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Review on Standalone Photovoltaic Water Pumping System using Induction Motor Drive

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Abstract: ***The project introduces a simple, low-cost agricultural pumping system. PV, Canonical Switching Cell Converter (CS CC), Boost Inverter and Motor Induction List. The input power of the booster inverter comes from CSV-based photovoltaic (PV). Requires a minimum number of current input elements that do not have the high characteristic power of a CSC converter. DC power conversion from a PV-converted CSV-based system to high voltage AC is achieved using inverter reinforcements. The system verified the maximum power output in the PV system using the P&O MPPT algorithm. Due to the CSC converter and the inverter boosting converter, this system requires a small number of PV series to start the induction motor pump system. The effectiveness of the proposed system will be verified by the MATLAB / SIMULINK environment and the required results will be displayed.***

Keywords: ***Boost inverter, Canonical Switching Cell Converter (CSCC), Induction Motor, Maximum Power Point Tracking (MPPT), Photo Voltaic (PV) array.***

I. INTRODUCTION

The rapid growth of energy technologies, the elimination of fossil fuels and the effects of global warming that drive communities to use renewable energy sources (RES) for a variety of applications. The automotive PV pump system is receiving a lot of attention in the agricultural sector. Typically, this can be done with a two-step conversion system, i.e. DC-to-DC conversion using a boost converter or buck-boost converter and a DC-to-AC conversion using a voltage source inverter (VSI). Although the lifting converter provides high power output, it does not provide a smooth start to the vehicle. Some consolidation converters like CUK and SEPIC converters require a large number of factors that make them powerful and inefficient. In addition, VSIs cannot provide high AC output from low DC input. To overcome the above problems, this paper proposes to simplify and reduce the cost of strengthening the inverter fed induction motor using PV based CSCC water pump systems in the agricultural sector. The advantages of the CSC converter are the inclusion of current and low power input. In both agriculture and domestic, the water pump system provided by cell-generators is one of the most important applications. Installing a pump through the action of controlling motors by building new efficient and flexible systems, this can be done by taking into account the variations in solar energy and the requirements for solar power generation. Photovoltaic-battery hybrid system usually controls the vector control of a non-compliant vehicle, this vector control is discussed in this paper. PV generator, DC-DC converter, battery, DC-AC converter, import vehicle vector-controlled and centrifugal pump are investigated in this paper. With interference and viewing (P&O) algorithm combined with power conversion control, PV generator can be used with great power. In all segregation cases, vehicle delivery is also guaranteed. The effectiveness and efficiency of this method is indicated by the simulation results. Extensive results are displayed based on MATLAB / SIMULINK.

II. LITERATURE SURVEY

A. *"PV Based Agricultural Pumping System uses boost inverter fed motor induction", V S Prasadarao K, Nagalinga Chary Kodavatiganti, A V Ravikumar, Shri Vishnu Engineering College for Women. International Journal of Modern Technology and Engineering · October 2019.*

This paper presents the simple and cost-effective drive system for agricultural pumping system. The proposed scheme requires a small number of PV ranges to drive a single-phase induction motor. The P&O MPPT algorithm used in this paper effectively monitors the maximum power from the PV range. The CSC converter and boost inverters used in the proposed scheme increase the low voltage input to the high voltage required for the induction motor. Due to the lower components presented in both converters reduces the size and implementation cost of the system.

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B. "Standalone Photovoltaic Water Pumping System Uses Induction Motor Drive with Reduced Sensors", Bhim Singh, Fellow, IEEE, Utkarsh Sharma, Member, IEEE, and Shailendra Kumar, Member, IEEE, Department of Electrical Engineering, Indian Institute of Technology Delhi, New Delhi, India.

An independent water pump system has been proposed. It uses only three sensors. The reference speed of the V / f control system is proposed based on the available power control capacity of the DC bus. PWM frequency and pump proximity regulation have been used to control the speed of the induction motor. Its performance is verified by simulation and test validation. Various working conditions such as starting, radiation variability and stable condition have been confirmed by trial and found satisfactory. A major contribution of the proposed control system is that, naturally, it is protected from error in the pumping station measurement. The system follows the MPP with acceptable tolerance or radiation.

III. OBJECTIVE

The primary objective of this look at can be summarized as follows:

A. To study the existing solar water pumping system.
B. To understand the existing CSC Converter fed Induction motor for Water pump.
C. To study the Induction motor photovoltaic pumping system configuration using P & O Algorithm.
D. To study simulation validations of the proposed system.

IV. PROBLEM IDENTIFICATION

Having a smaller number of components in a CSC converter makes it more efficient. The most important feature of a booster inverter is its ability to produce a higher AC output voltage than its DC input voltage. That means it is not only performing DC to AC conversion but also provides enhanced AC output voltage, unlike VSI which provides less output voltage from input DC source. Voltage enhancement feature of CSCC and boost inverters of the proposed scheme reduces the rating of the PV system. The soft start of the induction motor is ensured by the canonical switching cell converter.

Perturbation and observation (P & O) MPPT algorithm is used in this project to operate the PV array at maximum power point. Finally, the effectiveness of the proposed scheme is verified with the help of MATLAB/SIMULINK software and corresponding results are presented.

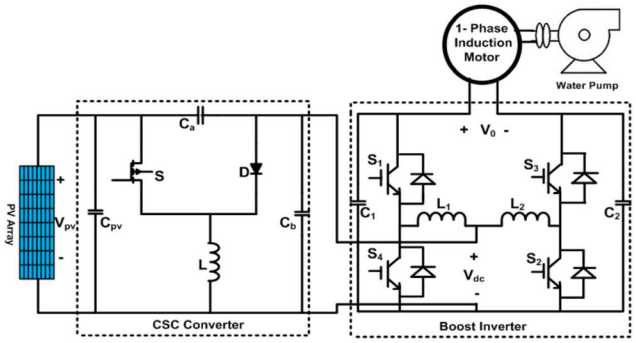

Fig. 1. CSC Converter fed Induction motor for Water pump

V. PROPOSED CONFIGURATION WORK

Various optimization methods to improve overall efficiency are discussed. Currently, for power conditioning, the PV generator acts as a DC-DC converter for MPPT. Many types of converters are used for MPPT, which promote converter, buck converter and boost-hack converter. Many different motors are used in PV water pumping systems. PV pumping system with induction motor is more reliable and no operating system. Different coupling modes are operated for the use of DC motors in PV water pumping systems. Various control methods must be used for permanent magnet synchronous motors (PMSM). In this project, induction motors on DC motors and PMSM will be used for induction motors for water pumping systems due to their superior advantages. In Induction Motor (IM), the authors demonstrate the indirect method of motor field control method in relation to the water PV pumping system. The water pumping system with the proposed photovoltaic battery is shown in figs. Large simulation work is done to get the desired result. To show the performance of the system, the results obtained are talked about and the suggested process has proven to be the best working method of water pumping system control.

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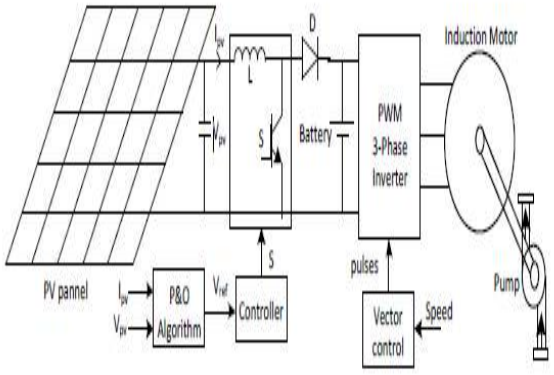

Fig.2.The suggested Induction motor photovoltaic pumping system configuration

Figure 2 below shows the overall construction of an inverter fed induction motor drive that promotes a PV based CSC converter for the water pumping system. It lists PV, CSC converter, booster inverter, import vehicle and water pump. The water pump requirement is obtained from the CVCC and booster inverter from the PV range.

VI. CONCLUSION

The project provides a simple and low-cost drive system for agricultural pumping systems. The proposed scheme requires a small number of PV ranges to drive a single-phase induction motor. The P&O MPPT algorithm used in this project effectively monitors the maximum power from the PV range. The CSC converter and boost inverters used in the proposed scheme increase the low voltage input to the high voltage required for the induction motor. The lower components displayed in both converters reduce system size and implementation costs.

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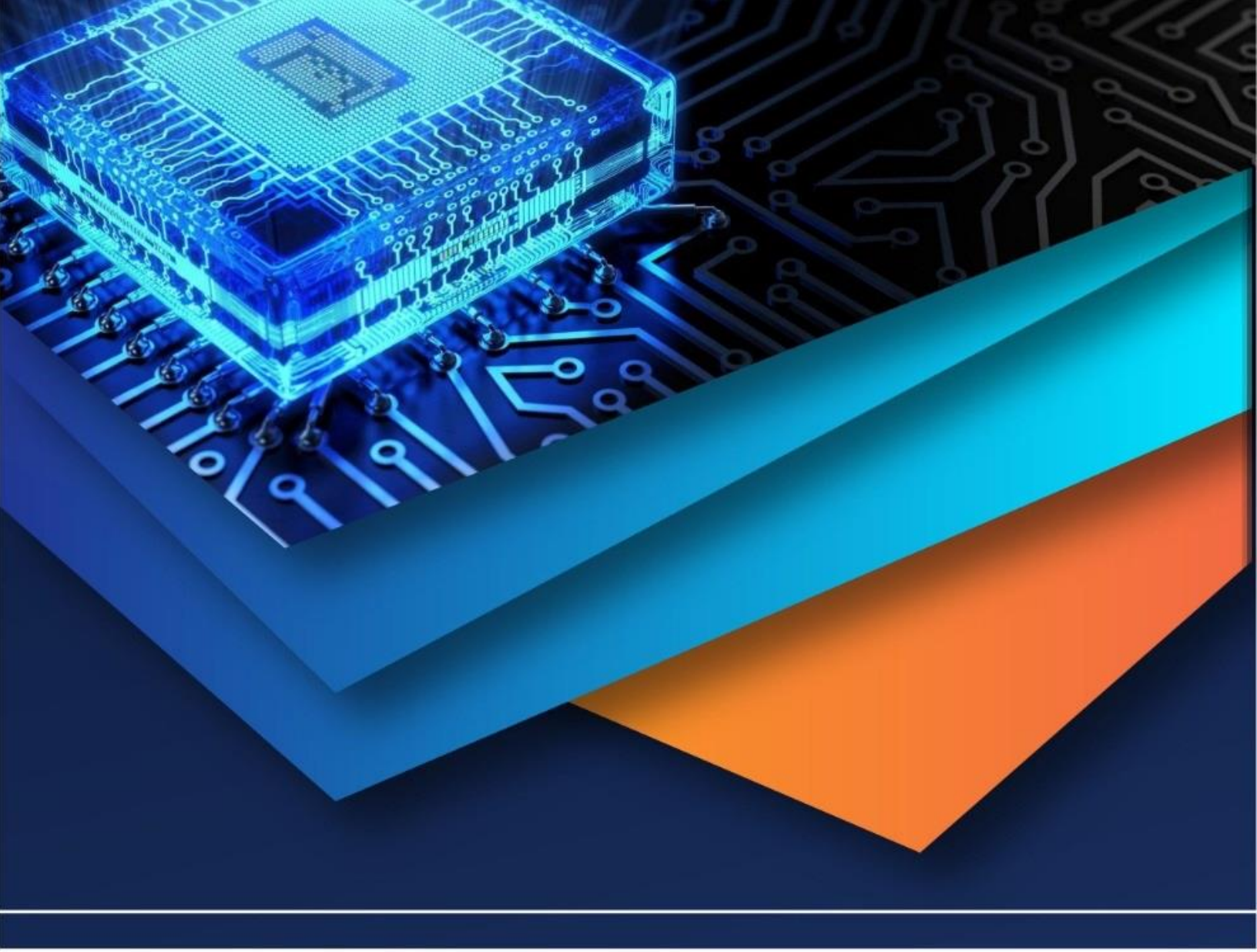

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