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Solar Power based Inverter

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Abstract:

The change in the design of photovoltaic (pv) inverter is creating new challenges in the design of low and medium voltage collector system for large solar power plant as the amount of equipment using the inverter increase the runtime will decreases our basic focus on the creating new circuit which is built by various component which help in the reduction of THD (Total harmonic distortion). This paper presents a higher functionality of inverter circuit. This paper also present the small description of solar power.

Keywords*:*

Photovoltaic effect, solar pane,l inverter, Total harmonic distortion (THD), Thyristor(Q_1,Q_2,Q_3,Q_4)

INTRODUCTION:

An inverter provides an AC voltage from DC power sources and is useful in powering electronics and electrical equipments rated at the AC main voltage in addition their widely used in the switched mode power supplies inverting stages the circuit are classified according the switching technology and switch type the waveform, the frequency and output waveform.

As the amount of equipment using the inverter increases the runtime will decreases. In order to prolong the runtime of an inverter, additional batteries can be added to the inverter. When attempting to add more batteries to inverters there are two configuration series and parallel.

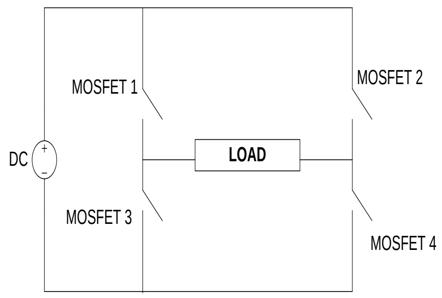
If the goal to increase input voltage then series connection of battery. If the goal to increase capacity and prolong the runtime of the inverter batteries connected in parallel.

$$\mathrm{PF} = \frac{\mathrm{DPF}}{\sqrt{1+\mathrm{THD}^2}}$$

Hence the optional source of energy become more important in power generation because of their ample availability and eco-friendly nature. The great advantage of solar power generation is that, it is pollution free, requires less maintenance. The power generated from solar energy can be used instead of generating power from coal or nuclear energy saving tremendous amount of cost and money.

METHODOLOGY:

The Inverter is the equipment responsible for converting DC to AC. The manufacturers provide some technical parameter for the inverter. Energy losses due to inverter overheating can be calculated through proposed methodology, providing a more accurate simulation of a determined photovoltaic system**.**



- **MODES OF OPERATION OF SINGLE PHASE FULL BRIDGE INVERTER:**

A single-phase full-bridge inverter is depicted by Figure where there are four power switches: Q_1–Q_4. The switch pairs (Q_1, Q_4) and (Q_2, Q_3) conduct in turn. The two terminals of the load are connected to the middle points of the left-hand leg and right-hand leg of the bridge circuit, respectively. The load considered is RL load with the impedance phase angle ϕ. Moreover, there are four diodes, D_1–D_4, which are employed to provide the paths for the load current driven by the stored energy in the load inductor. The period of a cycle is denoted by T.

The operation principle of the single-phase full-bridge inverter is illustrated as follows. During the interval $0 \le t < t_1$, the switch pairs (Q_1, Q_4) and (Q_2, Q_3) are both off, but the diode pair (D_1, D_4) is forced on by the energy remaining in the load inductor. Therefore, at this time, the output voltage v_o is V_d, and the inductor current i_o reduces gradually in amplitude. At the time instant t_1, the load current i_o becomes zero so that the diodes D_1 and D_4 are off, but the switches Q_1 and Q_4 are switched on by triggering. Therefore, during the time interval $t_1 \le t < t_2$, the voltage across the load is still $v_o = V_d$, but the direction of the current i_o is changed to positive. At the time instant t_2, the trigger signals are sent in order to switch off Q_1 and Q_4, but to switch on Q_2 and Q_3. The switches Q_1 and Q_4 are thus turned off immediately, but Q_2 and Q_3 cannot be turned on immediately as the energy stored in the load inductor forces the diodes D_2 and D_3 on. At this moment, the load voltage v_o becomes $-V_d$, but the load current i_o keeps the flow direction, but reduces its magnitude as times goes by. When the time reaches t_3, the load current reduces to zero so that the diodes D_2 and D_3 are off, but the switches Q_2 and Q_3 are on by triggering. Therefore, at the interval $t_3 \le t < t_4$, the output voltage across the load is still $-V_d$, but the load current changes direction and increases its amplitude as time goes by. At the time instant t_4, the trigger signals switch off Q_2 and Q_3, but cannot turn on Q_1 and

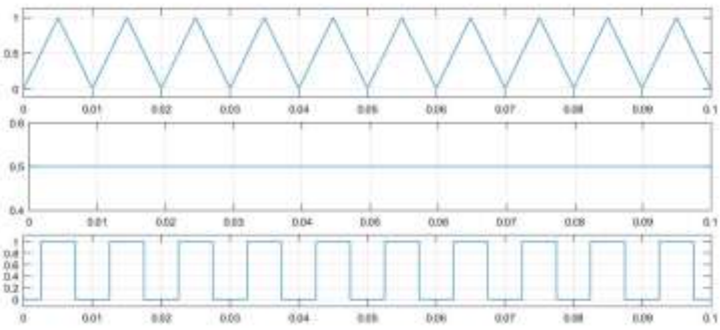
Q_4 immediately, as the energy stored in the load inductor forces the diodes D_1 and D_4 to turn on. Therefore, within the interval $t_4 \le t < t_5$, the output voltage v_o is changed to V_d, but the load current keeps the previous direction but reduces its amplitude as time goes by. Actually, the inverter during $t_4 \le t < t_5$ repeats the operation process of the inverter during the interval $0 \le t < t_1$.

- **WAVEFORM:**

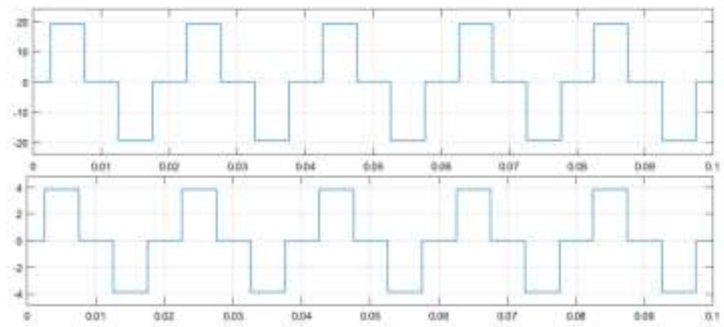
To determine the firing instant require to synthesize correctly the pulse width modulated wave, a method which can be used to generate a reference sinewave of the desired frequency within the control circuit, and to then compare this sinewave to an offset triangular wave as shown in figure. The crossover points of the two wave determine the firing instants. Figure shows the maximum output , a reduction to half this value being made by simply reducing the reference sinewave to half value as shown in figure. Figure shows how a reduction in frequency of the reference sinewave increases the number of pulses making each half cycle.

The justification of the use of the triangular wave can be given by reference to figure . The section of the upper reference sinewave within the period shown will be give a pulse of width b. Reduction of the reference sinewave height of a half will give a pulse of width c. Assuming the section of sinewave to be a straight line, c is half the width of b, the pulse height being unaltered, therefore the pulse area is then halved, corresponding to the reduction in height of the desired sinewave. Similarly arguments apply if the two sections of sinewave shown are at different time within the same reference sinewave, width a corresponding to the maximum of the sinewave. The ratio of the height of the reference sinewave to that of the triangular wave is known as the modulation index.

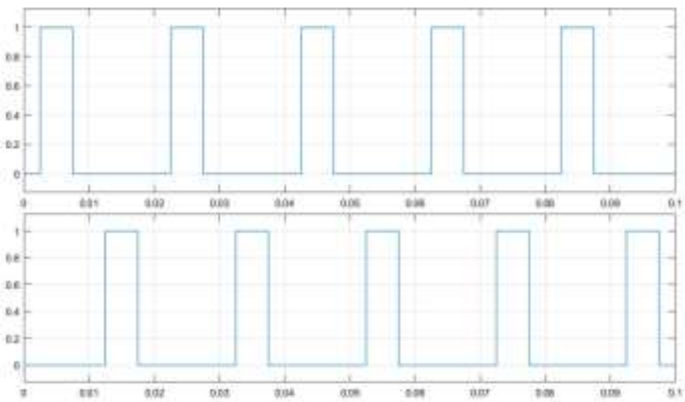
The high number of pulses within the output cycle does lead to a large increase in the number of high order harmonics,but these are more easily filtered than the low-order harmonics,an inductive load severely attenuating these harmonics in the current waveform. As an alternative to the pulse-width modulation control described above, the Inverter can be controlled so that the d.c.source is always connected to the load, by firing thyristors T_1 and T_2 as a pair,with thyristors T_3 and T_4 as the other pair,hence avoiding the zero periods. In this manner,the pulse-width modulated wave shown in fig is generated,having short reverse periodsduring the output half cycle. To determine the Thyristor firing instants, the high frequency triangular wave is modulated by the reference sinewave,this time the triangular wave not having any offset as in Fig. The high number of commutations taking place in each cycle with the notched and pulse-width modulated waveforms does result in high commutation losses in the thyristors within the inverter. In choosing between the quasi-squarewave inverter and the pulse-width modulated inverter ,consideration must be given to the additional cost of control circuitry and switching losses in the one and to the higher low-order harmonic content of the output in the other. A method which avoids excessive commutations within the output cycle,but reduces the low order harmonics,is shown in Fig. By reversing the output voltage for a short interval in each half cycle at particular angles, it ispossible to eliminate two harmonic components,say the third and fifth components. With a fixed d.c.source,it is possible to control the output level of this voltage by combining two such waveforms of Fig, phase-displaced to the principle demonstrated in Fig.



Triangular and Square Waveform



Output Voltage and Current Waveform



Gate Pulse for MOSFET 1,4 and MOSFET 2,3

CONCLUSION:

This research analyzes the related standards of domestic PV power generation system, propose specific test procedures and methods, and develop PV grid-connected inverter automatic test platform. The platform has been proved a fully functional system, device configuration, easy to operate.

The high-freqency AC link single-phase DC-AC converter which is hoping to apply for the household DSG system or the UPS have been commonly used the symmetrical control scheme to control the output voltage. We have described in this paper the operation principle and some features of symmetrical control scheme and have pointed out the some problem which is an increase of conduction losses and the soft-switching operation range have an limitation by load. These problem can be solved to apply the secondary phase-shifted PWM control scheme. Therefore, we have proposed a switching pattern which is inverter mode and rectifier mode at the secondary phase-shifted PWM control into the high-frequency AC link single-phase DC-AC converter. And, we have been confirmed that the proposed scheme can be controlled satisfactorily in the inductive load or the capacitor-input by simulating analysis. Thus, the secondary phase-shifted PWM control scheme have elucidated applicable to the high-frequency AC link single-phase DC-AC converter. To confirm the reduction of conduction losses in the proposed scheme, let us calculate the conduction loss generating the high-frequency AC link single-phase DC-AC converter with secondary phase-shifted PWM control and symmetrical control scheme and compare them and perform the consideration. The result show that all conduction losses generating the high-frequency AC link single-phase DC-AC converter was reduced to 81% by performing the secondary phase-shifted PWM control comparing with the symmetrical control. Especially, the proposed scheme have elucidated drastic reduction of conduction losses generating high-frequency inverter and transformer. For this reason, the high-frequecny AC link single-phase DC-AC converter seem to be suitable for the dispersed storage and generation system inverter such us used the power storage system or used both. Especially, in the case of setting up the respective home, they will be required strongly the achieving small size and light weight, enhancing control performance and efficiency, and reduction of EMI noise from consideration for around information apparatus. The proposed scheme, high-frequency AC link single-phase DC-AC converter with secondary phase-shifted PWM control scheme can be not only reduced conduction losses but also performed the soft-switching operation in all switching regardless of the load state. Therefore, to apply the secondary phase-shifted PWM control scheme is effective for the high-frequecny AC link single-phase DC-AC converter system realizing achieving small size and light weight, enhancing control performance and efficiency.

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