General Operation of a 6-Step Thyristor Inverter

General Schematic of Thyristor Inverter

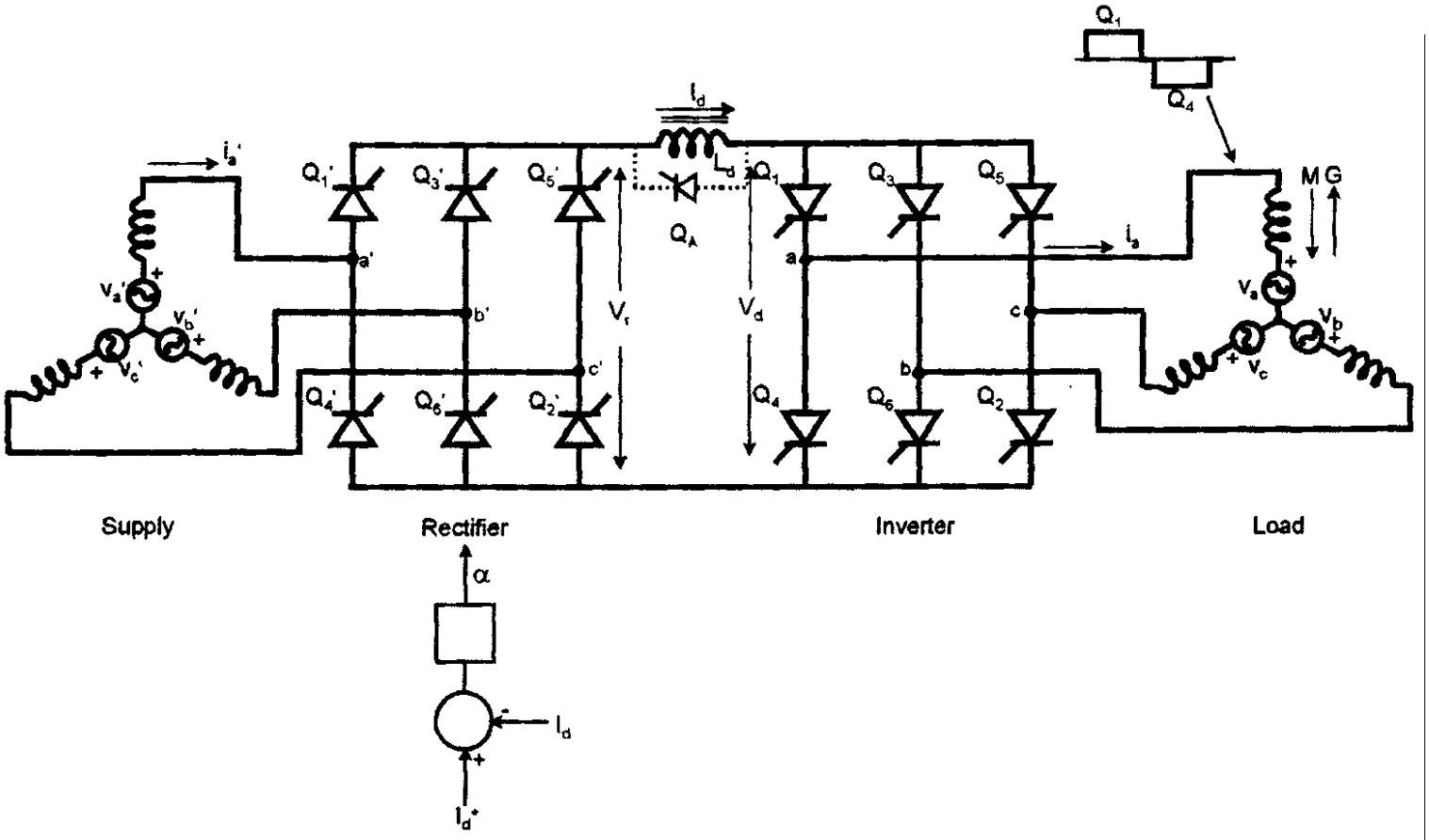

Figure 6.1 General power circuit of thyristor converter system

General Operation of a 6-Step Thyristor Inverter (cont'd)

Initially, ignore commutation considerations.

Induction motor load is modeled by back emf generator and leakage inductance in each phase of the winding.

The constant dc current I_d is switched through the thyristors to create a 3Φ 6-step symmetrical line current waves as shown on the next slide.

General Operation of a 6-Step Thyristor Inverter (cont'd)

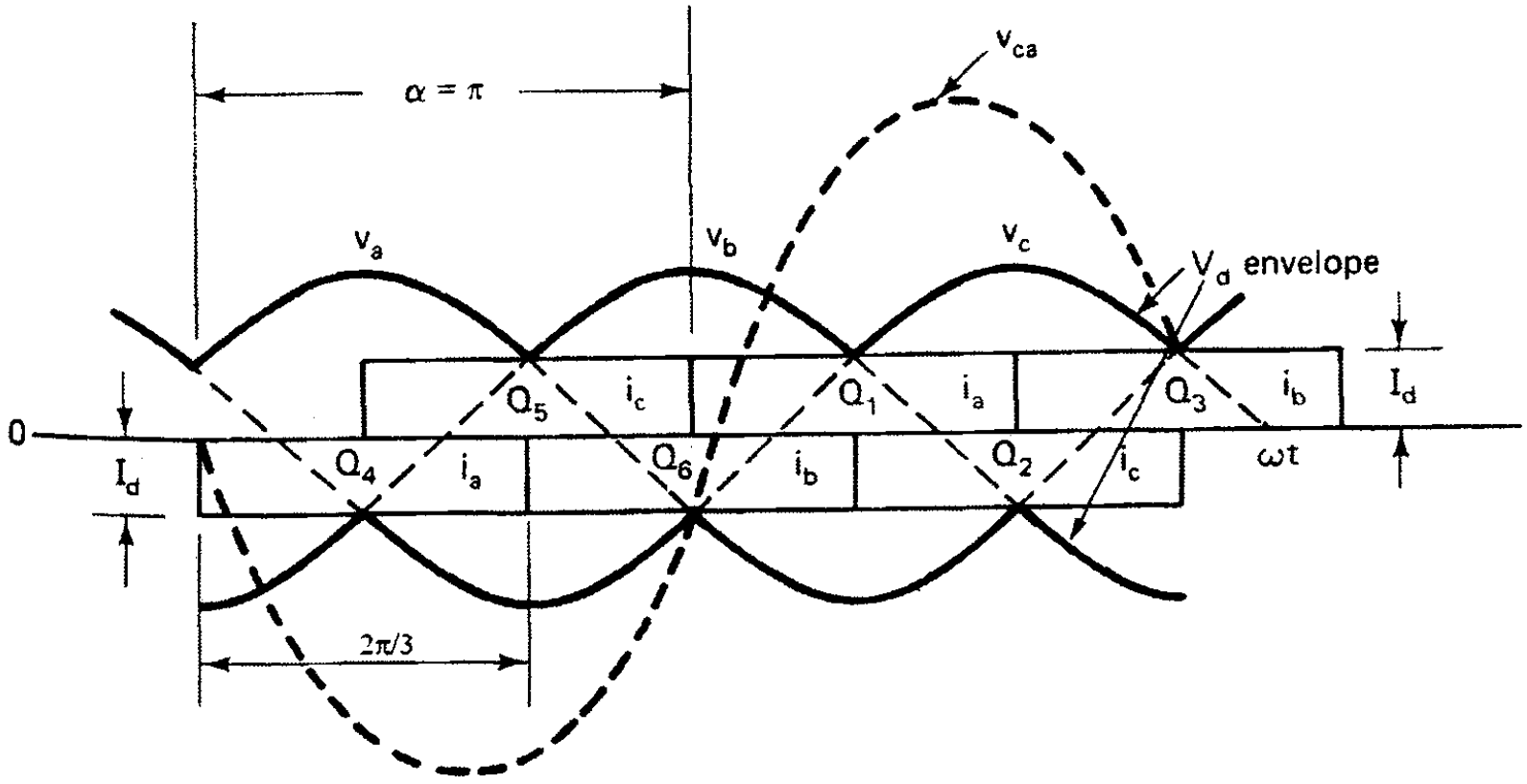

Figure 6.2 Idealized voltage and current waves of six-stepped thyristor inverter

General Operation of a 6-Step Thyristor Inverter (cont'd)

The load or line current may be expressed by a Fourier series as:

$$i_a = \frac{2\sqrt{3}}{\pi} I_d \left[\cos\omega t - \frac{1}{5}\cos 5\omega t + \frac{1}{7}\cos 7\omega t - \ldots \right]$$

where the peak value of the fundamental component is given . Each thyristor conducts for radians. At any instant one upper thyristor and one lower thyristor conduct.

General Operation of a 6-Step Thyristor Inverter (cont'd)

The dc link is considered harmonic-free and the commutation effect between thyristors is ignored.

At steady state the voltage output from the rectifier block = input voltage of inverter.

For a variable speed drive the inverter can be operated at variable frequency and variable dc current I_d.

General Operation of a 6-Step Thyristor Inverter (cont'd)

If thyristor firing angle $\alpha > 0$, inverter behavior.

If thyristor firing angle $\alpha=0$, rectifier behavior.

Max. power transfer occurs when $\alpha=\pi$.

NPTEL LINK

- **https://www.youtube.com/watch?v=WMi-ZN3qtSs**