Fundamentos de Transformadores y Máquinas Eléctricas

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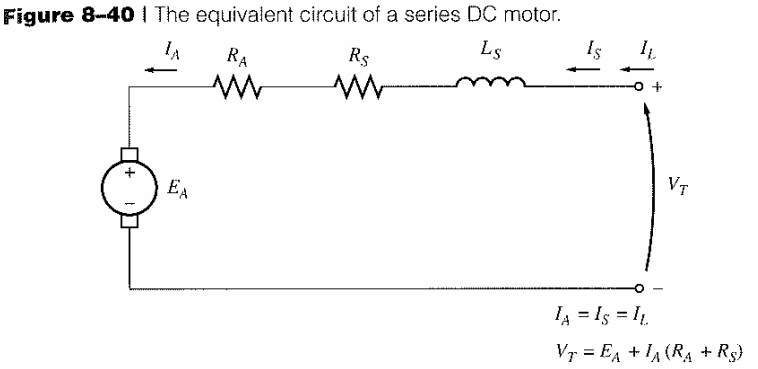
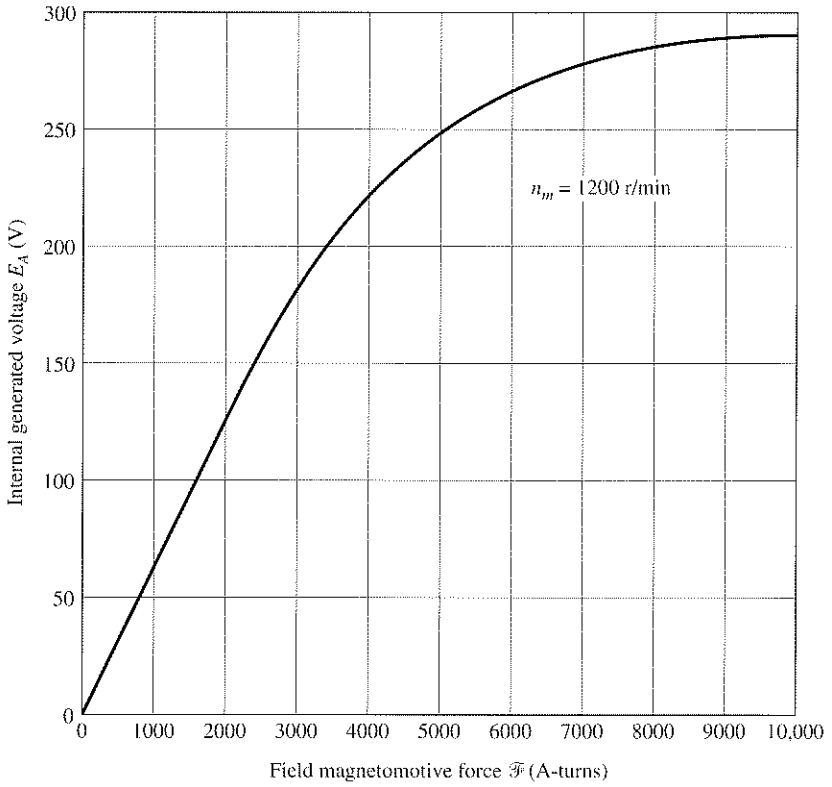
Clase 20

Ejemplo Motor DC

M DC: 250 V, "SERIES CONNECTED"; $R_A + R_S = 0{,}08\ \Omega$.
Embobinado del campo tiene 25 vueltas/polo. La curva de magnetización se muestra abajo. Hallar velocidad del rotor y torque inducido cuando la corriente de armadura es 50 A.

Figure 8–40 | The equivalent circuit of a series DC motor.





Ejemplo Motor DC

- $E_A = V_T - I_A(R_A + R_S) = 250\,v - 50\,A(0{,}08\,\Omega) = 246\,v$
- de la curva @ 1200 RPM

$$\mathcal{F} = NI = (25\,t)(50\,A) = 1250\ A\cdot t$$

$$E_{A0} \cong 80\,v$$

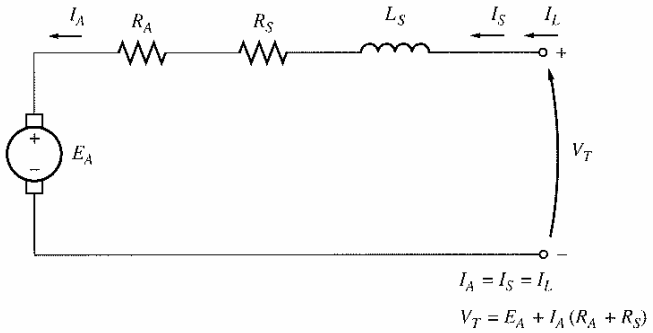
- $\dfrac{E_A}{E_{A0}} = \dfrac{n}{n_0} \rightarrow n = \dfrac{E_A}{E_{A0}} \cdot n_0 = \dfrac{246\,v}{80\,v} \cdot 1200\ RPM$

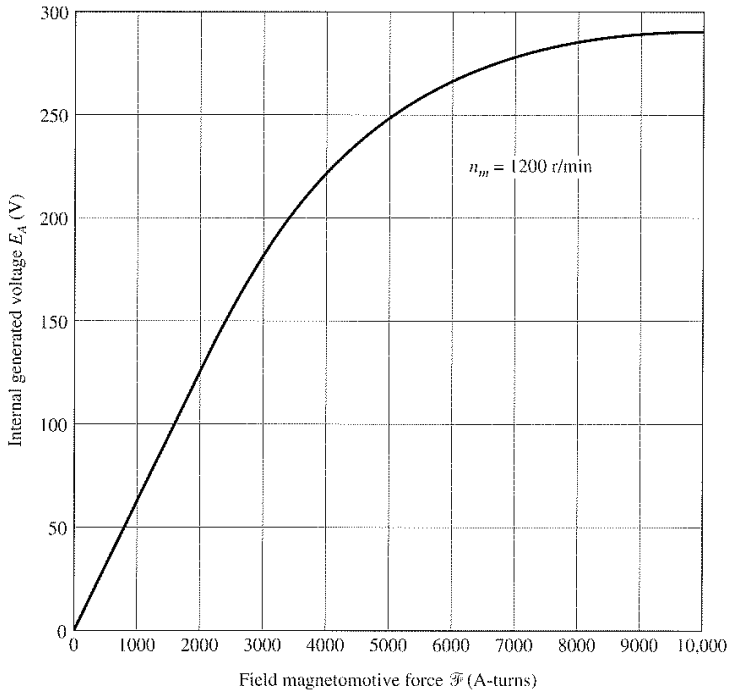
$$n = 3690\ RPM$$

- $P = \tau\omega \rightarrow \tau_{ind} = \dfrac{P}{\omega} = \dfrac{E_A I_A}{\omega} = \dfrac{(246\,v)(50\,A)}{\left(3690\ \frac{rev}{min}\right)\left(\frac{1\,min}{60\,s}\right)\left(\frac{2\pi\,r}{1\,rev}\right)}$

$$\tau_{ind} = 31.8\ n\cdot m$$

Figure 8–40 | The equivalent circuit of a series DC motor.





Ejemplo Motor DC

M DC: 100 hp, 250 v, "COMPOUNDED", $R_A + R_S = 0.04\Omega$.
Campo paralelo tiene 1000 t y campo en serie tiene 3 t por polo. Ver diagrama y curva. Sin carga $n_0 = 1200$ RPM.
Descarte perdidas mecánicas, de nucleo y parasiticas.

a) ¿Corriente de campo paralelo sin carga (I_F)?

b) Si el motor es compuesto acumulativo, hallar n para $I_A = 200$ A.

c) Si el motor es compuesto diferencial, hallar n para $I_A = 200$ A.

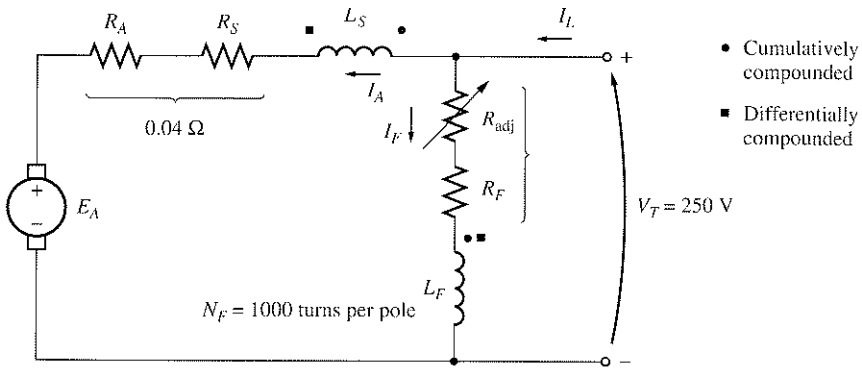
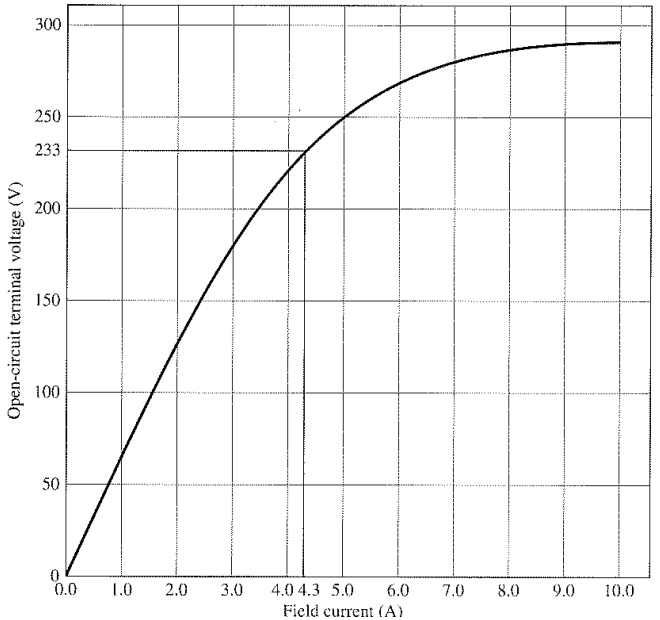


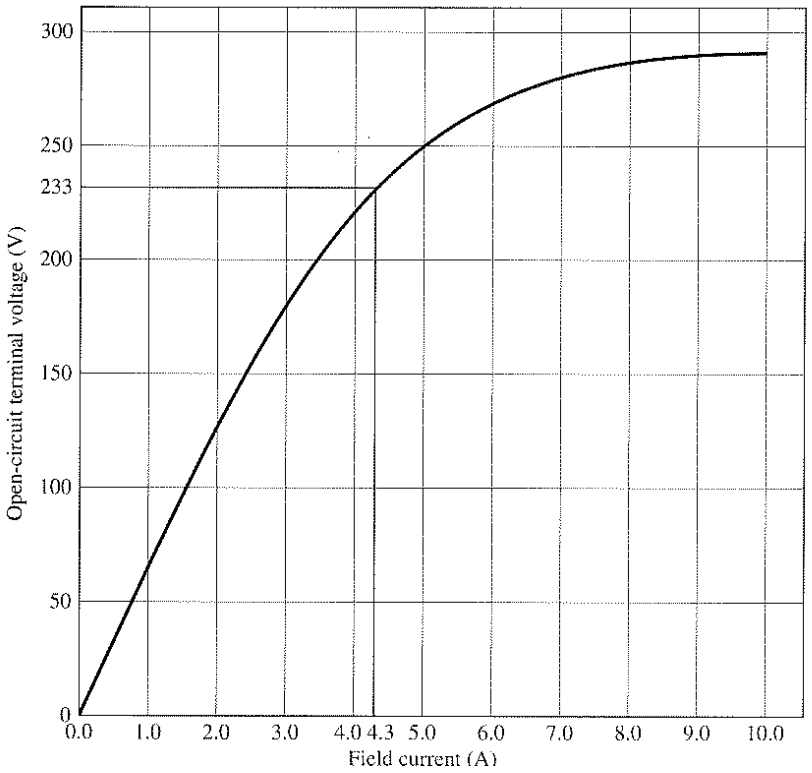
Figure 8–30 | The magnetization curve of a typical 250-V DC motor, taken at a speed of 1200 r/min.

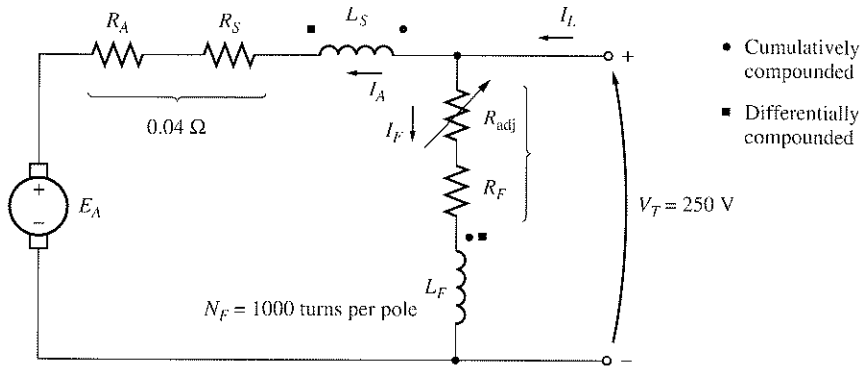


Ejemplo Motor DC

a) Sin carga $I_A = 0 = I_S$, $E_A = V_T = 250\,v$; de la curva $I_F = 5.0\,A$

Figure 8–30 | The magnetization curve of a typical 250-V DC motor, taken at a speed of 1200 r/min.





Ejemplo Motor DC

b) $I_A = 200A$; $E_A = V_T - I_A (R_A + R_s)$

$= 250v - 200A(0.04\Omega) = 242v$

* Corriente efectiva de Campo será

$$I_F^* = I_F \pm \frac{N_s}{N_F} I_A - \frac{F_{AR}}{N_F}$$

en el ejemplo no hay reacción de Armadura (AR),

en la parte b, "Cummulative Compounded"

$$I_F^* = I_F + \frac{N_s}{N_F} I_A = 5A + \frac{3}{1000}(200A) = 5.6\,A$$

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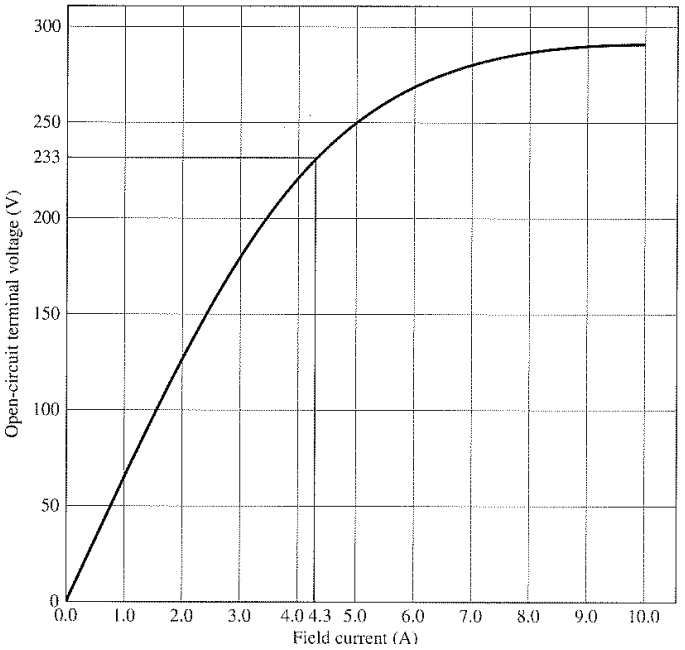
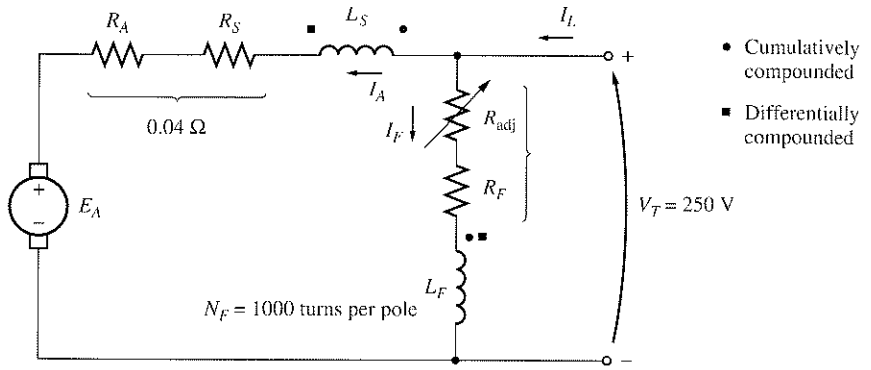




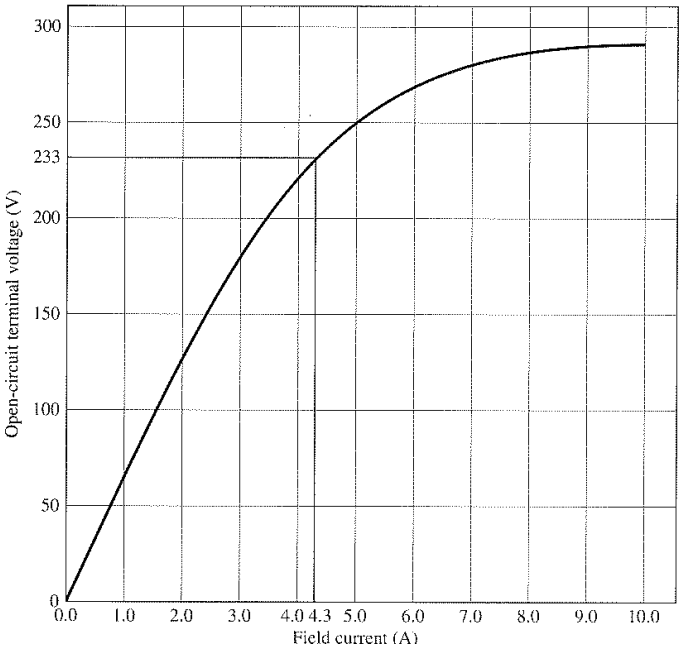
Ejemplo Motor DC

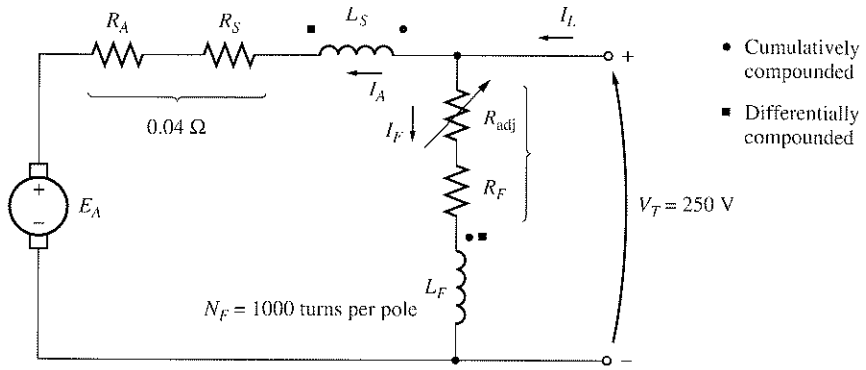
$$I_F^* = I_F + \frac{N_S}{N_F} I_A = 5.6\,A \quad , \text{ de la curva de mag.}$$

$E_{A0} \cong 262\,v$ @ 1200 RPM, entonces

$$n = \frac{E_A}{E_{A0}} \cdot n_0 = \frac{242\,v}{262\,v} \cdot 1200\,RPM = 1108\ RPM$$

Figure 8–30 | The magnetization curve of a typical 250-V DC motor, taken at a speed of 1200 r/min.





Ejemplo Motor DC

c. $I_A = 200A$, $E_A = V_T - I_A(R_A + R_S) = 242v$

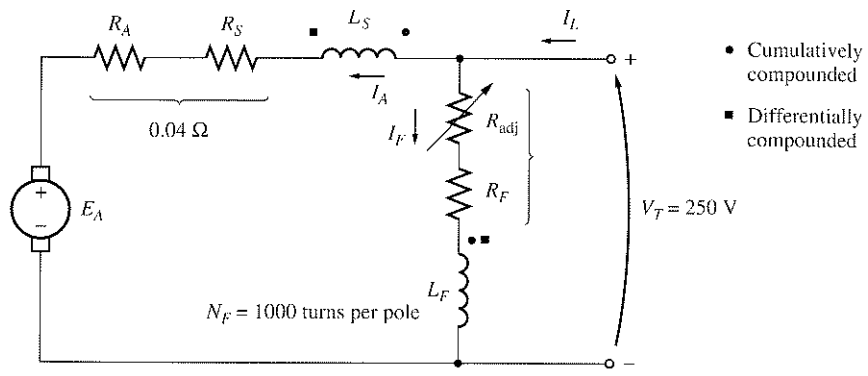
el "Differential Compounded"

$$I_F^* = I_F - \frac{N_S}{N_F} I_A = 5.0A - \frac{3}{1000}(200A) = 4.4A$$

de la curva de mag.

$E_{A0} \cong 236\,v$ @ 1200 RPM, entonces

$$n = \frac{E_A}{E_{A0}} n_0 = \frac{242v}{236v} \cdot 1200\,RPM = 1230\,RPM$$



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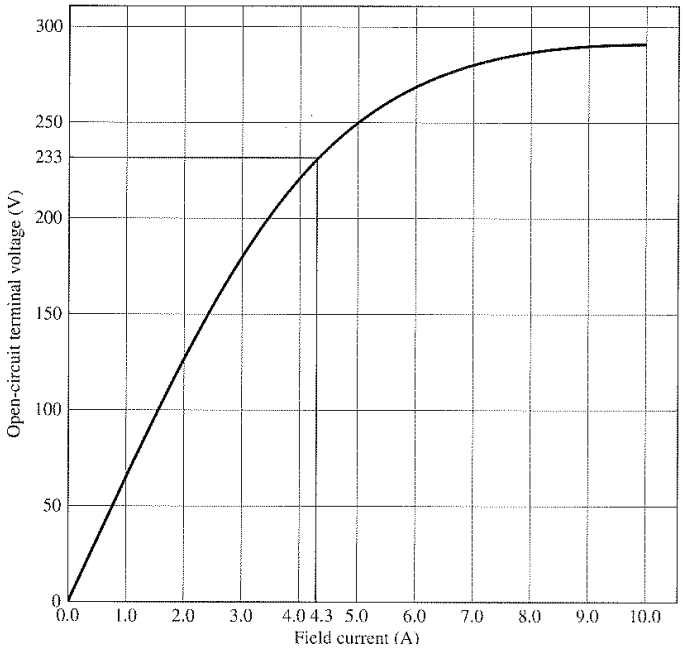

- En el "CC" velocidad disminuye con aumento en carga
- En el "DC" velocidad aumenta con aumento en carga