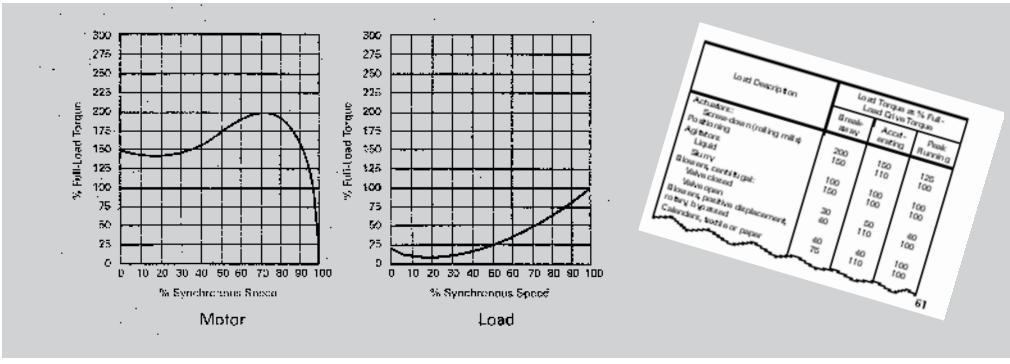
ENSURING THE MOTOR YOU SELECT MEETS YOUR LOAD'S SPECIFIC TORQUE REQUIREMENTS IS CRITICAL FOR OPTIMIZING OPERATING CONDITIONS

AC motors are used worldwide in many residential, commercial, industrial and utility applications. Motors transform electrical energy into mechanical energy. An AC motor may be part of a pump or fan, or connected to some other form of mechanical equipment such as a winder, conveyor or mixer. AC motors are found on a variety of applications from those that require a single motor to application requiring several motors.

A number of factors effect the correct selection of a motor for a specific application. One of these factors is whether the specific torque capabilities of a motor meet the torque requirements of the application's load.

AC motors running on an AC line operate with a constant flux (ϕ) because voltage and frequency are constant. Motors that operate with constant flux are said to have constant torque. Actual torque produced, however, is determined by the demand of the load.



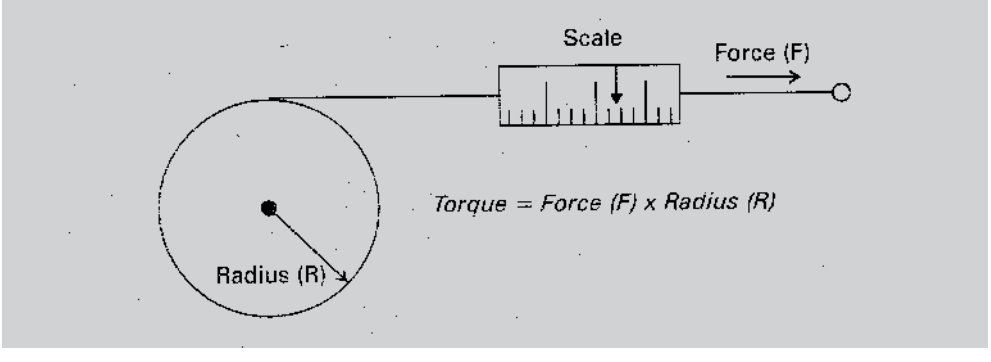
One way to evaluate whether the torque capabilities of a motor meet the torque requirements of the load is to compare the motor's speed-torque curve with the speed torque requirements of the load. To find the torque characteristics, a table, similar to the partial one shown above, can be used. NEMA publication MG 1 is one source of typical torque characteristics.

Matching AC Motors to the Load

One way to evaluate whether the torque capabilities of a motor meet the torque requirements of the load is to compare the motor's speed-torque curve with the speed torque requirements of the load.

To find the torque characteristics, a table, similar to the partial one shown above, can be used. NEMA publication MG 1 is one source of typical torque characteristics.

Note: NEMA (the National Electrical Manufacturers Association) sets standards for a wide range of electrical products, including motors. NEMA is primarily associated with motors used in North America. These standards can be found in NEMA Standard Publication No. MG 1. Some large AC motors may not fall under NEMA standards and are usually motors built to meet the requirements of a very specific application.



A simple experiment can be set up to show how the torque of a given load can be calculated. In the illustration above, a pulley is fastened to the shaft of a load that a motor is to drive. A cord is wrapped around the pulley with one end connected to a spring scale. The torque can be calculated by pulling on the scale until the shaft turns and noting the reading on the scale. The force required to turn the shaft, indicated by the scale, times the radius of the pulley equals the torque value.

Calculating load torque

The most accurate way to obtain torque characteristics of a given load is to obtain them from the equipment manufacturer. A simple experiment can be set up to show how the torque of a given load can be calculated. In the illustration below, a pulley is fastened to the shaft of a load that a motor is to drive. A cord is wrapped around the pulley with one end connected to a spring scale.

The torque can be calculated by pulling on the scale until the shaft turns and noting the reading on the scale. The force required to turn the shaft, indicated by the scale, times the radius of the pulley equals the torque value.

It must be remembered that the radius is measured from the center of the shaft. If the radius of the pulley and shaft were 1 foot, for example, and the force required to turn the shaft were 10 pounds, the torque requirement is 10 Lb-Ft. The amount of torque required to turn the connected load can vary at different speeds.

Continued on page 48