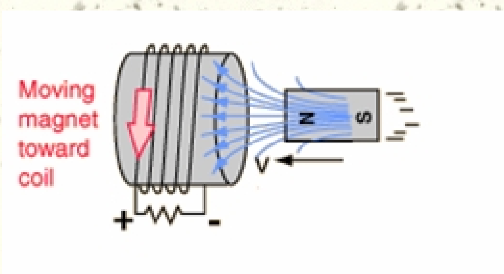
Velocity Monitoring via Magnetic Interaction: a Practical Application of Faraday's Law to a Real-World Situation[1]— a Mechantronics Demonstration Project



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Curriculum Standards

- ❖Project deals with Electromagnetic Induction which is a topic in Physics—The Physical Setting
- ❖Electromagnetic Induction constitutes 5% of AP Physics B syllabus
- ❖ Electromagnetic Induction constitutes 8% of AP Physics C syllabus

Historical Background

Faraday's Law: The induced voltage in a coil is proportional to the product of the number of loops and the rate at which the magnetic field changes within the loops $\varepsilon = -N\, d\phi/dt$

$$\Phi=\int \mathbf{B}\cdot d\mathbf{A} \quad (2)$$

Assumptions: Magnetic field is constant throughout the area:

- Change in the magnetic field with respect to

  Bv/L

Historical Background (continued)

$$\varepsilon = N\pi r^2 Bv/L$$

$$\varepsilon = K\,v$$

Project Objective:

In this project, K is calculated and then unknown velocities may be computed from the induced voltage.

Conclusions

Preliminary results indicate that there is a linear relationship between the voltage and the velocity thus proving our equation.

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