

ELECTRIC MOTORS

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1. INTRODUCTION

This section describes the main features of the electric motors.

1.1 Where motors are used

An electric motor is an electromechanical device that converts electrical energy to mechanical energy. This mechanical energy is used for, for example, rotating a pump impeller, fan or blower, driving a compressor, lifting materials etc. Electric motors are used at home (mixer, drill, fan) and in industry. Electric motors are sometimes called the “work horses” of industry because it is estimated that motors use about 70% of the total electrical load in industry.

1.2 How a motor works

The general working mechanism is the same for all motors (Figure 1):

- An electric current in a magnetic field will experience a force.
- If the current carrying wire is bent into a loop, then the two sides of the loop, which are at right angle to the magnetic field, will experience forces in opposite directions.
- The pair of forces creates a turning torque to rotate the coil.
- Practical motors have several loops on an armature to provide a more uniform torque and the magnetic field is produced by electromagnet arrangement called the field coils.

In understanding a motor it is important to understand what a motor load means. Load refers to the torque output and corresponding speed required. Loads can generally be categorized into three groups (BEE India, 2004):

- **Constant torque loads** are those for which the output power requirement may vary with the speed of operation but the torque does not vary. Conveyors, rotary kilns, and constant-displacement pumps are typical examples of constant torque loads.
- **Variable torque loads** are those for which the torque required varies with the speed of operation. Centrifugal pumps and fans are typical examples of variable torque loads (torque varies as the square of the speed).