

Chapter 16

Residential and Industrial Applications

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- Significant in energy conservation; productivity

Improving Energy Efficiency of Heat Pumps

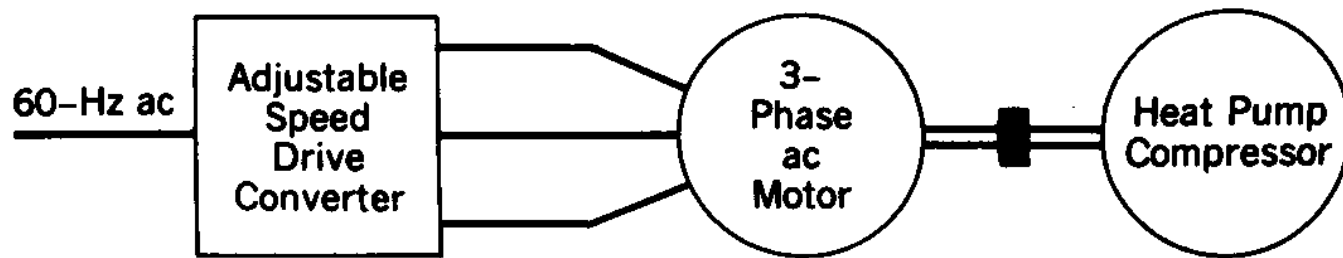


Figure 16-1 Load-proportional capacity-modulated heat pump.

- Used in one out of three new homes in the U.S.

Loss Associated with ON/OFF Cycling

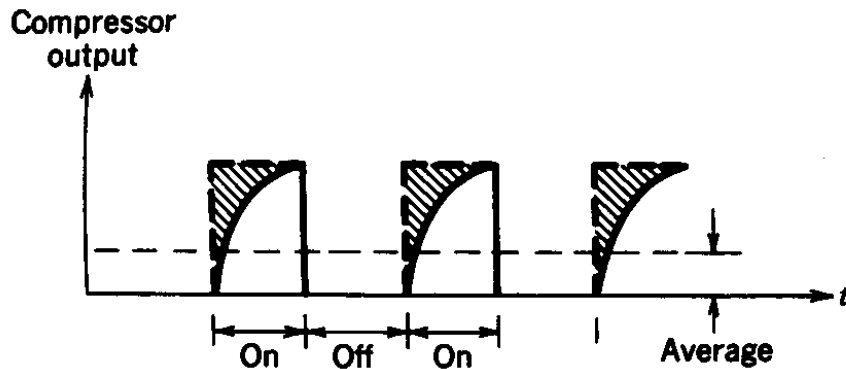


Figure 16-2 Conventional heat pump waveforms.

- The system efficiency is improved by ~30 percent

Inductive Ballast of Fluorescent Lamps

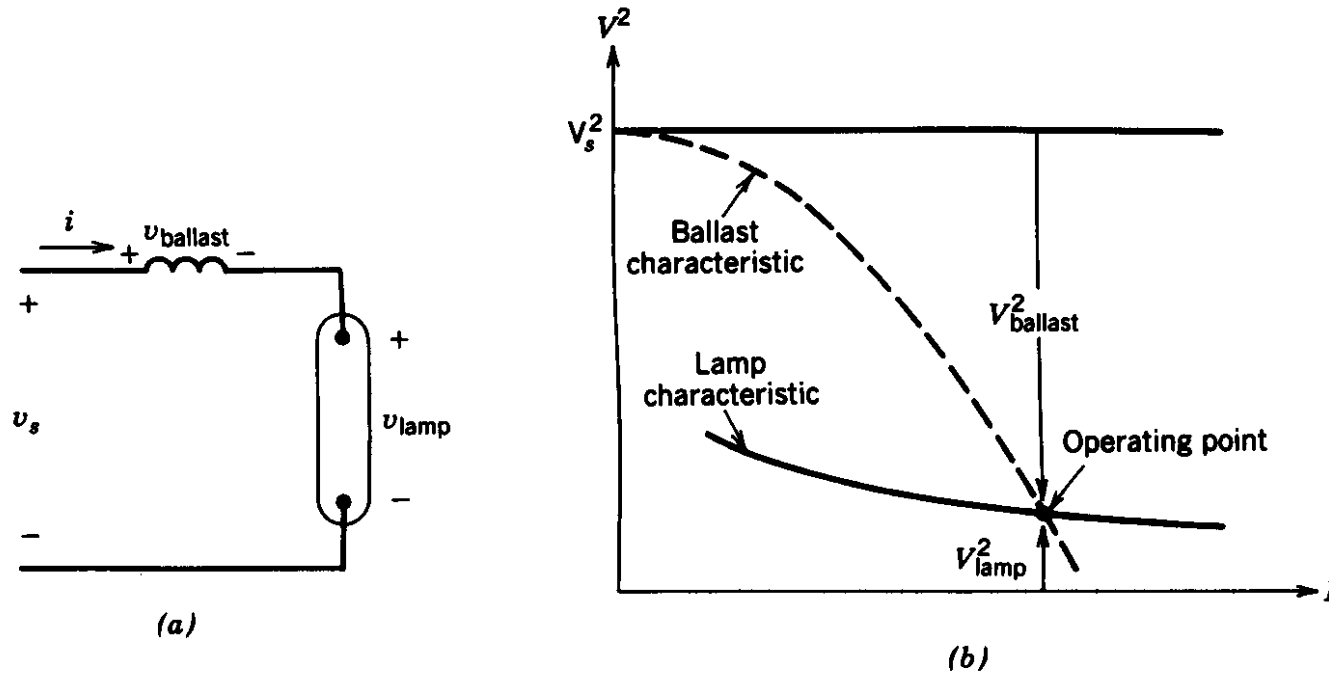


Figure 16-3 Fluorescent lamp with an inductive ballast.

- Inductor is needed to limit current

Rapid-Start Fluorescent Lamps

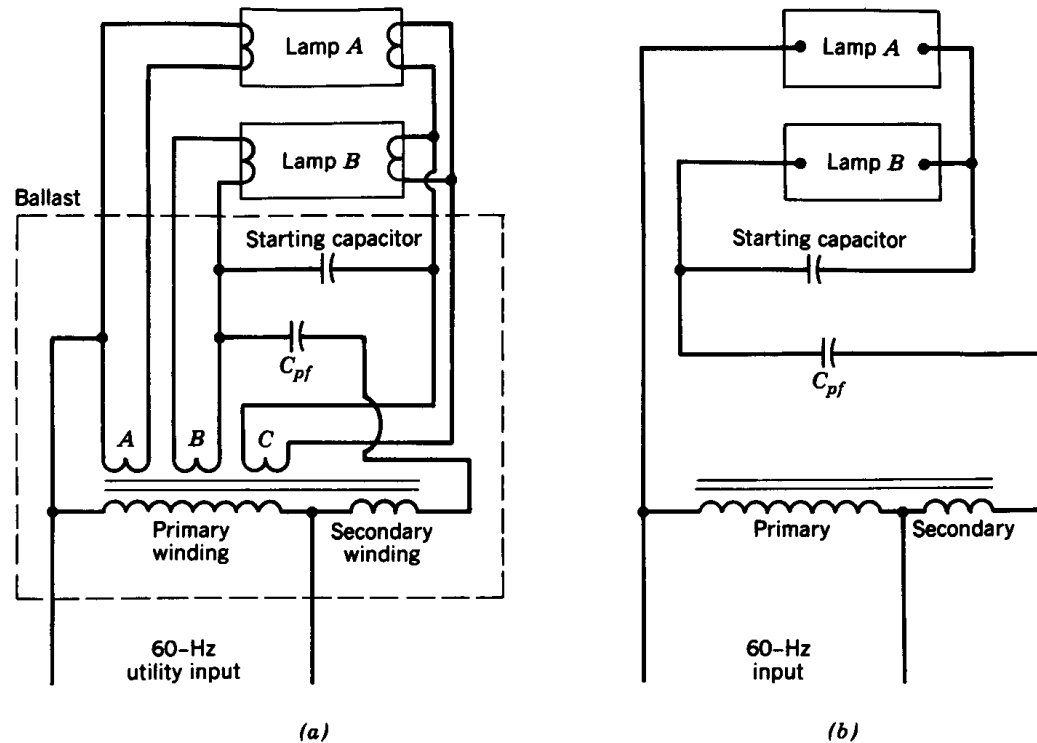


Figure 16-4 Conventional 60-Hz rapid-start fluorescent lamp: (a) circuit schematic; (b) simplified schematic.

- Starting capacitor is needed

Electronic Ballast for Fluorescent Lamps

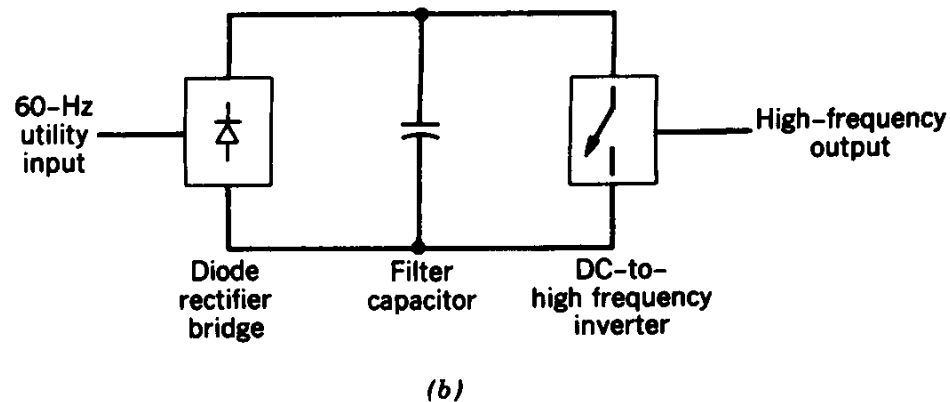
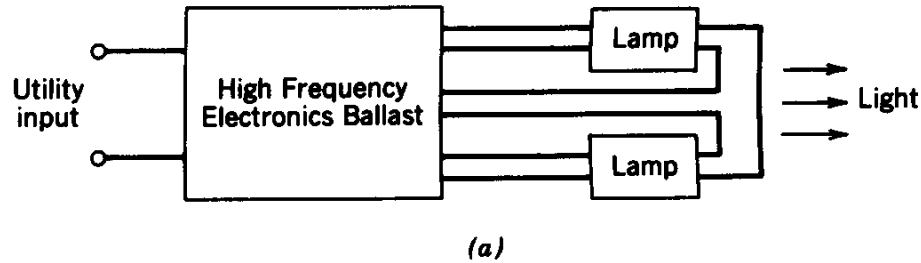


Figure 16-5 High-frequency fluorescent lighting system:
(a) system block diagram; (b) ballast block diagram.

- Lamps operated at ~40 kHz

Induction Cooking

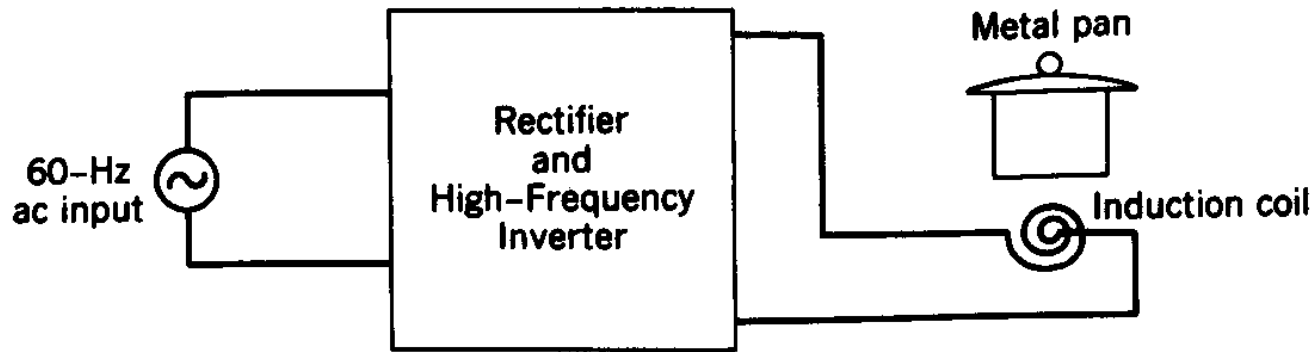


Figure 16-6 Induction cooking

- Pan is heated directly by circulating currents – increases efficiency

Industrial Induction Heating

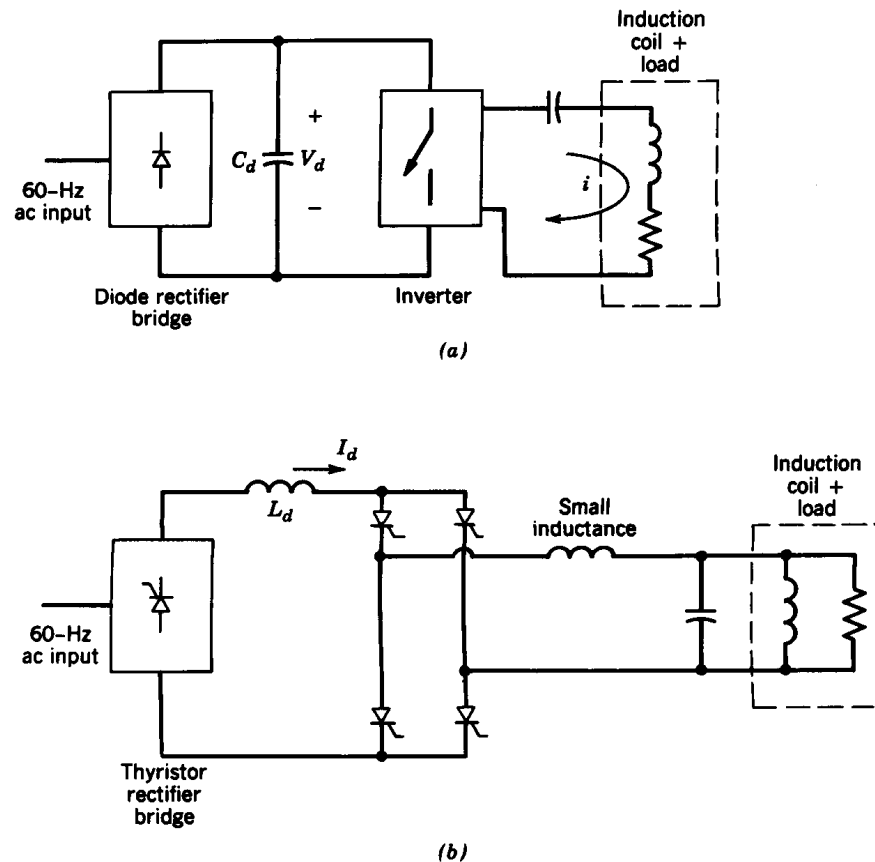


Figure 16-7 Induction heating: (a) voltage-source series-resonant induction heating; (b) current-source parallel-resonant induction heating.

- Needs sinusoidal current at the desired frequency: two options

Welding Application

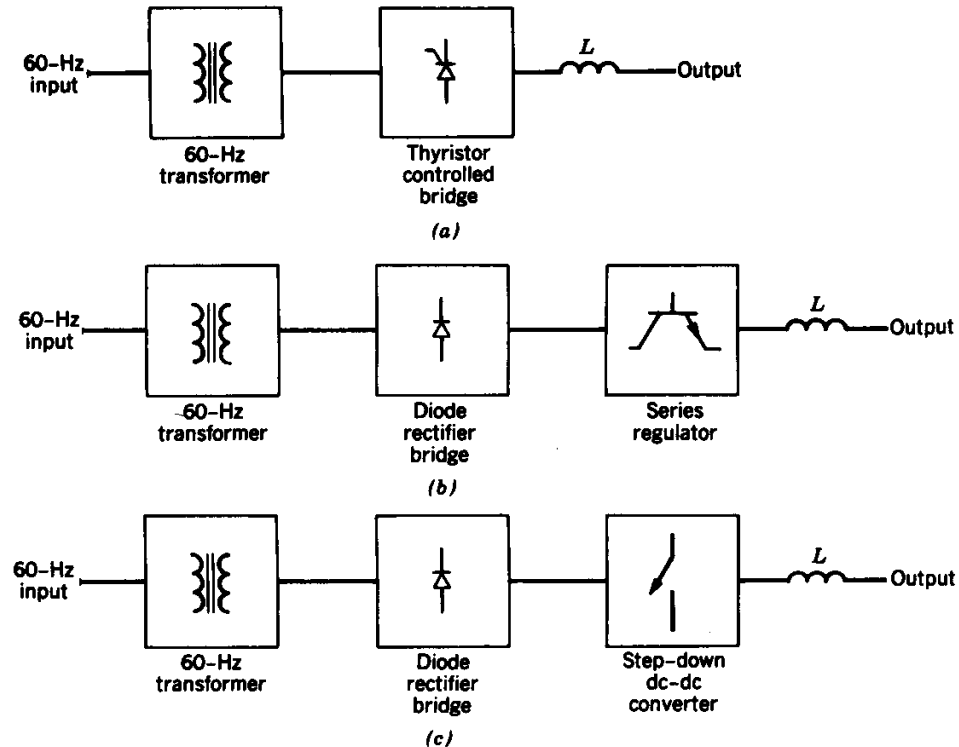


Figure 16-8 Welders with a 60-Hz transformer: (a) controlled thyristor bridge; (b) series regulator; (c) step-down dc-dc converter.

- Three options

Switch-Mode Welders

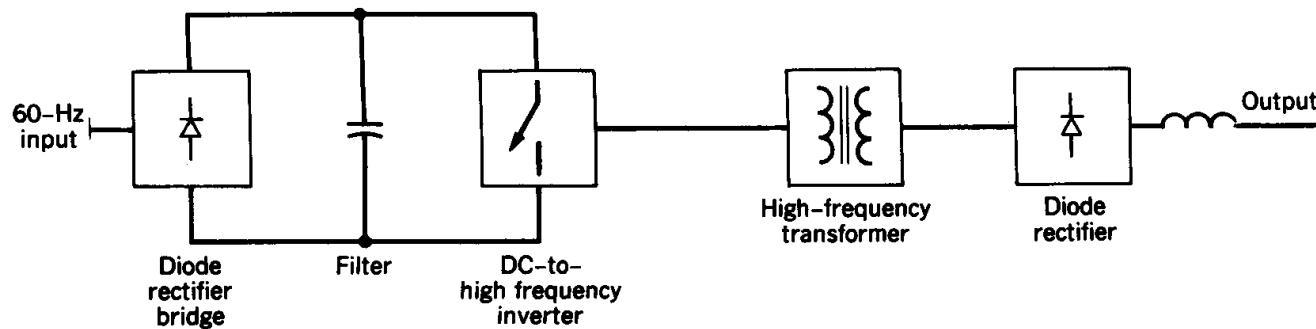


Figure 16-9 Switch-mode welder.

- Can be made much lighter weight

Integral Half-Cycle Controllers

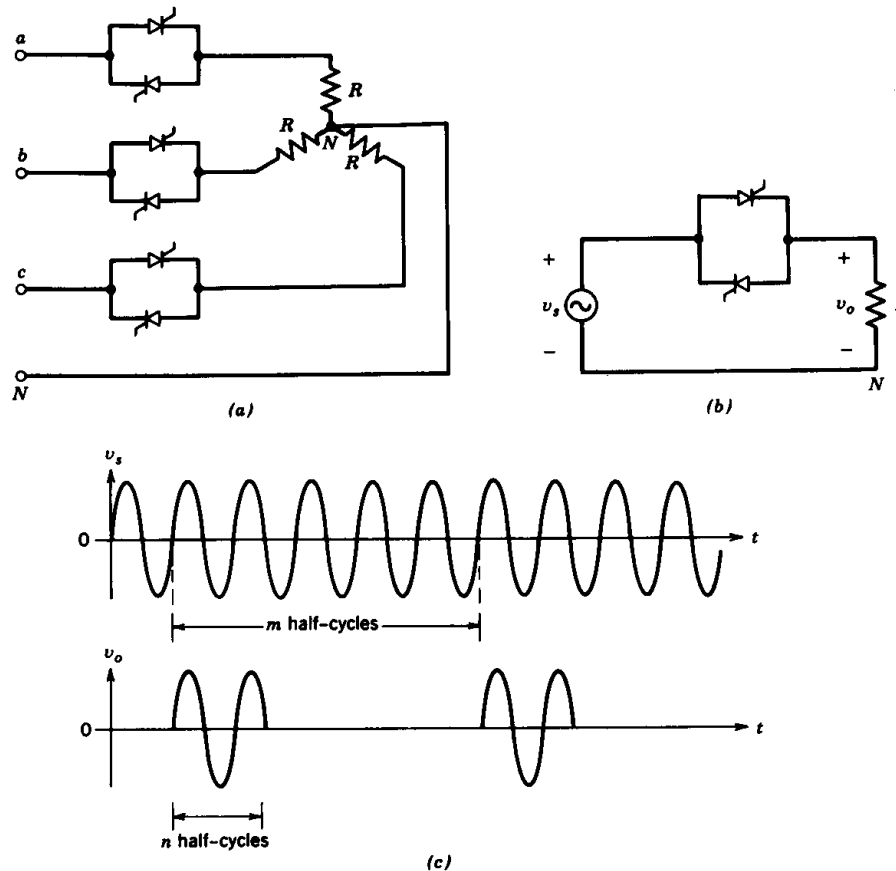


Figure 16-10 Integral half-cycle controllers: (a) three-phase circuit; (b) per-phase circuit; (c) waveforms.

- Used for heating