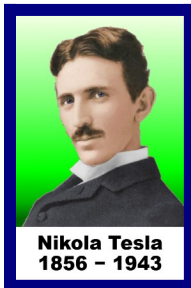


Turns Ratio Formula



Nikola Tesla
1856 - 1943

In 1834, **Emil Lenz** discovered Lenz's Law for a wire loop as:

$$\mathcal{E} = -\Delta\Phi_B/\Delta t$$

An **electromotive force** (\mathcal{E} - emf) & **current** flow oppose a change in magnetic flux ($\Delta\Phi_B$) supporting **Maxwell's 3rd Law** (1862).

$$\mathcal{E} = \oint (\mathbf{E} \cdot d\boldsymbol{\ell}) \quad \& \quad \Phi_B \equiv \iint (\mathbf{B} \cdot \hat{\mathbf{n}}_s) ds$$

In 1882, **L Gaulard** & **J Gibbs** first used transformers to reduce **Alternating Current (AC)** losses. **N Tesla**

& **G Westinghouse** subsequently made improvements in **AC motors** & other support **equipment**.

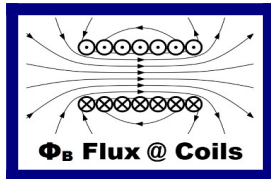
In **AC transformers**, voltage change (V_i) around the loop equals the emf ($V_i = \mathcal{E}$). With coil count (n_i), Lenz's Law becomes the Turns Ratio Formula:

$$-n_i(d\Phi_B/dt) = V_i \quad \Leftrightarrow \quad -d\Phi_B/dt = V_i/n_i \quad \Leftrightarrow \quad n_p/V_p = n_s/V_s$$

In 1896, Westinghouse applied this formula to **electrically power Buffalo**, New York from **Niagara Falls** 26 miles (42 km) away.

[Wikipedia.org](https://en.wikipedia.org)

Copyright © 2024 jefgeorge.com



Φ_B Flux @ Coils

