

4.5 TORQUE-SPEED CHARACTERISTICS OF BLPM

The torque-speed characteristics of BLPM sine wave motor is shown in fig. 4.5.1

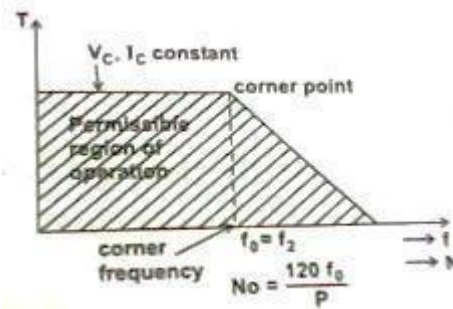


Figure 4.5.1 Torque-speed characteristics of BLPM sine wave (SNW) motor

[Source: "special electric machines" by Srinivasan page:5.46]

For a given and (i.e) maximum permissible voltage and maximum permissible current, f_c maximum torque remains constant from a low frequency to (i.e) corner frequency.

Any further increase in frequency decreases the maximum torque. At f_m (i.e.) the torque developed is zero. Shaded pole represents the permissible region of operation in torque speed characteristics.

Effect of over speed

In the torque speed characteristics, if the speed is increased beyond the point D, there is a risk of over current because the back E_b continues to increase while the terminal voltage remains constant. The current is then almost a pure reactive current flowing from the motor back to the supply. There is a small q axis current and a small torque because of losses in the motor and in the converter. The power flow is thus reversed. This mode of operation is possible only if the motor over runs the converter or is driven by an external load or prime mover.

In such a case the reactive current is limited only by the synchronous reactance. As the speed increase further, it approaches the short-circuit current which is many times larger than the normal current rating of the motor winding or the converter. This current may be sufficient to demagnetize the magnets particularly if their temperature is high. Current is rectified by the freewheeling diodes in the converter and there is a additional risk due to over voltage on the dc side of the converter, especially if a filter capacitor and ac line rectifiers are used to supply the dc. But this condition is unusual, even though in the system design the possibility should be assessed.

