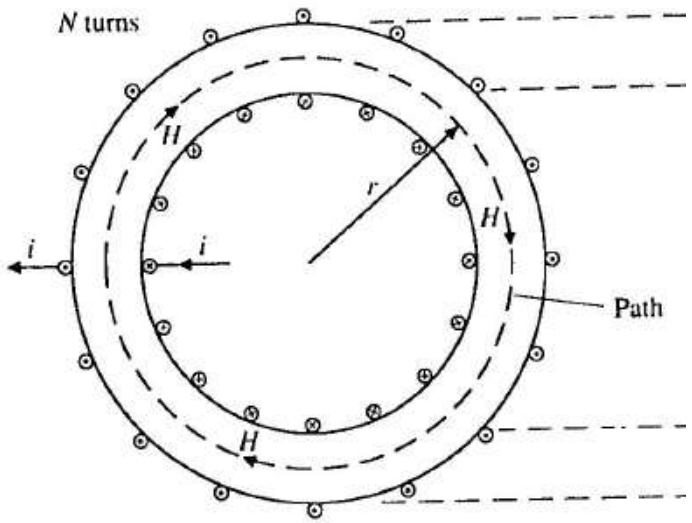
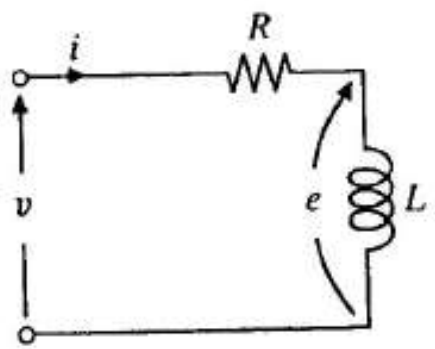
ماشینهای الکتریکی 1
مدار های مغناطیسی

دکتر رضا کی پور
دانشگاه سمنان

انرژی در میدان مغناطیسی





$$e = \frac{d\lambda}{dt} = L\frac{di}{dt} \qquad v = Ri + e = Ri + L\frac{di}{dt}$$

$$p = vi = Ri^2 + i\frac{d\lambda}{dt} \quad \text{W} \qquad p_B = i\frac{d\lambda}{dt} = NAi\frac{dB}{dt} = A\ell H\frac{dB}{dt} \quad \text{W}$$

$$W = \int p_B\,dt = \int_0^B A\ell H\,dB = \int_0^B \frac{A\ell}{\mu_0}B\,dB = (A\ell)\frac{B^2}{2\mu_0} \quad \text{J}$$

Because the product $A\ell$ is the volume of the space enclosed by the coil, the density of energy storage in the magnetic field is

$$w = \frac{B^2}{2\mu_0} \quad \text{J/m}^3$$

$$p_B = i\frac{d\lambda}{dt} = Li\frac{di}{dt} \quad \text{W} \qquad W = \int p_B\,dt = \int_0^i Li\,di = \frac{Li^2}{2}$$

$$W = \frac{\lambda i}{2} = \frac{\lambda^2}{2L} \quad \text{J}$$

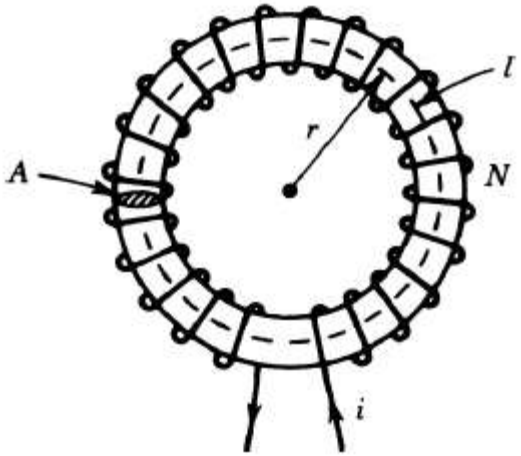
$$P_B = i\frac{d\lambda}{dt}$$

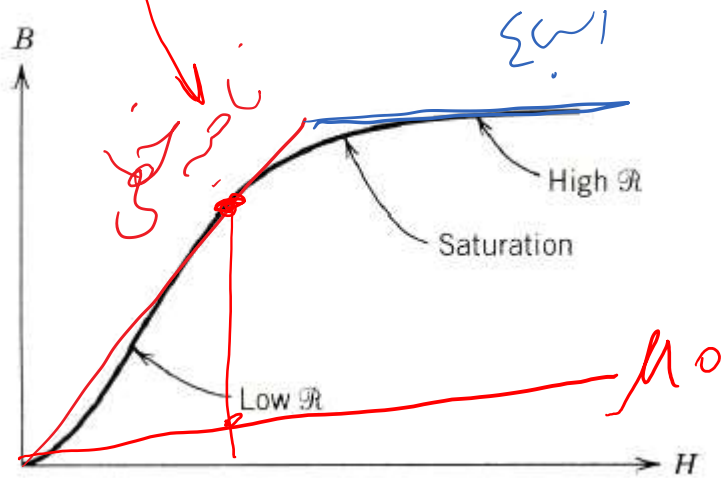
$$W = \int P_B\, dt = \int i\, d\lambda$$

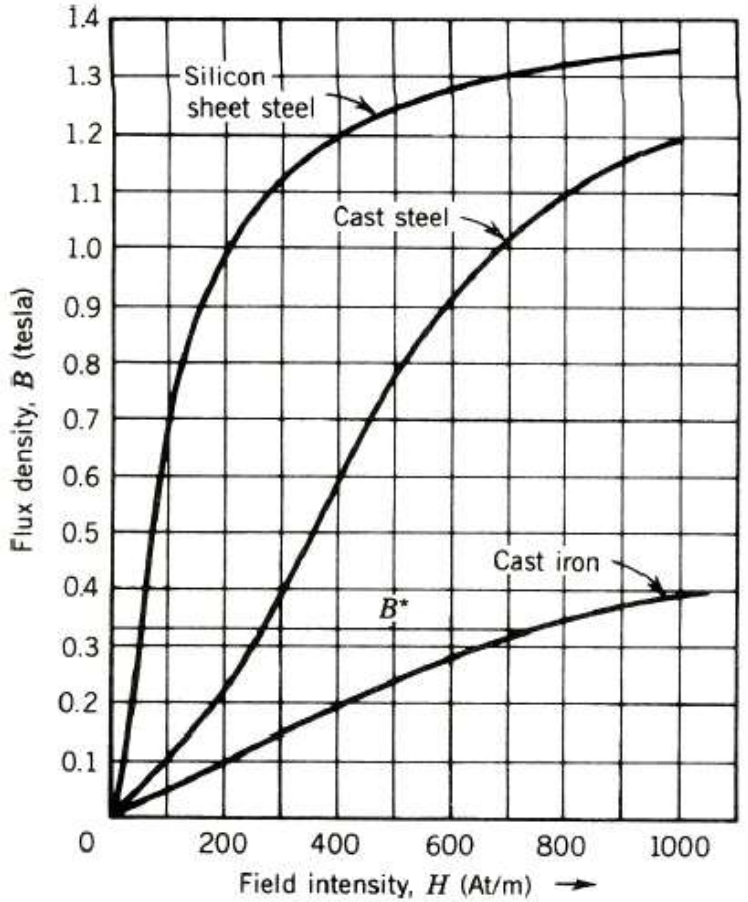
$$W = \int F\, d\Phi$$

$$W = Al \int H\, dB$$

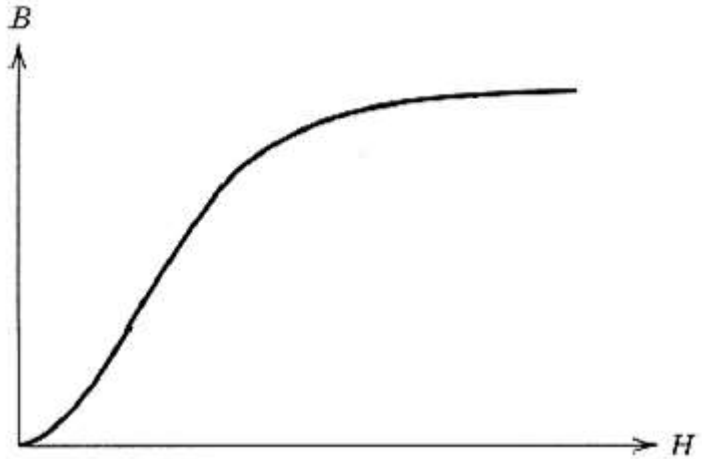
منحنی مغناطیسی مواد



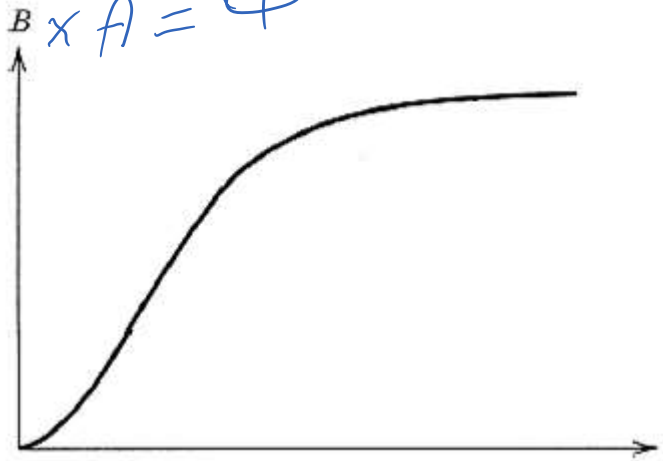




Magnetization curves



B-H

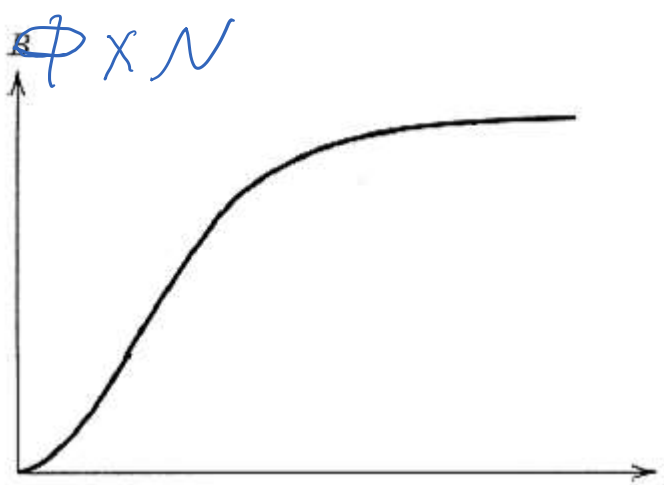


$B \times A = \Phi$

$H \times l = F$

Φ-F

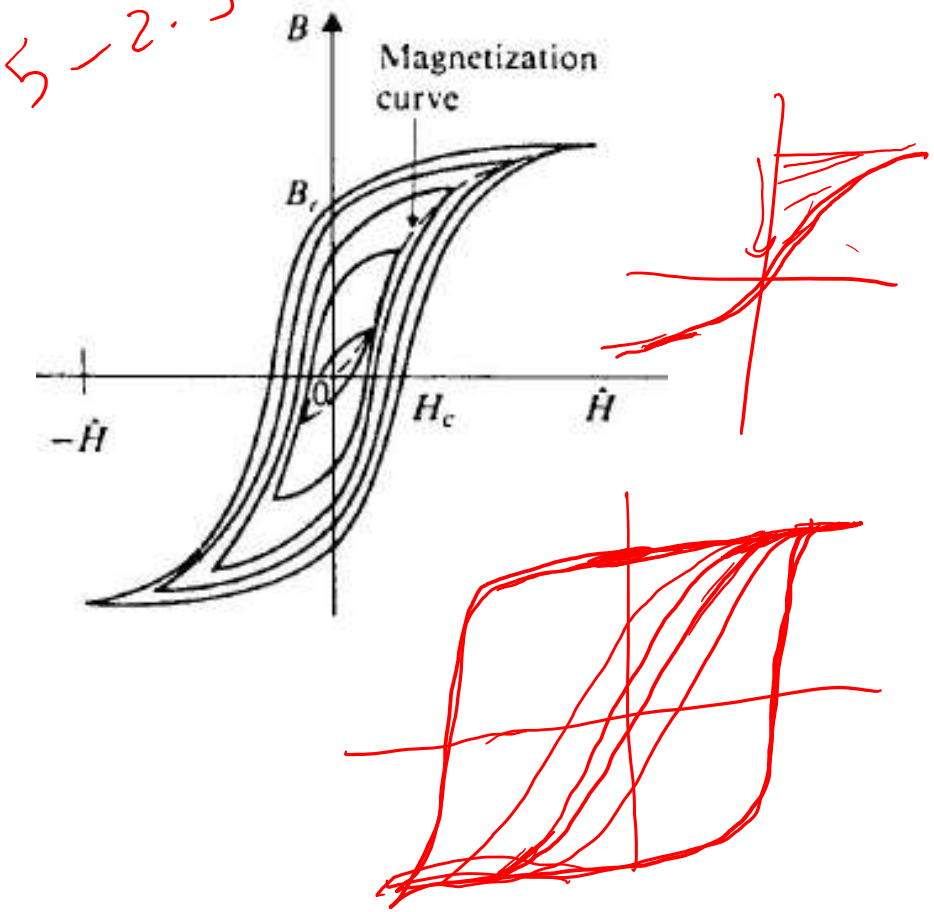
$\lambda = \Phi \times N$



$i = \frac{F}{N}$

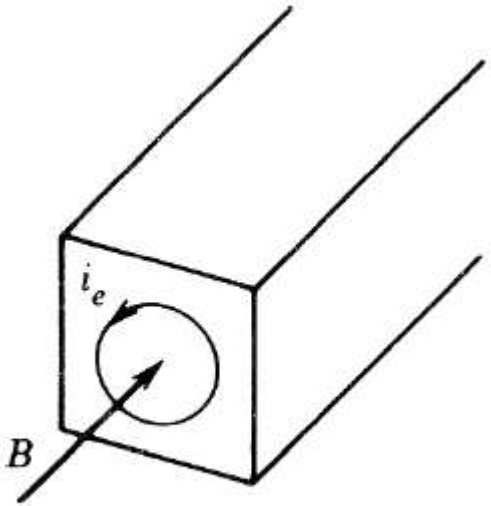
λ-i

تلفات هیسترزیس

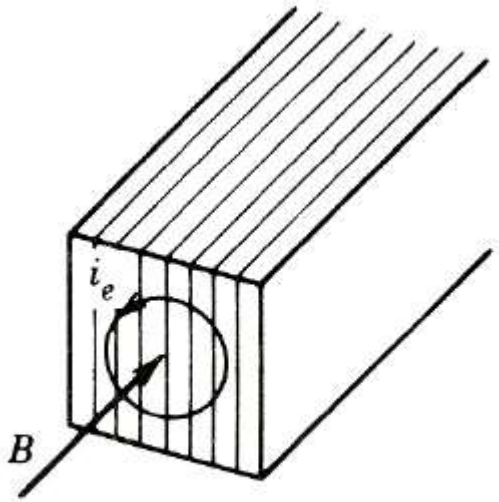


$$P_h = K_h B_{max}^n f$$

تلفات فوکو (جریانهای گردابی)



(a)



(b)

$$P_e = K_e B_{max}^2 f^2$$