Analysis of Matrix Converter in variable frequency mode

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ABSTRACT

The indirect matrix converter is a dc-link-free converter. be short of power storeroom mechanism in the dc-link is one of the compensation of the medium converter. In adding, the matrix converter has filled four quadrant occupation and current sinusoidal effort. The standard production voltage is imperfect to 0.866 effort voltages. The circuitous matrix converter requires a twice switch in the alteration phase to attach six indirect switches in the conversion phase. Bidirectional switch is not accessible on the souk today and wants to be built by semiconductor procedure. The majority of the study labor on matrix converters has so distant alert on the suppleness and manages of the matrix converter. Real experiences are immobile extremely in complete.

Key words- Matrix Converter, MATLAB/Simulink model, Photovoltaic (PV) System, Bidirectional switches

1. INTRODUCTION

In adding, the majority manufacturing application requires frequencies in the 50Hz-60Hz series, which are without difficulty nearby by cycloconverter. For a three- to three-phase cycloconverter, 36 thyristors are necessary. This make cycloconverter system extremely great and multifaceted and is frequently used in system wherever high authority is necessary (1MW and over).

They indicate that the most probable production exchange speed for the new AC-AC converter is p3 = 2 once more, suggestive of a few inconsistency and completion of manage base on the planned converter nourish. The AC-AC Matrix Converter is appropriate for a minute figure of switches and minute filter supplies.

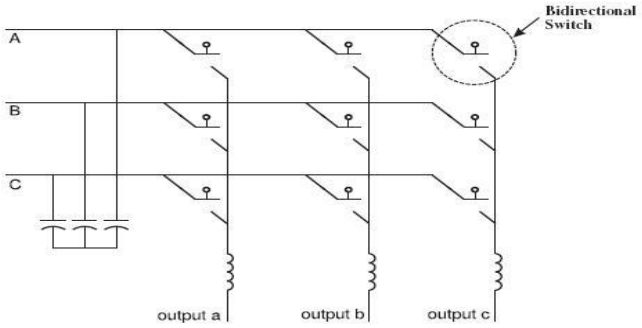


Figure 1.1: Matrix converter design.

2. TOPOLOGIES OF BI-DIRECTIONAL SWITCHES.

Directional switch are competent of jamming the voltage and flood authority in all information necessary by Matrix Converter. Unluckily this equipment are not extensively to be had. Consequently, analog policy is worn to craft switch-bi-directional control cell and convene those supplies. The bi-directional control collection also dictate which current switch method can be worn. This part describes the probable configurations of the bi-directional control as well as the compensation and disadvantage of every location. Inside the conversation under it was consideration that the control machine would be IGBT (insulated gate bipolar transistor) but additional campaign such as MOSFET, MCTs and IGCT might be used evenly.

2.1 DIODE BRIDGE TOPOLOGY

The diode bridge system is the most reliable bi-directional control. This procedure is perform using IGBT throughout single phase of the diode arm scheme, exposed in Figure 2.1. The major benefit of this agenda is that just single active machine is required, reduced by the cost of power circuit charges and the difficulty of control / gateway driving. Throughout the flow it produces high losses by three devices. The main difficulty is so as to the way of the current transitory from side to side the switch cannot be forbidden. Lots of new exchange strategies are outlined in the current self-regulation on both sides.

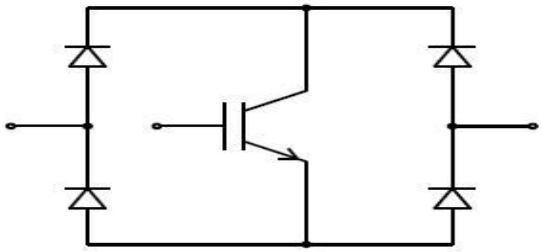
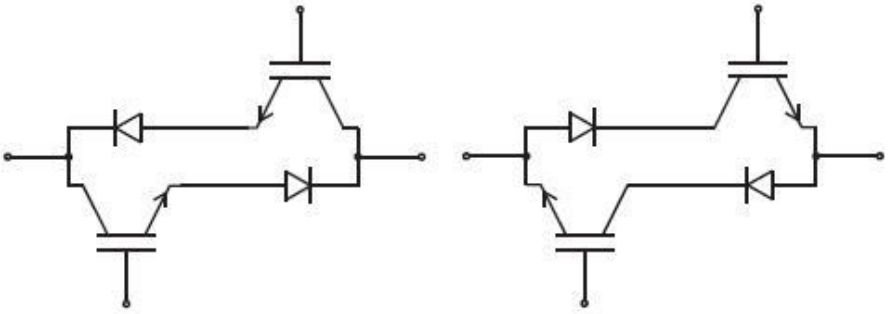


Figure 2.1 Diode Bi-directional Switch

2.2 SERIES IGBT DIODE CONFIGURATIONS.

Together the normal scanner and the normal radio dish pattern can be second-hand devoid of a connection as shown in Figure 2.2. In a conservative emitter pattern scheme, this will take away the benefit of life form clever to force two IGBT (integrated bipolar transistor gate) as of the similar divide power supply cause.



(a) Common Emitter (b) Common Collector

Figure 2.2 Back to back devices lacking central association

3. SINGLE PHASE MATRIXCONVERTER

The Single-Phase Matrix converter consists of a matrix of contribution and output outline by means of four two-directional switches that attach single-phase contribution to single-phase output in conflicting relations. It contrast all four appropriate switches Sl, S2, S3 and S4 capable of the theater in each course, blocking onward voltages and reversing and switching flanked by regions with no holdup.

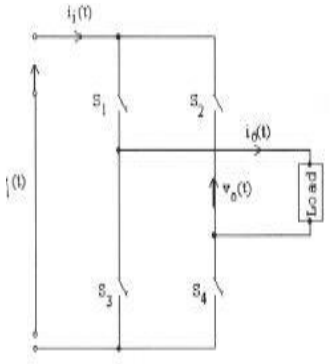


Figure 3.1 Representation of single phase matrix

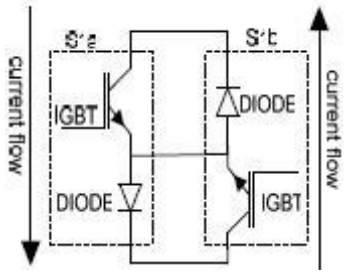


Figure 3.2 Bi-directional switch module

3.1 SWITCHING STRATEGIES

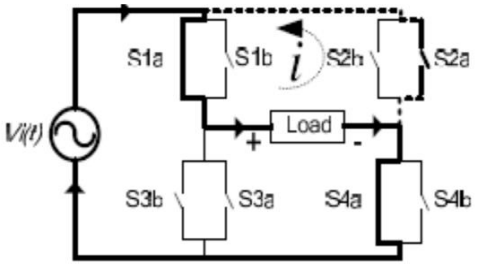


Figure 3.3 Positive Cycle (State 1)

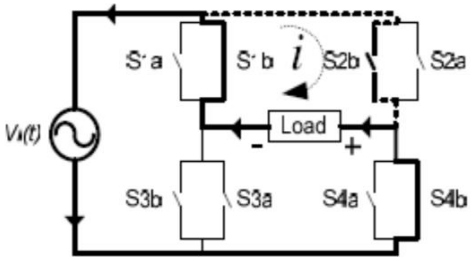


Figure 3.4 Negative Cycle (State 2)

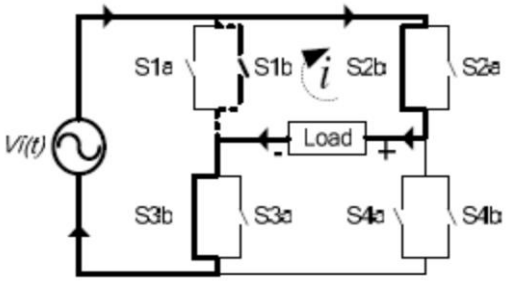


Figure 3.5 Positive Cycle (State 3)

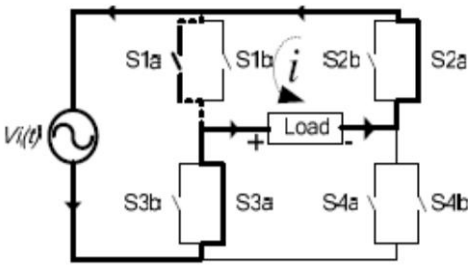


Figure 3.6 Negative Cycle (State 4)

4. TWO PHASE TO SINGLE PHASE MATRIX CONVERTER

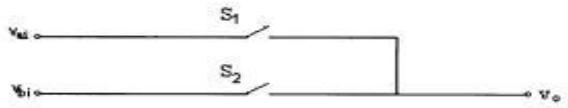


Figure 4.1 Representation of two phases to single phase

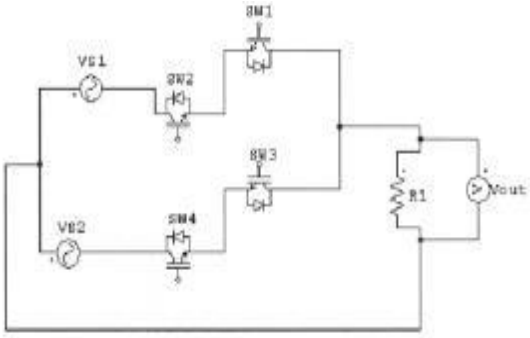


Figure 4.2 Simulation Circuit of a Two Phase to Single Phase Matrix Converter

5. INPUT FILTER

Electrical circuits turn resting on and off great amounts of current at elevated voltages and therefore can produce like-minded electrical signals so as to can injure extra electrical systems. In each day life, the extent of high-level harmonics can as well be continuously precious by current spikes reason by the innumerable number of slope shifts. As a result, it is always necessary for the filter to be added to the power input power converter to reduce harmonics. With the help of the reduction of the fluctuations of the harmonics introduced in the current waveform, the effort strain enters in harmony through the rule that restrictions the electromagnetic intrusion. The input strain can in addition put rancid the converter and its cargo from transients on or after effort voltage, thus altering the inflexibility of the scheme.

As mentioned earlier, in order to reduce the current ripple of the input with less power drawn from the active component, it is essential to put in the strain effort to the control converter. The LC low-pass filter is supplementary to the converter effort. The employ of additional compound topology has been referred to in literature to achieve a higher reduction in frequency change, but it is not possible. The LC filter reduces the harmonics of the currents generated through the switching frequency in the authority converter, and therefore clears the current waveform in use on or after the power foundation. Create an effort filter by means of inferior frequency of switching,

To get better system dependability, contribution filters are from time to time necessary to function usually what time overheating or periodic interruptions are applied to power inputs. Such precision processing forces the input of the input filter sound, so that the input interference does not produce too much current or voltage inside the strain or control converter. It have been recognized together by sensible psychiatry and difficult so as to in the Matrix Converter request it is sensible to place dampness in the sieve, in the shape of resistors in row by means of the

Inductors, since there is a elevated likelihood that in a exacting operational matrix converter. Effort will have a piece shut to the ringing frequency of the sieve. Figure 5.1 shows an LC sieve by a constraint resistor additional. The inner inductor resistance is standing for by r. By means of this agenda diagram, the move meaning of the effort filter can be intended. This move meaning is worn to decide the timbre and wounding frequency of the effort filter. Portend sites are worn for thorough resonance sensing and frequency slash.

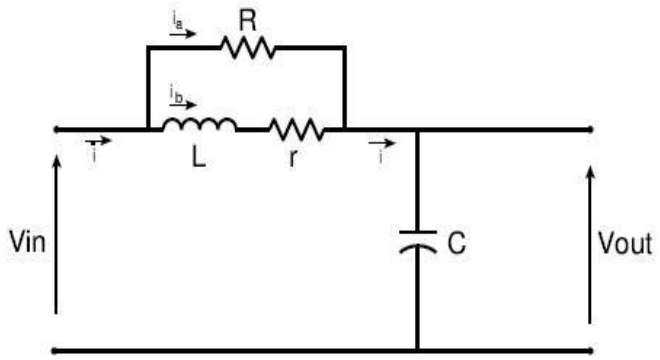


Figure 5.1 drawing to calculate transfer function of effort FILTER.

6. RESULTS

6.1 ESSENTIAL SIMULATION CIRCUIT OF SINGLE PHASE TO SPMC

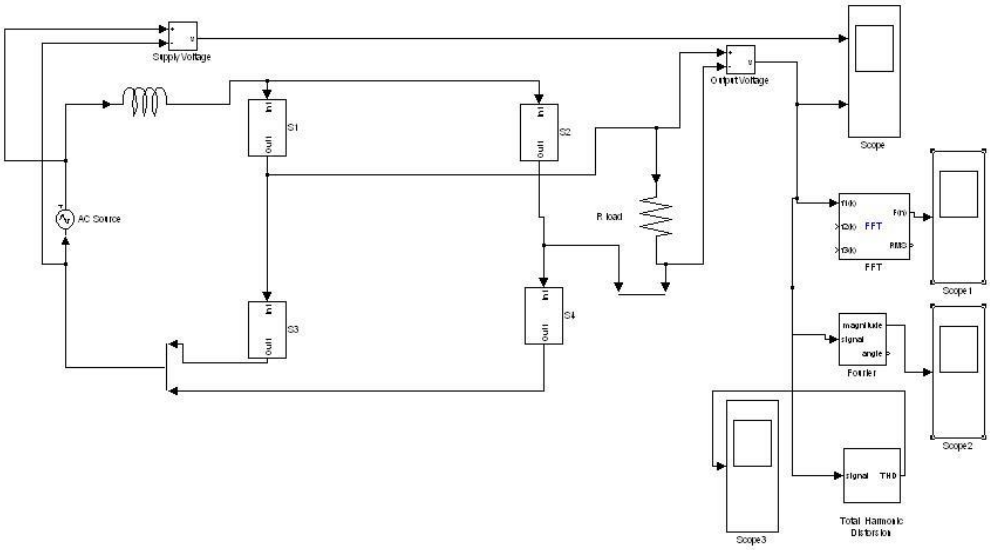


Fig 6.1 Essential for SPMC

6.2 SIMULATION RESULT FOR 25HZ

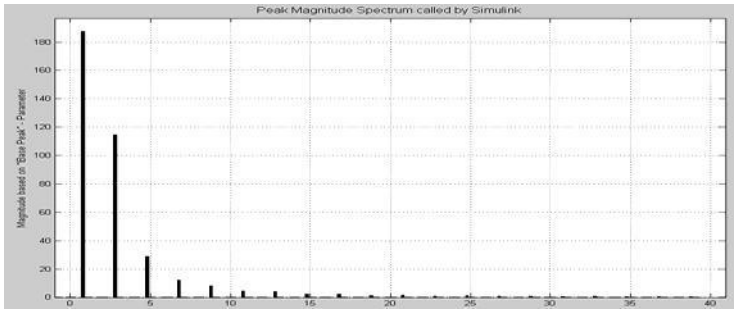


Fig 6.2 Harmonics without filter

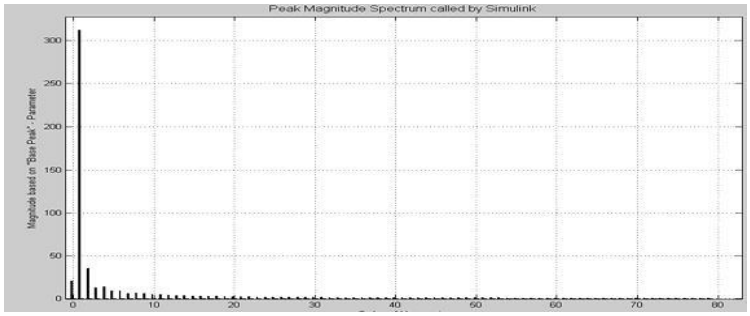


Fig 6.3 Harmonics after filtration

6.3 INPUT AND OUTPUT WAVEFORM

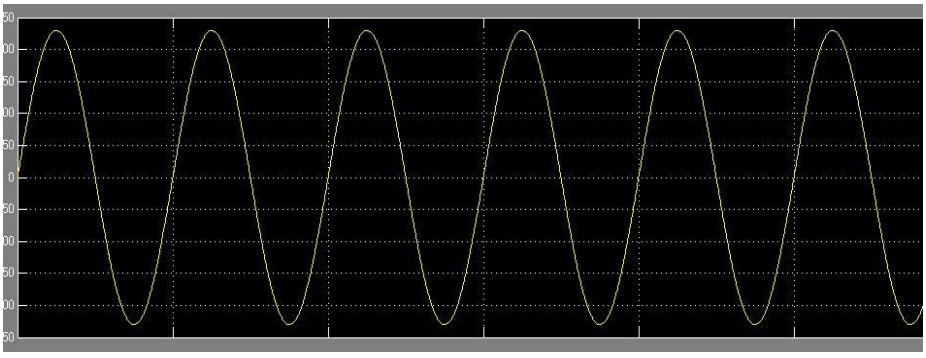


Fig 6.4 Input voltages of 50Hz

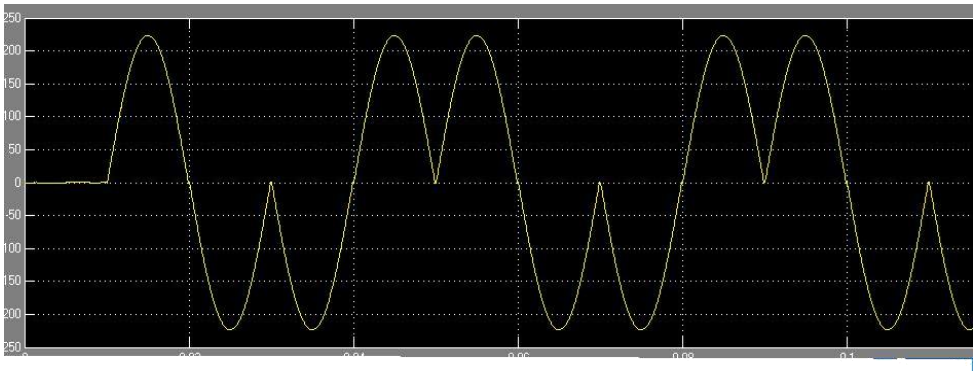


Fig 6.5 Output voltage of 25Hz without filter

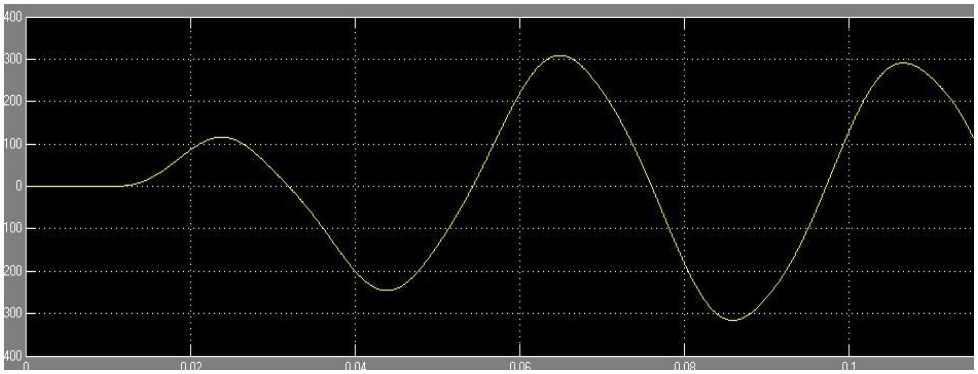


Fig 6.6 Output voltage of 25Hz after filtration

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