M.S. polos salientes - Rég. Lineal

"Teoría de 2 reacciones"

<u>Obs</u>: 1) $\boxed{\begin{array}{l}\vec{I}_r = 0\\ \vec{I}_s \neq 0\end{array}} \Rightarrow \vec{\Psi}_s \neq L_s \vec{I}_s$

$\vec{\Psi}_s$ e $\vec{I}_s$ no son colineales.

⇒ identif. ejes d y q del rotor.

$$\vec{\Psi}_s = \vec{\Psi}_d + \vec{\Psi}_q$$

con $\vec{\Psi}_d = L_d \vec{I}_d$

$\vec{\Psi}_q = L_q \vec{I}_q$

$\vec{I}_s = \vec{I}_d + \vec{I}_q$

$L_d \neq L_q$ → si $L_d = L_q \Rightarrow \vec{\Psi}_s = L_s \vec{I}_s$, $L_s = L_d = L_q$.

será $L_d > L_q$

$\vec{\Psi}_r = M_{rs} \vec{I}_d \leftarrow M_{rs}(\vec{I}_d + \vec{I}_q)$

pero el flujo $M_{rs}\vec{I}_q$ debe ser 0, $\vec{\Psi}_r$ y $\vec{I}_q$ son $\perp$.

2) $\boxed{\begin{array}{l}\vec{I}_r \neq 0\\ \vec{I}_s = 0\end{array}} \Rightarrow \begin{array}{l}\vec{\Psi}_r = L_r \vec{I}_r\\ \vec{\Psi}_s = M_{rs} \vec{I}_r\end{array}$

3) $\boxed{\begin{array}{l}\vec{I}_r \neq 0\\ \vec{I}_s \neq 0\end{array}}$ → Superposición:

$$\boxed{\begin{array}{l}\vec{\Psi}_s = M_{rs}\vec{I}_r + L_d \vec{I}_d + L_q \vec{I}_q\\ \vec{\Psi}_r = L_r \vec{I}_r + M_{rs}\vec{I}_d\end{array}}$$

$$\boxed{\vec{\Psi}_s = M_{rs}\vec{I}_r + L_d \vec{I}_d + L_q \vec{I}_q}$$

1 $\pm L_d \vec{I}_q \Rightarrow \vec{\Psi}_s = M_{rs}\vec{I}_r + L_d \overbrace{(\vec{I}_d + \vec{I}_q)}^{\vec{I}_s} - L_d \vec{I}_q + L_q \vec{I}_q$

$$\boxed{\vec{\Psi}_s = M_{rs}\vec{I}_r + L_d \vec{I}_s - (L_d - L_q)\vec{I}_q} \quad (1)$$

2 $\pm L_q \vec{I}_d \Rightarrow \vec{\Psi}_s = M_{rs}\vec{I}_r + L_d \vec{I}_d - L_q \vec{I}_d + L_q \underbrace{(\vec{I}_d + \vec{I}_q)}_{\vec{I}_s}$

$$\boxed{\vec{\Psi}_s = M_{rs}\vec{I}_r + L_q \vec{I}_s + (L_d - L_q)\vec{I}_d} \quad (2)$$

3 $\vec{\Psi}_r = L_r \vec{I}_r + M_{rs}\vec{I}_d \Rightarrow \vec{I}_r = \frac{1}{L_r}\left(\vec{\Psi}_r - M_{rs}\vec{I}_d\right)$

(3) $$\vec{\Psi}_s = \frac{M_{rs}}{L_r}\left(\vec{\Psi}_r - M_{rs}\vec{I}_d\right) + L_{od}\vec{I}_d + L_{oq}\vec{I}_q$$

$$\vec{\Psi}_s = \frac{M_{rs}}{L_r}\vec{\Psi}_r + \underbrace{L_{od}\left(1 - \frac{M_{rs}M_{rs}}{L_r L_{od}}\right)}_{M_d}\vec{I}_d + L_{oq}\vec{I}_q$$

$$\vec{\Psi}_s = \frac{M_{rs}}{L_r}\vec{\Psi}_r + M_d\vec{I}_d + L_{oq}\vec{I}_q$$

$$\pm M_d\vec{I}_q$$

$$\boxed{\vec{\Psi}_s = \frac{M_{rs}}{L_r}\vec{\Psi}_r + M_d\vec{I}_s + (L_{oq} - M_d)\vec{I}_q} \quad (3)$$

Funcionamiento a V_s, f = cte.

$$v_s + R_s i_s = e_s$$

$$e_s = -\frac{d\Psi_s}{dt}$$

Rég. sinusoidal permanente.

$$\Rightarrow \boxed{\vec{V}_s + R_s\vec{I}_s = -j\omega\vec{\Psi}_s}$$

Tomando (1): $$\vec{V}_s + R_s\vec{I}_s = -j\omega M_{rs}\vec{I}_r - j\omega L_{od}\vec{I}_s + j\omega(L_{od} - L_{oq})\vec{I}_q$$

$$\boxed{\vec{V}_s + R_s\vec{I}_s + j\omega L_{od}\vec{I}_s = \underbrace{-j\omega M_{rs}\vec{I}_r + j\omega(L_{od} - L_{oq})\vec{I}_q}_{\text{2 comp. en } \perp}}$$

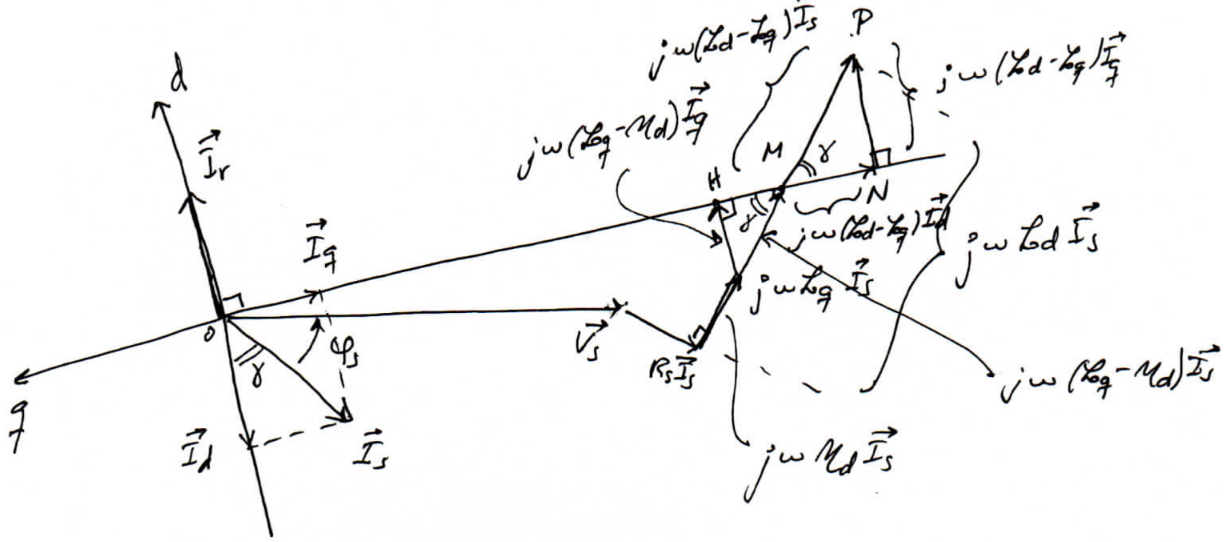
Tomando (2): $$\vec{V}_s + R_s\vec{I}_s = -j\omega M_{rs}\vec{I}_r - j\omega L_{oq}\vec{I}_s - j\omega(L_{od} - L_{oq})\vec{I}_d$$

$$\boxed{\vec{V}_s + R_s\vec{I}_s + j\omega L_{oq}\vec{I}_s = \underbrace{-j\omega M_{rs}\vec{I}_r - j\omega(L_{od} - L_{oq})\vec{I}_d}_{\text{colineal con el eje } -q}}$$

colineales con el eje d

Tomando (3) $$\boxed{\vec{V}_s + R_s\vec{I}_s + j\omega M_d\vec{I}_s = -j\omega\frac{M_{rs}}{L_r}\vec{\Psi}_r - j\omega(L_{oq} - M_d)\vec{I}_q}$$

De 2, supuestos conocidos todos los parámetros de MS



de 1, 2 ⇒ $\overrightarrow{ON} = -j\omega M_{rs}\vec{I}_r$

de 1, 2, 3 ⇒ $\overrightarrow{OH} = -j\omega \frac{M_{rs}}{L_r}\vec{\Psi}_r$