

Load Characteristics

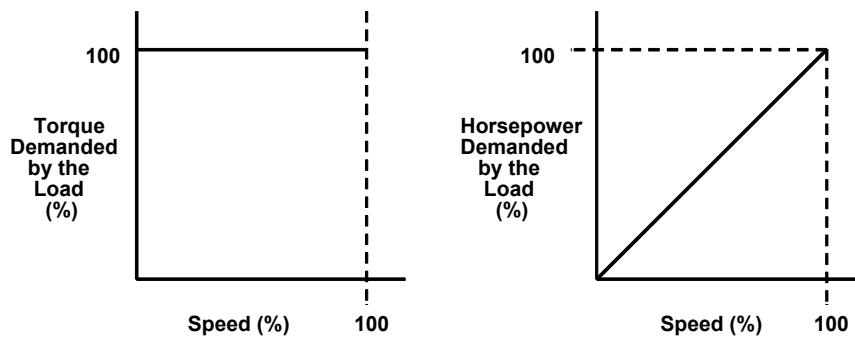
Introduction

Motor loads are classified into two main groups depending on how their torque requirement varies with operating speed. The following paragraphs deal with the various load types found in industry.

Constant Torque Load

The torque demanded by the load is constant throughout the speed range. Loads of these types are essentially friction loads. Figure 2.1 shows the constant torque and its effect on horsepower demanded by the load.

Figure 2.1
Constant Torque Load



Since HP is a product of Torque times speed, and torque remains constant in this type of load, horsepower is a function of speed.

$$HP = \frac{\text{Torque} \times \text{Speed}}{5250}$$

Where:

Torque = lb-ft.

Speed = RPM

5250 = a proportionality constant

Examples of this type of load are conveyors and extruders. Constant torque is also used when shock loads, overloads or high inertia loads are encountered.

Variable Torque Load

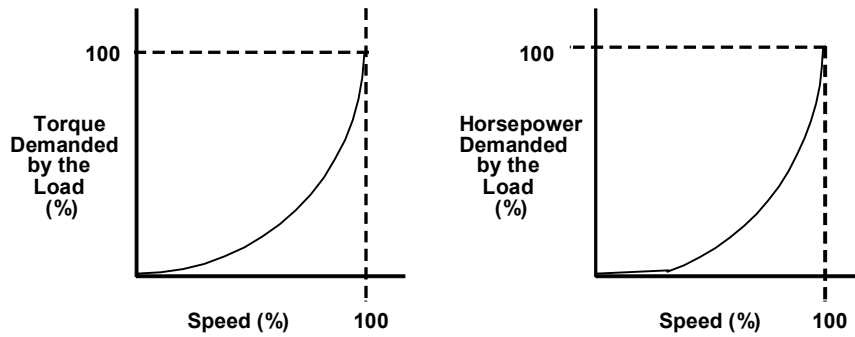
With this type of load, the torque demand increases with speed, usually speed squared (Speed^2).

$$\text{Torque Constant} \times (\text{Speed})^2$$

Horsepower is typically proportional to speed cubed (Speed^3).

Figure 2.2 shows the variable torque and its effect on horsepower demanded by the load.

Figure 2.2
Variable Torque Load

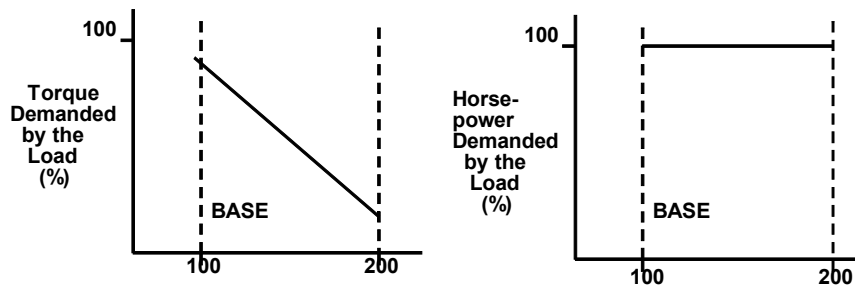


Examples of loads that exhibit variable load torque characteristics are centrifugal fans, pumps and blowers. This type of load requires much lower torque at low speeds than at high speeds.

Constant Horsepower Operation

This is a function of the motor being operated above base motor speed. The horsepower demanded by the load is constant within the speed range. The speed and torque are inversely proportional to each other. Figure 2.3 shows the constant horsepower and variable torque demanded by the load.

Figure 2.3
Constant Horsepower Load



Examples of this type of load are center-driven winders and machine tool spindles.