4.2 Two Pulse Converter

FULLY CONTROLLED BRIDGE CONVERTER

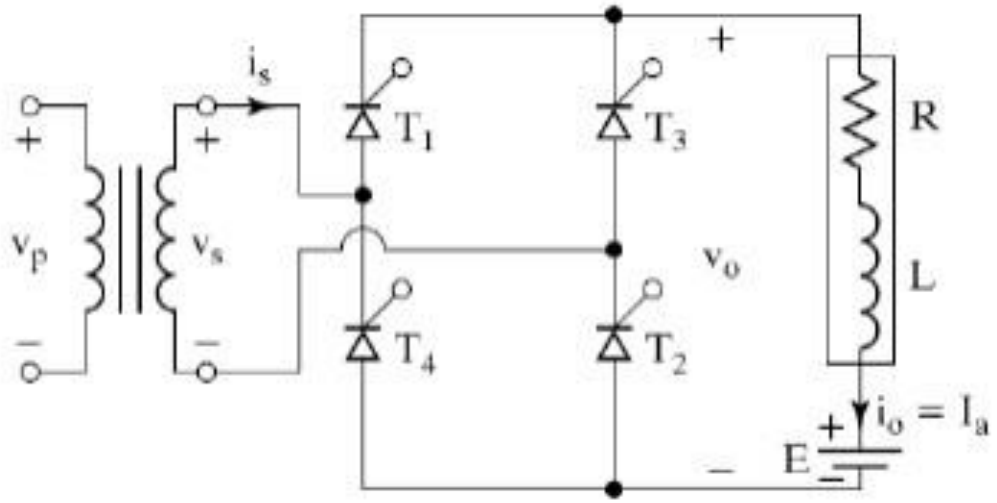

Figure 4.2.1 SINGLE PHASE FULL CONVERTER

[Source: "Power Electronics" *by* P.S.Bimbra*,* Khanna Publishers *Page: 191]*

CONSTRUCTION

The circuit diagram of a single phase fully controlled bridge converter is shown in the figure with a highly inductive load and a dc source in the load circuit so that the load current is continuous and ripple free (constant load current operation). The fully controlled bridge converter consists of four thyristors T1, T2,T3 and T4 connected in the form of full wave bridge configuration as shown in the figure. Each thyristor is controlled and turned on by its gating signal and naturally turns off when a reverse voltage appears across it.

During the positive half cycle when the upper line of the transformer secondary winding is at a positive potential with respect to the

lower end the thyristors T1and T2are forward biased during the time interval ωt = 0 to π. The thyristors T1and T2are triggered simultaneously ωt =α; (0 ≤α≤π) , the load is connected to the input supply through the conducting thyristors T1and T2.. Due to the inductive load T1 and T2will continue to conduct beyond ωt =π, even though the input voltage becomes negative. T1 and T2 conduct together during the time period α to (π+α) , for a time duration of π radians (conduction angle of each thyristor = 180^0).

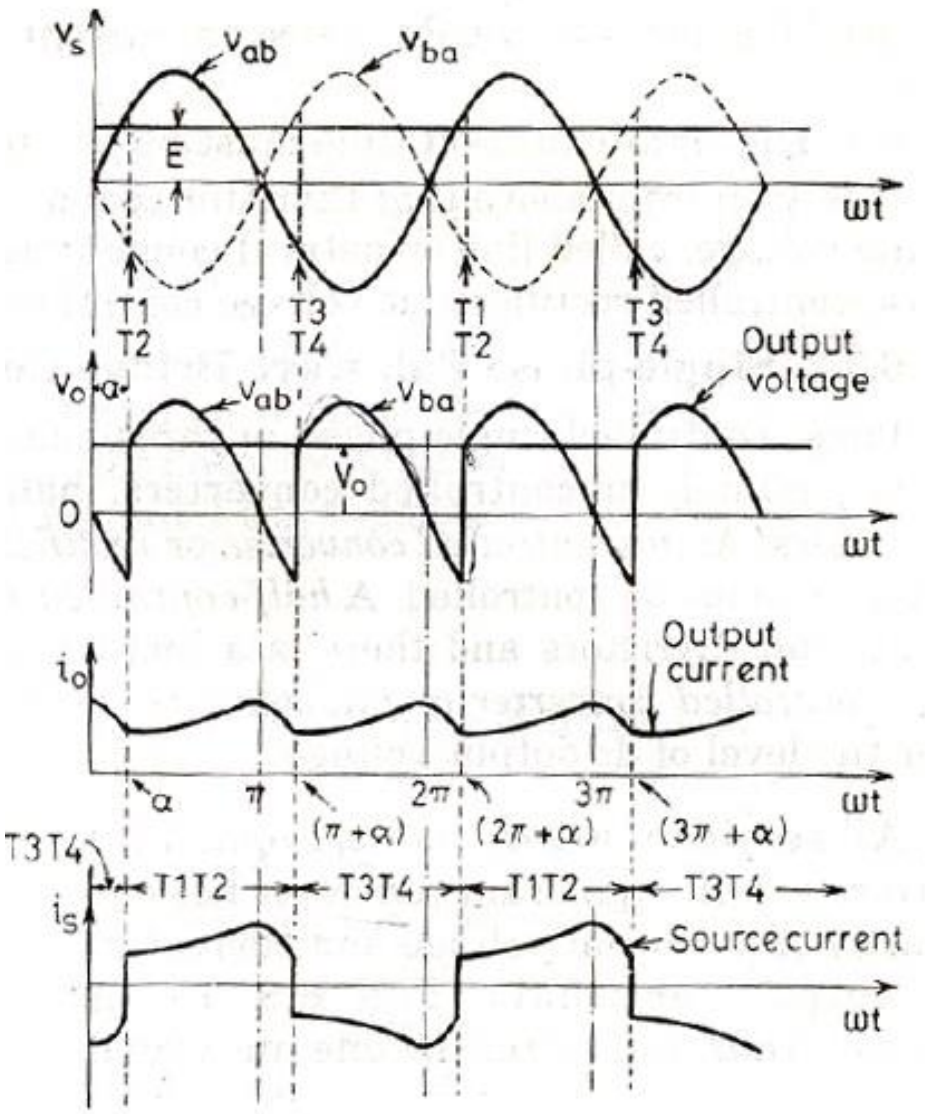

Figure 4.2.2 FULL CONVERTER WAVEFORM

During the negative half cycle of input supply voltage for ωt =π to 2π the thyristors T3and T4are forward biased. T3 and T4are triggered at ωt = (π+α) . As soon as the thyristors 3 T and 4 T are triggered a reverse voltage appears across the thyristors T1and T2and they naturally turn-off and the load current is transferred from T1and T2to the thyristors T3and T4. In the next positive half cycle when T1and T2 are triggered, T3and T4are reverse biased and they turn-off. The figure shows the waveforms of the input supply voltage, the output load voltage, the constant load current with negligible ripple and the input supply current.

During the time period ωt =α to π, the input supply voltage V_S and the input supply current is both positive and the power flows from the supply to the load. The converter operates in the rectification mode during ωt =α to π.

During the time period ωt =π to (π+α) , the input supply voltage Vs is negative and the input supply current is positive and there will be reverse power flow from the load circuit to the input supply. The converter operates in the inversion mode during the time period ωt =π to (π+α) and the load energy is fed back to the input source.

The single phase full converter is extensively used in industrial applications up to about 15kW of output power. Depending on the value of trigger angle α, the average output voltage may be either positive or negative and two quadrant operation is possible.

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