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IMPROVED DYNAMIC CURRENT HARMONICS AND A REACTIVE POWER COMPENSATION SCHEME FOR POWER DISTRIBUTION SYSTEMS

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Abstract— This proposed project active power filter performance for renewable power generation system. An active power filter implemented with a four-leg voltage-source inverter using a predictive control scheme is presented. The use of a four-leg voltage-source inverter allows the compensation of current harmonic components, as well as unbalanced current generated by single-phase nonlinear loads. Improved dynamic current harmonics and reactive power compensation scheme for power distribution systems with generation from renewable sources has been proposed to improve the current quality of the distribution system. A detailed yet simple mathematical model of the active power filter, including the effect of the equivalent power system impedance, is derived and used to design the predictive control algorithm. The compensation performance of the proposed active power filter and the associated control scheme under steady state and transient operating conditions is demonstrated through simulations and experimental results.

Keywords— **Four Leg Voltage Source Inverter, Reactive Power Compensation.**

I. INTRODUCTION

Solar energy originates in the depth of the sun. The sun endures a continuous stream of thermonuclear explosions as hydrogen atoms used into the helium atoms. We encounter the resultant energy as radiation that strikes of the surface of the earth. Solar panels converter this solar radiation into useful to electrical energy and store them in batteries for the use of various purposes and enough the solar radiation strikes the earth every day to meet earth's energy needs for an entire year. Solar panels help us to harvest this energy and it is convert into [1][2] usable energy to meet the everyday needs of modern life.

II. PRINCIPLE OF POWER GENERATION

The principle of power generation behind the solar cells consists of the utilization of the photovoltaic effect of semiconductors.

When such a cell is exposed to light, electron-hole pairs are generated in proportion to the intensity of the light. Solar cells are made by bonding together p-type and n-type semiconductors. The negatively charged electrons move to the n-type semiconductor while the positively charged holes move to the p-type semiconductor. They collect at both electrodes to form a potential. When the two electrodes are connected by a wire, a current flows and the electric power thus generated can be transferred to an outside application [3].

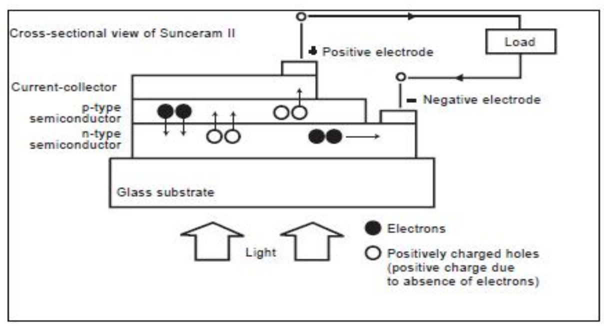

Fig 1 : Operating Principle

2.1 Solar Cells

Solar cells are devices that convert light into electricity, but they do not store electric power. In addition, since the actual amount of power produced varies depending on factors such as the installation conditions and location, as well as the weather, there are a few requirements which must be borne in mind when designing a system. One of the properties of semiconductors that makes them most useful is that their conductivity may easily be modified by introducing impurities into their crystal lattice.

2.2 Wind Power System

Wind power is a clean, renewable source of energy which produces no greenhouse gas emissions or waste products.

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Production of electricity by means of wind mills has been around for a long time.A wind turbine is a device that converts kinetic energy from the wind into electrical power. A wind turbine used for charging batteries may be referred to as a wind charger.

III. BLOCK DIAGRAM DESCRIPTION

3.1 Block Diagram

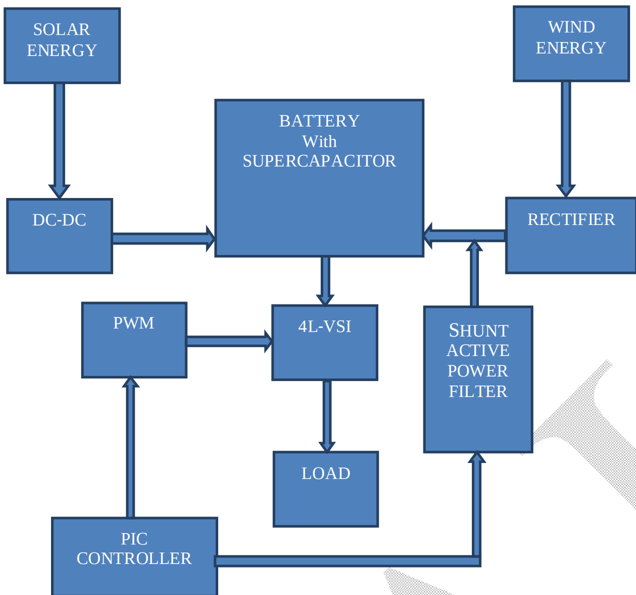

Fig 2. : Functional Block Diagram

Fig 2 shows the functional block diagram of proposed system. The solar power is generated by number of solar panel or solar array, which generate DC power. The DC power output is given to DC-DC Converter which convert the variable DC input power into fixed DC output power. The fixed DC output power is given to Battery storage with Super capacitors, it stores the energy DC output power [4].

The Wind Power is generated by wind mills, which generate the AC output power. The output power is given to rectifier which converts the AC input power into DC output power i.e. fixed DC output power. The fixed DC output power is stored in Battery storage with Supercapacitors.PIC Microcontroller used to controls the PWM and shunt active power filter. The PWM is used to generate the gate pulse to the 4L-VSI.

IV. SIMULATION OUTPUT

In this system normal active filter is used for inverting purpose. We can get the power from renewable energy resources. So that power quality problem will occur. There is no exact PWM method is used to overcome the power quality problem.

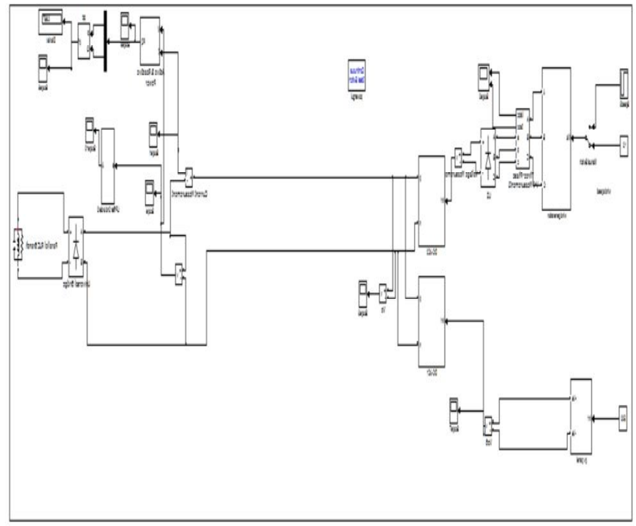

Fig 3 : Normal System Simulation Diagram.

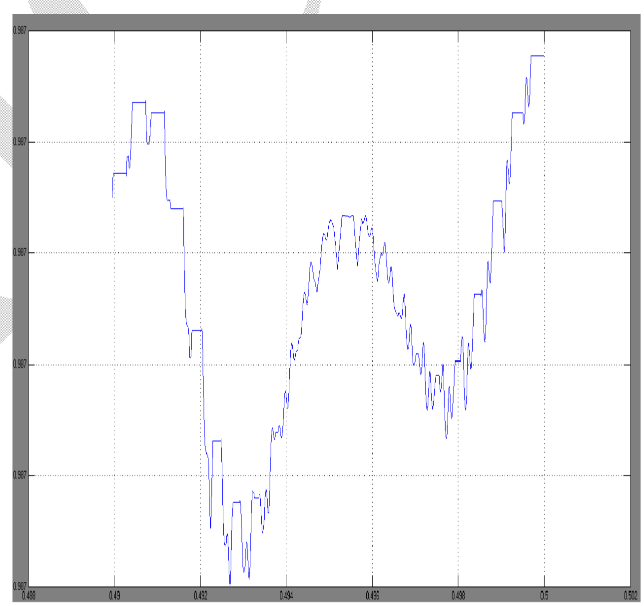

Fig 4 : Simulation Output

4.1 Proposed system

In our proposed method we are using improved dynamic current harmonics and a reactive power compensation scheme for power distribution systems with generation from renewable sources has been proposed to improve the current quality of the distribution system. The use of a predictive control algorithm for the converter current loop proved to be an effective solution for active power filter applications, improving current tracking capability, and transient response.

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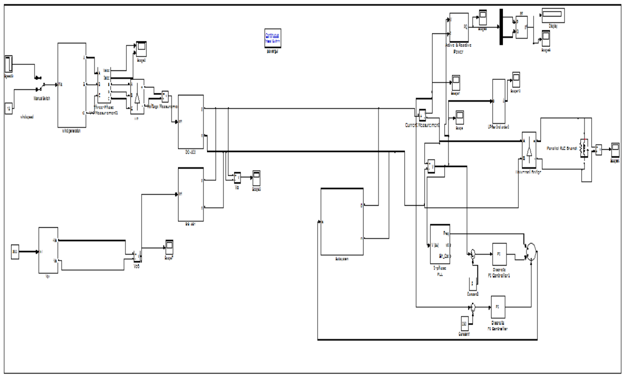

Fig 5 : Proposed System Simulation Diagram

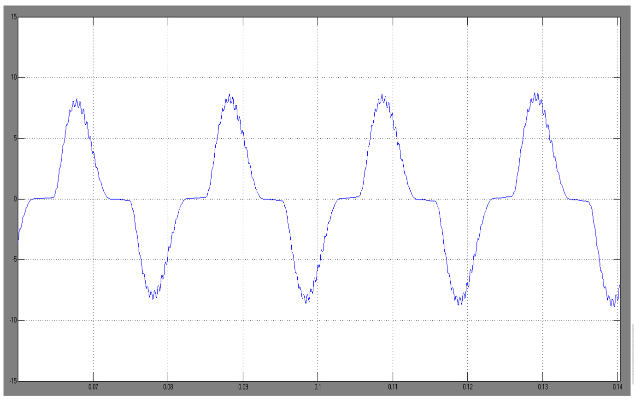

Fig 6 : Filter Output

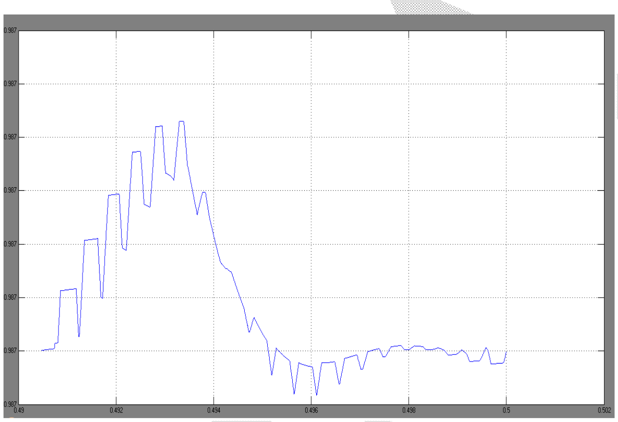

Fig 7 : Proposed Output

V. CONCLUSION

Improved dynamic current harmonics and a reactive power compensation scheme for power distribution systems with generation from renewable sources has been proposed to improve the current quality of the distribution system. Advantages of the proposed scheme are related to its simplicity, modeling, and implementation. The use of a predictive control algorithm for the converter current loop proved to be an effective solution for active power filter applications, improving current tracking capability, and transient response. Simulated and experimental results have proved that the proposed predictive control algorithm is a good alternative to classical linear control methods. The predictive current control algorithm is a stable and robust solution. Simulated and experimental results have shown the compensation effectiveness of the proposed active power filter.

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