Analysis On Different Types Of Converters
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Abstract:
In nature two types of electrical signals AC and DC. But different types loads are available nature which works on AC and DC. But in the universe only AC available and some loads operate on DC. Due to these conditions there are some conversions derived high power applications so that conversions called as converters. These converters classified like rectifiers, Inverters, Choppers, AC voltage controllers and cycloconverters etc. Main advantage of these converters is these used for high power applications.

Key words: Rectifiers, Choppers, Inverters, AC voltage controller, Cyclo-converters.

1. Introduction

1.1 Rectifiers
Generally, AC power can be transfer from one place to other place through transformers. But AC signal can’t be stored because signal changes continuously as time changes[1]. DC signal can be stored but can’t transfer from one place to other place[2]. Because of these conditions AC signal can be changes to DC signal by using rectifier and these useful in high power applications like HVDC, motor drives etc[3].

Rectifiers are classified as below

![Fig1. Classification of rectifiers](image)

1.2 Choppers
These are DC-DC converters which are useful regulated power supplies[4 -5]. Choppers convert high power DC supply to low power DC supply and this low power DC which is used in regulators these DC-DC converters are classified as below[6 - 8].
1.3 Inverters

Generally, inverters convert fixed input DC signal to variable AC signal. Nowadays, these converters are useful in high power applications. For that, multilevel inverters are derived and mainly used for HVDC applications. Inverters are classified as below [9-13].

1.4 AC-AC Converters

These converters convert fixed AC signal to variable AC signal. These converters are divided into two parts like AC voltage controller, cyclo-converters. In AC voltage controller, output signal magnitude can be changed but frequency is constant. In cyclo-converter, both magnitude and frequency can be changed. These converters are classified as below [8, 11, 14-17].
2. Principle of Operation of different converters

2.1 Principle operation of rectifiers

Generally, all the converters operate in four quadrants. These rectifiers operate in 1st and 4th quadrants. 1st quadrant converters operate as rectifiers means power supplied from source to load whereas 4th quadrant converters operate as inverters means power supplied from load to source. Based on this condition these single-phase converters convert single phase AC supply to unidirectional DC. Three phase rectifiers converts Three phase AC supply to 6 pulse unidirectional DC. All the rectifier circuits as shown below.

2.2 Principle operation of choppers

All the chopper circuits works based on the charging and discharging conditions of inductor and capacitor. These circuits operates as like LC filter means inductor reduces the current ripples and capacitor reduces the ripple voltage across the load. Both inductor and capacitor make the continuous conduction. Chopper circuit diagrams as shown in below fig.
2.3 Principle operation of inverters

Inverters convert fixed DC signal to variable AC signal with changing of switching on and off control the output power at the load. Pair of electronic switches operates in positive direction and another pair devices operates in negative cycle based on this conditions output voltage is in inversion form. Single phase and three phase inverter circuit diagrams as shown below.

2.4 Principle operation of AC-AC converters

AC-AC converters convert fixed AC voltage to variable AC voltage. But these are two types one is converter which changes the magnitude of output with change of switching sequences and the other is changes both magnitude as well as frequency, circuit diagrams as shown below.
3. Results

3.1 Output results of rectifier circuits

Fig 8. Basic single phase and three phase AC voltage controllers

Fig 9. Basic cyclo-converters circuit

1-Ø half wave rectifier output waveform with RL load

1-Ø full wave rectifier output waveform with RL load

1-Ø half-controlled rectifier output waveform

3-Ø half controlled rectifier output waveform
3.2 Output results of chopper circuits

Buck chopper output wave forms

Boost chopper output wave forms

Buck-boost chopper output wave forms

3.3 Output results of inverter circuits

Basic single-phase inverter output waveform
Basic three-phase inverter output waveform

4. Conclusion:
In this paper explained about the different types of converters. These converters behaviour at different loads as shown in the result. Based on the operation of these converters used in some many high-power applications like DC drives, HVDC applications, high power applications, regulator supplies etc.

5. References


