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Comparison of solar based closed loop dc-dc converter using PID and ANN control for shunt motor drive

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ABSTRACT

This paper explained details of Comparison of solar based closed loop DC - DC converter using PID and ANN Control for Shunt motor drive. Solar panel output is given to full bridge converter, stepup transformer, full wave converter, ∏ filter and Shunt motor drive are connected. Comparator compare the set value and the output signal of the motor produce a signal, based on the signal, full wave conveter produce the voltage to run the motor, Speed of motor, Torque and Armature current, Rise time, Peak time, Settling time and Steady state error are measured and evaluated by experimental.A circuit operation and simulation designed for a 1000 RPM speed of shunt motor arrived and tested.

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1. INTRODUCTION

The time of operation, Quasi-square wave is used. High amount of inductance current ripple is desired in this manner that is restricted the maximum achievable managed by this method and current collective among the modules, total power is increased based on the quantity of modules. Advantage of this circuit is total current ripple was minimized and increased efficiency for low to intermediate load [1]. Fixed-frequency restricted three-phase DC-DC LCL-type series resonant converter with incorporated boost function is future for middle to great power applications with broad input voltage difference is typical of alternate energy sources. In this circuit component stresses decreases because of parallel connected LCL-type resonant bridge inverter modules and also predetermined frequency control of output power achieved, input voltage is boosted [2]. Thermal pressure investigation of the modular multilevel converter and in operation are provided and proposes a thermal matching advance, which is embedded in the capacitor voltage-balancing algorithm. Thermal balancing is to attain related pressure distribution with the special sub-modules to improve the lifetime.The joint temperatures in the special sub modules are considered for HVDC applications [3]. This type of converter overcomes the fine voltage gain and getting more amount of efficiency during the broad choice of operation voltage with connecting full-bridge mode and a half-bridge mode operation during each switching cycle. A fixed-frequency phase-shift control system is planned with normalized voltage gain to the load. In case of broad range, maintain less conduction losses [4]. The DC Micro grid connected with Renewable energy sources and energy storage system [5]. Hardware implementation of solar based DC-DC converter for inductive load application [6] Regenerative braking concept for electric vehicle enhanced with bidirectional converter [7] Power reliability with photovoltaic system [8] control of GSO method based on HPFC using an interconnected hybrid power generation

systems [9] interleaved boost converter combined with switched capacitor for the low power application [10] Different control techniques for interleaved DC-DC converter [11]. The proposed converter's block diagram, operation of the circuit, speed and Torque wave forms are discussed in this paper.

2. BLOCK DIAGRAM OF PROPOSED SHUNT MOTOR DRIVE

Figure 1 shows block diagram of proposed Shunt motor drive circuit. In this diagram input voltage is getting from solar panel, output side connected shunt motor drive. PID control circuit and Artificial Neural Network control circuit is control the full wave converter.

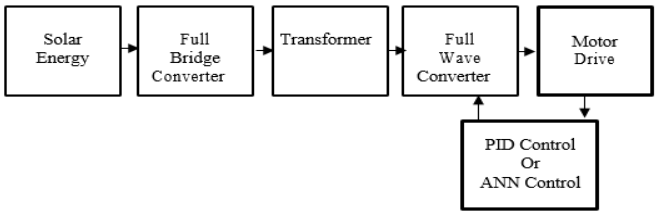

Figure 1. Block diagram of proposed shunt motor drive

3. PROPOSED ANN CONTROL CIRCUIT FOR SHUNT MOTOR DRIVE

Figure 2 shown in circuit diagram of closed loop DC-DC converter using ANN control circuit for Shunt motor drive. From solar panel some DC voltage is present that voltage applied to the first converter, single PWM circuit is controlled to the first converter of the circuit. Full wave converter is connected secondary side of transformer then connected ANN closed circuit.

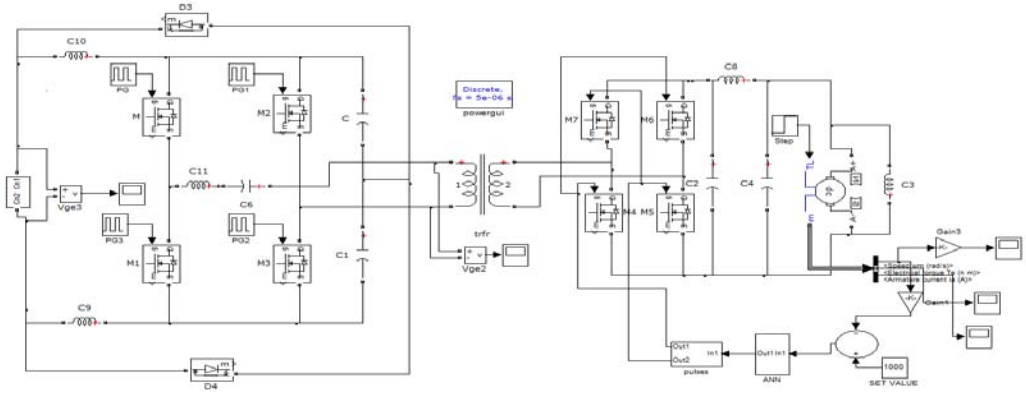

Figure 2. ANN control circuit for shunt motor drive

In Figure 2 source side some DC voltages are present from a solar panel initially turn on the switches M and M3 after some time turn on the switches M1 and M2, like full bridge converter is present. So, this converter connects AC voltage that voltage applied to the step-up transformer this transformer is stepup the AC voltage that transformer output voltage is passed to the load side converter. In the load side Converter M5 and M7 is triggred afterthat switchs M6 and otherswitch are triggred from this converter DC voltage is present. Filtered this DC voltage in a∏ filter circuit then DC voltage applied to the shunt motor drive.

Shunt motor drive circuit is forming the closedpath with ANN control circuit. Based on ANN control circuit pulses producing; this pulse triggered to the load side converter and generates output voltage to that shunt motor run at constant speed.

Figure 3 indicate the input voltage of the proposed circuit. In the waveform nearly 125 voltages is from solar panel circuit that will be move to the sourse side converter.

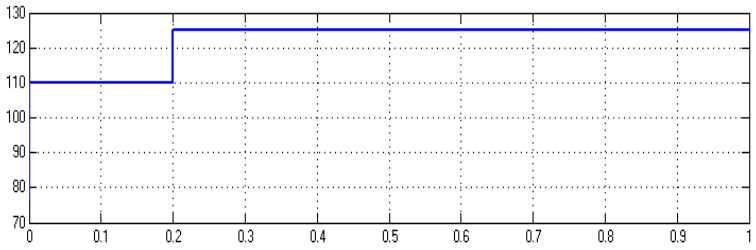

Figure 3. Input voltage of a proposed circuit

Figure 4 indicating speed of the motor. In this diagram motor runs at 1000 RPM (constant speed) with help of ANN control closed circuit.

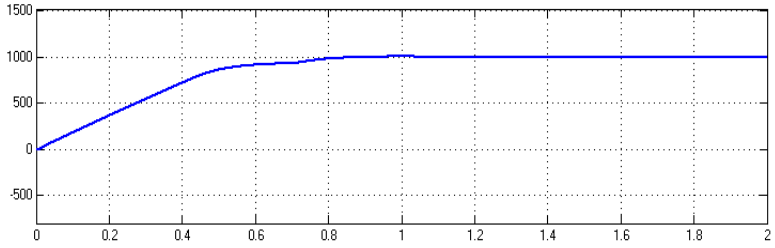

Figure 4. Speed of the motor

Figure 5. Indicating Torqueof the motor and Figure 6 indicating arumature current of the motor.

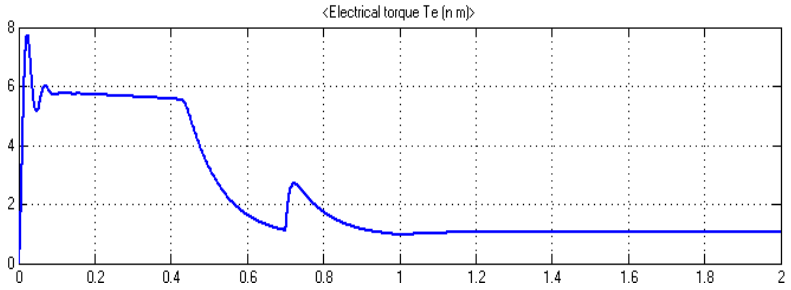

Figure 5. Torque of the motor

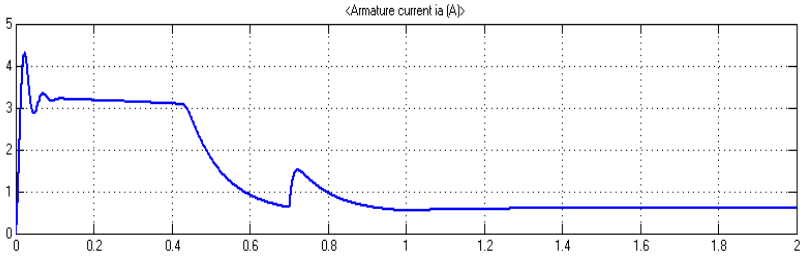

Figure 6. Arumature current of the motor

4. ANALYSIS OF SOLAR BASED CLOSED LOOP DC-DC CONVERTERS

Analysis of solar based closed loop DC-DC Converter using PID control and ANN Control for Shunt motor drive was done. The readings are noticeable in the Table 1. In the PID controller circuit rise time is 0.05 is present and the same time Artificial Neural Network Control circuit rise time 0.82 present likewise peak time and settling time also noticeable. The analysis is shown in Figure 7.

Table 1. Experimental result

Controllers	Rise time (S)	Peak time (S)	Settling time (S)	Steady State Error (RPM)
PID Controller	0.05	0.24	1.3	10
Artificial Neural Network Controller	0.82	0.02	0.6	0.9

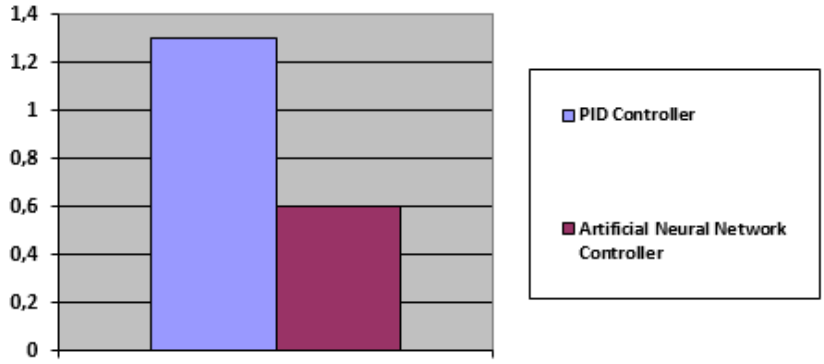

Figure 7. Analysis of settling time

5. CONCLUSION

The analysis of solar based closed loop DC-DC Converter using PID control and Artificial Neural Network for shunt motor drive is simulated. Solar panel output is given to full bridge converter, stepup transformer, full wave converter, ∏ filter and Shunt motor drive are connected. Settling time of PID control is high as compared to Artificial Neural Network control circuit. This circuit operation and simulation designed for a 1000RPM speed of shunt motor arrived and tested.

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