Analysis assuming Fictitious Filters

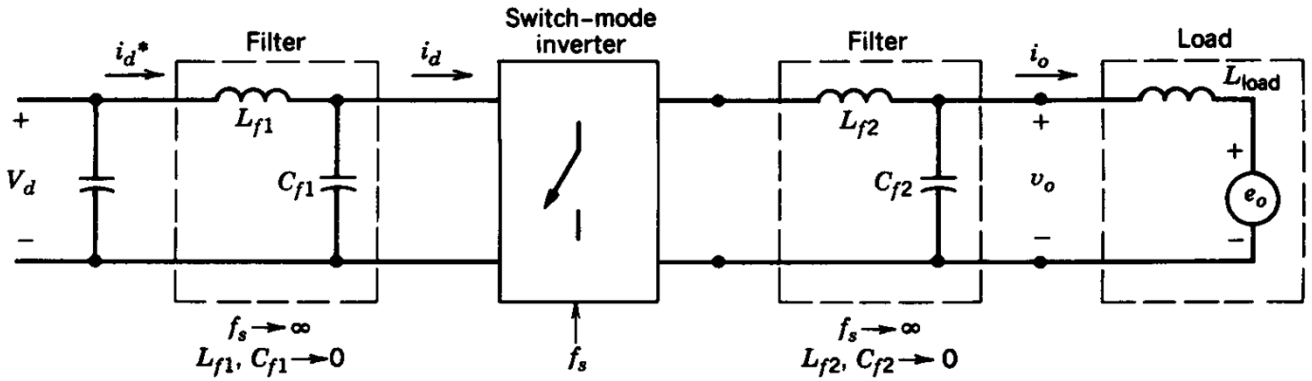

Figure 8-13 Inverter with "fictitious" filters.

- Small fictitious filters eliminate the switching-frequency related ripple

DC-Side Current

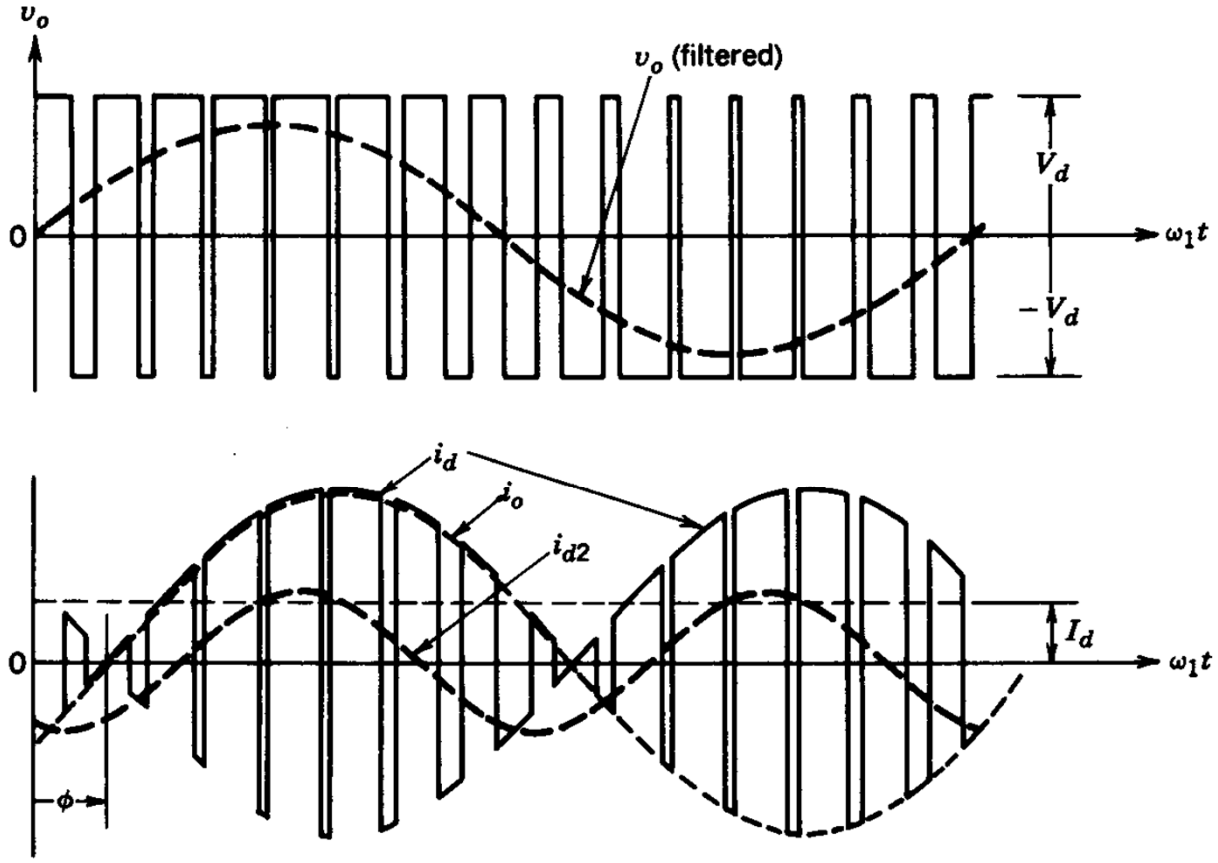

Figure 8-14 The dc-side current in a single-phase inverter with PWM bipolar voltage switching.

- Bi-Polar Voltage switching

Output Waveforms: Uni-polar Voltage Switching

- Harmonic components around the switching frequency are absent

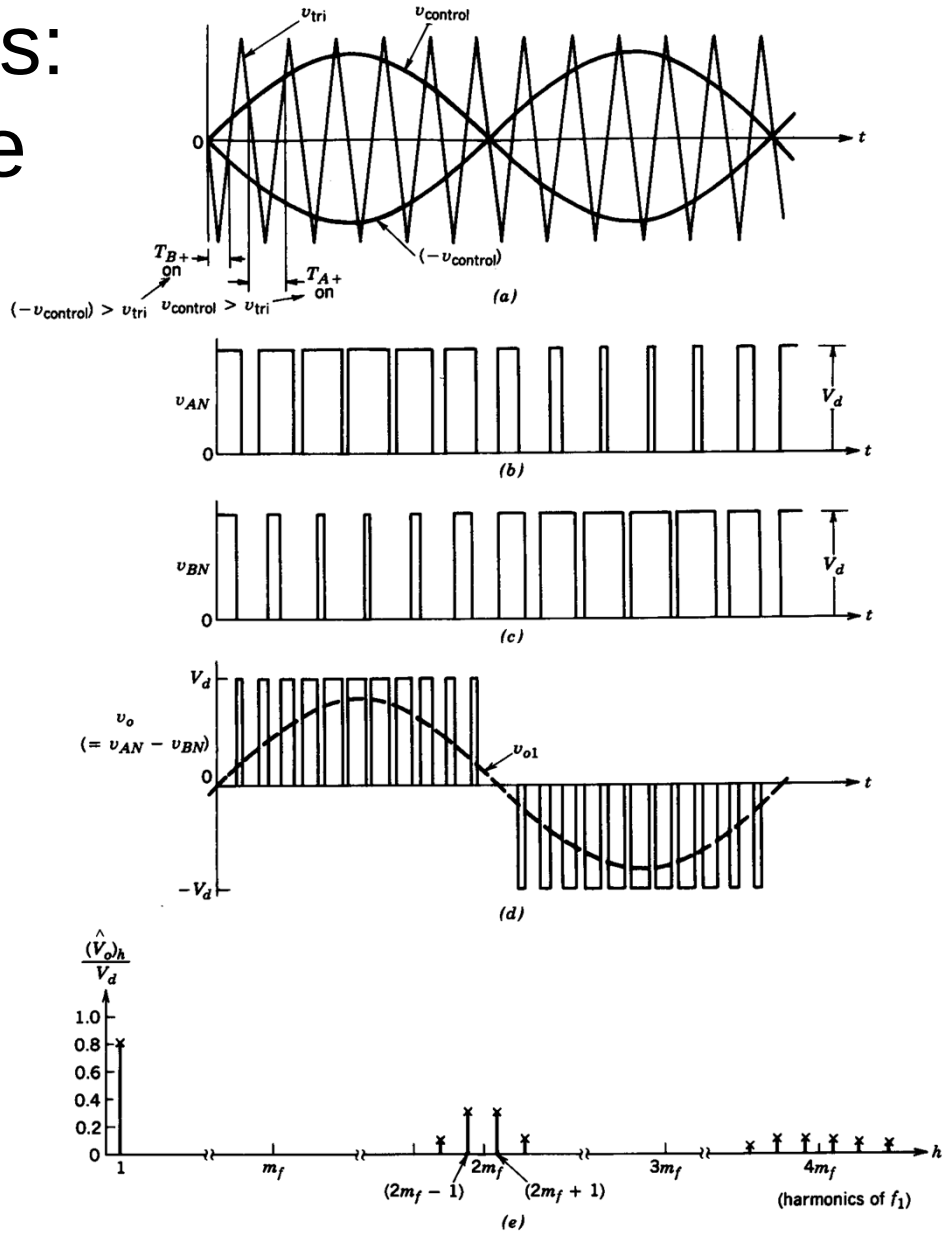

Figure 8-15 PWM with unipolar voltage switching (single phase).

Sinusoidal Synthesis by Voltage Shift

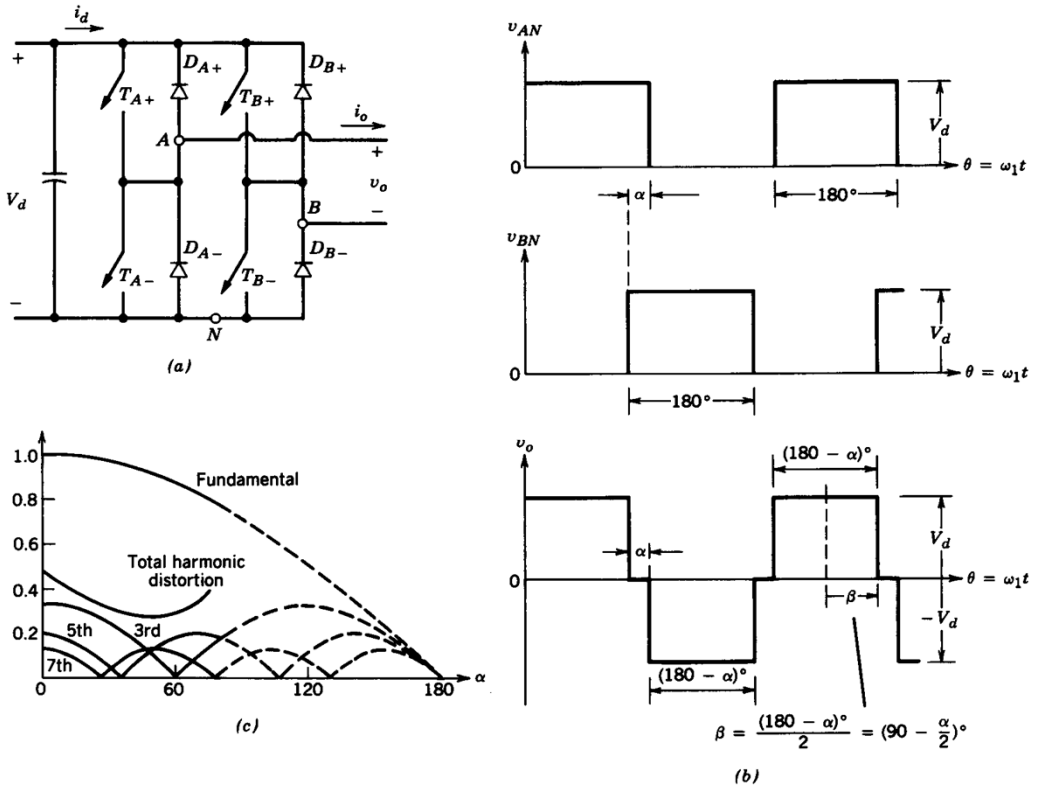

Figure 8-17 Full-bridge, single-phase inverter control by voltage cancellation: (*a*) power circuit; (*b*) waveforms; (*c*) normalized fundamental and harmonic voltage output and total harmonic distortion as a function of α.

- Phase shift allows voltage cancellation to synthesize a 1-Phase sinusoidal output

Single-Phase Inverter

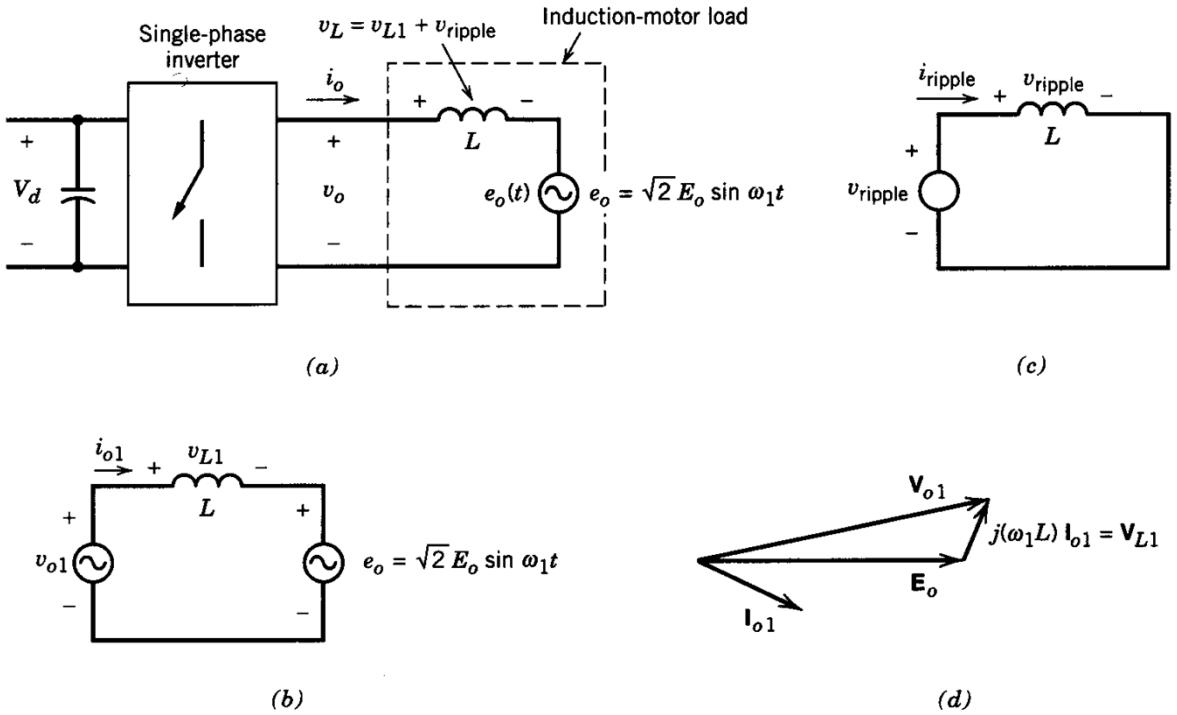

Figure 8-18 Single-phase inverter: (*a*) circuit; (*b*) fundamental-frequency components; (*c*) ripple frequency components; (*d*) fundamental-frequency phasor diagram.

- Analysis at the fundamental frequency

Square-Wave and PWM Operation

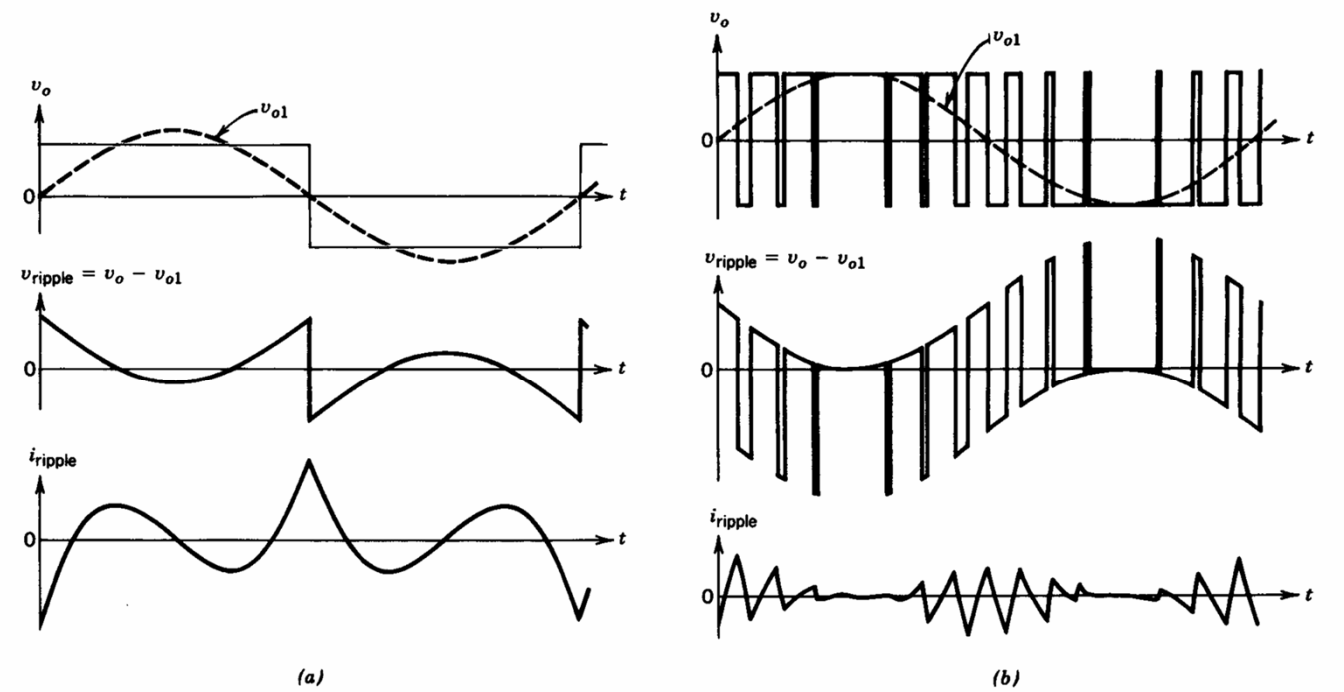

Figure 8-19 Ripple in the inverter output: (*a*) square-wave switching; (*b*) PWM bipolar voltage switching.

- PWM results in much smaller ripple current

Three-Phase Inverter

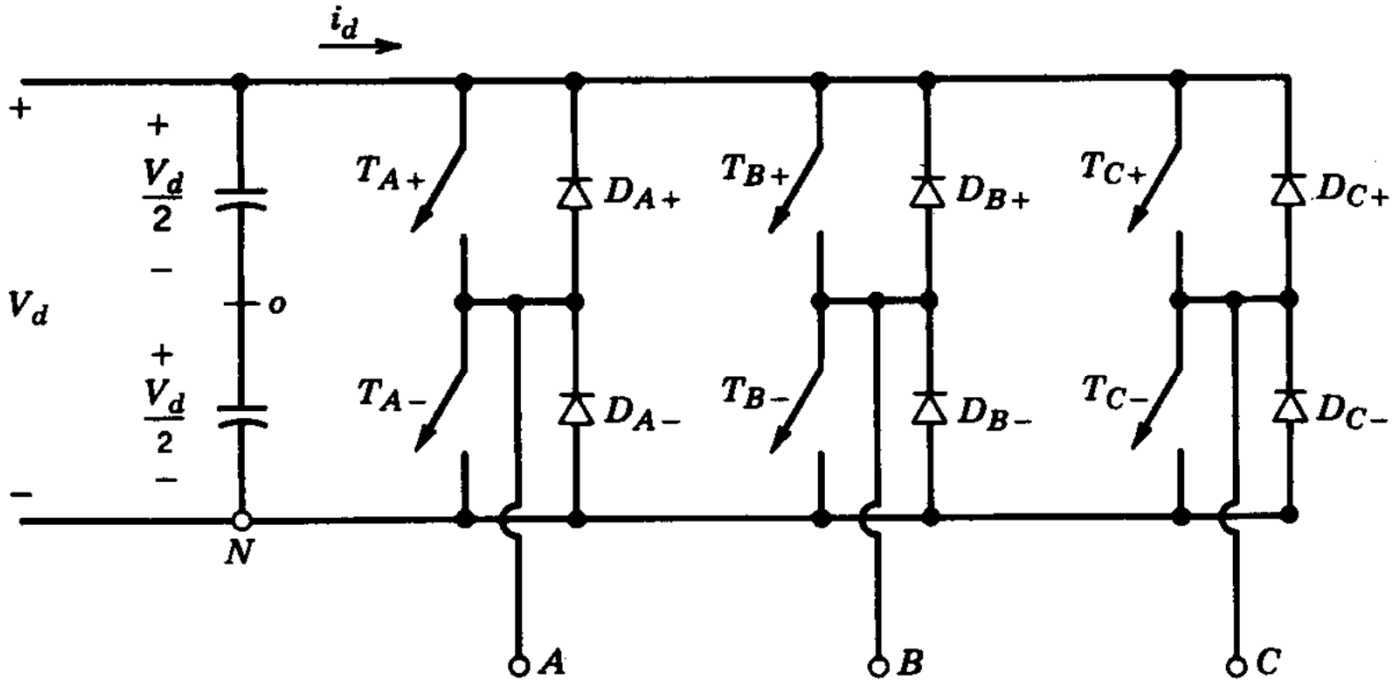

Figure 8-21 Three-phase inverter.

- Three inverter legs; capacitor mid-point is fictitious

Three-Phase PWM Waveforms

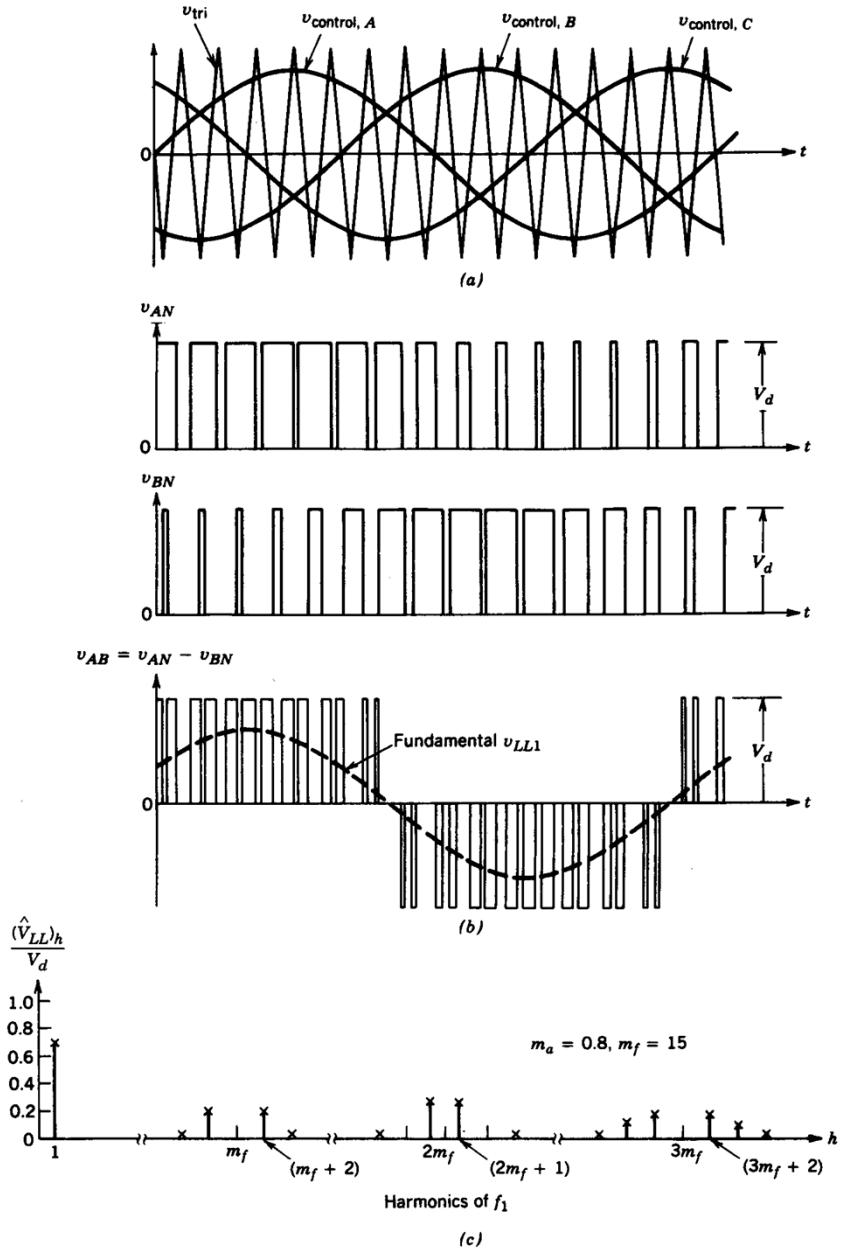

Figure 8-22 Three-phase PWM waveforms and harmonic spectrum.

Three-Phase Inverter: Square-Wave Mode

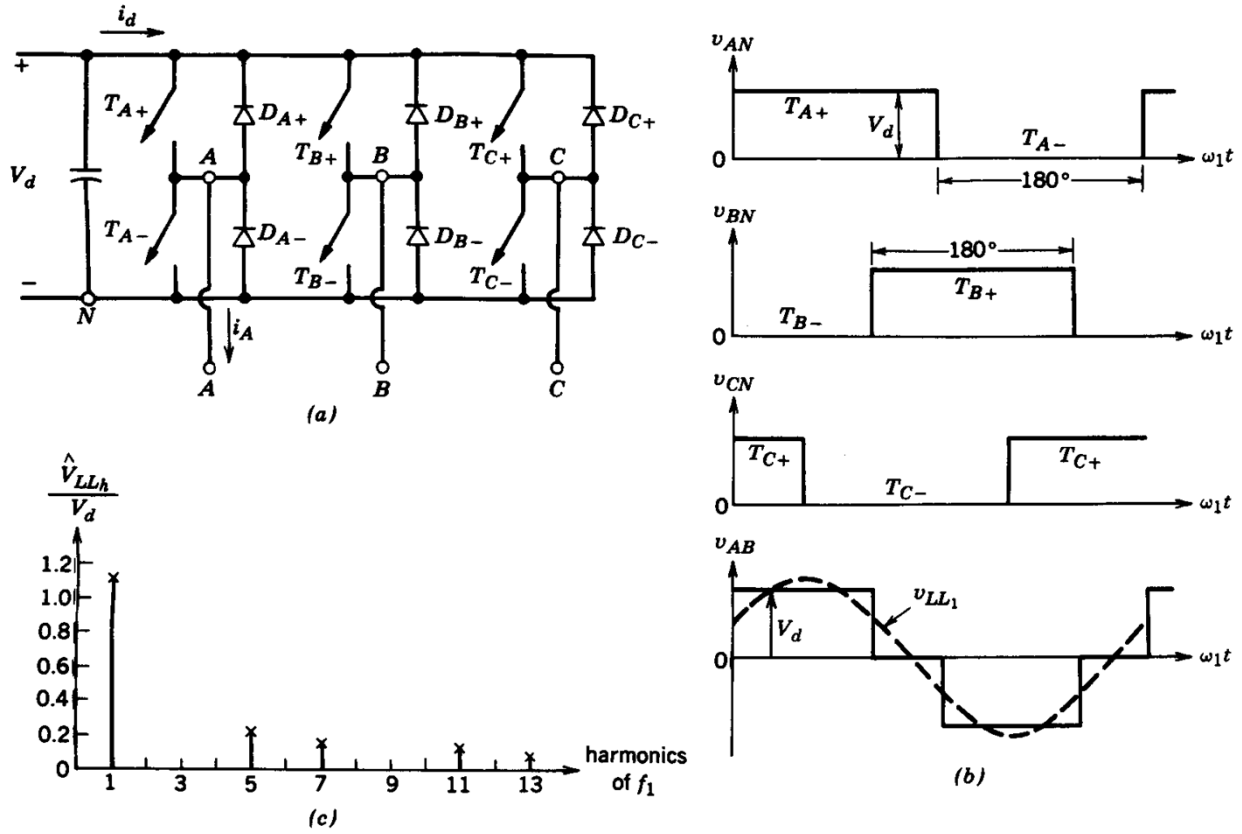

Figure 8-24 Square-wave inverter (three phase).

- Harmonics are of the fundamental frequency

Programmed Harmonic Elimination

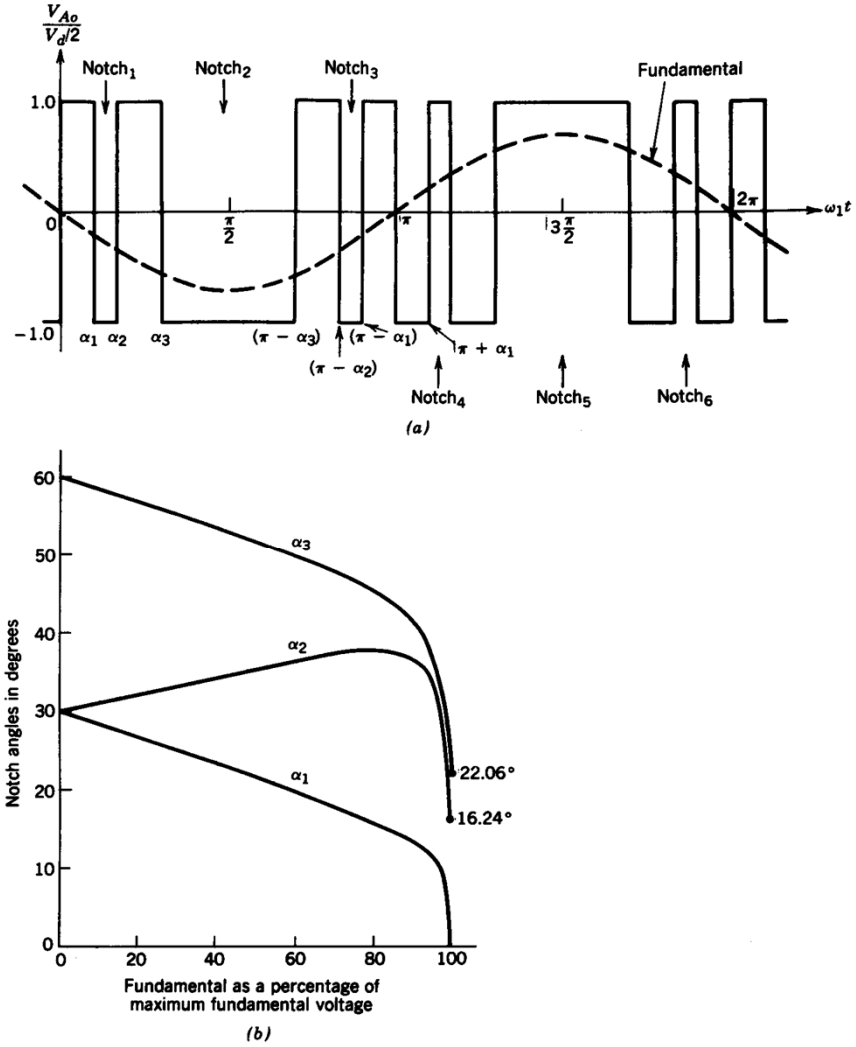

Figure 8-34 Programmed harmonic elimination of fifth and seventh harmonics.

- Angles based on the desired output

Three-Phase Inverter: Fundamental Frequency

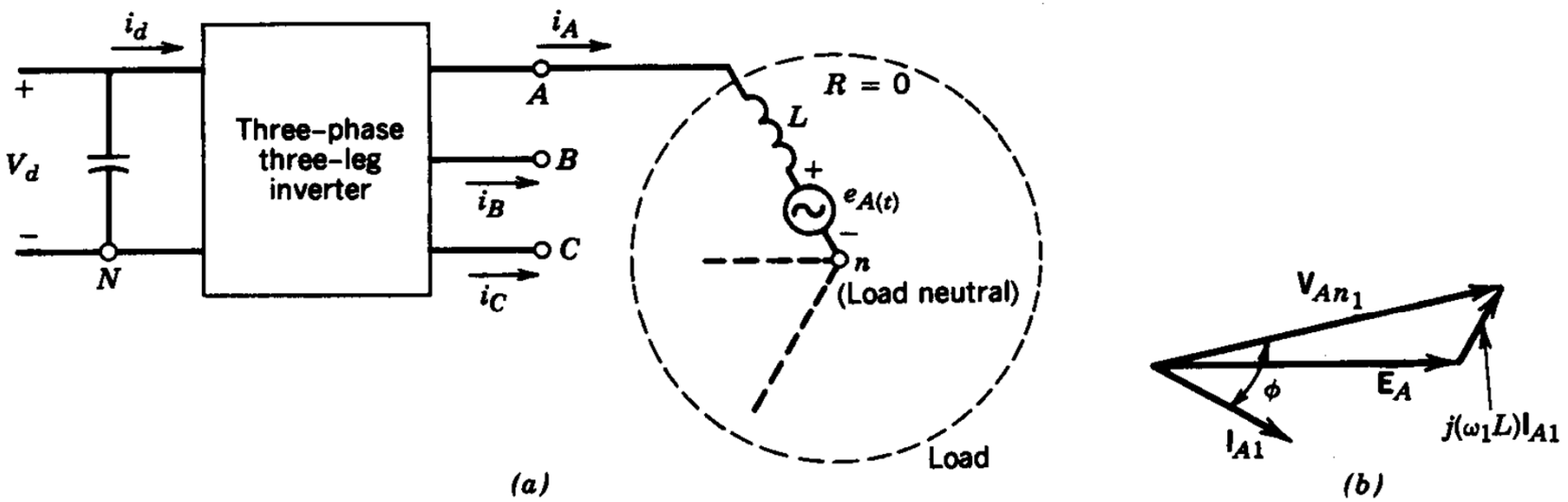

Figure 8-25 Three-phase inverter: (*a*) circuit diagram; (*b*) phasor diagram (fundamental frequency).

- Analysis at the fundamental frequency can be done using phasors

Square-Wave and PWM Operation

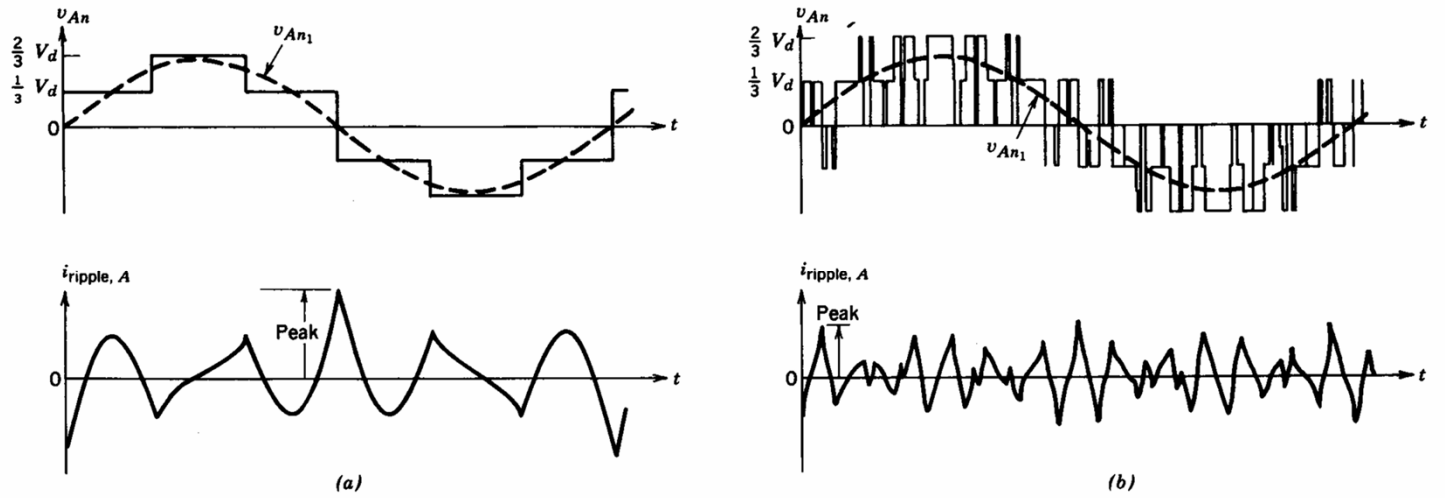

Figure 8-26 Phase-to-load-neutral variables of a three-phase inverter: (*a*) square wave; (*b*) PWM.

- PWM results in much smaller ripple current

Effect of Blanking Time

- Results in nonlinearity

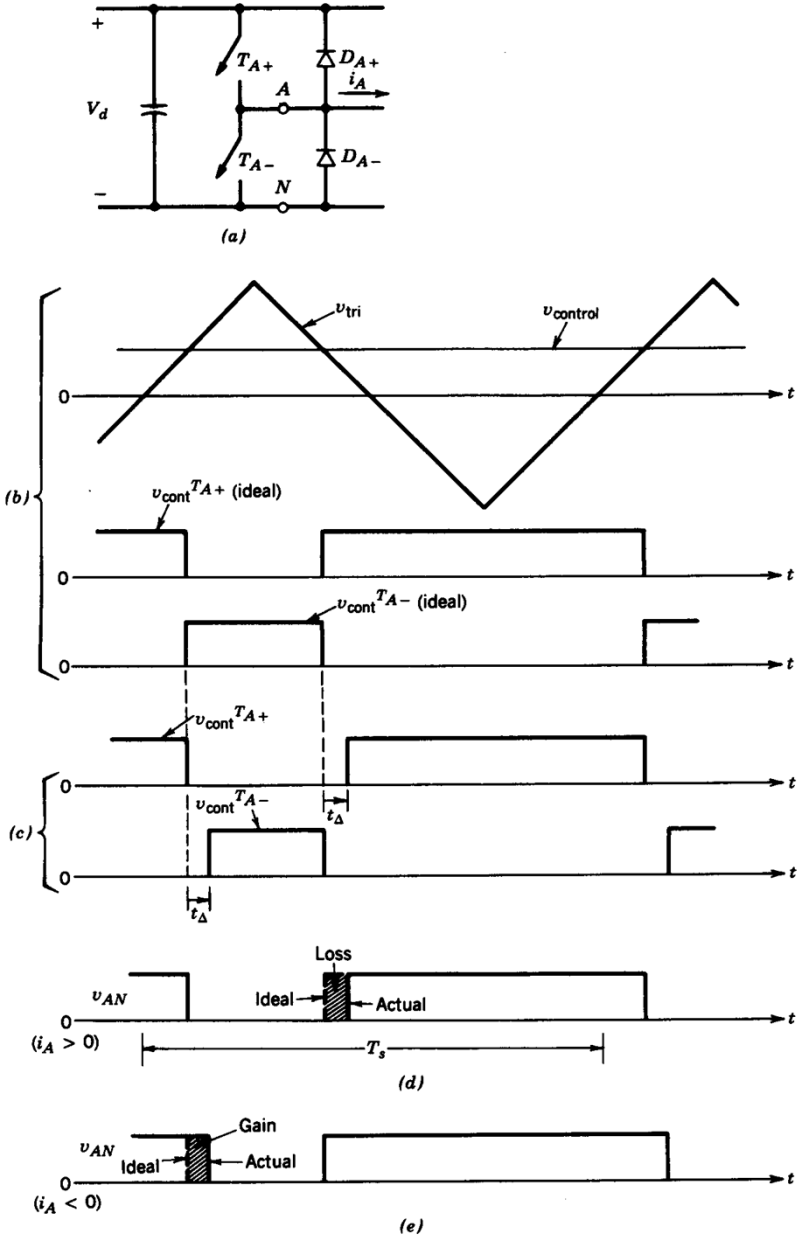

Figure 8-31 Effect of blanking time t_Δ.

Effect of Blanking Time

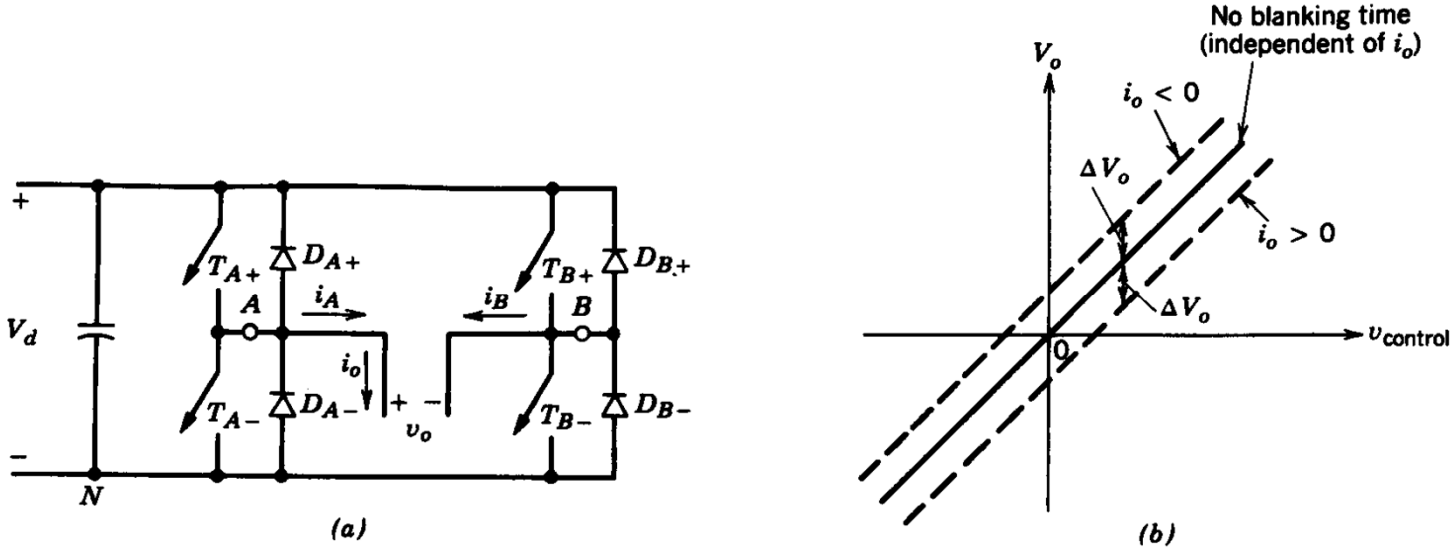

Figure 8-32 Effect of t_Δ on V_o, where ΔV_o is defined as a voltage drop if positive.

- Voltage jump when the current reverses direction

Effect of Blanking Time

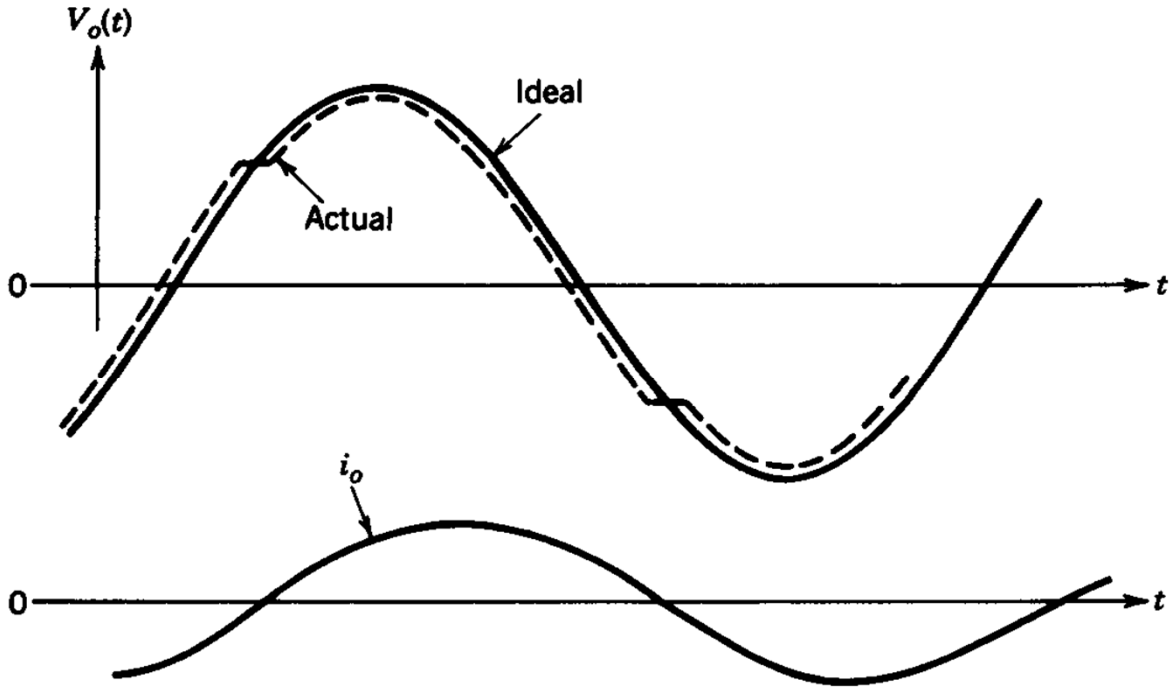

Figure 8-33 Effect of t_Δ on the sinusoidal output.

- Effect on the output voltage

Tolerance-Band Current Control

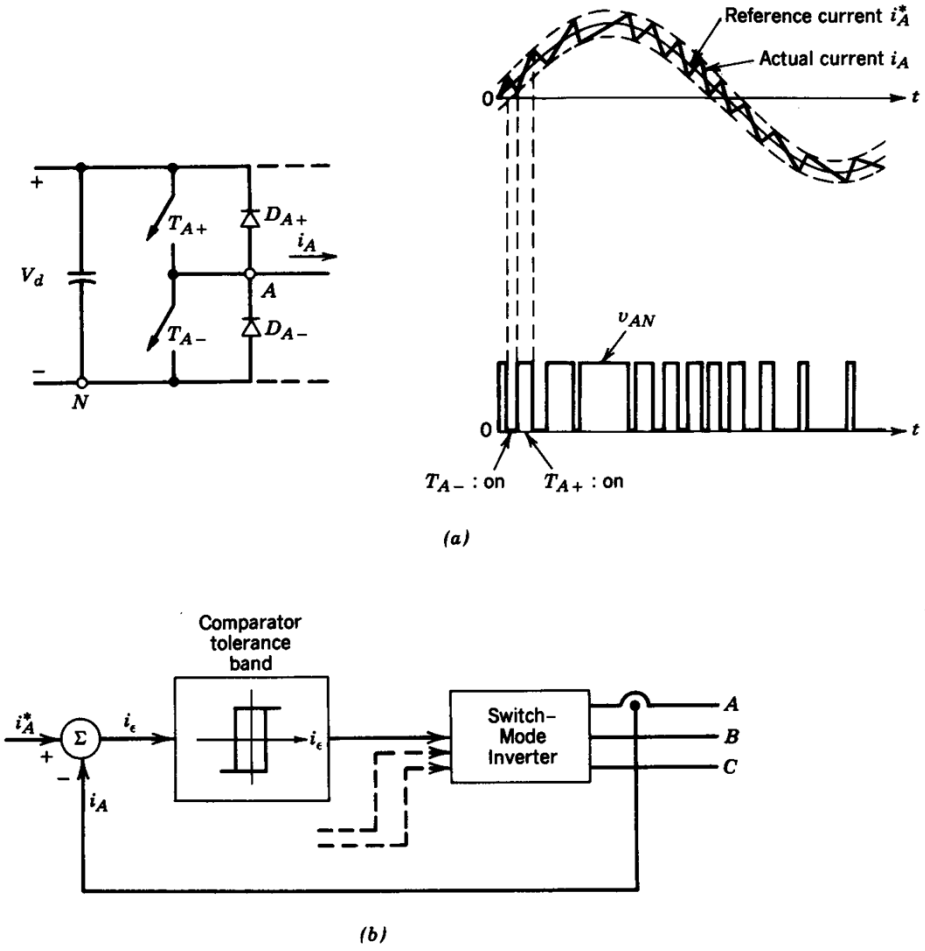

Figure 8-35 Tolerance band current control.

- Results in a variable frequency operation

Transition from Inverter to Rectifier Mode

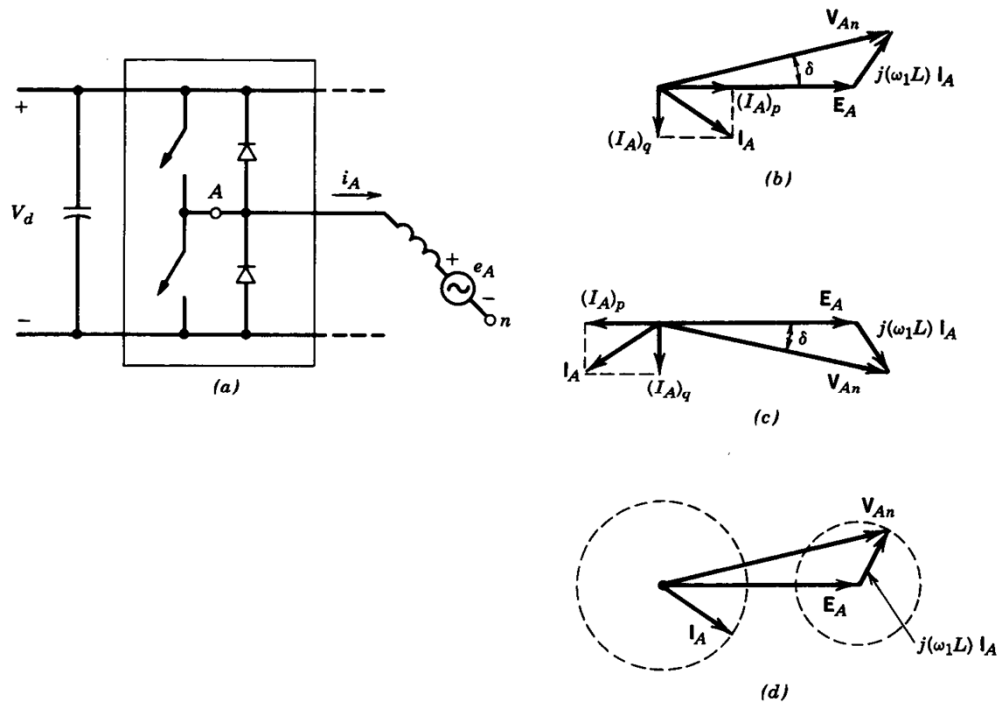

Figure 8-37 Operation modes: (*a*) circuit; (*b*) inverter mode; (*c*) rectifier mode; (*d*) constant I_A.

- Can analyze based on the fundamental-frequency components