METR3100 Sensors and Actuators

Actuators Practical Aligned Assignment

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Executive Summary

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2. Equipment and Procedure

2.1 Equipment

2.1.1 Practical Equipment

The equipment used in the practical were:

- AC motor
- Brake
- Cooling fan
- ABB drives
- PC with *drivewindows*; and
- DSP7000

2.1.2 Safety Equipment

The safety equipment used in the practical were:

- Enclosed shoes; and
- Hearing protection

2.2 Procedure

The procedure followed for this practical was:

1. The ABB motor drives were turned on.
2. *Drivewindows* was started on the PC connected to the ABB motor drive.
3. Remote control was taken over the motor.
4. The control mode of the motor was switched to scalar.
5. The frequency of the motor was set to 50 Hz.
6. The cooling fan was started for the brake.
7. The DSP7000 was started and set to open loop mode.
8. The brake was turned on.
9. The torque and speed displayed on the DSP7000 and the torque, speed, and motor current on *drivewindows* and the information panel on the ABB drive were noted.

10. The brake percentage was increased incrementally and the torque, speed, and motor current were noted for all brake percentages examined.

3. Results

The experiment yielded the raw data which can be seen in Appendix A. This data was transferred to a set of graphs to aid the usefulness of the data, and to allow easy viewing of patterns and trends. These graphs can be seen below in Figures 3.1 and 3.2.

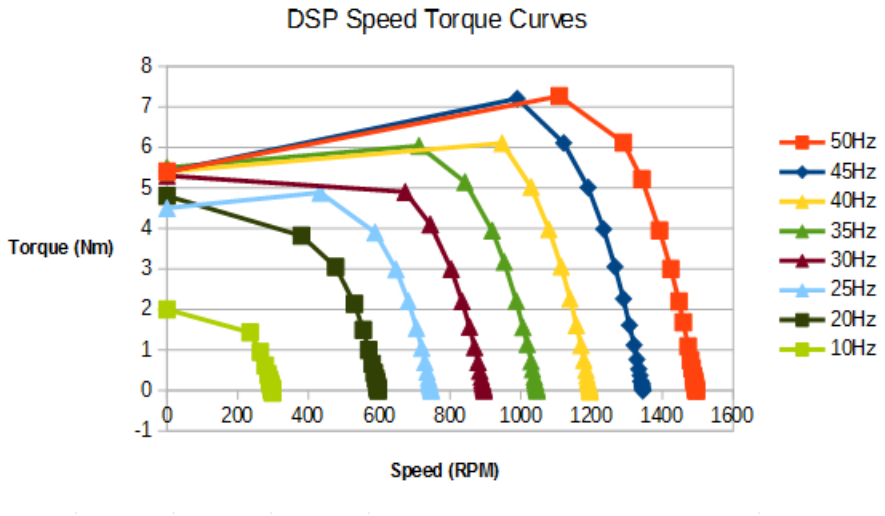

Figure 3.1: Results from the dynamometer for various frequencies

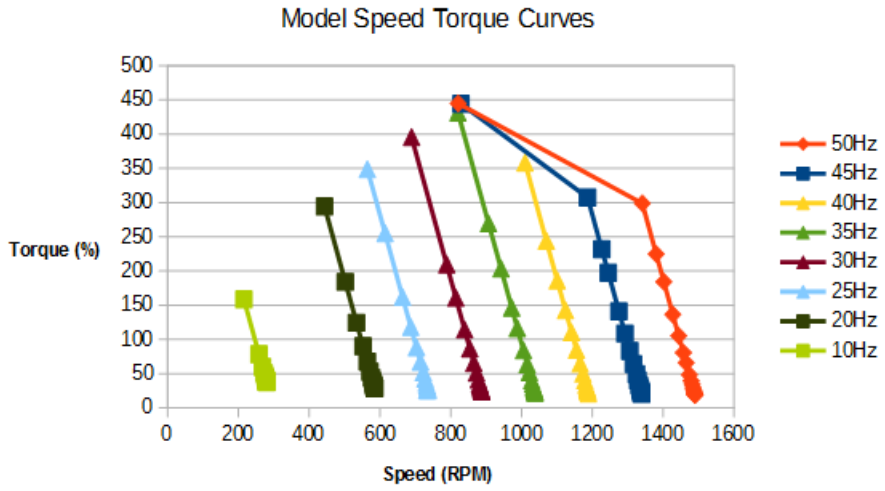

Figure 3.2: Results from the motor drive panel for various frequencies

4. Analysis and Discussion

4.1 Experimental vs Theory

4.2 50Hz Low Slip Region

Figure 3.1 shows that in the 50 Hz data from the dynamometer, there is a linear trend in the low slip region. This region is from 1496 RPM to 1392 RPM, and is approximated by the linear equation shown in Equation 4.1.

$$T = -0.040\omega + 60.027 \tag{4.1}$$

The theoretical curve is given by Equation 4.2.

$$T = -0.033\omega + 49.435 \tag{4.2}$$

These curves can be seen in Figure 4.1.

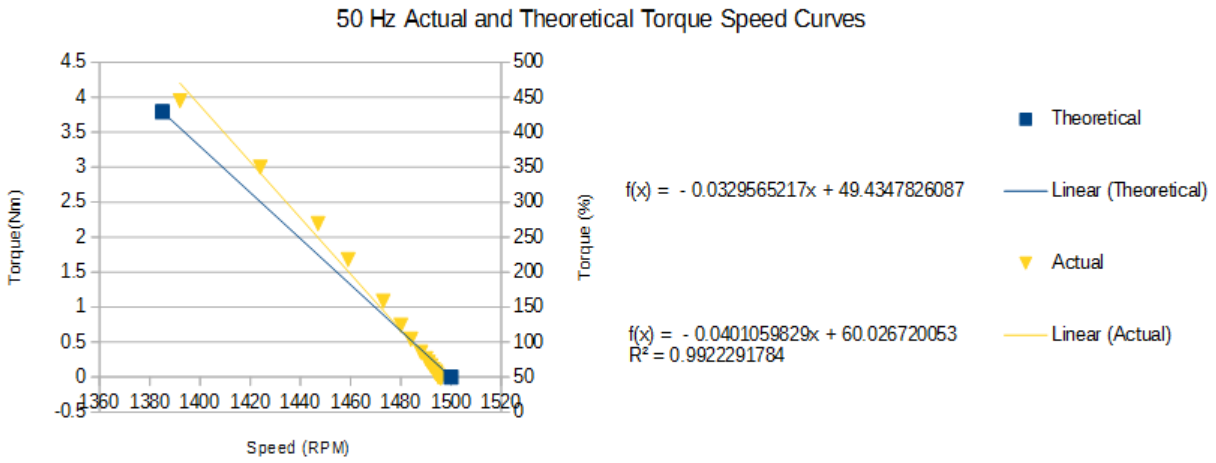

Figure 4.1: Low slip region of 50 Hz data from dynamometer and theoretical curve from Part A

These equations are quite similar, which indicates that the theoretical model of the low slip region provides an adequate approximation of the motor.

4.3 Relationship Between Different Frequencies

The data collected from the dynamometer for various frequencies has been plotted in Figure 4.2 below.

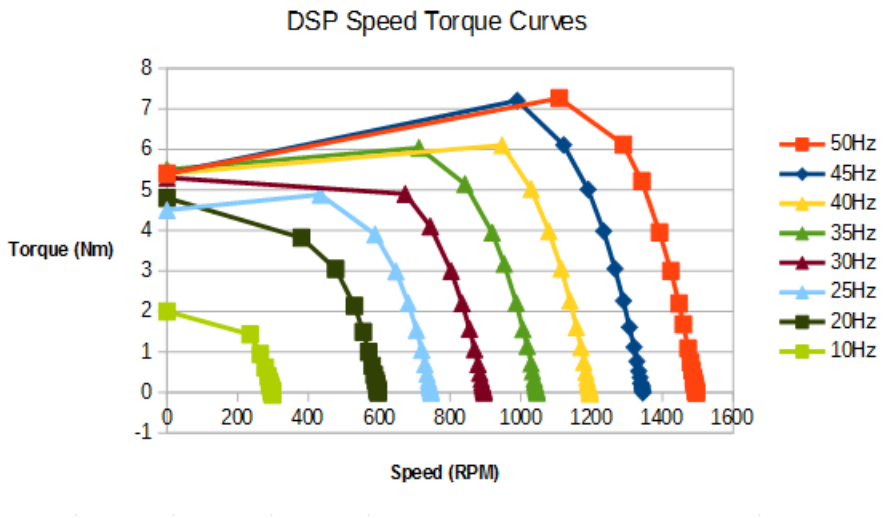

Figure 4.2: Results from the DSP for various frequencies

4.4 Voltage and Speed Requirements to Drive Nominal Load at Set Speed

5. Design Analysis

6. Conclusions

7. Recommendations

8. References

9. Appendices