

I - Mesure de puissance

A/- $v = V\sqrt{2} \cos(\omega t)$ $i = I\sqrt{2} \cos(\omega t + \varphi)$

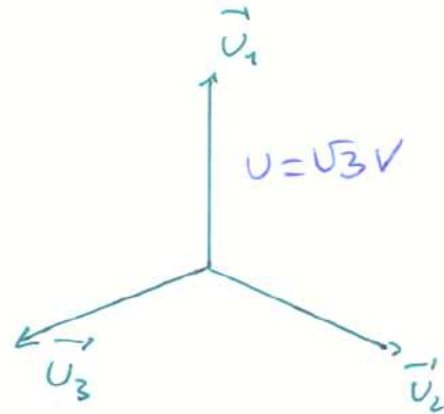
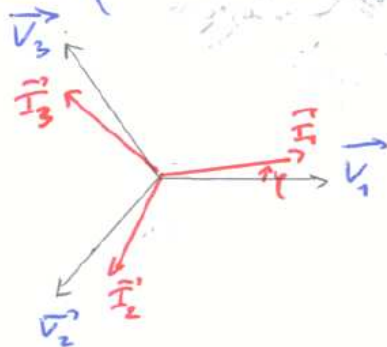
1) $p = v i = V I \cos \varphi + V I \cos(2\omega t + \varphi)$

2) $P = \langle p \rangle$

$P = V I \cos \varphi$

B/-

1)



$u_1 = v_3 - v_2 = V\sqrt{6} \cos(\omega t + \pi/2)$

$u_2 = v_1 - v_3 = V\sqrt{6} \cos(\omega t - \pi/6)$

$u_3 = v_2 - v_1 = V\sqrt{6} \cos(\omega t - \frac{5\pi}{6})$

2) $P = \frac{1}{T} \int_0^T (u_1 - u_3) i_1 dt + \frac{1}{T} \int_0^T (u_2 - u_3) i_2 dt$

$P = \frac{1}{T} \int_0^T u_1 i_1 dt + \frac{1}{T} \int_0^T u_2 i_2 dt - \frac{1}{T} \int_0^T u_3 (i_1 + i_2) dt$

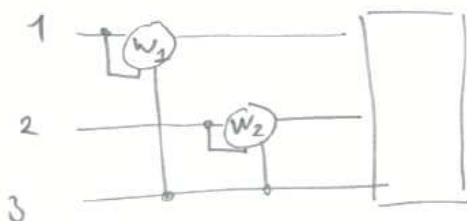
$-i_3$
d'après $i_1 + i_2 + i_3 = 0$

$P = P_1 + P_2 + P_3$

$P = \frac{1}{T} \int_0^T u_3 i_2 dt + \frac{1}{T} \int_0^T -u_2 i_3 dt$

$P = \frac{1}{T} \int_0^T u_1 i_3 dt + \frac{1}{T} \int_0^T -u_3 i_1 dt$

3)



4)

$$W_1 = \frac{1}{T} \int_0^T V\sqrt{6} \cos(\omega t - \frac{\pi}{6}) I\sqrt{2} \cos(\omega t + \varphi) dt$$

avec $\cos(\omega t - \frac{\pi}{6}) \cos(\omega t + \varphi) = \frac{1}{2} \cos(2\omega t + \varphi - \frac{\pi}{6}) + \frac{1}{2} \cos(\varphi + \frac{\pi}{6})$
 (le premier terme est nul sur $[0, T]$)

$$W_1 = \frac{VI\sqrt{3}}{T} \int_0^T \cos(\varphi + \frac{\pi}{6}) dt$$

$$W_1 = VI\sqrt{3} \cos(\varphi + \frac{\pi}{6})$$

de façon similaire

$$W_2 = VI\sqrt{3} \cos(\varphi - \frac{\pi}{6})$$

$$\begin{aligned} W_2 - W_1 &= VI\sqrt{3} \cos(\varphi - \frac{\pi}{6}) - VI\sqrt{3} \cos(\varphi + \frac{\pi}{6}) \\ &= VI\sqrt{3} [\cos(\varphi - \frac{\pi}{6}) - \cos(\varphi + \frac{\pi}{6})] \\ &= -2 \sin \varphi \sin(-\frac{\pi}{3}) \\ &= \sqrt{3} VI \sin \varphi \end{aligned}$$

$$W_2 - W_1 = \sqrt{3} VI \sin \varphi$$

d'où $Q = \sqrt{3} (W_2 - W_1)$

5) 150 div calibre 300V-SA

↳ 1500W pleine échelle
 cad 10W/div

En outre T.I. 20/s = 4

d'où $P_{lue} = 40W/div$

$$\left. \begin{aligned} W_1 \text{ lue} &= 110 \text{ div} \\ W_2 \text{ lue} &= 55 \text{ div} \end{aligned} \right\} \begin{aligned} P &= 40 \times 165 = \underline{6600W} \end{aligned}$$

$$Q = \sqrt{3} \times 40 \times (110 - 55) = \underline{3810 VAR}$$

$$S = \sqrt{P^2 + Q^2} = 7620 VA$$

$$\cos \varphi = \frac{P}{S} = 0,86$$

$$\varphi = \frac{\pi}{6}$$

$$S = \sqrt{3} UI \quad \underline{I = \frac{S}{\sqrt{3}U} = \frac{7620}{\sqrt{3} \times 220} = 20A}$$

ou encore
 $\tan \varphi = \frac{Q}{P} = \frac{\sqrt{3} \times 40 (W_2 - W_1)}{40 (W_1 + W_2)}$
 $= \frac{\sqrt{3}}{3} = \frac{1}{\sqrt{3}}$