

Squirrel Cage Induction Motors Electrical (44:53)

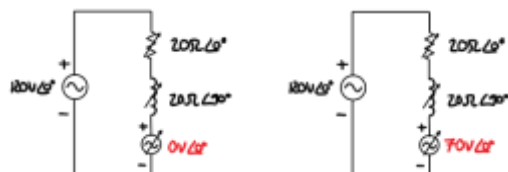
Draw the speed torque curve and power curve for a type B squirrel cage induction motor. Identify: the unloaded condition, the rated condition, the breakdown torque or maximum torque condition, the peak mechanical power condition, and locked rotor condition.

Given this motor nameplate determine the rated speed, slip, rated torque, current at 208V, and power factor. Calculate apparent, real and reactive power.



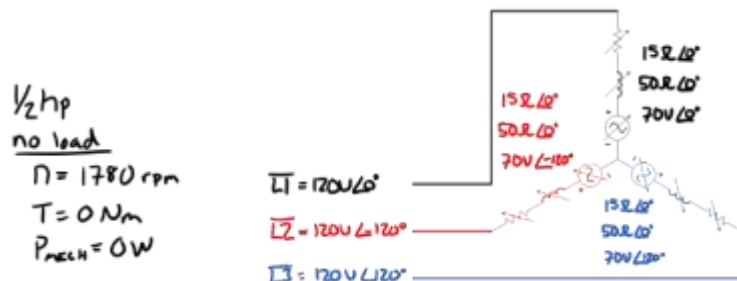
Predict how current, real and reactive power, power factor, and efficiency react to under and over load conditions. Identify region of peak efficiency.

Solve for current given different values of CEMF.



Plot CEMF and torque as a function of rotational speed. Identify the effect of CEMF on current for different rotational speeds.

Calculate current, efficiency, power factor, real, and reactive power for the unloaded condition given this model. At the no load condition the motor rotates at 1780rpm and produces 0Nm of torque.



Calculate current, efficiency, power factor, real and reactive power for the rated condition given the impedances in the above model change to $27+j20$ and CEMF drops to 67V. At the rated condition the motor rotates at 1730rpm and produces 2.1Nm of torque.

Calculate current, efficiency, power factor, real and reactive power for the peak mechanical power condition given the impedances in the above model change to $20+j9$ and CEMF drops to 66V. At the rated condition the motor rotates at 1680rpm and produces 3.2Nm of torque.

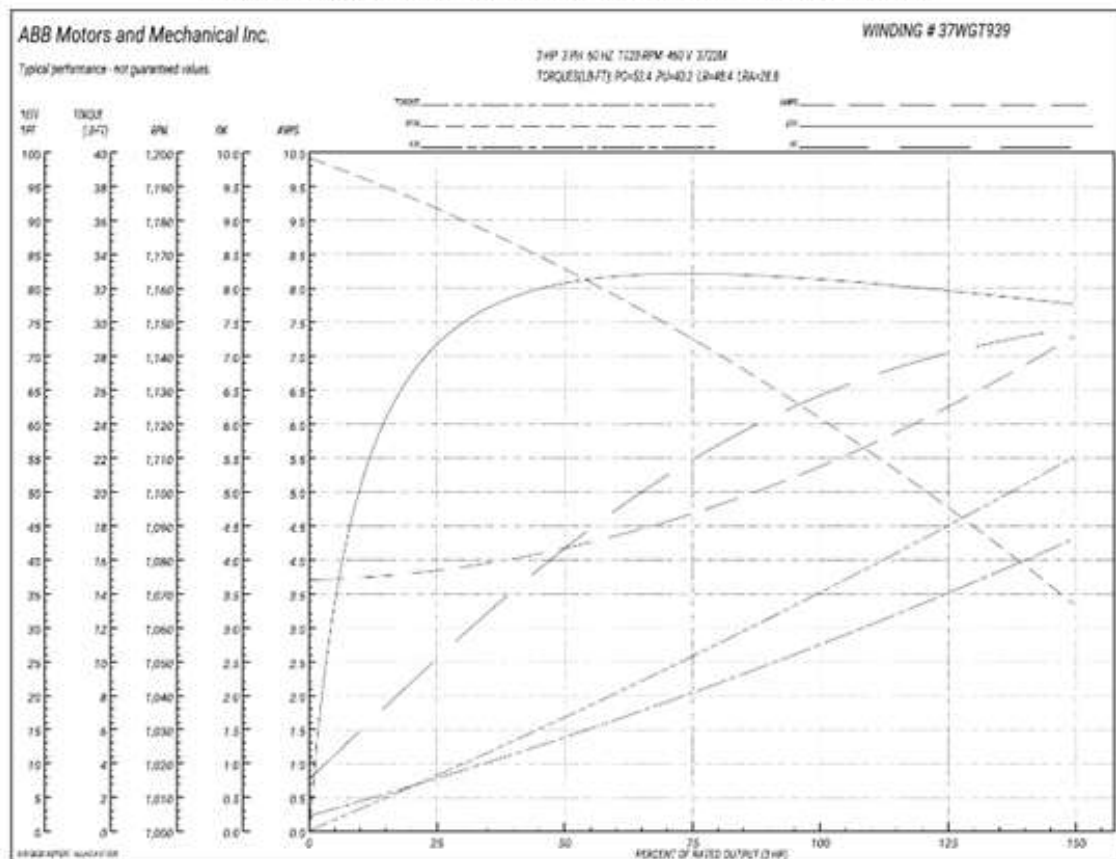
Draw plots of torque, mechanical power, current, real and reactive power, efficiency, and power factor as a function of rotational speed. Locate the rated condition.

Describe the behavior of real and reactive power as a function of mechanical power at or around the rated condition.

Describe the consequences of decreasing mechanical power, real electrical power, and efficiency inside the breakdown region.

Given this plot of a 3hp design D squirrel cage induction motor, identify the data specified on the horizontal x axis. Identify the rated condition. Identify where data at the rated condition can be acquired.

Performance Graph at 460V, 60Hz, 3.0HP Typical performance - Not guaranteed values



Identify the rotational speed curve. Determine rotational speed and slip at the rated condition. Identify the upper and lower limits of rotational speed and identify the significance of this range. Identify why rotational speed slopes downward left to right.

Identify the torque curve. Determine torque at the rated condition. Identify why torque slopes upward left to right.

Determine mechanical power output, efficiency, and electrical power input at the rated condition.

Identify the current curve. Determine current at the rated condition. Identify why current slopes upward left to right.

Identify the power factor curve. Determine power factor at the rated condition. Identify why power factor slopes upward left to right.

Identify the efficiency curve. Determine efficiency at the rated condition. Identify why the efficiency curve behaves as it does.

Identify the real power curve. Determine real power at the rated condition. Identify why real power slopes upward left to right.