

B) Energie dissipée / en effet Joule au cours de l'opération

Equation de maille

$$u_1 i = u_2 i + u_R i$$

$$\left| \begin{array}{l} i = -C_1 \frac{du_1}{dt} \\ i = +C_2 \frac{du_2}{dt} \end{array} \right| \rightarrow \int -C_1 \frac{du_1}{dt} u_1 dt = \int C_2 \frac{du_2}{dt} u_2 dt + \int R i^2 dt$$

$$-\left[\frac{1}{2} C_1 u_1^2 \right]_0^t = \left[\frac{1}{2} C_2 u_2^2 \right]_0^t + \int_0^t R i^2 dt$$

$$\Rightarrow \int_0^t R i^2 dt = -\left[\frac{1}{2} C_1 u_1^2 + \frac{1}{2} C_2 u_2^2 \right]_0^t$$

$$\int_0^t R i^2 dt = \frac{1}{2} C_1 (u_{10}^2 - u_{1\infty}^2) + \frac{1}{2} C_2 (\underbrace{u_{20}^2}_{=0} - u_{2\infty}^2)$$

$$= +\frac{1}{2} C_1 u_{10}^2 - \frac{1}{2} (C_1 + C_2) u_{\infty}^2$$

$$= +\frac{1}{2} C_1 u_{10}^2 + \frac{1}{2} (C_1 + C_2) \left(\frac{C_1 u_{10}}{C_1 + C_2} \right)^2$$

$$= +\frac{1}{2} C_1 u_{10}^2 + \frac{1}{2} C_1^2 \frac{u_{10}^2}{C_1 + C_2}$$

$$= \frac{1}{2} u_{10}^2 \frac{C_1^2 + C_1 C_2 - C_1^2}{C_1 + C_2}$$

$$\boxed{\int_0^t R i^2 dt = + \frac{1}{2} \frac{C_1 C_2}{C_1 + C_2} u_{10}^2}$$