Chapter 12

Introduction to Motor Drives

- Motor drives are one of the most important applications of power electronics

Control Structure of Drives

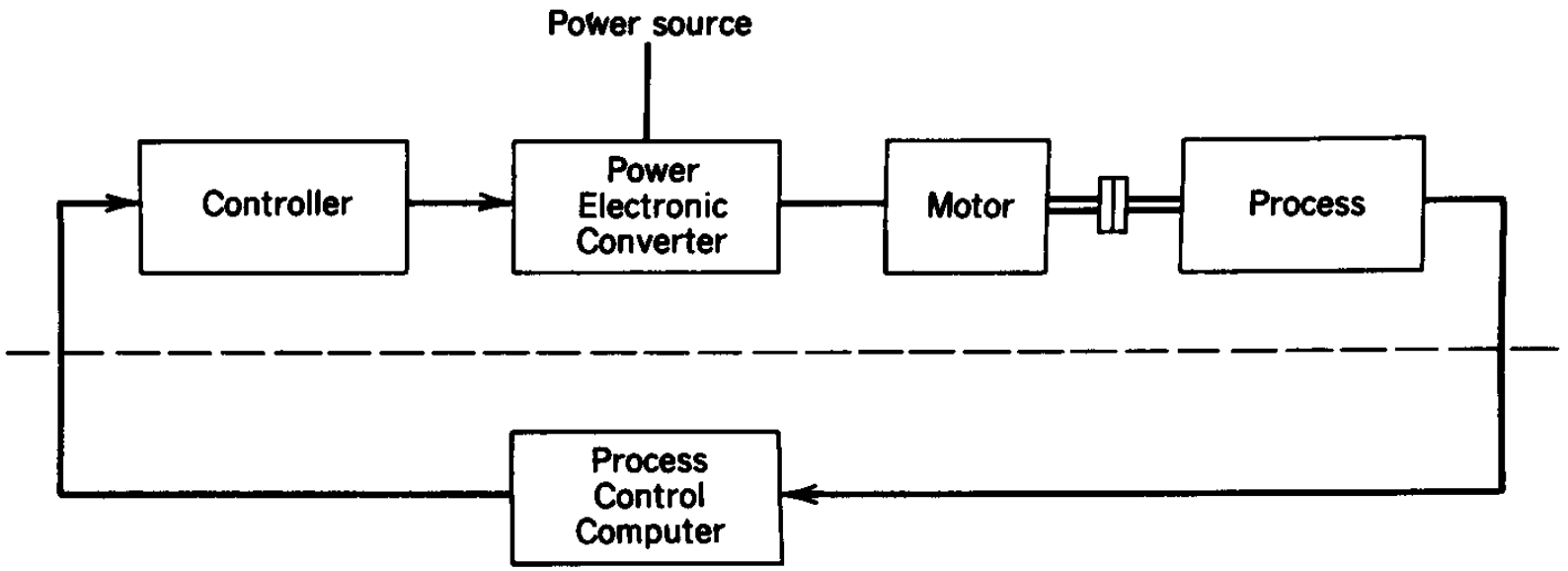


Figure 12-1 Control of motor drives.

- Very general description

Servo Drives

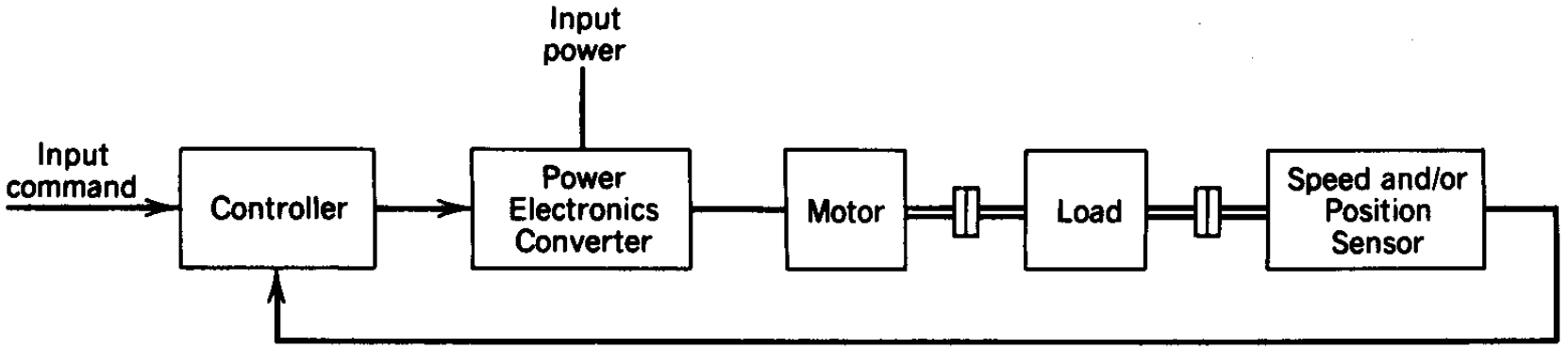


Figure 12-2 Servo drives.

- The basic structure is the same regardless of the drive that is selected

An Example of Adjustable Speed Drives

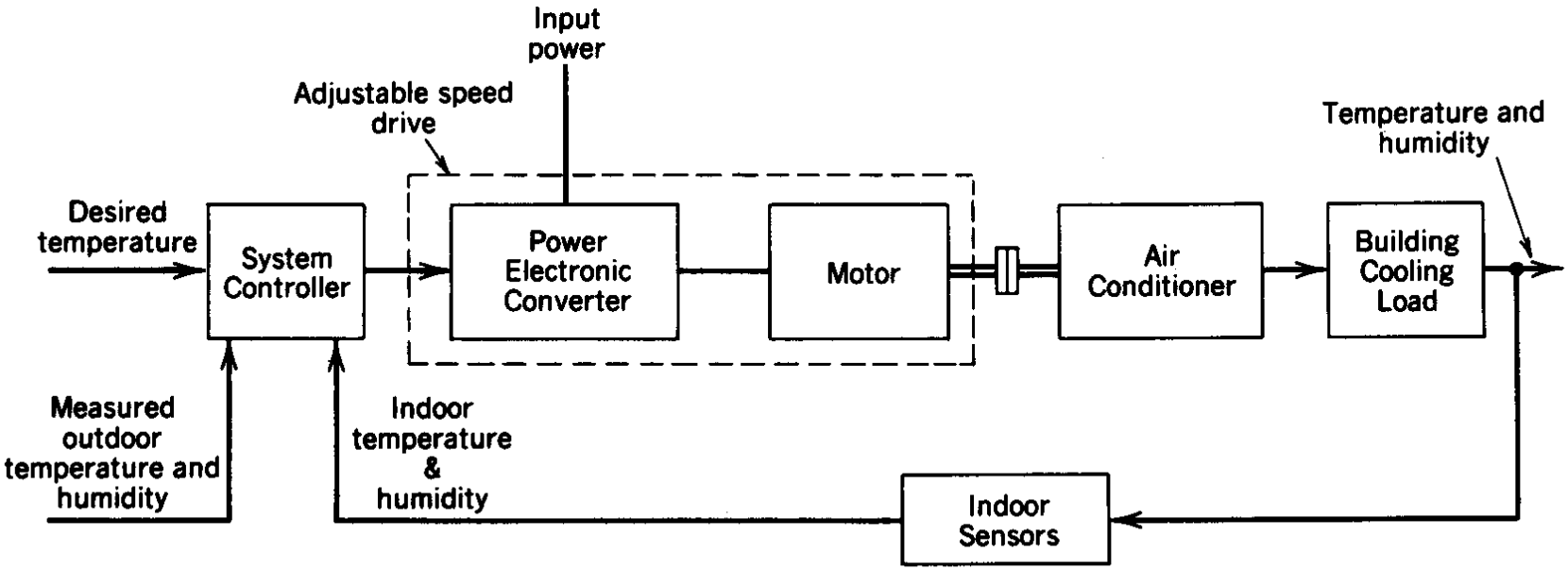


Figure 12-3 Adjustable-speed drive in an air conditioning system.

- The speed of the drive response is not important here

A Representation of the Load on a Drive

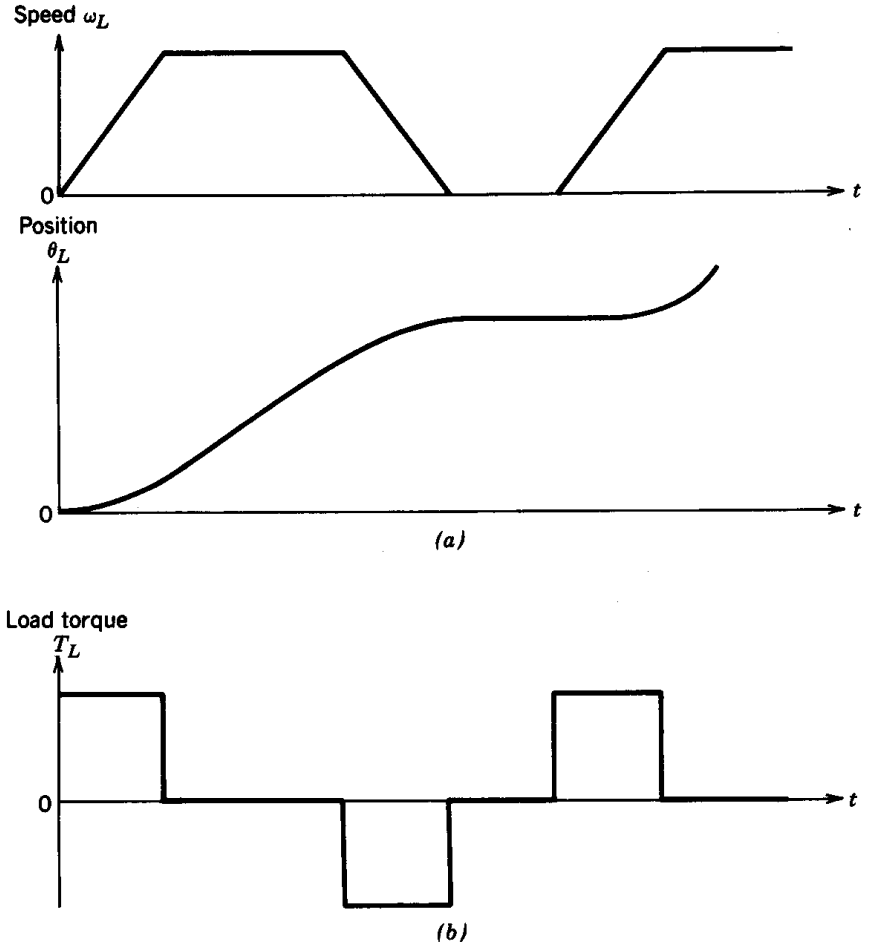
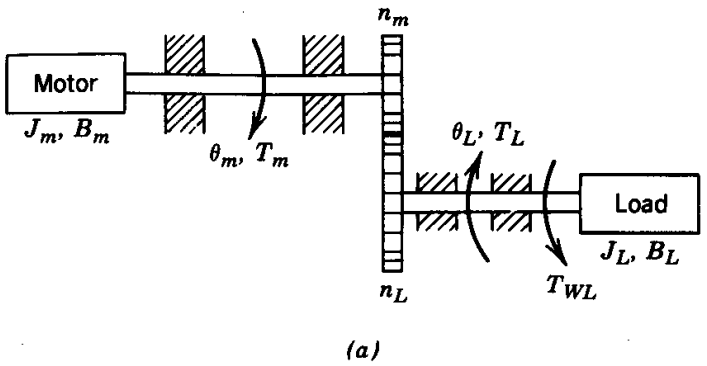


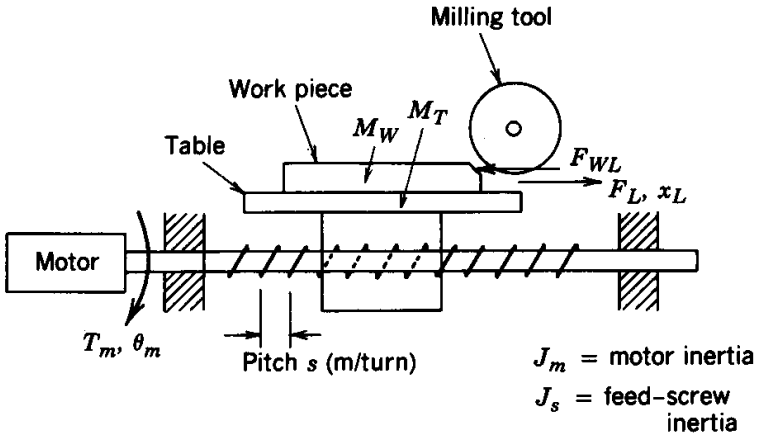
Figure 12-4 Load profile: (*a*) load–motion profile; (*b*) load–torque profile (assuming a purely inertial load).

- This cycle may repeat continuously

Two Coupling Mechanisms



(a)



(b)

Figure 12-5 Coupling mechanisms: (*a*) gear; (*b*) feed screw.

- Commonly used

Instantaneous Waveforms of Torque and Current

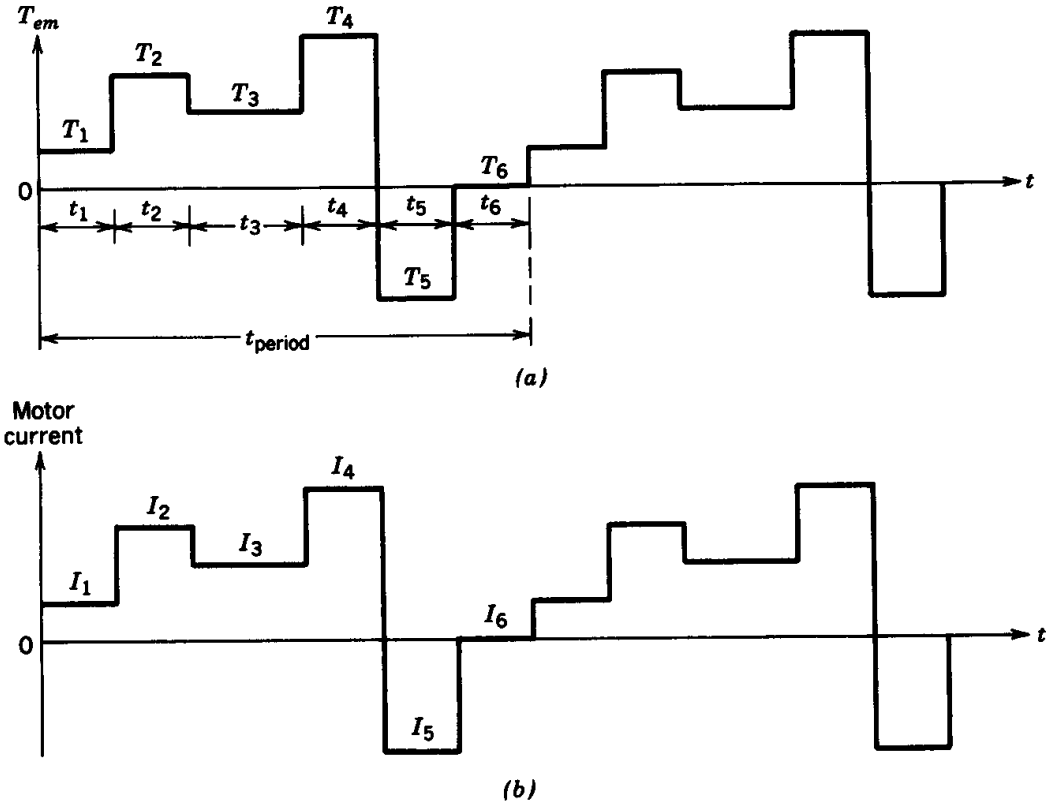


Figure 12-6 Motor torque and current.

- Their RMS values may determine the limit

Simplified Circuit of a Drive

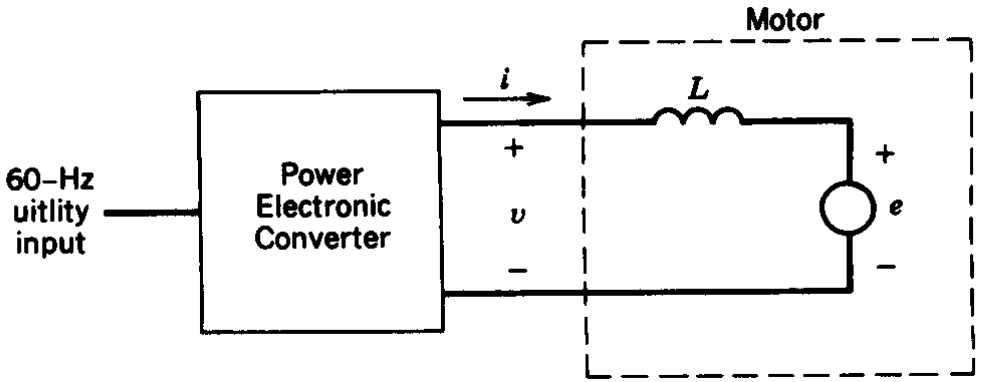


Figure 12-7 Simplified circuit of a motor drive.

- Allows discussion of various parameters and operating conditions on losses and ratings

Control of Servo Drives

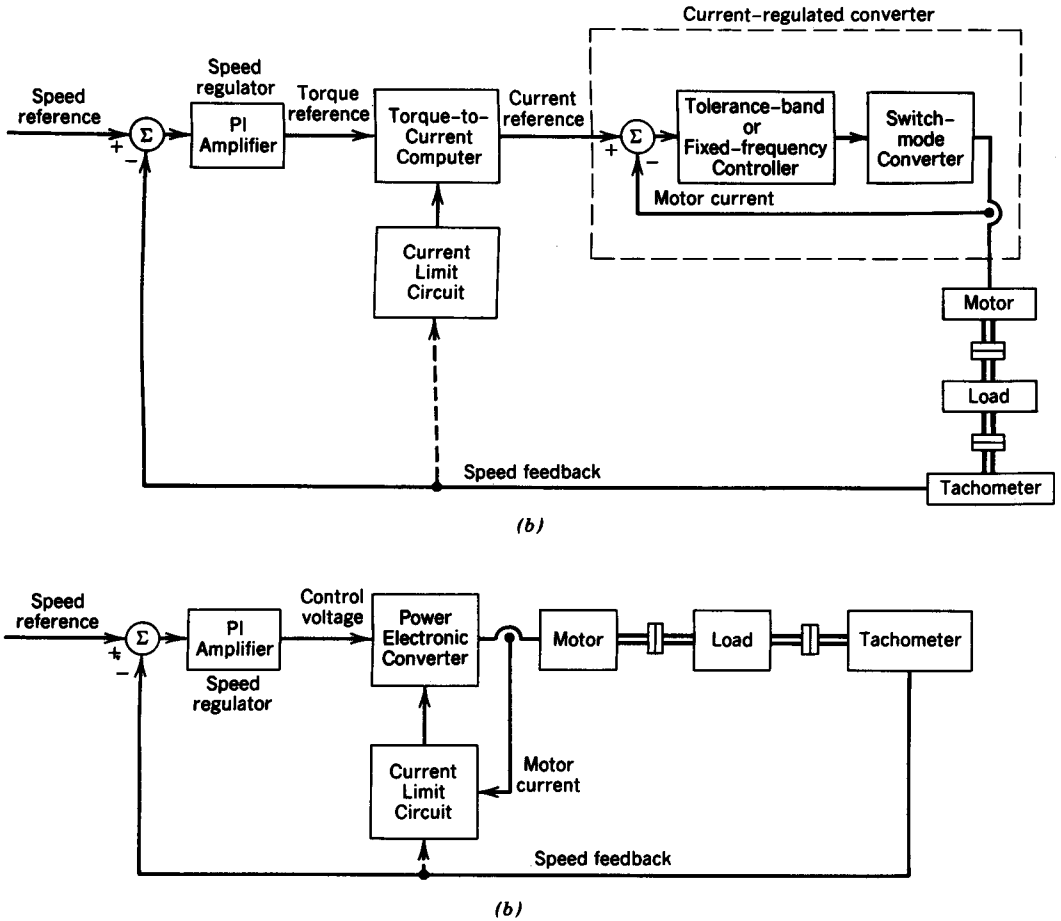


Figure 12-8 Control of servo drives: (*a*) inner current loop; (*b*) no inner current loop.

- The structure is application dependent

Limiters in the Control Structure

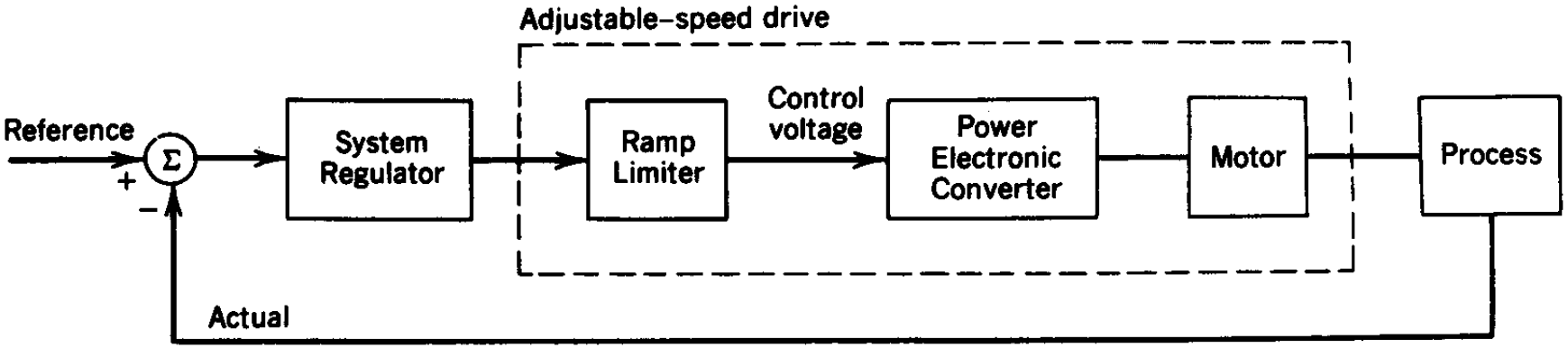


Figure 12-9 Ramp limiter to limit motor current.

- By providing ramp limiters, for example, drive can be prevented from “triping” under sudden changes