TECHNICAL INFORMATION ELECTRICAL

VARIABLE SPEED DRIVES

Variable speed drives may be applied to accelerate or decelerate in either or both directions, against constant torque loads, constant power loads, or loads where both the power and torque vary. They may thus be used to control variables such as speed, flow rate, tension, thickness, density, temperature, etc.

CONSTANT TORQUE APPLICATIONS

The torque required to drive the load is approximately constant regardless of speed and hence the power varies directly with speed. Applications include:

- Extruders
- Conveyors
- Treadmills
- Paper and printing
- Rubber extrusion

CONSTANT POWER APPLICATIONS

The power required to drive the load does not vary with speed and hence the torque varies inversely with speed. Applications include:

- Re-wind stands
- Machine tools
- Crane hoists
- Wire drawing
- Dynomometers

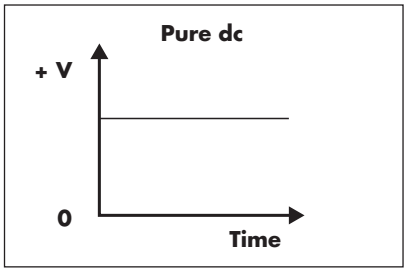
TORQUE AND POWER

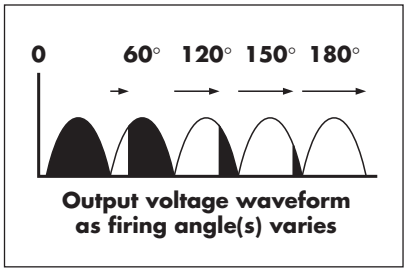
These type of applications vary the torque with the square of the speed and the power with the cube of the speed. In these cases it is usual to supply a drive capable of working against constant torque but to take the reduced torque and power requirements at the lower speeds. Applications include:

- Centrifugal fans and pumps

FORM FACTOR

Form factor describes the smoothness of a rectified dc waveform.





The most common sources of dc supply are:

- Battery (pure dc - form factor 1.0)
- Thyristor converter (rectified dc)
- PWM converter

Supplies originating from a thyristor converter are unable to achieve pure dc and hence have a certain amount of waveform ripple. The amount of ripple is designated by a form factor e.g. 1.05. A poor form factor e.g 1.4 will significantly affect the performance of small dc motors such as; MP, MD and YD/CD ranges. To offset the impaired performance it is necessary to derate the motor to maintain the temperature rise and reduce the risk of excessive sparking at the commutator.

Form factor can often be improved by the addition of inductance (e.g. a choke) in the armature circuit. If in doubt, please contact your controls supplier.

Definition: $FF = \frac{Irms}{Iav}$

Where: FF - Form Factor
Irms - Root Mean Square Current
Iav - Average Current

MOTOR TYPES

Motors are designed for a varity of applications, two of the common designs (shunt wound and permanent magnet) are detailed below. Designs including compound wound motors are available. Details available from Bull Electric.

SHUNT WOUND

Shunt motors with separatlely-excited fields are the popular choice where speed control is required over a wide range. If the field current is held constant and the armature voltage reduced, then infinite speed range can be obtained down to zero speed with constant torque capability. If the armature voltage is held constant and the field current is reduced, then speed increase over a limited range of 2:1 or 3:1 can be achieved with constant power output capability, commutation and stability being the limiting factors.

Field trimming can be applied in order to equally match two or more similar motors being fed in parallel from the same armature supply source.

BROOK Hansen ™
POWERFUL CONNECTIONS