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Power Factor Correction and Speed Control of Luo Converter Fed Induction Motor Using Neuro Fuzzy

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ABSTRACT

The worth of power factor correction and speed control in induction motor by neuro fuzzy logic based LUO converter was bestowed in this paper. Proposed scheme adopt neuro fuzzy controller for LUO converter to improve PF in supply side, simulation are carried out with mat lab simulink, indices of power quality are determined and evaluated with the standards. Result obtained shows a considerable improvement in power factor and reduction of THD in comparison with exciting LUO converter and PI controller based LUO converter.

Keywords: Induction Motor, Neuro fuzzy, Luo Converter, Power Factor Correction.

1. NTRODUCTION

Robustness and high efficiency of induction motor at low cost has gained a indispensible role in the field of industrial drives and traction [1]. In spite of the merits what they posses It drastically affect the power quality as they offer lower power factor and increase the reactive power loss, recent progress in D-DC converter have put forth a number solution to overcome the short comings. Speed control in the induction is achieved with VSI or CSI [2] in order to triumph over its inherent limitation.

In conventional boast converter the THD are over than one sixty percentage and loss in switching also very high [3, 6]. Application of buck boast converter is limited as it bears low ratio of voltage conversion [4, 7]. Though the SEPIC converter has wide ratio of voltage conversion but it requires correction in main supply to increase the real power and the scenario is same in the case of bridgeless CUK converter [5, 9]. This restriction can be easy retrieved with help of LUO converter [8].

LUO converter operated under DICM for power factor correction to reduce conduction losses, diode bridge rectifier at front end is eradicated with bridgeless converter [12,13], it also helps in reducing the harmonic and hence it reduces the losses and cost of distribution, generation, capacity of equipment etc.

2. PROPOSED SYSTEM

Schematic diagram of proposed system is exposed in the figure 1, main two objective of the recommended approach are speed control and power factor correction, power factor correction is obtain with Neuro Fuzzy algorithm to tune the LUO converter this controller continuously gets the feedback from the output of LUO converter which operate in DICM. SMO PWM controller is provided to VSI of load side for speed control of induction motor. AC supply is rectified by diode bridge rectifier. Rectified DC supply is feed to LUO converter where phase of voltage and current differ due to induction motor are reduced with Neuro

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Fuzzy algorithm. DC output of LUO converter is feed to VSI which is tuned by SMO PWM controller to archive a wide range of speed control.

The figure 2 display the elementary diagram in which the proposed ANFIS-based Luo converter-fed induction motor drive, a single-phase supply followed by a filter and a Luo converter is used to feed a VSI driving an induction motor.

The LUO converter is designed to operate as an inherent power factor pre-regulator. The speed of the induction motor is controlled by adjusting the dc-link voltage of VSI. This allows VSI to operate at fundamental frequency switching and hence has low switching losses in it, which are considerably high in a PWM-based VSI feeding a Induction motor.

The proposed scheme is designed, and its performance is simulated for achieving an improved power quality at ac mains for a wide range of speed control and supply voltage. Finally, the simulated performance of the proposed drive is validated with test results on a developed prototype of the drive.

Figure 3 depict the model develop with simulink tools box in MATLAB, model develop is mainly consist of five section, section consist of rectifier which convert AC to DC, Section two is the LUO converter which working in DICM for PF correction, Section three is the VSI at load side with constant DC link for

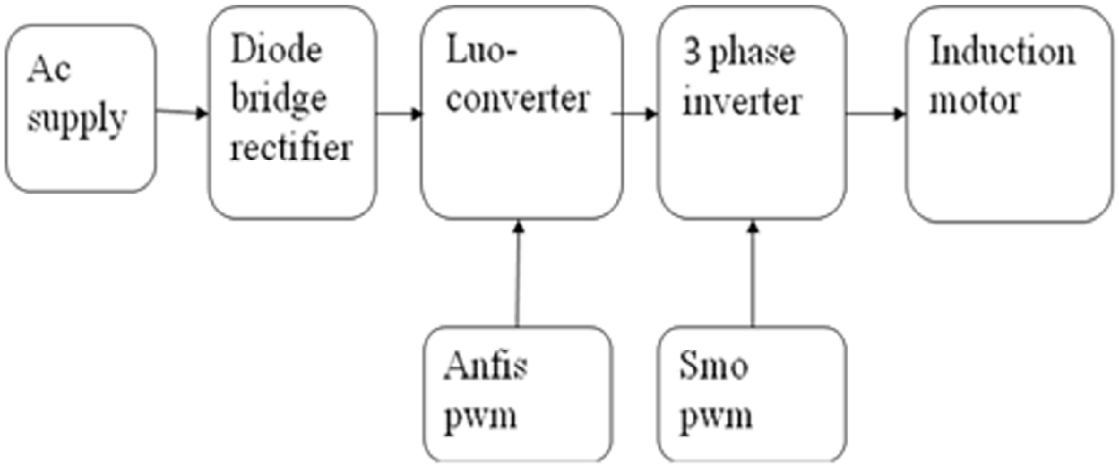

Figure 1: Schematic Diagram of Proposed System

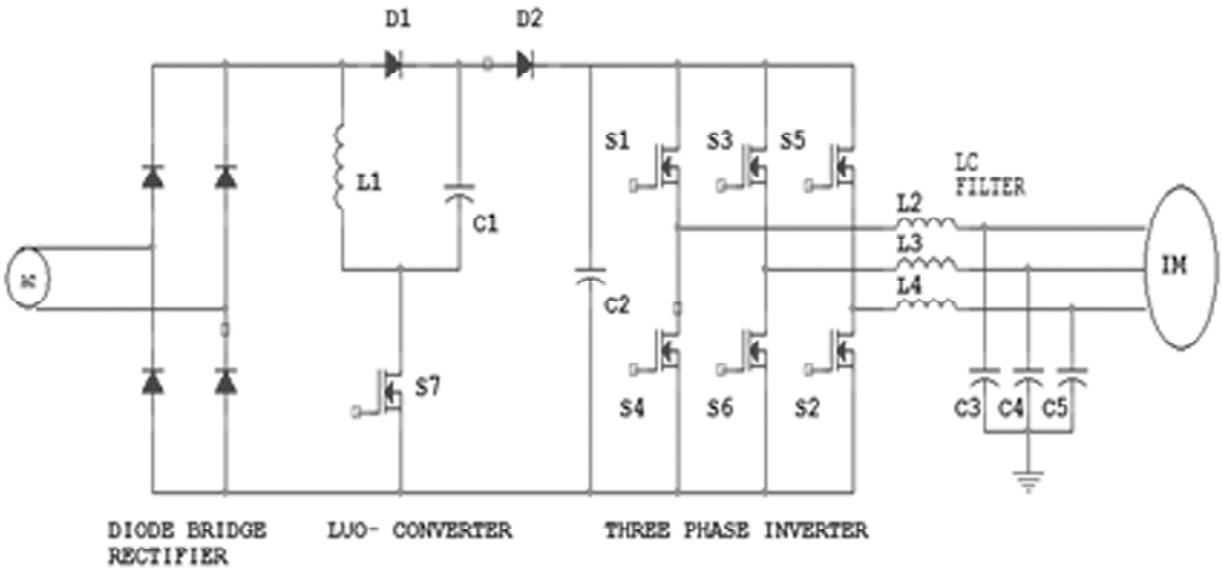

Figure 2: Elementary diagram of proposed System.

speed control. Section four is the sub blocks which hold the pseudo code of Neuro Fuzzy algorithm which tunes the firing of the LUO converter for power factor correction.

2.1. Inference of the waveform

Figure 4 exposes the stator current waveforms show clearly it is free distortion which inturn reduce the THD. figure 5 exposes the voltage and current waveform in a superimposed form to analysis the

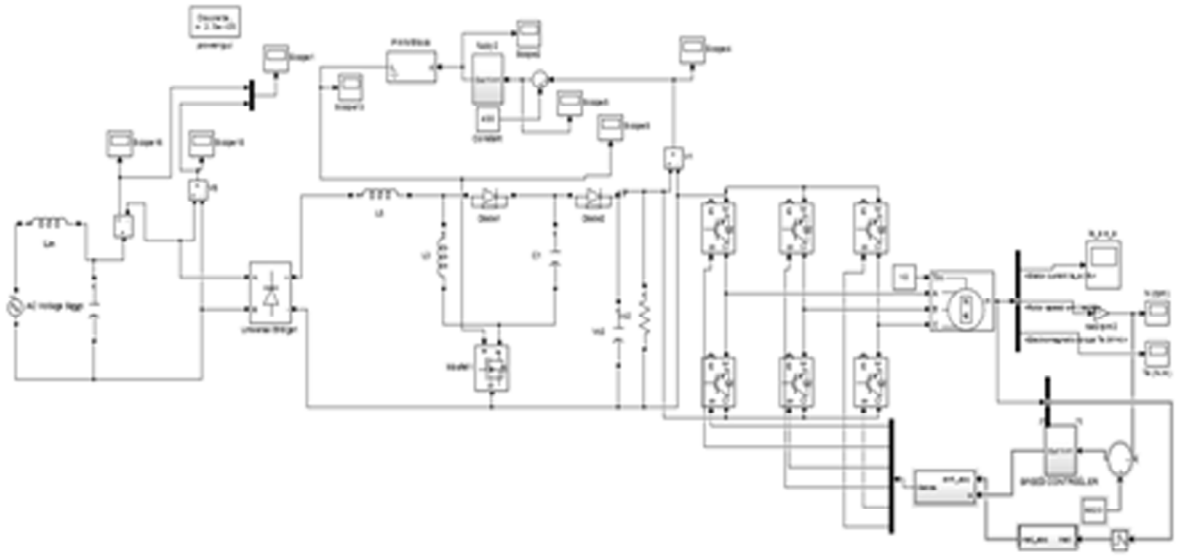

Figure 3: simulink model

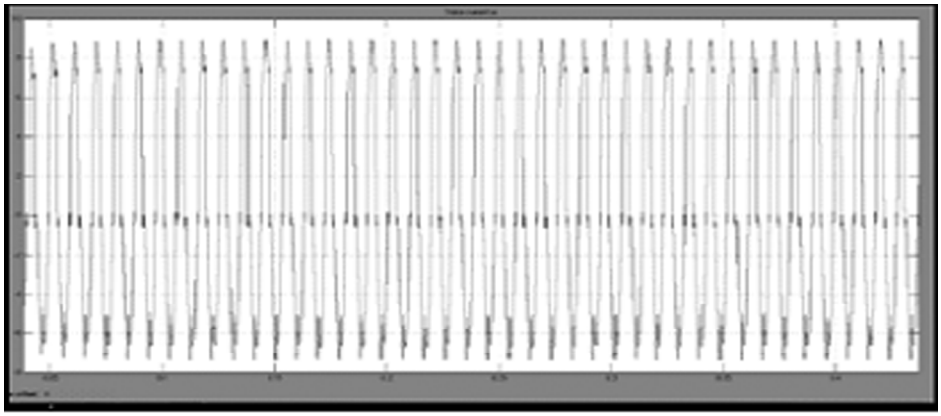

Figure 4: Waveform of stator current

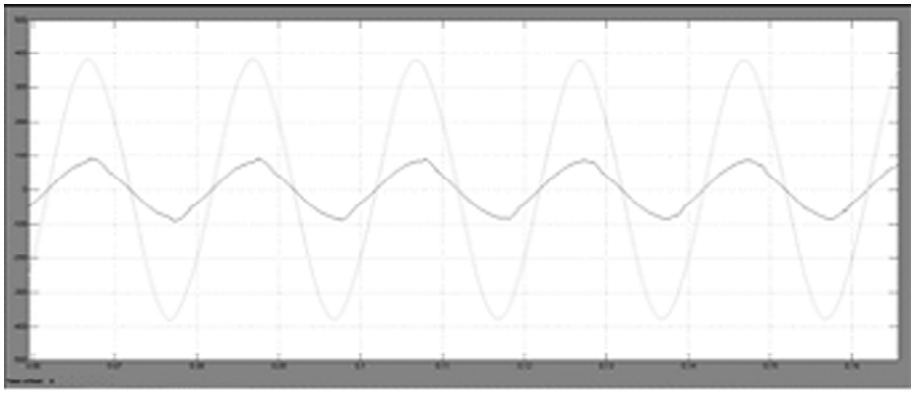

Figure 5: Waveform of power factor

phase angle difference between them, but it clearly emphasis power factor is close to unity. Speed wave form exposed here in figure 6 shows that system attains a stable constant speed quickly with short rise and time, it also offer good transient response. Torque waveform exposed in figure 7 infers that system offer low torque ripple which inturn suppress the vibration and mechanical stress to the motor

Table 1 indicates the PF and THD of induction motor driven at various speed, from this we can easily visualize that there is good improvement in PF and it is reaching close to unity. THD is also drastically reduced and within the accepted level of IEEE power quality standards.

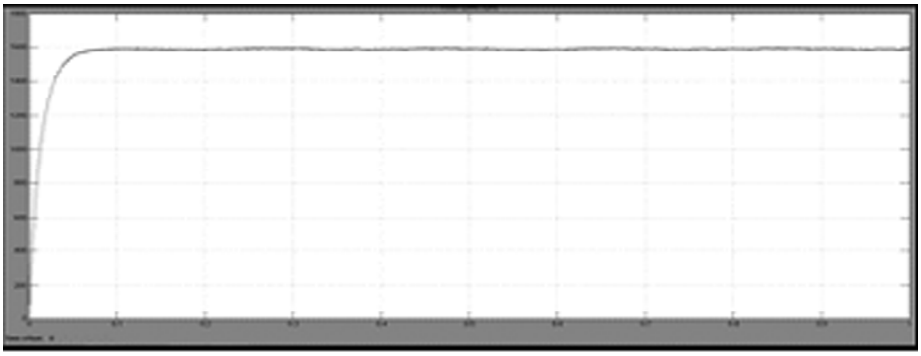

Figure 6: Waveform of speed

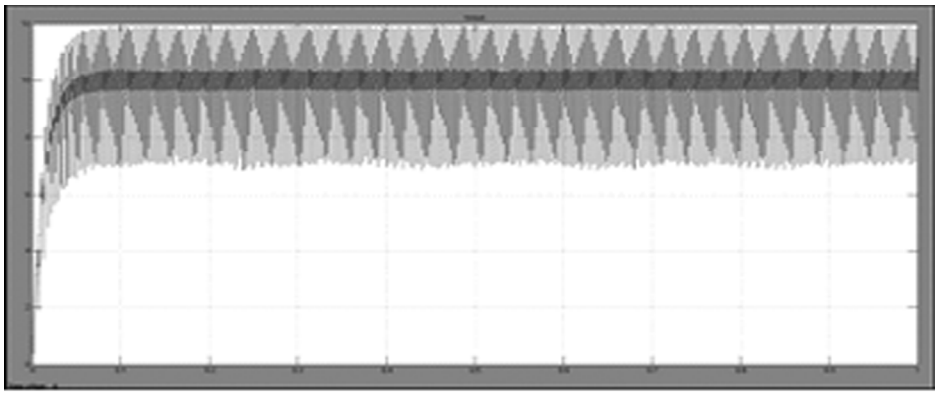

Figure 7: waveform of torque

Table 1
Power quality indices with load torque in PU

S. No	*THD*	*Input Power Factor*	*Torque in PU*	*Speed in Rpm*
1	0.421	0.8973	0.12	1465
2	0.415	0.9124	0.15	1462
3	0.393	0.9357	0.34	1439
4	0.374	0.9465	0.42	1427

3. CONCLUSION

Simulated result clearly emphasis that the fuzzy based LUO converter for induction motor will have red carpet greeting the industries, as it improve the PF drastically equal to unity. While the existing LUO are PI based LUO converter are offering very high THD value which don't satisfy the power quality standards. THD offered by the proposed approach is within the power quality standards. it provide wide range of speed control at the reduced power.

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