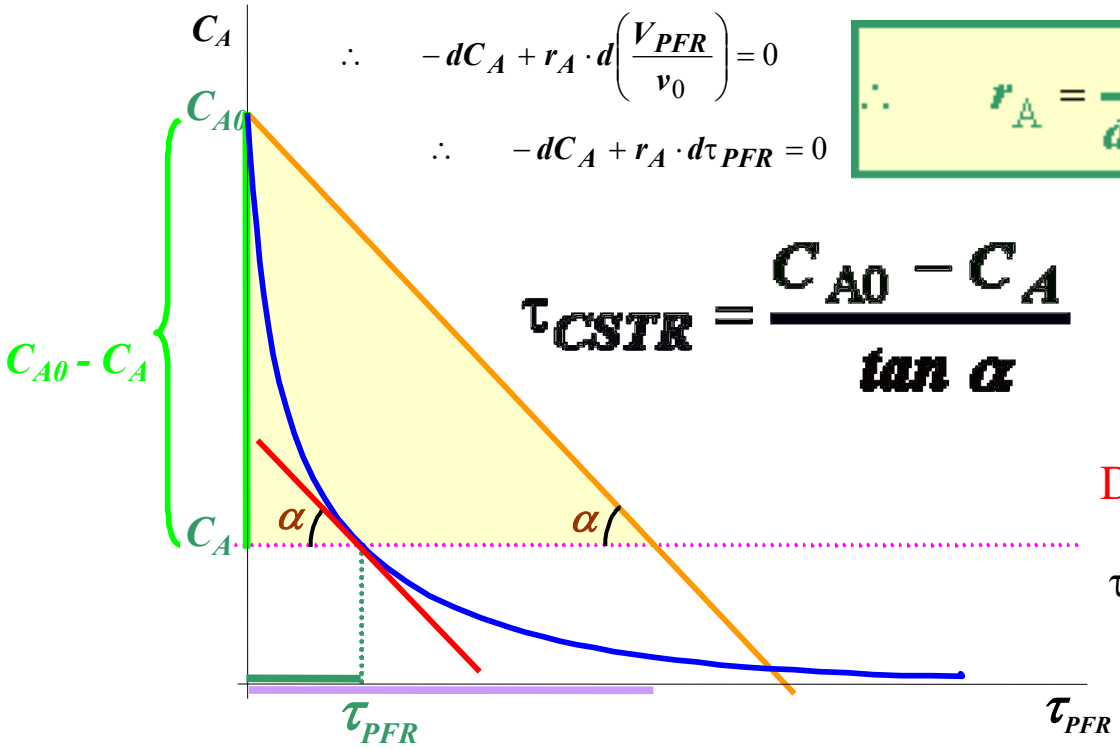

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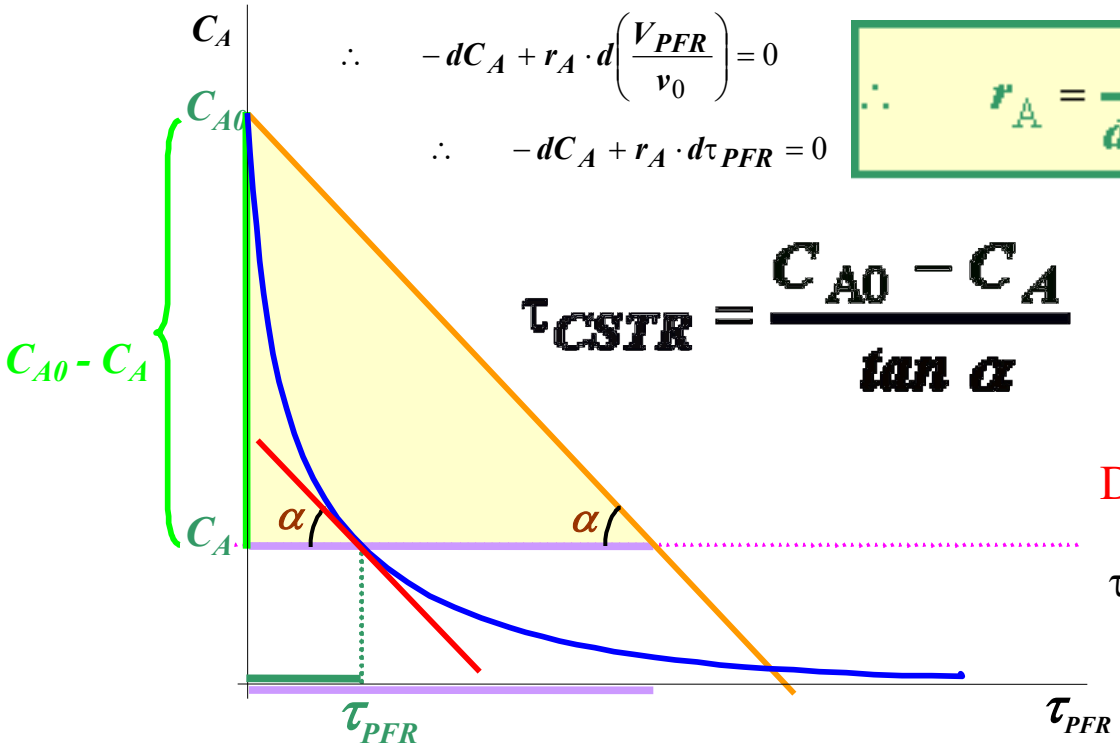

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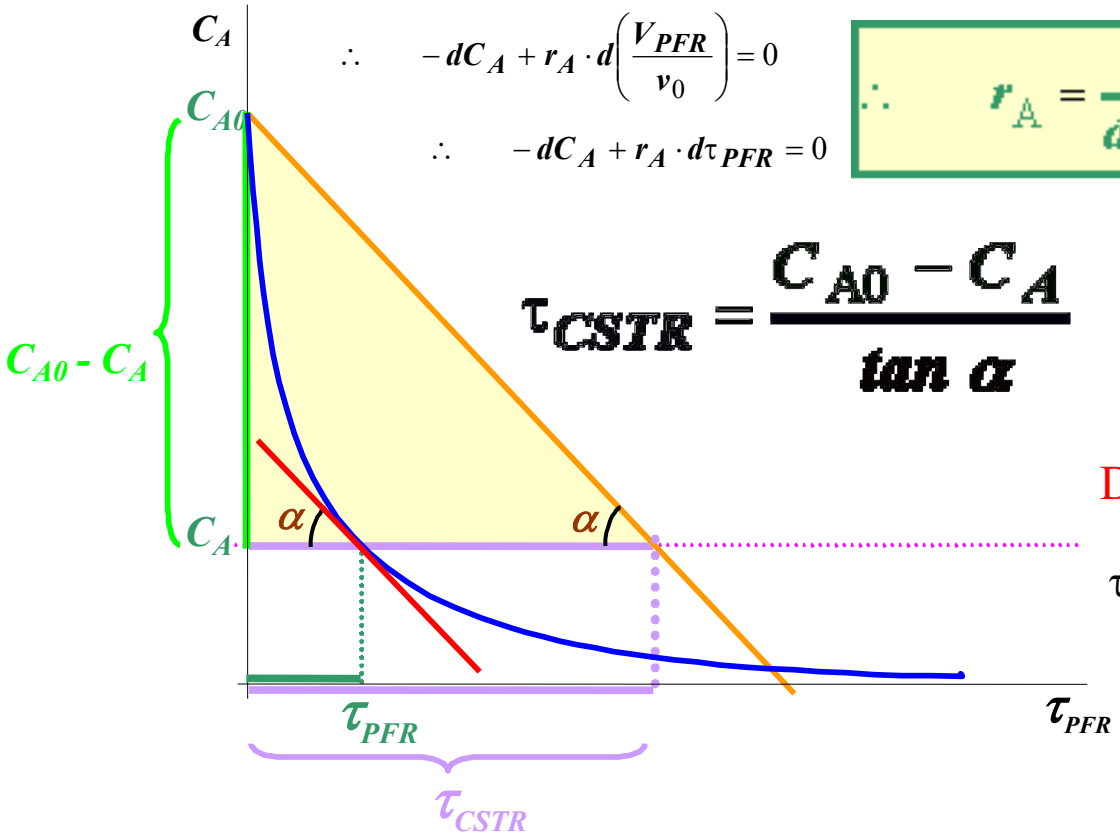

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