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Modelling of Wind-PV Hybrid System using PSO MPPT Technique

Kota Srinivasa Rao[1] | M. Veerabadrarao[2]

[1]PG Scholar, Department of EEE, Sri Vani School of Engineering, Chevuturu, Vijayawada, Andhra Pradesh, India.
[2]Assistant Professor, Department of EEE, Sri Vani School of Engineering, Chevuturu, Vijayawada, Andhra Pradesh, India.

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ABSTRACT

This paper proposes an idea of grid associated air conditioning connected stand-alone half and half vitality framework. For the most part, in this paper Wind and PV frameworks go about as essential power sources. This paper likewise demonstrates the data with respect to power administration procedures between stand-alone mixture frameworks relying upon the heap request. Molecule Swarm Optimization calculation is utilized for boosting the produced power in view of MPPT usage. The dynamic conduct of the proposed display is inspected under various working conditions. Sunlight based irradiance, temperature and wind speed information is accumulated from a grid associated, 28.8kW sun based power framework situated in focal Manchester. Ongoing estimated parameters are utilized as contributions for the created framework. The proposed model and its control system offer a legitimate device for brilliant grid execution advancement. The proposed half and half framework is tentatively checked in Matlab/Simulink.

Keywords: *Power Management, Wind, Solar System, Fuel Cell and Sliding Mode.*

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I. INTRODUCTION

Increased demand of sustainable power source into power grid brought forth a few difficulties those are knowledgeable about coordinating such sources among themselves and in addition with the grid. In spite of the fact that the vitality got from such sources is condition agreeable, the power and voltage acquired from such sources shifts haphazardly with the variety of climate. Besides, non-direct power converters, utilized for molding the yields from such sources, contorts the waveform and henceforth debases the nature of dispatched power subsequently influencing touchy burdens associated with the grid [1]. Weariness of petroleum derivatives, their perilous effect on condition and an expanding power request brings about an expanded usage of sustainable power sources into the utility grid.

An interconnected Wind, PV and Electrolyzer based Hybrid system is proposed in this paper for effective power management. In this, solar power generator acts as a primary making systems which to satisfy the features of non-conventional resources.

II. CONFIGURATION OF PROPOSED HYBRID SYSTEM

Figure 1, shows the schematic diagram for proposed hybrid system.

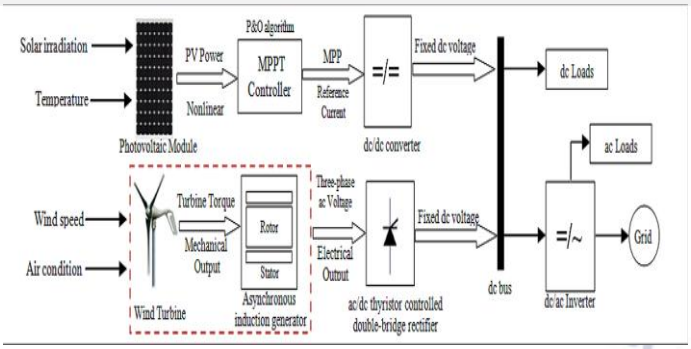

Fig 1: Basic architecture of Hybrid System

Solar System:

In photovoltaic (PV) system, solar powered cell is the fundamental segment. Figure 2 appears at a protection yield power trademark bends for the PV exhibit. It can be seen that a most extreme power point exists on each yield power trademark bend [5-8]. The Figure 3 demonstrates the (I-V) and (P-V) qualities of the PV exhibit at various sun oriented forces.

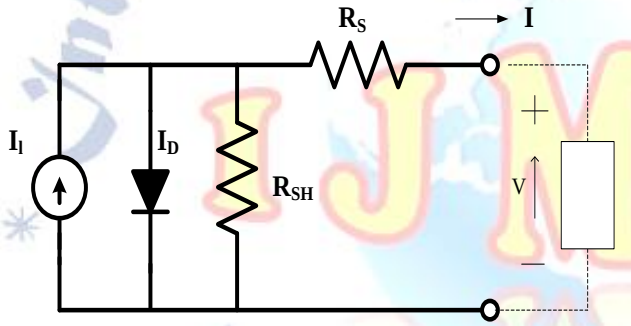

Figure 2: Electrical Equivalent circuit for PV Panel

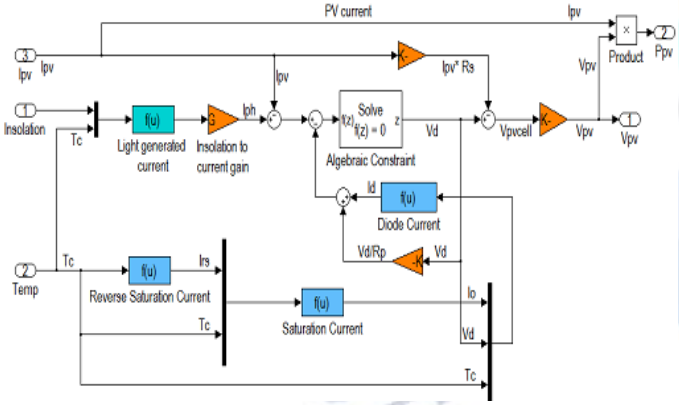

Figure 3: Control Diagram for PV System

III. PSO MPPT TECHNIQUE

PSO is a bio motivating computing tool. It is developed based on the activities of birds, fish, and other animals. Who are psychiatrist and electrical engineer. It is a robust stochastic marketing technique based on the movement and intelligence of swarms. PSO applies the concept of social conversation for problem solving. There are numerous of particles in this algorithm which move around in space to search for the best or optimum value.

Velocity function

$$Vi(k+1) = Vi(k) + t1i(Pi - Xi(k)) + t2i(G - Xi(k))$$

FLOW CHART OF PSO ALGORITHM

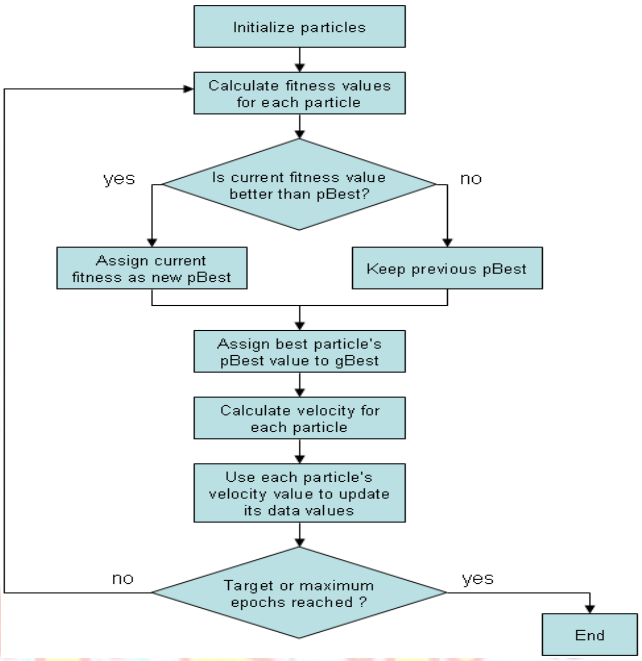

Figure 4: Algoritham for PSO MPPT7

WIND TURBINE:

Wind Energy system plays a key role in non-conventional power sources, as we know, wind turbine converts Wind energy to mechanical energy and from that it converted to electrical energy with the help of Generators. The group of wind turbines called as wind form. The wind generator system using SCIG is shown in physique 5 & 6.

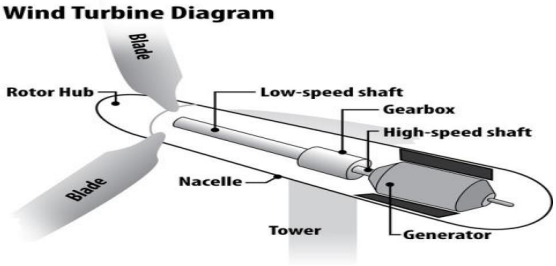

Figure 5: Basic Wind Turbine System

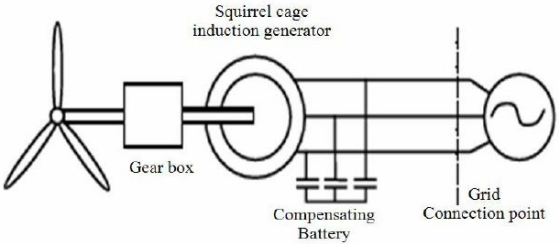

Figure 6: SCIG based WES

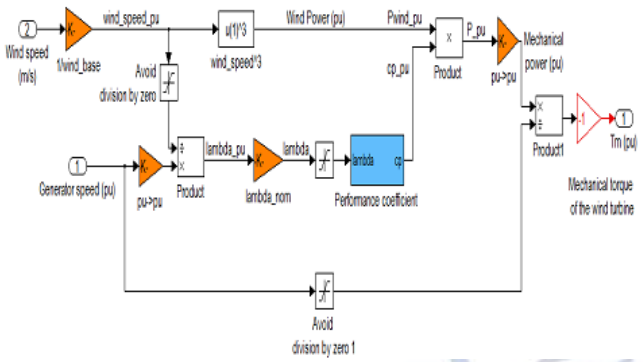

Figure 7: Implementation of Wind Turbine System

Control Structure:

The control structure for inverter in proposed hybrid system is shown in Figure 8. It is used to control the power obtained from the combined sources based on load requirement. Reference signals required for this control circuit is generated from grid and hybrid system parameters.

$$P_{net} = P_{wind} + P_{PV} - P_{load}$$

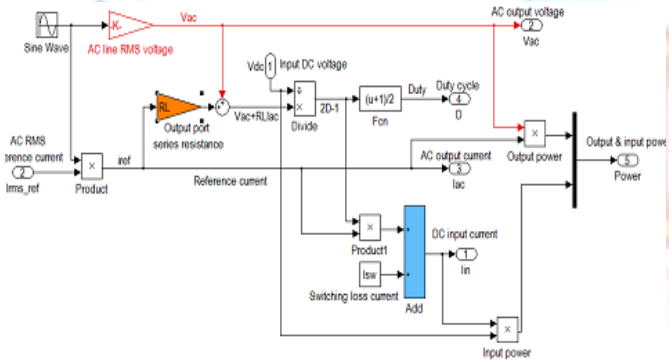

Figure 8: Hybrid System Proposed Control Strategy

IV. SIMULATION DIAGRAM AND RESULTS

The proposed system as shown in figure 1, is experimentally tested by using Matlab Simulink.

Case 1: With P & O MPPT

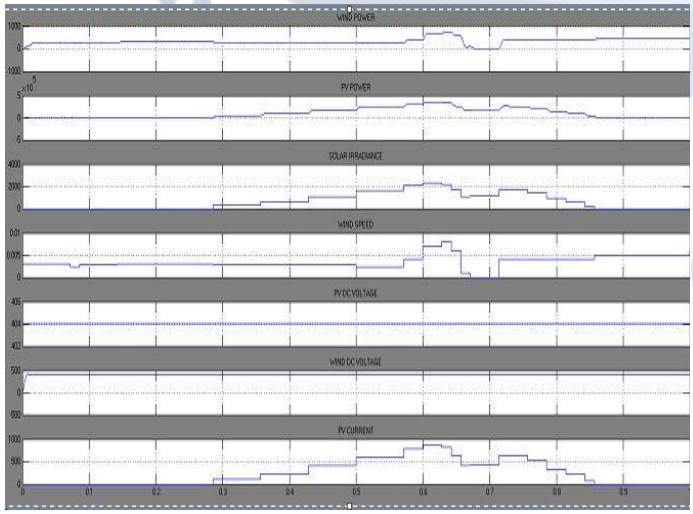

Figure 9: Simulation waveform for Hybrid System with P&O MPPT technique

Figure 9 shows the various simulation results measured from proposed hybrid system such as, wind and PV based system with P&O MPPT technique.

Case 2: With PSO MPPT

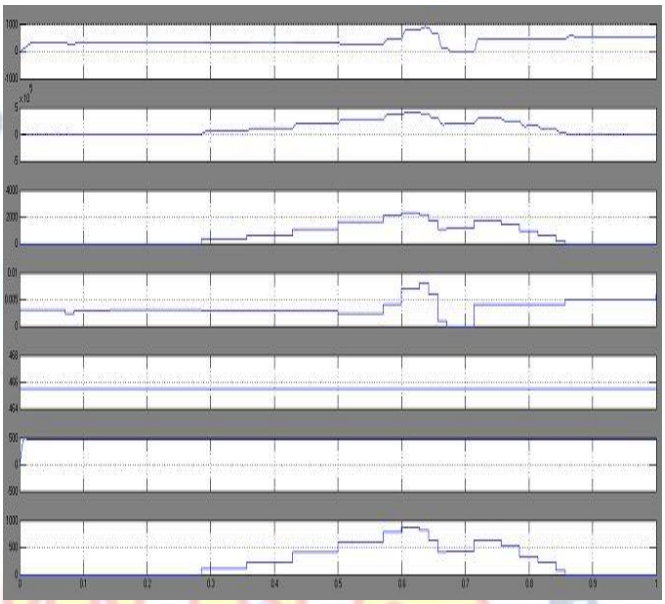

Figure 10: Simulation waveform for Hybrid System with P&O MPPT technique

Figure 10 shows the various simulation results measured from proposed hybrid system such as, wind and PV based system with PSO MPPT technique.

V. CONCLUSION

A novel wind-pv based hybrid system is proposed in this paper for smart grid applications. The proposed PSO MPPT algorithm comprises the system components and also balance the power flow. The available power from the PV product is highly reliant on solar radiation. To overcome this lack of the PV system, the PV module was included with the wind generator system. And the suggested system i. e PV & Wind systems are implemented with PSO MPPT technique in order to increase the system performance. The dynamic behavior of the proposed model is analyzed under different operating conditions.

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