Abu Dhabi University

Electromagnetics Fields And Waves

Lab Report 3

Effect of speed and torque on rate of change of flux

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Section 1

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Abstract

We are introduced to application of induction in generating current in any power plant. There are basically two motors; one which is supposed to be moved by dc power. This motor moves a second motor motor having coils designed in it with a magnet on the rotor.
When the second motor is moved, the rotation of magnet cuts the wires resulting in the generation of electricity.

1 Introduction

- Inside the generator there is a long, coiled wire on its shaft surrounded by a giant magnet. The shaft that comes out of the turbine is connected to the generator. When the turbine turns, the shaft and rotor is turned. As the shaft inside the generator turns, an electric current is produced in the wire.
- We learnt in electromagnetic induction that the change ion flux creates current. Th value of the current depends on the rate of change of flux. Increasing the speed increases the rate at which the magneticx field lines are cut by the coil and it generates higher current.
- Increasing the torque means more energy is spent in moving the shaft instead of actually rotating the shaft and hence it makes the shaft rotation which should result in a lower EMF.

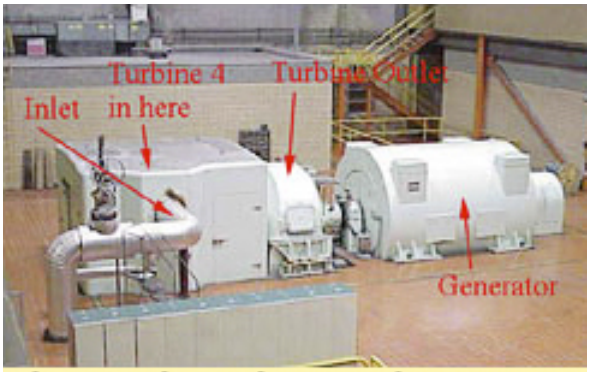


Photo credit: Carl Lira, Mich. State Univ.

2 Experiment Set-up

The setup is identical for both the parts.
Connect the driver motor with generator motor.
Connect the generator motor with measuring tools; embedded voltmeter and embedded ammeter.

3 List of Equipment used

- Driver Motor.
- Generator Motor.
- Voltmeter.
- Ammeter.

4 Procedure

4.1 Part 1

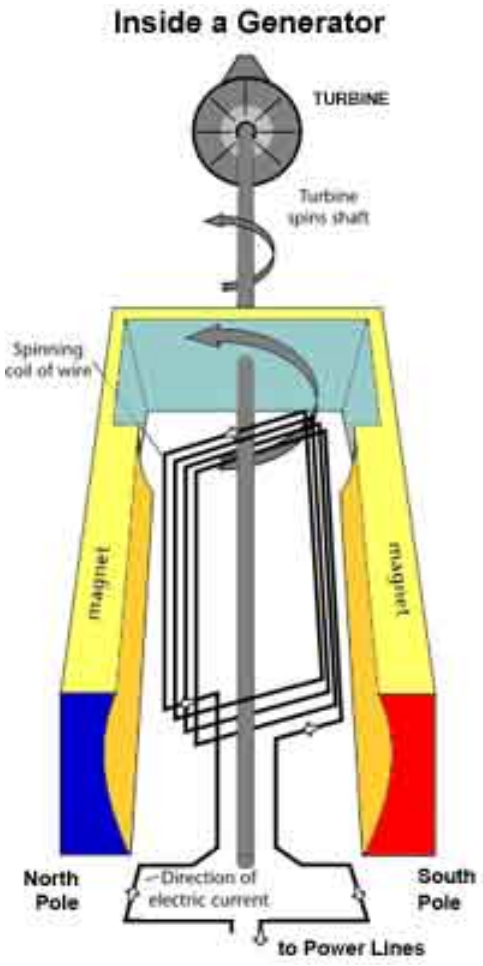
Select to speed mode and then vary the speed using the knob. Observe the changes in voltage and current in the measuring panel.

4.2 Part 2

Select to torque mode and then vary the torque using the knob. Observe the changes in the voltage and the current displayed in the measuring panel.

5 Results and Discussions

Part 1 We noticed that increasing the speed by turning the knob clockwise displays greater voltage in the voltmeter. This is because the value of voltage depends on the rate of change of magnetic flux which in our case is caused by increasing the speed of rotation.



Part 2 We noticed that increasing the valueof torque displays a decreasing voltage in the voltmeter. This is because a greater torque comes by compensating speed. A slower speed has slower rate of flux change which generates a relatively lower voltage and current

6 Conclusion

In this lab session we learnt a very practical application used in the power industry based upon the understanding of electro magnetics . We learn that a rotating magnet creates the changing magnetic flux which in turn generates EMF. This is the core aspect that makes the current in the power industries which finally makes it possible to have the many conviniences of electronic appliances in our everyday life.

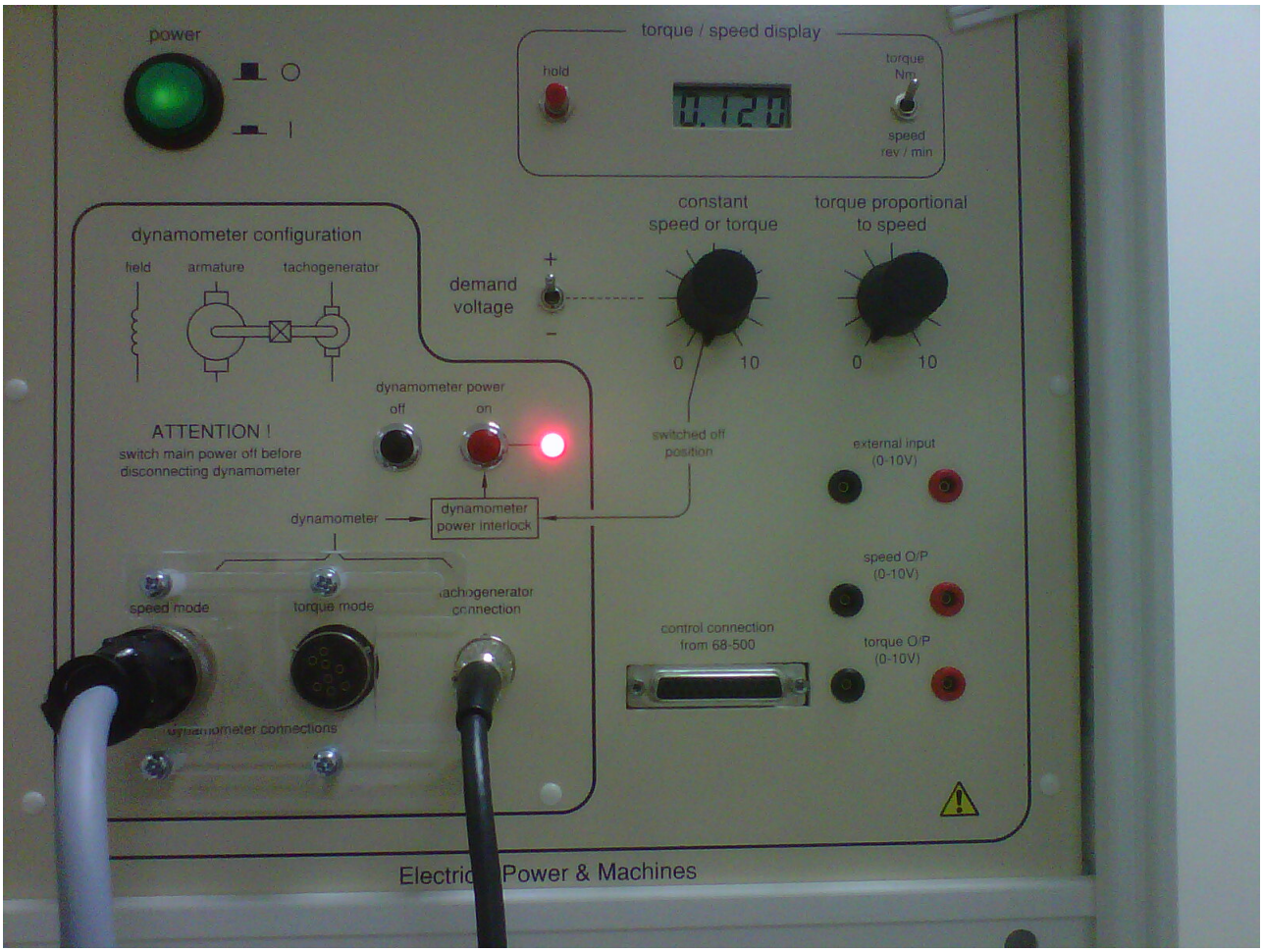


Figure 1: Experiment Setup

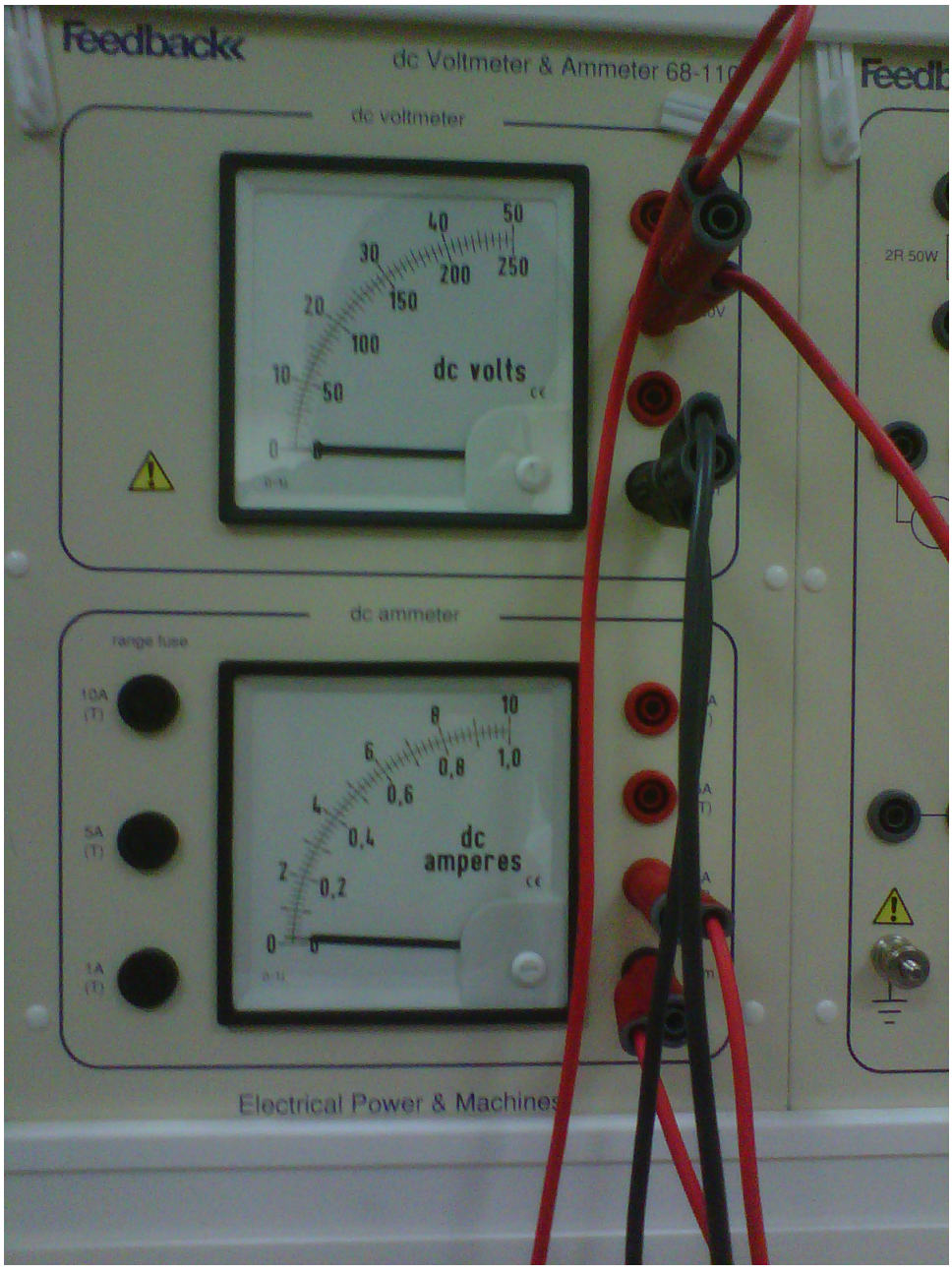


Figure 2: Experiment Setup 2

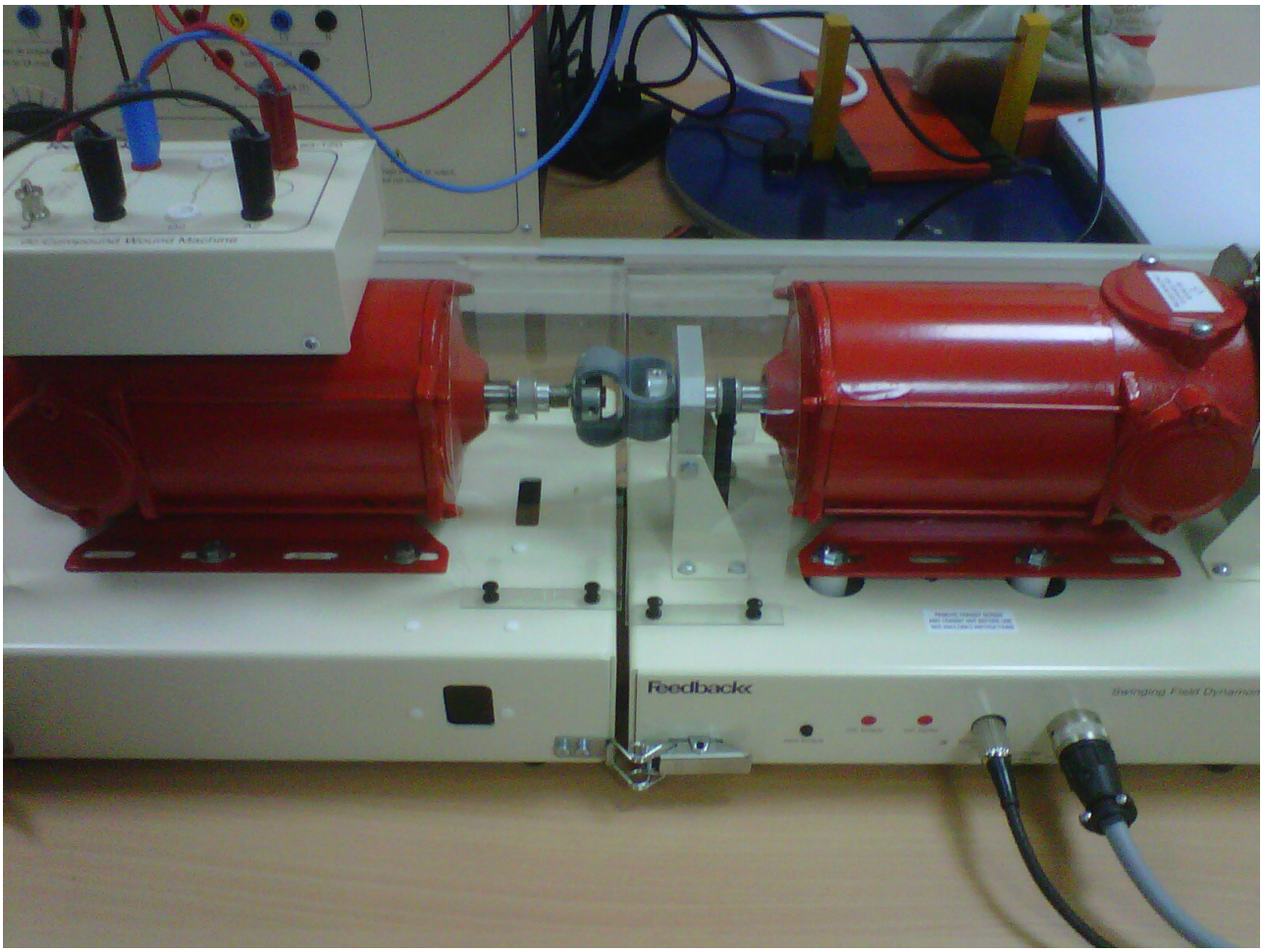


Figure 3: Experiment Setup 3