

Abstract

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High starting performance separately excited DC motor

Electric motors have a variety of speed-torque characteristics during steady state and transient operations. For a given drive applications, motors are often ed to match the characteristics of the required operation, determined by the mechanical load characteristics and the available power supply. Due to advances in power electronics, such restrictions no longer exist where the characteristics of most motors can now be altered to match the desired performance when external power converters are used and advanced control strategies are employed. Series DC motor has a high starting torque. Reversing its speed direction is normally done using a relay arrangement, which requires an off time interval and results in waste of energy during braking. Also DC series motor doesn't run above base speed because there is no separate control on the field current unless a field diverter is used which causes losses. Separately excited DC motor can operate above the base speed in the field-weakening region by reducing the field current independently. Also its speed direction can be reversed by reversing the armature voltage. In this paper a DC drive control system is suggested to run the DC motor so as to obtain the performance of the series DC motor below base speed and the performance of the separately excited DC motor above base speed and to change speed direction in a regenerative braking mode at any motor speed. The model of the DC motor including the saturation is reviewed. The control strategy is explained and the control circuit is proposed. A steady state and transient analysis of the motor is performed below and above base speed.