

Calcul de la capacité thermique du calorimètre :

$$C_{eau} = 4,1855 \cdot 10^3 J \cdot kg^{-1} \cdot K^{-1}$$

$$m_{eau1} = 200 \cdot 10^{-3} kg$$

$$m_{eau2} = 100 \cdot 10^{-3} kg$$

$$\theta_f = 309K$$

$$\theta_{i1} = 293K$$

$$\theta_{i2} = 353K$$

$$Q = m * C * (\theta_f - \theta_i)$$

$$Q_1 = m_{eau1} * C_{eau} * (\theta_f - \theta_{i1}) + C * (\theta_f - \theta_{i1})$$

$$Q_2 = m_{eau2} * C_{eau} * (\theta_f - \theta_{i2})$$

$$Q_1 + Q_2 = 0$$

$$m_{eau1} * C_{eau} * (\theta_f - \theta_{i1}) + C * (\theta_f - \theta_{i1}) + m_{eau2} * C_{eau} * (\theta_f - \theta_{i2}) = 0$$

$$m_{eau1} * C_{eau} * (\theta_f - \theta_{i1}) + m_{eau2} * C_{eau} * (\theta_f - \theta_{i2}) = -C * (\theta_f - \theta_{i1})$$

$$\frac{m_{eau1} * C_{eau} * (\theta_f - \theta_{i1}) + m_{eau2} * C_{eau} * (\theta_f - \theta_{i2})}{-(\theta_f - \theta_{i1})} = C$$

$$C = \frac{200 \cdot 10^{-3} kg * 4,1855 \cdot 10^3 J \cdot kg^{-1} \cdot K^{-1} * (309K - 293K) + 100 \cdot 10^{-3} kg * 4,1855 \cdot 10^3 J \cdot kg^{-1} \cdot K^{-1} * (309K - 353K)}{-(309K - 293K)}$$

$$C = 314 J \cdot K^{-1}$$

Calcul de la capacité thermique de l'élastique :

$$m_e = 40,0 \cdot 10^{-3} kg$$

$$\theta'_f = 297K$$

$$\theta'_{i1} = 293K$$

$$\theta'_{i2} = 353K$$

$$Q = m * C * (\theta_f - \theta_i)$$

$$Q'_1 = m_{eau1} * C_{eau} * (\theta'_f - \theta'_{i1}) + C * (\theta'_f - \theta'_{i1})$$

$$Q_e = m_e * C_e * (\theta'_f - \theta'_{i2})$$

$$Q'_1 + Q_e = 0$$

$$m_{eau1} * C_{eau} * (\theta'_f - \theta'_{i1}) + C * (\theta'_f - \theta'_{i1}) + m_e * C_e * (\theta'_f - \theta'_{i2}) = 0$$

$$m_{eau1} * C_{eau} * (\theta'_f - \theta'_{i1}) + C * (\theta'_f - \theta'_{i1}) = -m_e * C_e * (\theta'_f - \theta'_{i2})$$

$$\frac{m_{eau1} * C_{eau} * (\theta'_f - \theta'_{i1}) + C * (\theta'_f - \theta'_{i1})}{-m_e * (\theta'_f - \theta'_{i2})} = C_e$$

$$C_e = \frac{200.10^{-3} kg * 4,1855.10^3 J.kg^{-1}.K^{-1} * (297K - 293K) + 314J.K^{-1} * (297K - 293K)}{-40,0.10^{-3} kg * (297K - 353K)}$$

$$C_e = 2,06.10^3 J.kg^{-1}.K^{-1}$$

Calcul de la capacité thermique du fil d'imprimante 3D :

$$m_{eau} = 200.10^{-3} kg$$

$$m_{fil} = 10,19.10^{-3} kg$$

$$\theta'_f = 320,65K$$

$$\theta'_{i1} = 292,45K$$

$$\theta'_{i2} = 353,15K$$

$$Q = m * C * (\theta_f - \theta_i)$$

$$Q'_1 = m_{eau} * C_{eau} * (\theta'_f - \theta'_{i1}) + C * (\theta'_f - \theta'_{i1})$$

$$Q_{fil} = m_{fil} * C_{fil} * (\theta'_f - \theta'_{i2}) + m_{eau} * C_{eau} * (\theta'_f - \theta'_{i2})$$

$$Q'_1 + Q_{fil} = 0$$

$$m_{eau} * C_{eau} * (\theta'_f - \theta'_{i1}) + C * (\theta'_f - \theta'_{i1}) + m_{fil} * C_{fil} * (\theta'_f - \theta'_{i2}) + m_{eau} * C_{eau} * (\theta'_f - \theta'_{i2}) = 0$$

$$m_{eau} * C_{eau} * (\theta'_f - \theta'_{i1}) + C * (\theta'_f - \theta'_{i1}) + m_{eau} * C_{eau} * (\theta'_f - \theta'_{i2}) = -m_{fil} * C_{fil} * (\theta'_f - \theta'_{i2})$$

$$\frac{m_{eau} * C_{eau} * (\theta'_f - \theta'_{i1}) + C * (\theta'_f - \theta'_{i1}) + m_{eau} * C_{eau} * (\theta'_f - \theta'_{i2})}{-m_{fil} * (\theta'_f - \theta'_{i2})} = C_{fil}$$

$$C_{fil} = \frac{200.10^{-3} kg * 4,1855.10^3 J.kg^{-1}.K^{-1} * (320,65K - 292,45K) + 314J.K^{-1} * (320,65K - 292,45K) + 200.10^{-3} kg * 4,1855.10^3 J.kg^{-1}.K^{-1} * (320,65K - 353,15K)}{-10,19.10^{-3} kg * (320,65K - 353,15K)}$$

$$C_{fil} = 1,59.10^4 J.kg^{-1}.K^{-1}$$

Calcul de la capacité thermique du gros élastique :

$$m_{eau} = 300.10^{-3} kg$$

$$m_{eau} = 176,96.10^{-3} kg$$

$$m_{ge} = 78,78.10^{-3} kg$$

$$\theta'_f = 314,45K$$

$$\theta'_{i1} = 290,25K$$

$$\theta'_{i2} = 353,15K$$

$$Q = m * C * (\theta_f - \theta_i)$$

$$Q'_1 = m_{eau} * C_{eau} * (\theta'_f - \theta'_{i1}) + C * (\theta'_f - \theta'_{i1})$$

$$Q_{ge} = m_{ge} * C_{ge} * (\theta'_f - \theta'_{i2}) + m_{eau} * C_{eau} * (\theta'_f - \theta'_{i2})$$

$$Q'_1 + Q_{fil} = 0$$

$$m_{eau_f} * C_{eau} * (\theta'_f - \theta'_{i1}) + C * (\theta'_f - \theta'_{i1}) + m_{ge} * C_{ge} * (\theta'_f - \theta'_{i2}) + m_{eau_c} * C_{eau_c} * (\theta'_f - \theta'_{i2}) = 0$$

$$m_{eau_f} * C_{eau} * (\theta'_f - \theta'_{i1}) + C * (\theta'_f - \theta'_{i1}) + m_{eau_c} * C_{eau} * (\theta'_f - \theta'_{i2}) = -m_{ge} * C_{ge} * (\theta'_f - \theta'_{i2})$$

$$\frac{m_{eau_f} * C_{eau} * (\theta'_f - \theta'_{i1}) + C * (\theta'_f - \theta'_{i1}) + m_{eau_c} * C_{eau} * (\theta'_f - \theta'_{i2})}{-m_{ge} * (\theta'_f - \theta'_{i2})} = C_{ge}$$

$$C_{ge} = \frac{300.10^{-3}kg * 4,1855.10^3J.kg^{-1}.K^{-1} * (314,45K - 290,25K) + 314J.K^{-1} * (314,45K - 290,25K) + 176,96.10^{-3}kg * 4,1855.10^3J.kg^{-1}.K^{-1}(314,45K - 353,15K)}{-78,78.10^{-3}kg * (314,45K - 353,15K)}$$

$$C_{ge} = 3,06.10^3 J.kg^{-1}.K^{-1}$$