MINIMIZATION OF THE DC COMPONENT IN TRANSFORMERLESS THREE-PHASE GRID-CONNECTED PHOTOVOLTAIC INVERTERS

Priyanka.K\textsuperscript{1}, Karthikeyani.A\textsuperscript{2}, Prakash.R\textsuperscript{3}

\textsuperscript{1,2,3}Vivekanandha college of engineering for women

ABSTRACT- The dc component is a special issue in Transformerless grid-connected photovoltaic (PV) inverter systems and may cause problems regarding system operation and safety. The limit for dc component in the grid-side ac currents, e.g., below 0.5\% of the rated current. The dc component can cause line-frequency power ripple, dc-link voltage ripple, and a further second-order harmonic in the ac current. To proposed an effective solution to minimize the dc component in three-phase ac currents and a method for accurate extraction of the dc component based on bat algorithm control, has been devised and approved effective even under grid-frequency variation and harmonic conditions. The total harmonic distortion and the second-order harmonic have also been reduced as well as the dc-link voltage ripple.

LITERATURE REVIEW AND RELATED WORKS

The elimination of the output transformer from grid-connected photovoltaic (PV) systems not only reduces the cost, size, and weight of the conversion stage but also increases the system overall efficiency. However, if the transformer is removed, the galvanic isolation between the PV generator and the grid is lost. This may cause safety hazards in the event of ground faults. Various inverter topologies are presented, compared, and evaluated against demands, lifetime, component ratings, and cost. Finally, some of the topologies are pointed out as the best candidates for either single PV module or multiple PV module applications[1]. The accuracy of the DC current sensor then becomes important to achieving this. A scheme is proposed in which DC link current sensing and current control are used to minimize the output DC current component. Current controllers are affected by errors associated with nonlinearity and offset in the current sensors[4]. Transformers operating under saturation conditions present increased power losses, overheating and distorted current waveforms. Since a DC current component causes a small DC voltage component drop across the parasitic resistance of the distribution grid conductors, canceling the DC voltage component at the Point of Common Coupling (PCC) implies the compensation of the DC current injection by electric loads or grid connected converters connected at the same PCC[5]. The main goal is to ensure
a reduction of the switching frequency ripple at a reasonable cost and, at the same time. The experimental results demonstrate the effectiveness of the design procedure both of the LCL-filter and of the controllers. The performance of the overall system is good both in the low and high frequency ranges[3].

EXISTING SYSTEM- Grid-connected photovoltaic (PV) systems often include a line transformer between the power converter and the grid. The transformer guarantees galvanic isolation between the grid and the PV systems, thus fulfilling safety standards. It ensures that no direct current (dc) is injected to the grid. A proportional integral-resonant controller is further designed to regulate the dc and line-frequency component in the current loop to provide precise control of the dc current. The low-frequency transformer is bulky, heavy, and expensive and its power loss brings down the overall system efficiency.

DISADVANTAGE OF EXISTING SYSTEM

- Increased cost, weight.
- Physical size of the system
- Extra power loss.

PROPOSED SYSTEM- This paper has proposed an effective solution to minimize the dc component in three-phase ac currents by using bat algorithm. To eliminate the transformer and to achieve cost, size, and weight reduction as well as efficiency improvement. The bat algorithm is uses by frequency tuning method to solve problems. Bat algorithm can also solve large scale problems effectively. Bat algorithm is easy to implement and such a simple algorithm can be very flexible to solve a wide range of problems. Bat algorithm can deal with highly nonlinear problems efficiently and can find the optimal solutions accurately.

![Fig 1. Block diagram](image)

Minimization of the dc component in transformerless PV inverters has been extensively investigated in literatures. The dc component minimization methods of single-phase PV inverters differ from that of three-phase PV inverters. In three-phase PV inverters, dc component may exist in each phase and flow between phases. It is more challenging to minimize the dc component for all the three phases at the same time due to their couplings. To eliminate the transformer and to achieve cost, size and weight reduction as well as efficiency improvement, to achieve this condition the interest on transformerless power conversion is growing. The proposed method has been implemented with bat algorithm to eliminate the dc component in the transformerless three-phase grid-connected photovoltaic inverters.

There are several issues associated with transformerless alternative or special inverter topologies such as two-level or structures, such as dc component in the inverter output (grid) three-level half-bridge configurations, which are not current, ground leakage current (due to common-mode voltage extendable to other inverter topologies. Regarding active and parasitic capacitance) and the voltage level mismatch
methods, auto-calibrating techniques for dc-link sensors in between the solar panel (inverter) and grid.

**SIMULATION:** The proposed method have been implemented in simulation model and the output of the proposed method have been mentioned below.

**Fig 2.** CURRENT WAVEFORM WITHOUT DC COMPONENT

**Fig 3.** CURRENT WAVEFORM WITH DC COMPONENT

**CONCLUSION:** This paper has presented an effective method to minimize the dc component in a three-phase transformerless grid-connected PV system using bat algorithm. The dc component can introduce line-frequency power ripple in the system and further cause dc-link voltage ripple and second-order harmonics in the ac currents. BA uses echolocation and frequency tuning to solve problems. BA uses parameter control, which can vary the values of parameters as the iterations proceed.

**REFERENCES:**


