Series DC Motor Connection

Defining Formulas

\[ T_d = K_B I_f I_a \]

Series connection so \( I_f = I_a \)

\[ T_d \propto I_a^2 \Rightarrow T_d = K_t I_a^2 \]

Speed Characteristics

\[ n = \frac{V_f}{I_a(R_f + R_a)} \]

as load decreases \( I_a \) decreases. This causes \( \Phi_p \) to decrease, \( n \) increases due to field weakening.

Torque Speed Characteristics

- Series motor must operate with a mechanical load at all times or speed will increase to damaging levels.
- Applications
  - Hoisting
  - Traction - Trains, Cars etc
  - Lab used dynamometer as load show \( T \) vs Speed

Rheostat

\[ V_f = 0 - 125 \text{ Vdc} \]

Shunt Field

Load Box

separately excited generator
DISCUSSION POINTS
Experiment # 8
Hampden #19

Series Motor Characteristics

1. Compare and contrast the torque – speed characteristics of Series Connected and Shunt Connected DC Motors.

2. Explain the relationship between the motor torque and armature current using words and formulas.

3. Explain why series motors should always be rigidly connected to the load.

4. List typical applications of series motors and explain why this type of machine is a good choice.

5. Refer to the graphs made from the collected data and explain why or why not the results support the theory presented in lecture.