

Lab 6: Separately Excited DC Motor
Performed: March 4, 2013
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Abstract

In this experiment, the operating characteristics of a separately excited DC motor were analyzed. This report highlights two parts: the investigation of the relationship between motor torque and armature current, and the investigation of DC motor saturation effects. To determine the relationship between the motor torque and armature current, the load torque at the dynamometer was increased while the voltage supply was held at 116.5-V. The motor torque and resulting armature current was then recorded and analyzed. To determine the DC motor saturation effect, the field current was increased using the field control rheostat while the armature current was held at 1.5-A. The field current and resulting output torque was then recorded and analyzed.

Results

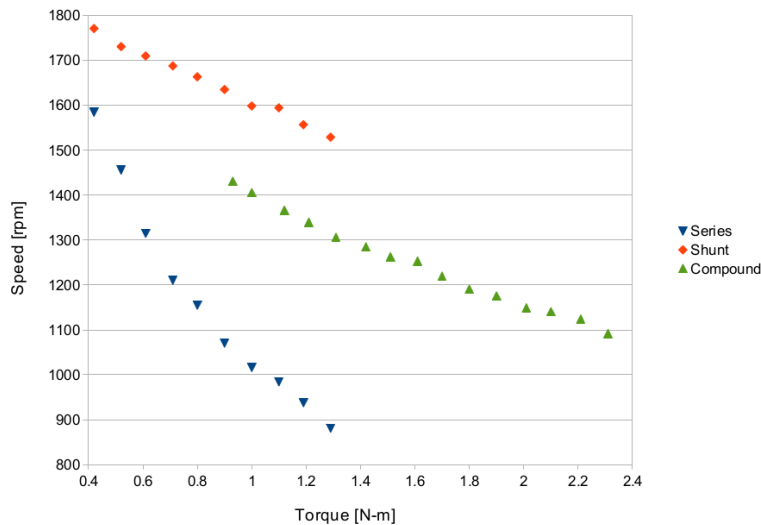


Figure 1: Comparison of Speed vs. Torque Plots

Conclusions

In Figure ??, the linear relationship between DC motor speed n_m and torque τ is exemplified. The DC motor was initially operating at approximately 1500-rpm. As the load torque was increased, the DC motor experienced a decrease in speed. The armature current was also increasing while the load torque was increasing, and thus the internal generated voltage E_A was decreased.

In Figure ??, the DC motor saturation effects are shown. This plot is similar to a DC motor magnetization curve, where the field current is plotted against the internal voltage. Here, the field current was plotted against the output torque. Since the torque in any real machine depends on the flux in the machine, and the internal voltage E_A is directly proportional to the flux produced, the y-axis in Figure ?? can be represented by torque and not E_A as in a DC machine magnetization curve. This plot shows that initially a large increase

in field current correlates to a sharp increase in output torque. Initially the dynamometer load torque was set to its max value. Thus as the DC motor output torque nears this max dynamometer load torque, further increases in field current produce less and less increases in output torque.