CHARGING BIKE STATION SECOND GENERATION

ELECTRICAL SYSTEMS

ALHARBI, DEVINE, DHILLON

11/20/13

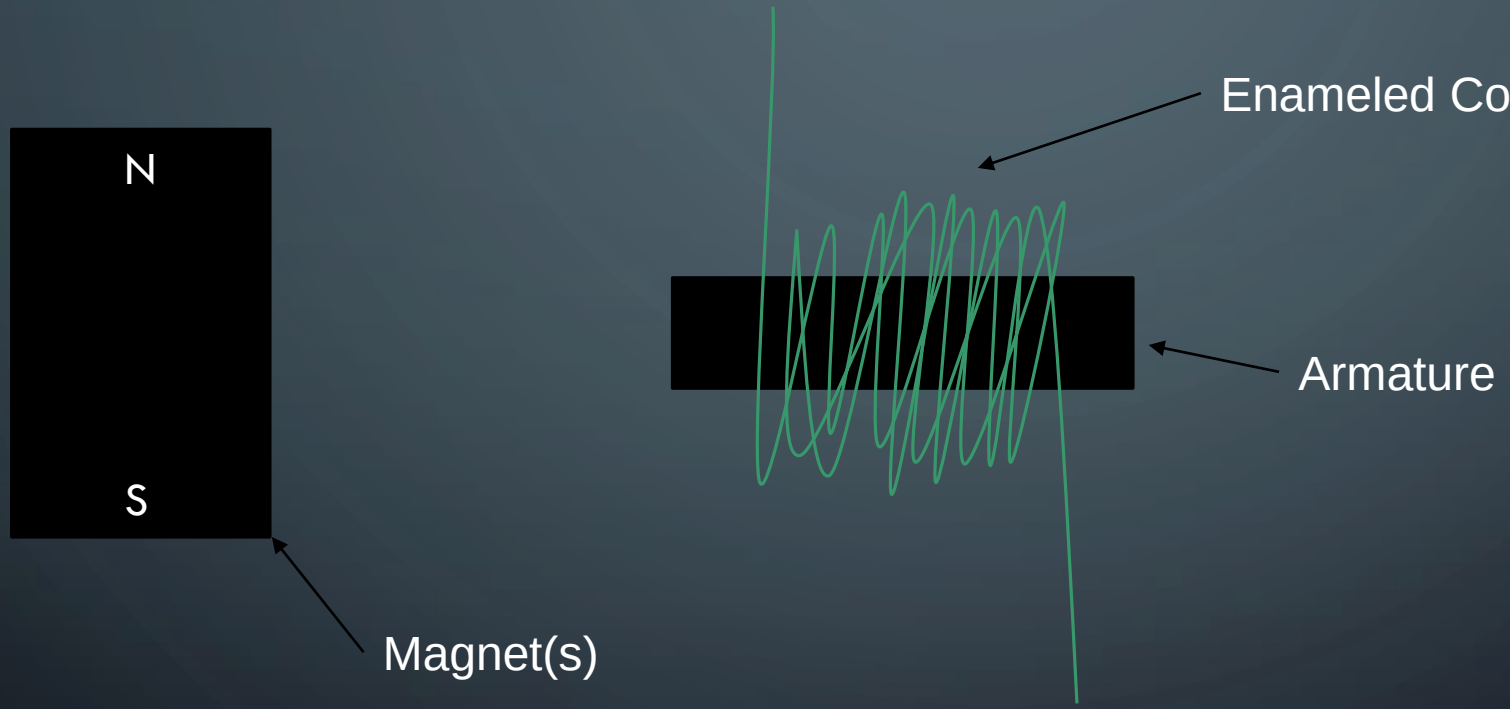
OVERVIEW

- Generator Analysis
- Generator Equations
  - Faradays Law
  - Magnetic Field
  - Magnetic Flux
- How a Generator Works
- Conclusion

PURCHASED GENERATOR

From Testically

CUSTOM BUILT GENERATOR



GENERATOR ANALYSIS

	Type of Current	# Coil Turns	Magnets	Price	Type of Wire	Design (Portability)
Purchased Generator	AC/DC	Hundreds of Thousands	Rare Earth Magnets (Neodymium)	135$-Several Thousands	Enameled Wire	Fixed
Custom Generator	Unregulated AC	1000-5000	Rare Earth Magnets (Neodymium)	35-100$	Enameled Wire	Non-Fixed

MAGNETIC FIELD EQUATIONS

- Reasons to know what the magnetic field is
  - Amount of power generated
  - Heat generated
  - Safety

FARADAY'S LAW

- A change in the magnetic environment of a coil of wire will cause a voltage (EMF) to be "induced" in the coil
- The change could be produced by
  - Changing the magnetic field strength
  - Moving a magnet toward or away from the coil
  - Moving the coil into or out of the magnetic field
  - Rotating the coil relative to the magnetic field direction

MAGNETIC FIELD IN A WIRE

- The strength of the magnetic field depends on the current ***I*** in the wire and ***r***, the distance from the wire.
- $\beta = \frac{\mu_0 * I}{2\pi r}$
- $\mu_0 = 4\pi * 10^{-7} \frac{Tm^2}{C}$

MAGNETIC FIELD USING N LOOPS

- $\beta = \frac{\mu * i * N}{2r}$
- μ – Permeability
- i – Current
- N – Number of loops of wire around the armature
- r – Radius

MAGNETIC FIELD OF A SOLENOID

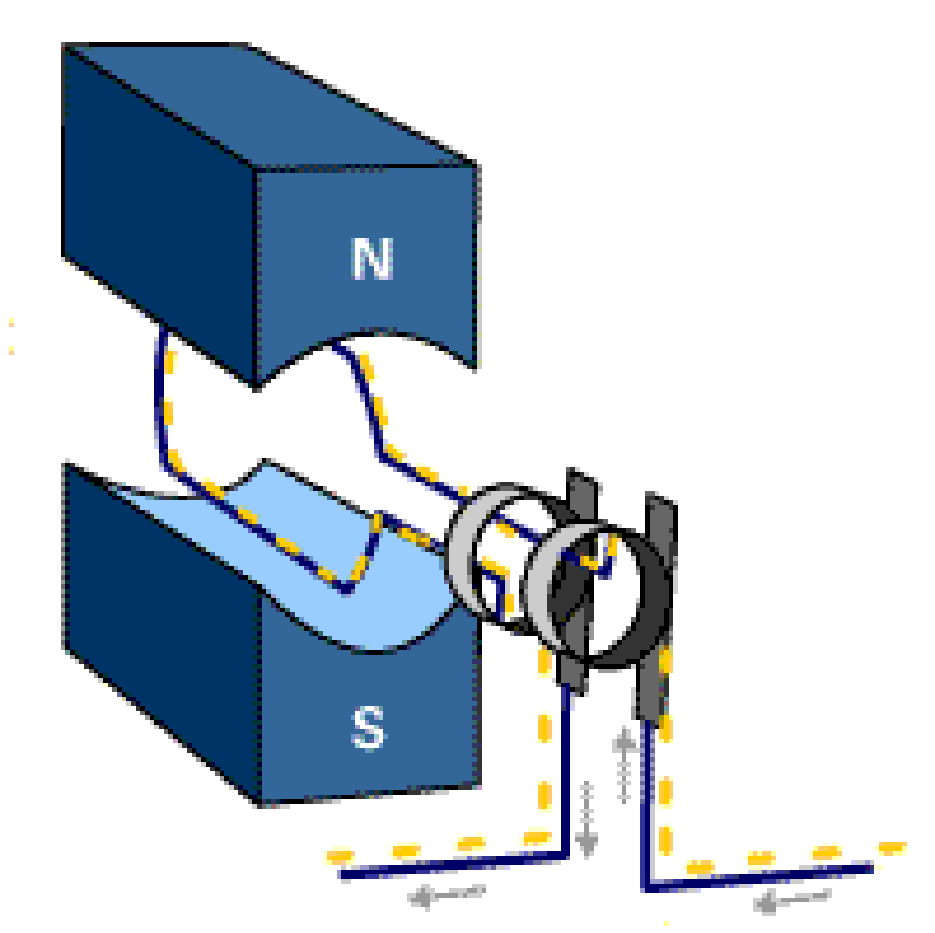
- $\beta = \frac{\mu * i * N}{L}$

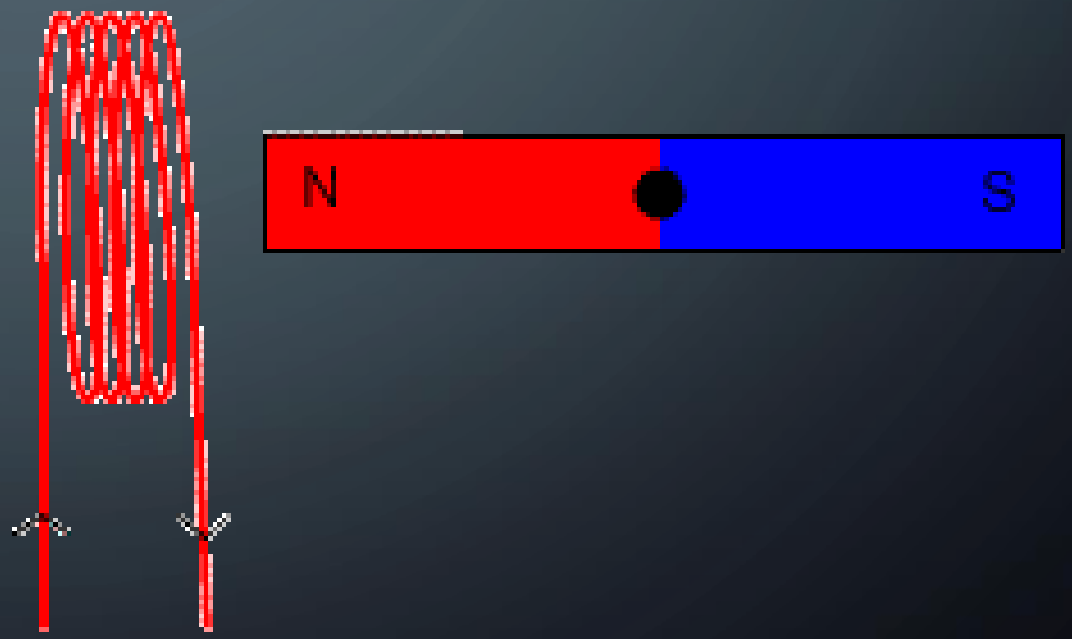
- μ – Permeability
- i – Current
- N – Number of loops of wire around the armature
- L – Length of wire

MAGNETIC FLUX

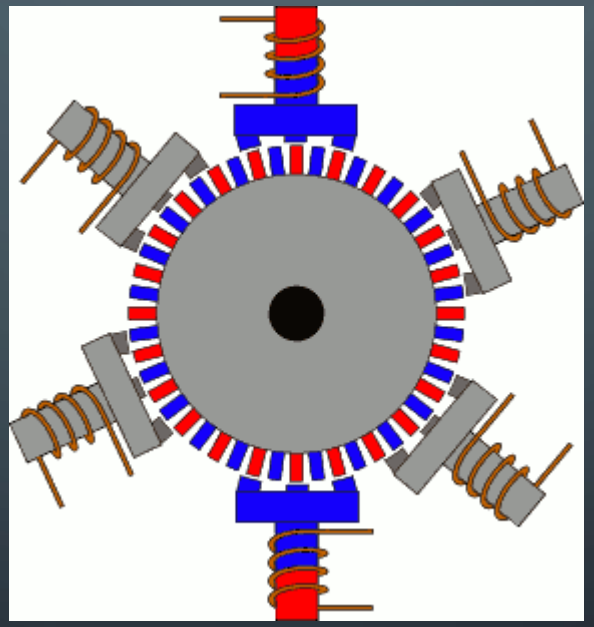
- $\emptyset = \beta * A$
  - $\emptyset$ – Magnetic Flux
  - β – Magnetic Field
  - A – Surface Area

HOW A GENERATOR WORKS





MULTI-POLE GENERATOR



CONCLUSIONS

- To maximize power generation we need to consider:
  - Maximizing the magnetic field
  - Maximizing the number of poles
  - Maximizing number of turns
  - Maximizing number of rotations per second
  - Minimizing Distance between magnet and coil

REFERENCES

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