

# Analysis Power Quality Improvement in Single Phase Inverter

G. Karthikeyan<sup>1</sup> P. Balapriyan<sup>2</sup>

<sup>1,2</sup>Department of Electrical & Electronics Engineering

<sup>1,2</sup>IFET College of Engineering, Tamil Nadu, India

**Abstract**— This document implements the high-performance single-sensitive AC-DC Luo converter that improves energy quality by alleviating the problems. The proposed converter is used to control the current output voltage, power factor and low source weapons and supply. The main purpose of this work is to add four diodes named as an inverter to get high AC output in the secondary part of the circuit. The control system designed consists of two control loops, the voltage control in the outer loop and the current controller are designed in the inner loop. The diffusion controller is used for the current controller and the PI controller as a voltage controller. In MATLAB / SIMULINK platform, the proposed AC-DC Luo-Super converter is simulated. The simulation results show that it is proven that the integrated fuzzy controller for PI prefers voltage and control than the classic PI with hysteresis controllers. This system can achieve a high power output factor.

**Keywords:** LUO Converter, Inverter, Fuzzy Controller, PI Controller

## I. INTRODUCTION

Enhanced single-phase Luo AC / DC improves the quality of power by alleviating the problems. The proposed converter is used to control the output voltage, improve the power factor and reduce supply side source oscillations. The main purpose of this thesis is to design suitable closed loop controllers for this high AC / DC high intensity converter to achieve an unity power factor in the source area

### A. Super-lift Luo Converters

The Luo converters are Boost converters in DC-DC switch mode. An impulse converter (step-up converter) is a power converter with a DC output voltage higher than its input voltage. Luo converters are a class of converters that offer high benefits with relatively few components. Although the Luo converters give a high profit, the gain only increases the stages of the stage of mathematical progression, that is, these switches use the voltage list technique (VL). In order to solve this discrepancy in the classic converters of Luo, another class of converters called Super-lift Luo Converters has been developed. Although they retain the positive aspects of the classic Luo converters in Super-Lift converters, the Super Converters also have the advantage of favoring the benefits of this converter in geometric progression, stage by stage.

DC DC converters are important in portable electronic devices, such as mobile phones and battery-powered laptops. These electronic devices often contain several sub-circuits, each of which requires unique voltage levels different from those provided by the battery (sometimes more or less than the battery voltages or even negative voltages). In addition, the battery voltage is reduced because its stored energy is empty. DC DC converters offer a method to generate multiple voltages controlled by a single battery voltage, saving space instead of using multiple batteries to supply different parts of the device. The Luo

converters are DC-DC switch Boost Mode converters. A growth converter (step converter) is a power converter with a DC output voltage greater than its input voltage. Luo converters are a class of converters that provide a high win with relatively fewer components. Although the Luo converters give a high profit, the gain only increases the stages of the stage of mathematical progression, that is, these switches use the voltage list technique (VL). The rest of the article is organized as follows. Section II presents funds and related work. In section III, we encourage our system methodology and provide a description of our proposed block diagram. The conclusion is summarized in Section IV

## II. BACKGROUND AND RELATED WORKS

This article introduces a single-phase adjustment of the digital power factor (PFC) adjustment that does not require a sensation of input voltage or explicit current compensation, but it causes a low harmonic operation for a range of universal input voltage and loads that They range from high power operation to continuous driving to zero charge. The controller is based on a low resolution A / D converter and a digital pulse modulator, does not require a microcontroller or DSP programming, and is suitable for simple and inexpensive integrated circuit processing or as a description nucleus of Hardware suitable for integration. with other functions of management of energy and management of energy. A fairer accessory with an overload power factor that improves the efficiency of the low line of the universal line series is launched. The elimination of the entrance bridge diodes further increases the efficiency of the rectifier proposed. In addition, the rectifier doubles its output voltage, which increases the usable power of the large capacitor to a drop in line voltage. The voltage lifting technique used by the voltage elevation circuit has been successfully applied to various ranges

DC-DC Luo converters. However, the path of voltage certainly has an inevitable impact on overall conversion performance. An attempt is made to explain such an effect. Four inverters of voltage-boosted circuit are analyzed: Positive-Positive Positive-shift Luo Converter, Positive Output Super-Lever Switch, Positive-Output Negative-Output Luo Switch, and Positive-Output Luo Switch. These inverters are believed to work in both continuous and discontinuous conduction systems. The conversion performance in continuous conduction mode is first analyzed. The proposed control technique includes an integral proportional controller (PI) in the external voltage loop and the control of the average inductance current mode (IACMC) in the inner loop for PFC BBC. IACMC has advantages such as robustness when there are large variations in line voltage and output load. The PI controller is developed using the average BBC state-space model. The proposed control technique includes an integral proportional controller (PI) in the external voltage loop and the control of the average inductance current mode (IACMC) in the inner loop for PFC

BBC. IACMC has advantages such as robustness when there are large variations in line voltage and output load. The PI controller is developed using the BBC state space model. The main purpose of the proposed system is to design a single phase AC-DC super lift Luo converter offering high input power factor with reduced THD even under source and load variations. To achieve this PI-fuzzy current controllers for voltage and current control are adapted in this paper, since conventional PI current Control requires precise and precise mathematical modeling and is ineffective during parameter deviation, non-linearity, load disturbances, etc. Hysteresis drivers only limit the error value to certain limits. The diffuse current regulator responds very quickly and improves the reliability of the system.

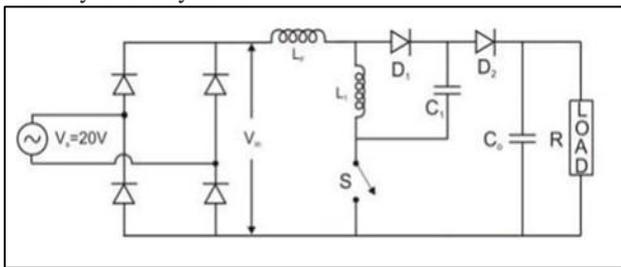


Fig. 1: Circuit Diagram

The AC-DC power converter grabs the attention, since it meets the commercial requirements in precise manner. But with deviation in the source parameters by the use of power converters may results in potential power quality problems. Among various power quality issues the harmonic distortions are considered to be one of the most important reasons for the power quality problems. On account of reducing the price of the AC to DC conversion system, diode bridge rectifier along with a capacitor is commonly employed in classic methods. But the main drawbacks of the conventional systems are low power factor, high harmonic distortions, voltage distortion and low efficiency. To prevail over these shortcomings, single phase rectifier with boost topology is adopted. In comparison to bridge rectifiers, the boost topology offers reduced supply current harmonics, improved input power factor and reduced filter requirements. Even though, it offers lot of advantages it has its own drawback of high switching loss thereby efficiency gets lowered.

### III. SYSTEM METHODOLOGY

The main purpose of this system is to add a four diodes act as a inverter at the secondary side of the circuit offering high AC output power factor. Fuzzy controller is used for current controller whereas PI controller as voltage controller, since conventional PI current controller requires an accurate and precise mathematical modelling and it ineffective during parameter variation, nonlinearity, load disturbance, etc., and whereas hysteresis controller will limit the error value only to certain limits .The fuzzy current controller gives very fast response and improves the reliability of the system. It is clear from the simulation results that PI integrated fuzzy controller for voltage and control is proven to be better than classical PI with hysteresis controllers.

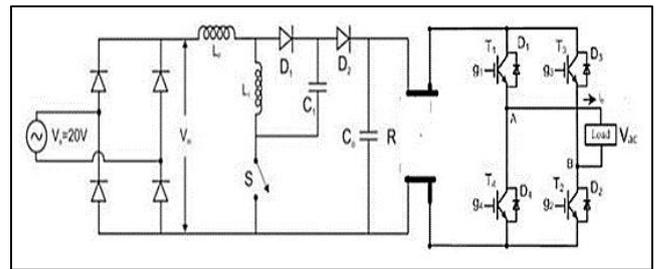


Fig. 2: Circuit Diagram

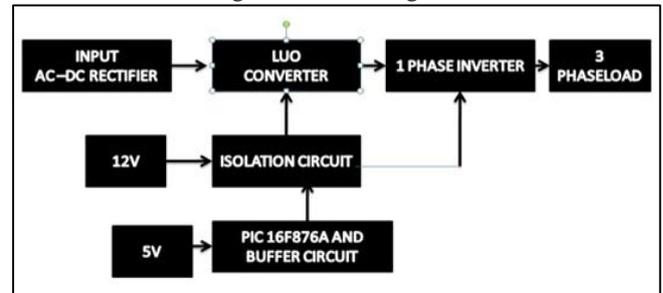


Fig. 3: Block Diagram

#### A. Applications

- Renewable Energy
- Inverter
- Power Quality Improvement
- Drives

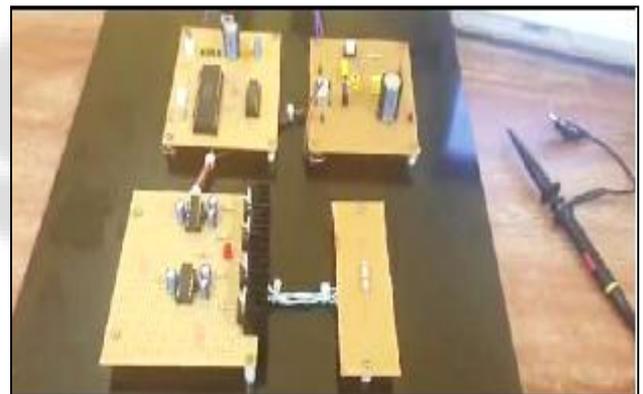


Fig. 4: Hardware Implementation

Microcontroller is main part of the project. Microcontroller is a low power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. The microcontroller is used to send the data to converter and single phase inverter by using driver circuit and send to load unit. The microcontroller is used to control and monitors this projects (or build projects around it).

#### IV. SIMULATION OF SINGLE PHASE LUO CONVERTER

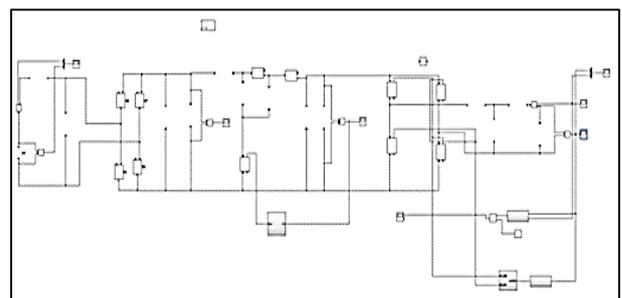


Fig. 5: Simulation Circuit Diagram

### A. V&I MUX

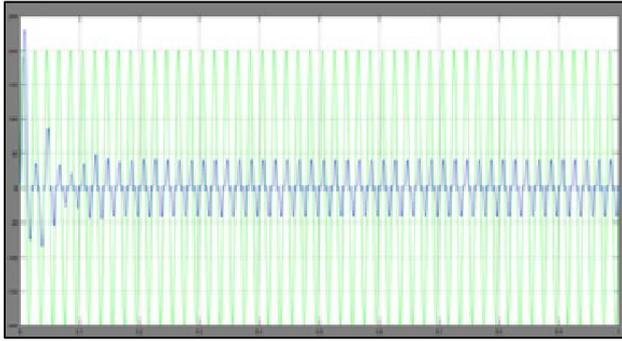


Fig. 6: V&I Mux

### B. Output Current

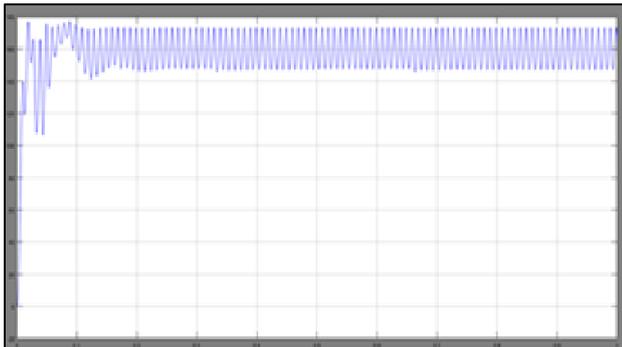


Fig. 7: Output current

### C. Boosted Output

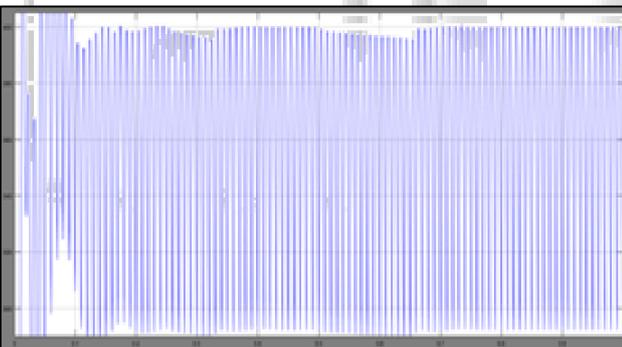


Fig. 8: Boosted Output

### D. Grid Voltage and Current in Mux

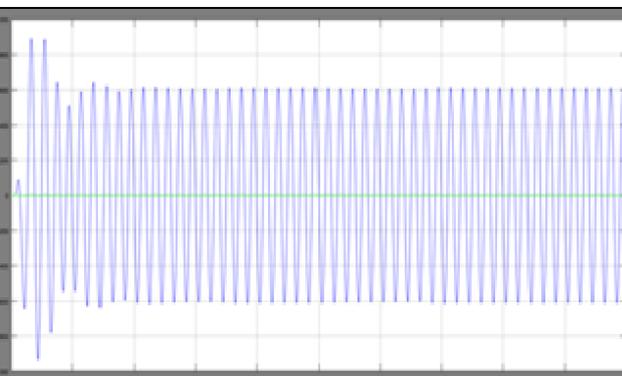


Fig. 8: Grid voltage and current in Mux

### V. CONCLUSION

The proposed converter is used for output voltage control, power factor improvement and reduced source current harmonics at supply side. The main intention of this work is to add four diodes named as an inverter to get high AC output at the secondary part of the circuit. In the MATLAB/SIMULINK platform, simulation of the proposed AC-DC super lift Luo converter is done. It is clear from the simulation results that PI integrated fuzzy controller for voltage and control is proven to be better than classical PI with hysteresis controllers. This system is able to achieve high output power factor.

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