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An Overview of the Design of the KY Boost Converter for Photovoltaic Application

Dipali R. Narade[1*], L. S. Patil[2]
[1]PG Student, Department of Electrical Engineering, Padmabhooshan Vasantraodada Patil Institute of Technology, Sangli, India
[2]Associate Professor, Department of Electrical Engineering, Padmabhooshan Vasantraodada Patil Institute of Technology, Sangli, India

***Abstract*: To meet the increasing demand of electricity with solar energy market, the proposed KY boost converter for PV generation to transfer power from PV panel to grid system. This project designing and implementing a DC-DC KY boost converter for photovoltaic application to step up DC voltage to suitable level with high efficiency, fast transient response and minimum voltage ripple. This output level can be adjusted by feedback control circuits with digital signal processor.**

***Keywords*: KY converter, DC-DC boost converter, efficiency.**

1. Introduction

In India 53% of energy is produced from thermal power stations. The major problems with thermal energy are lack of coal, ash production, fuel emission, high running cost. This mainly focuses on renewable energy sources like photovoltaic system to fulfil demand.

The project is focusing on designing KY Boost converter with low output voltage ripple, fast transient response and high power efficiency [1]. Photovoltaic module has low efficiency due to solar irradiance and temperature. For increasing efficiency, a DC-DC converter is used to set output voltage at point of maximum power by changing duty cycle of signal [2]. For reducing the output voltage ripple, the KY converters are operating in continuous conduction mode by providing non pulsating output current. Thus, decreases current stress on output capacitors and overall efficiency increases [3]. To fulfil the requirements of different applications such as portable devices, car electronic devices etc.KY converter used to stabilize output voltage as compared to traditional buck-boost converters [5].

2. Proposed Work

A. Scope

The concept can be used efficiently in electricity system to minimize voltage ripple, energy losses and maximize the efficiency. A KY Boost converter in which improved output from the PV is used to feed different systems.

This fig. 1, shows the construction of a control loop using PID controller to run the system properly in different situations. By designing controller and using DSP the proper power level can be achieve for the overall system.

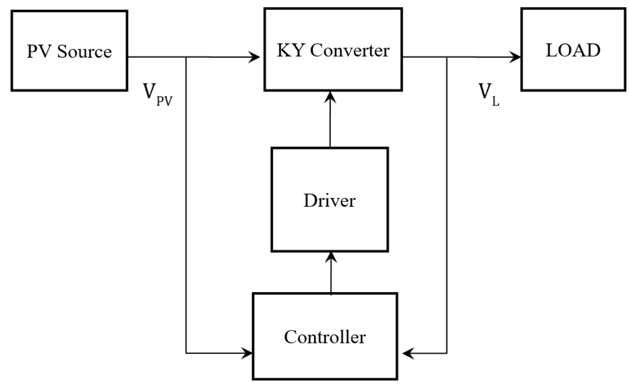

Fig. 1. Block diagram of KY boost converter

3. Objectives of Proposed Work

The key aim of this study is to design and implement KY Boost converter for PV application to provide high power efficiency and low voltage ripple.

4. Basic KY Converter

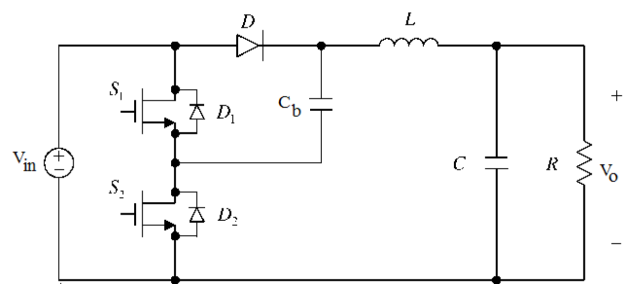

Fig. 2. Basic KY converter

Fig. 2 shows the KY boost converter. It is constructed with two semiconductor switching devices S_1 and S_2, a diode D, energy transferring capacitor C_b, output inductor L, and the output capacitor C. The working of KY converter can be explained in two modes [6] as follows:

Mode 1: $S_1 = ON, S_2 = OFF$

In this mode, the inductor L is magnetized as the voltage across inductor L is,

$$V_L = V_{in} + V_c - V_O$$

*Corresponding author: dipalinarade@gmail.com

Neglecting voltage drop across diode D,

$$V_C = V_{in}$$
$$\therefore V_L = 2V_{in} - V_O$$

Here the capacitor C_b is discharged,

Mode 2: S_1 = OFF, S_2 = ON

In this mode, the inductor L is demagnetized as the voltage across inductor is,

$$\therefore V_L = V_{in} - V_O$$

Here the capacitor C_b is quickly charged to the input voltage level in very short interval.

The voltage gain is thus given as,

$$\frac{V_O}{V_{in}} = 1 + D$$

5. Conclusion

For providing high power efficiency, fast transient response and low voltage ripple, a KY Boost converter technique is effective for photovoltaic application with minimum energy loss.

References

[1] H. J. Wen, C. S. Lam, W. H. Choi, C. K. Wong and M. C. Wong, "A 97.0% maximum efficiency, fast response, low voltage ripple KY boost converter for photovoltaic application," 2018 IEEE International Conference on Industrial Electronics for Sustainable Energy Systems (IESES), Hamilton, New Zealand, 2018, pp. 71-75.

[2] P. P. Surya, D. Irawan and M. Zuhri, "Review and comparison of DC-DC converters for maximum power point tracking system in standalone photovoltaic (PV) module," 2017 International Conference on Advanced Mechatronics, Intelligent Manufacture, and Industrial Automation (ICAMIMIA), Surabaya, Indonesia, 2017, pp. 242-247.

[3] V. K. Jiteash, U. Kirubhakaran, and G. Karthikeyan, R. R. Essaki, “KY Converter for Renewable Energy Systems,” in International Journal of Pure and Applied Mathematics, vol. 118, no. 24, pp. 1-13, 2018.

[4] G. S. Vikram and B. A. Kumar, "Comparative Study of KY Boost Converter using different Controllers," in Journal of Engineering Sciences, vol. 11, no. 4, pp. 986-989, April 2020.

[5] J. K. Mathews, A. P. Ommen, and B. Elias, "Comparative Study of Different Transformerless Buck-Boost Converters,” in International Journal of Engineering Applied Sciences and Technology," vol. 2, no. 9, pp. 1-8, Jan. 2018.