Inductor

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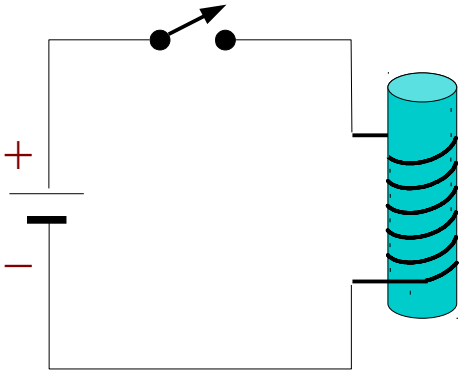
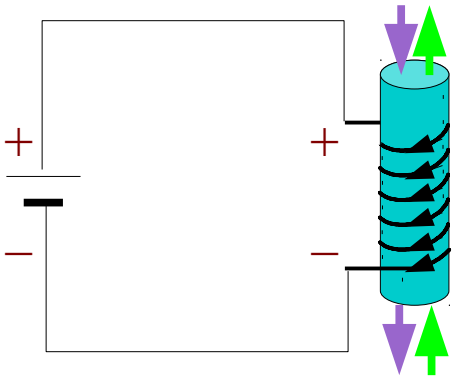
Resist Magnetic Field

Before

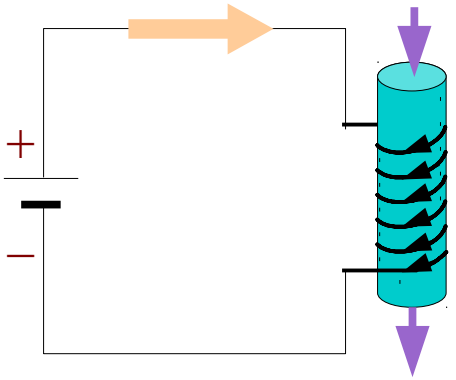


Initial



Final

No More EMF

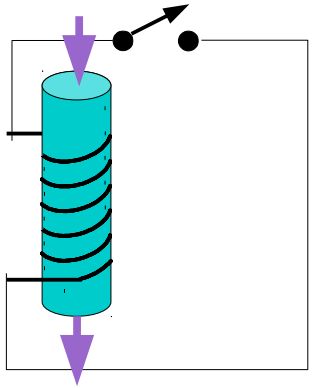


Induced EMF

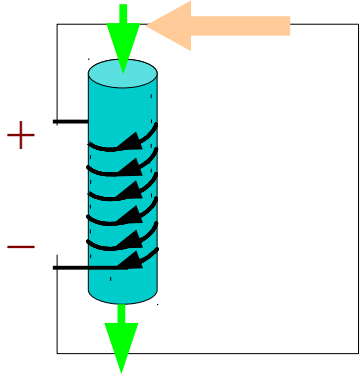
Energy stored in Electric Field

Maintain Magnetic Field

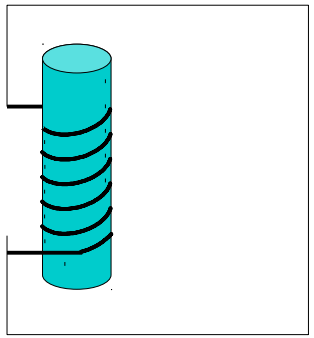
Before



Initial



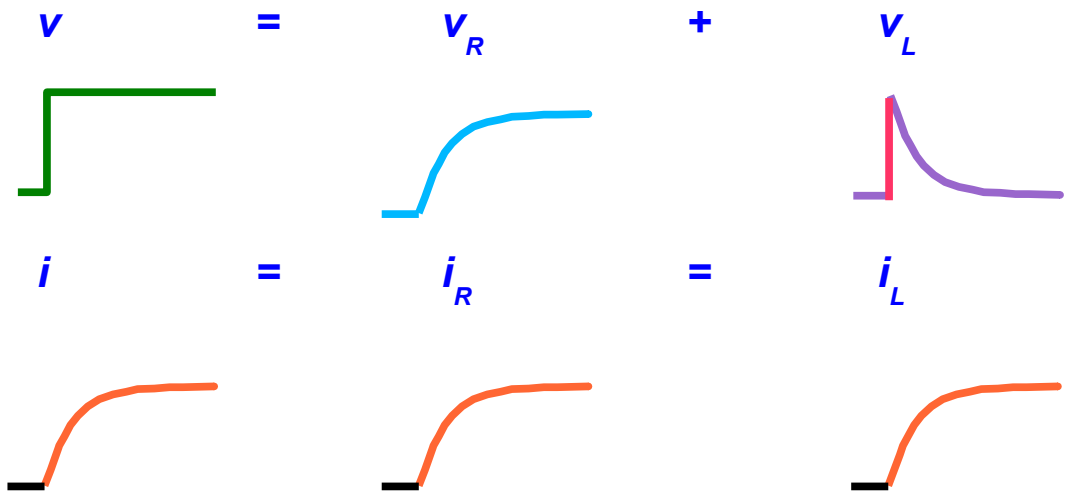
Final



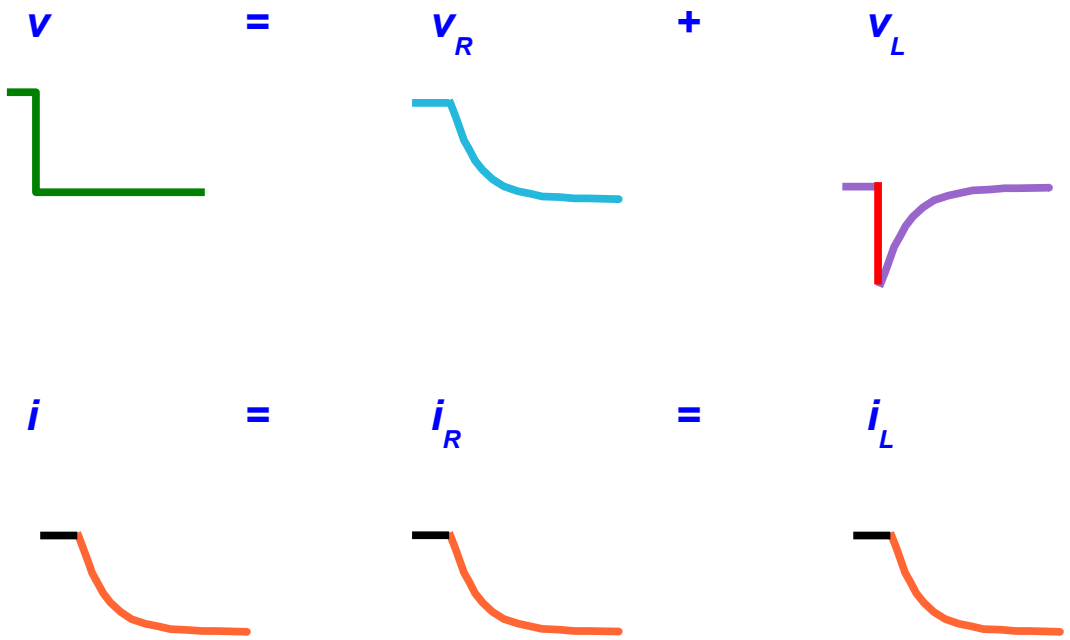
No Energy in magnetic field

Induced EMF

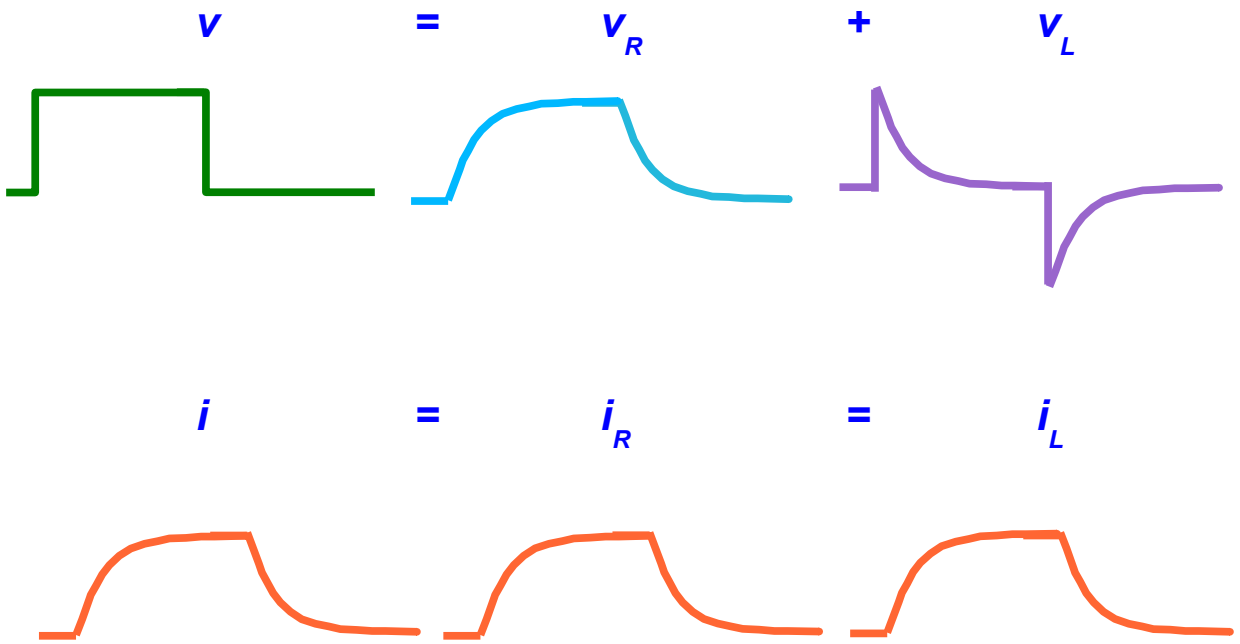
Storing Magnetic Energy



Dissipate Magnetic Energy



Pulse



Phasor

Sinusoid (Sine Waves)

$$A\cos(\omega t + \theta)$$

- ***Amplitude*** A
- ***Angular Frequency*** ω
- ***Angular Frequency*** θ

1. Representation using Euler's Formula

$$A\cos(\omega t + \theta) = \frac{A}{2}\cdot e^{+i(\omega t+\theta)} + \frac{A}{2}\cdot e^{-i(\omega t+\theta)}$$

2. Representation using Real Part

$$A\cos(\omega t + \theta) = Re\{A e^{i(\omega t + \theta)}\} = Re\{A e^{i\theta}\cdot e^{i\omega t}\}$$

$$\Rightarrow A e^{i\theta}\cdot e^{i\omega t}$$

$$\Rightarrow A e^{i\theta}$$

$$\Rightarrow A \measuredangle \theta$$

Phase Lags and Leads

$$\frac{d}{dx} f(x) = \cos(x) \quad \textbf{leads} \quad f(x) = \sin(x)$$

$$\frac{d}{dx} f(x) = -\sin(x) \quad \textbf{leads} \quad f(x) = \cos(x)$$

$$\int f(x)\,dx = -\cos(x) + C \quad \textbf{lags} \quad f(x) = \sin(x)$$

$$\int f(x)\,dx = \sin(x) + C \quad \textbf{lags} \quad f(x) = \cos(x)$$

$$\frac{d}{dx} f(x) \quad \textbf{leads} \quad f(x) \quad \textbf{by} \quad \frac{\pi}{2}$$

$$\int f(x)\,dx \quad \textbf{lags} \quad f(x) \quad \textbf{by} \quad \frac{\pi}{2}$$

References

[1] http://en.wikipedia.org/
[2] J.H. McClellan, et al., Signal Processing First, Pearson Prentice Hall, 2003