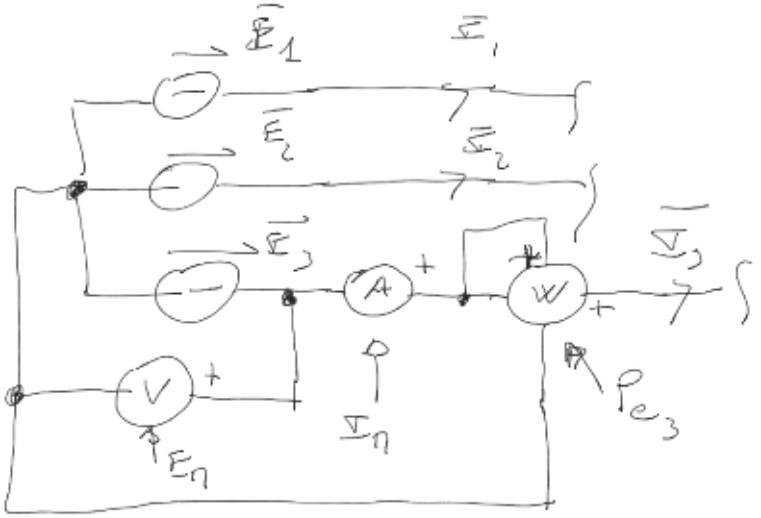
Lezione 31

MISURA DELLA POTENZA NEI SISTEMI TRIFASE SIMMETRICI ED EQUILIBRATI



$$\bar{P} = \overbrace{\frac{3}{2} E_\eta I_\eta \cos\varphi}^{P_e} + \overbrace{J \frac{3}{2} E_\eta I_\eta \sin\varphi}^{Q}$$

φ È LO SFASAMENTO (DI OGNI FASE)

$$P_{e_3} = \frac{1}{2} E_\eta I_\eta \cos\varphi$$

$$\cos\varphi = \frac{P_{e_3}}{\frac{1}{2} E_\eta I_\eta}$$

VOLENDO ESPLICITARE φ HO CHE:

$$\varphi = \pm \arccos\left(\frac{P_{e_3}}{\quad}\right)$$

$\left(\frac{1}{2} E_n I_n\right)$

QUINDI CALCOLO IL VALORE DELLA POTENZA REATTIVA A MENO DEL SEGNO:

$$Q = \pm \frac{3}{2} E_n I_n \sin\varphi$$

QUINDI CON QUESTA PROCEDURA NON SONO IN GRADO DI CONOSCERE LA NATURA DEI CARICHI.

INSERZIONE ARON

È POSSIBILE MISURARE LA POTENZA DIRETTAMENTE SUI CAVI DELLA LINEA TRIFASE

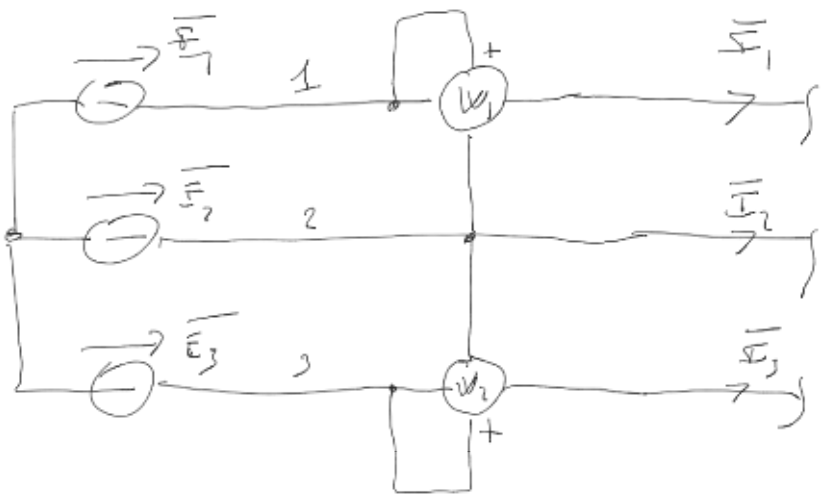
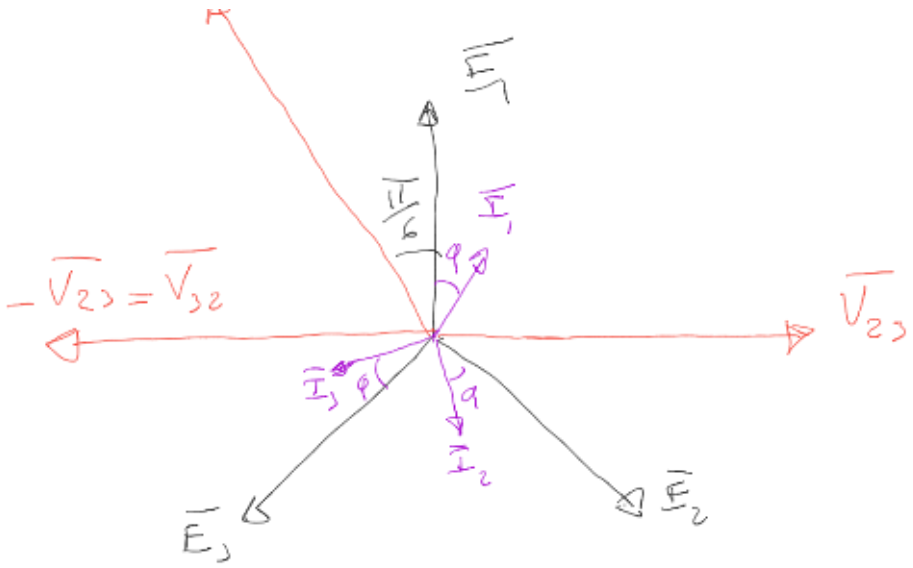


DIAGRAMMA FASORIALE:

$\bar{V}_{12}$



$$\bar{P} = \frac{1}{2}\bar{V}\cdot\bar{I}^{*} = \underbrace{\frac{1}{2}V_n I_n \cos\varphi}_{P_e} + j\frac{1}{2}V_n I_n \operatorname{sh}\varphi$$

$$P_{e_1} = R_E\left[\frac{1}{2}\bar{V}_{12}\cdot\bar{I}_1^{*}\right] = \frac{1}{2}V_n I_n \cos\left(\varphi + \frac{\pi}{6}\right)$$

$$P_{e_2} = R_E\left[\frac{1}{2}\bar{V}_{32}\cdot\bar{I}_3^{*}\right] = \frac{1}{2}V_n I_n \cos\left(\frac{\pi}{6} - \varphi\right)$$

$$P_{e_2} = \frac{1}{2}V_n I_n \cos\left(\varphi - \frac{\pi}{6}\right)$$

$$P_{e_1} + P_{e_2} = \frac{1}{2}V_n I_n \cos\left(\varphi + \frac{\pi}{6}\right) + \frac{1}{2}V_n I_n \cos\left(\varphi - \frac{\pi}{6}\right)$$

$$\cos(\alpha+\beta) = \cos\alpha\cos\beta - \operatorname{sh}\alpha\operatorname{sh}\beta$$

$$P_{e_1} + P_{e_2} = \frac{1}{2}V_n I_n \left[\cos\varphi\cos\frac{\pi}{6} - \operatorname{sh}\varphi\operatorname{sh}\frac{\pi}{6} + \cos\varphi\cos\left(-\frac{\pi}{6}\right) - \operatorname{sh}\varphi\operatorname{sh}\left(-\frac{\pi}{6}\right)\right]$$

$\cos\frac{\pi}{6}$ $-\sin\frac{\pi}{6}$

$$P_{e_1} + P_{e_2} = \frac{1}{2} V_n I_n \cdot 2 \cos\varphi \underbrace{\cos\frac{\pi}{6}}_{\sqrt{3}/2}$$

$$\boxed{P_{e_1} + P_{e_2} = \frac{\sqrt{3}}{2} V_n I_n \cos\varphi}$$

POTENZA ATTIVA TOTALE DELLA LINEA

$$P_{e_2} - P_{e_1} = \frac{1}{2} V_n I_n \cos\left(\varphi - \frac{\pi}{6}\right) - \frac{1}{2} V_n I_n \cos\left(\varphi + \frac{\pi}{6}\right)$$

$$P_{e_2} - P_{e_1} = \frac{1}{2} V_n I_n \left[\cos\varphi \cos\left(-\frac{\pi}{6}\right) - \sin\varphi \sin\left(-\frac{\pi}{6}\right) - \cos\varphi \cos\frac{\pi}{6} + \sin\varphi \sin\frac{\pi}{6} \right]$$

$$+\sin\varphi \sin\frac{\pi}{6}$$

$$P_{e_2} - P_{e_1} = \frac{1}{2} V_n I_n \, 2 \sin\varphi \underbrace{\sin\frac{\pi}{6}}_{1/2} = \frac{1}{2} V_n I_n \sin\varphi$$

$$\boxed{\sqrt{3}\left[P_{e_2} - P_{e_1}\right] = \frac{\sqrt{3}}{2} V_n I_n \sin\varphi}$$

POTENZA REATTIVA TOTALE DELLA LINEA

$$\overline{P} = \underbrace{\left(P_{e_1} + P_{e_2}\right)}_{P} + j \underbrace{\left[\sqrt{3}\left(P_{e_2} - P_{e_1}\right)\right]}_{Q}$$

$$\varphi = \arctg\left(\frac{Q}{P_e}\right) = \arctg\left[\frac{\sqrt{3}\left(P_{e_2} - P_{e_1}\right)}{P_{e_1} + P_{e_2}}\right]$$

SFASAMENTO