CHAPTER 2

TYPES OF CONVERTERS

There are two types of basic practical circuits of dc-dc converters. They are

1. Self-oscillating type
2. Driven type

2.1 Self-Oscillating Converter

The basic circuit for a self-oscillating converter is shown in Fig. 1. Its output is magnetically coupled to its input through a transformer.

To begin the explanation of its operation, assume that the circuit is oscillating. If Q_1 is conducting the supply voltage, V_{in}, is dropped across the transformer primary, N_1, and rate of flux change is linear, as indicated by the equation

$$\frac{d\phi}{dt} = \frac{V_{in}}{N_1} \qquad \text{.....(2-1)}$$

This changing flux in the core will then induce a voltage in the other coils, with polarity as shown by the dots and magnetude proportional to the turn ratio. Therefore, transistor Q_1 is biased ON with a negative base voltage and transistor Q_2 is OFF with a positive voltage. Curves 2 and 3 of Fig. 3 show the collector and base voltages of transistor Q_1. Curve 4 shows that flux change is linear as indicated by eq. (2.1). When the core approaches saturation, the induced voltages are reduced. Since Transistor Q_1 is turning OFF, the induced voltage across N_1 is reversed. This causes a reversal of bias, and transistor

Q_2 is turned ON as transistor Q_1 is turned OFF. The cycle then continues. It should be noted from Fig. 1 that when transistor Q_1 is conducting, N_1 of transistor Q_2 has an induced voltage of such polarity as to add to the supply voltage. Therefore, twice the supply voltage appears across each transistor during its OFF time.

2.2 Driven Converter

The circuit of a driven converter is shown in Fig. 2. Output-power- transistor switching is accomplished by multivibrator drive rather than by feedback from the output transformer. For very high power output, driven converters are more common than self-oscillating ones.

Note

All the components discussed in this thesis are referred to Fig. 1 and Fig. 2.