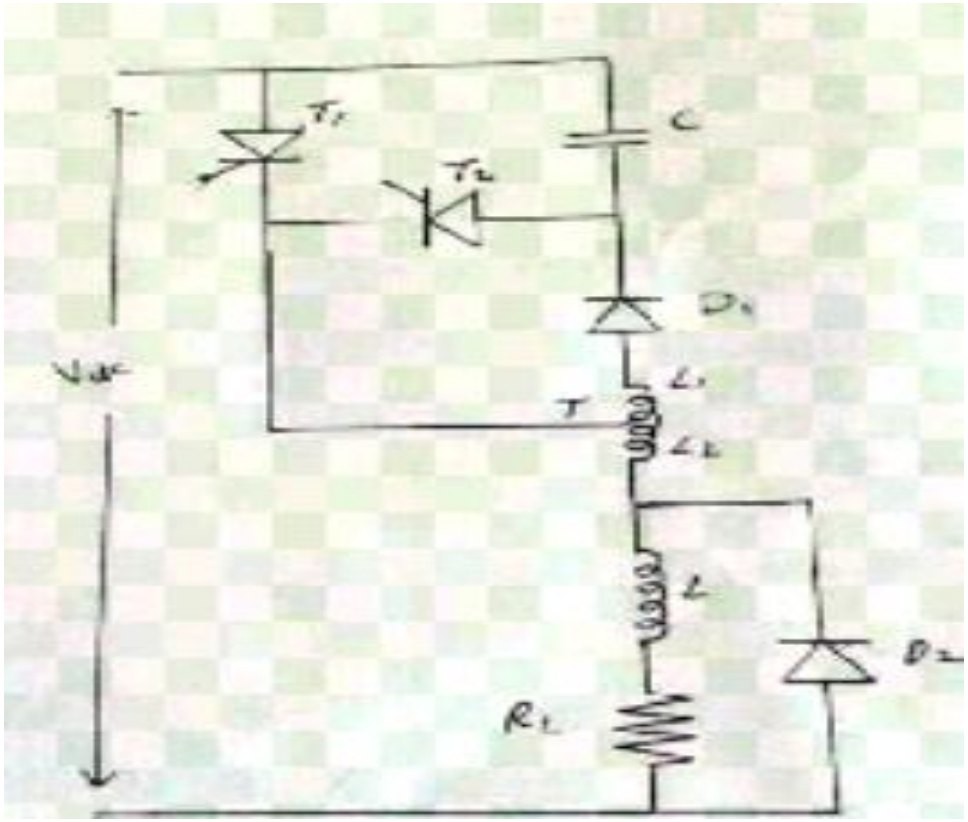
Jones Chopper



Jones chopper is an example of class D commutation in which a charged capacitor is switched by an auxiliary SCR to commutate the main SCR. In this circuit SCR1 is the main switch and SCR2 is the auxilary switch which is of lower capacity than SCR1 and is used to commutate SCR1 by a reverse voltage developed across the capacitor C. The special feature of the circuit is the tapped autotransformer T through a portion of which the load current flows".

When T1 is ON, capacitor C discharges resonantly through T1, L1, D1 . This discharge current doesnot flow through L2 and back to the battery because of transformer action of T. The load current is picked up by T1 and the freewheel diode D1 is reverse biased. As the capacitor voltage swings negative, the reverse bias on diode D2 decreases. This continues upto a time pi(L1C)^1/2. When T2 is on the negative voltage on capacitar C is applied across T1 and it becomes OFF.The load current which is normally constant starts to flow in T2 and capacitor C.

The capacitor C charged positively at first up to a voltage equal to supply voltage Vdc. The freewheel diode become forward bias and begins to pickup load current. And capacitor current starts to reduce. After this the energy 1/2LI^2 is the inductance L2 is forced in to the capacitor C. Charging is positively to 1/2CV^2 the capacitor current continues to decrease as a result current through T2 decreases gradually become OFF. The cycle repeat when T1 is again turned ON.

CYCLOCONVERTER

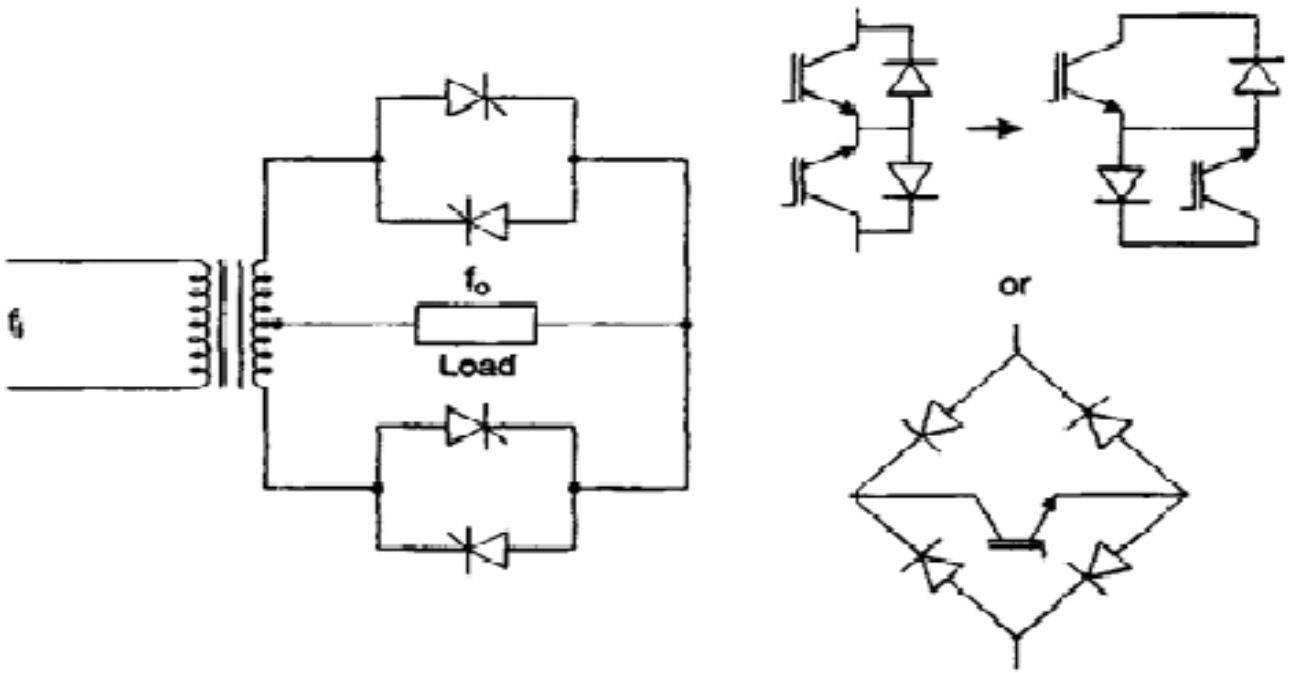
Introduction

Cycloconverters directly convert ac signals of one frequency (usually line frequency) to ac signals of variable frequency. These variable frequency ac signals can then be used to directly control the speed of ac motors.

Thyristor-based cycloconverters are typically used in low speed, high power (multi-MW) applications for driving induction and wound field synchronous motors.

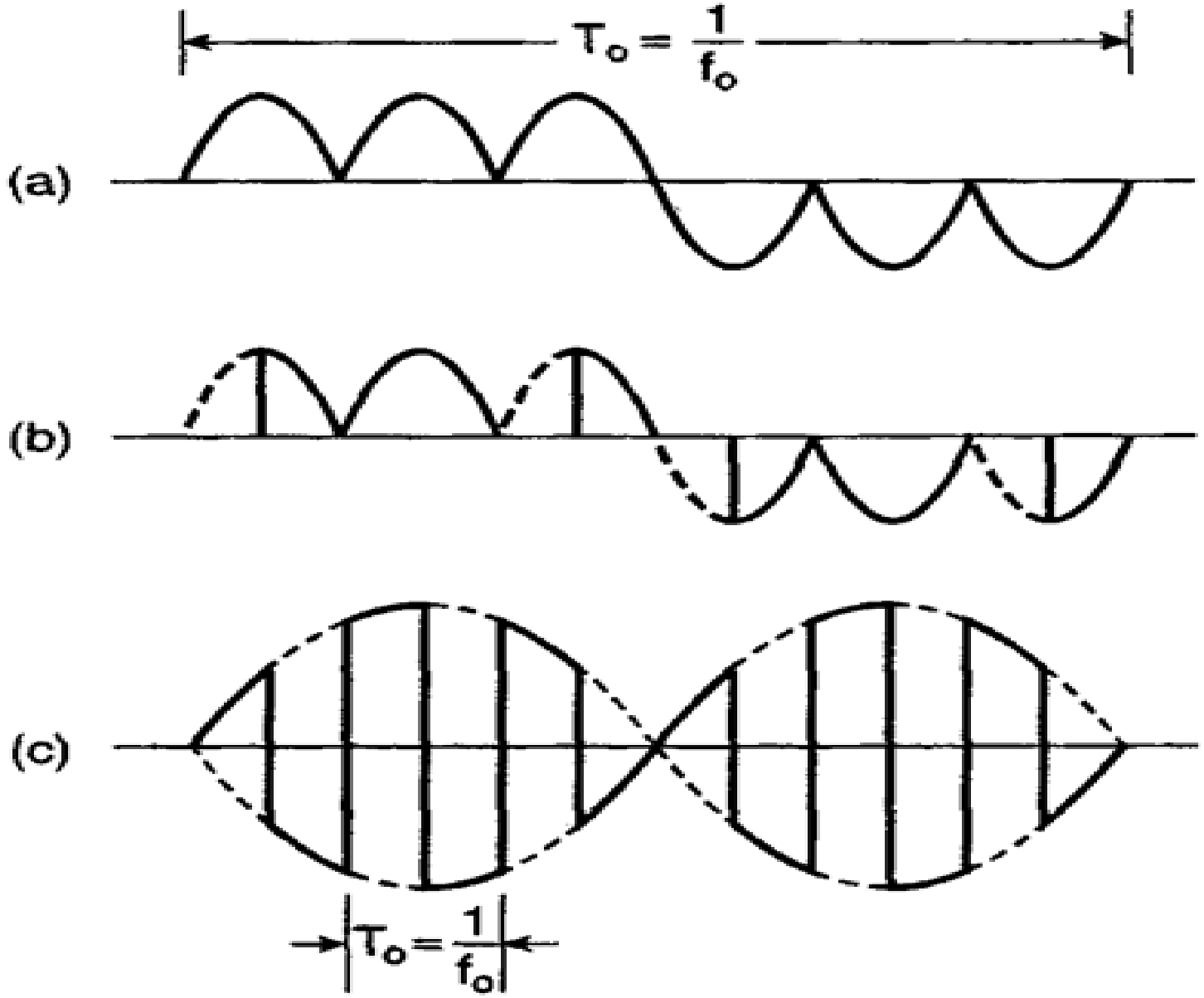
Basic Principle of Single phase to Single Phase Cycloconverter

The basic principle of cycloconverter is illustrated by the single phase-to-single phase converter shown below.



A positive center-tap thyristor converter is connected in anti-parallel with a negative converter of the same type. This allows current/voltage of either polarity to be controlled in the load.

An integral half-cycle output wave is created which has a fundamental frequency $f_0=(1/n)\ f_i$ where n is the number of input half-cycles per half-cycle of the output. The thyristor firing angle can be set to control the fundamental component of the output signal.


$T_o = \frac{1}{f_o}$
(a)
(b)
(c)
$T_o = \frac{1}{f_o}$

Step-up frequency conversion can be achieved by alternately switching high frequency switching devices (e.g. IGBTs, instead of thyristors) between positive and negative limits at high frequency to generate carrier-frequency modulated output.