

A REVIEW ON POWER QUALITY IMPROVEMENT OF HYBRID SYSTEM

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ABSTRACT-

Power quality issue is a biggest problem in today's life. The power consuming is increased day by day. The reduction in amount of fossil fuel and cost of electricity are increased. Which are responsible for us to move towards the renewable sources? Consumer always prefers good quality of power. The quality of power can be measured by voltage sag, harmonics and power factor. We use hybrid system to get the good quality of power as well as reduce the tariff of electricity. The hybrid system has problems of protection, synchronization and power quality but here we are discussing about power quality.

KEYWORDS— component; Off grid; Power quality; Solar PV panels; Wind energy; hybrid system etc.

I. INTRODUCTION

Hybrid means the combination of two or more energy sources. Due to shortage of fossil fuel and to get rid of air pollution we are moving towards the renewable energy sources (RES). There are many energy sources present solar, wind, tidal, geothermal etc. India is a one of the developing country in the world. The growth of the population is increasing the electricity demand. To meet the need of electricity we are moving towards the hybrid system. Solar and wind are the easiest available sources. Solar and wind both do not effect environment and maintains is also less. Many industries and customer have equipment which has power sensitivity equipment. Therefore it is important to study the power quality. Hybrid Renewable Energy sources (HRES) system is shown as in fig.1. In power quality there are power factor, threshold current, threshold voltage etc. Here we are concerning on power quality of hybrid system

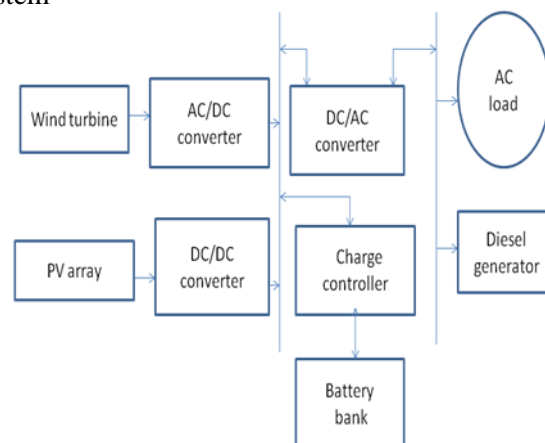


Fig 1.1: Block diagram of Hybrid system



Fig.1.2: PV/wind/battery/diesel generator HRES

II. DESIGN OF SURVEY

Power qualities are power frequency variation, voltage fluctuation, harmonic current or harmonic voltage variation, long duration of voltage variation (under voltage, over voltage) and short duration (sag), noise etc. The Power quality is gaining importance because new equipments are sensitive to power and new equipment of power electronics creates new disturbance.

The harmonic current induced by diesel generator in the transmission line can be reduced by the help of D STATCOM. We can reduce the harmonic current by PQ theory with the help of hysteresis loss current algorithm. STATCOM is used for voltage stabilization in wind energy system and also used for harmonic filtering. It is commonly used for stability purpose. The D STATCOM is used for reduction of THD value of current reduced up to 3.21% with hysteresis loss current algorithm with the help of MATLAB simulation. [1] In this model, inductive active filtering is used for the improving of power quality. It improves the power quality of public grid and also the power system connected to it. The inductive active filtering is stop to harmonic component to flow into the primary winding of the transformer. In this we are using the MPPT technique and battery energy storage for making the system more reliable and which is not dependent on atmospheric condition. We use inductive filter transformer and FT branch for improving power quality. The output of hybrid system is reduction in harmonics from 20.26% to 4.53% of source current and also the sag reduction produce due to fluctuation. Its application is in supply of power system. [2]

The novel control of interfacing inverter is used to compensate load reactive power, current unbalance, and harmonic distortion to active power injection from renewable energy sources. It enables the grid to work at unity power factor. In this fuzzy and PI controllers are used to reduction of harmonics. Fuzzy controller gives better result. It reduced THD 3.32% of source current and PI controller give 4.37% of source current. Also source voltage THD of fuzzy is up to 0.48% and with PI up to 1.05%. The fast response is given by the fuzzy controller. [3]

The custom power device also plays a vital role in enhancing the power quality of hybrid system at point of common of coupling. In custom power device STATCOM, DVR, UPQC etc. came. It improves the power through custom power park. [4]

In this circuit, author has observed that the power quality improvement using Facts is better than without use of fact devices. Fact devices are used for reduction in harmonic current and also in the voltage. When the non linear load is present then the harmonics are introduce in the system. we can regulate it by use of fact devices. The THD of current source without use of fact device is 9.49% and with the help of fact device is 4.39%. [5]

The high gain integrated cascade boost converter is used on PV side and MPPT tracking performance has less ripple current and this paper also deal with the voltage regulation of battery converter. Micro grid voltage source converter (VSC) is used and it perform some function a) feed the generated active power in proportion to irradiation of grid b) load balancing c) reduction of current harmonics due to non linear load. In this reduction of harmonic current and less ripple of current is taken in consideration. The value of current with the help of micro grid VSC is reduced up to 2.06%. [6]

Authors are focused on the power factor improvement and also the current harmonic reduction. We use transformer less hybrid active power filter for power quality improvement. Transformer less hybrid power filter is used for making power factor unity, reactive power compensation and mitigation of harmonics. It reduces the THD value of source current from 9.02% to 3.08% at no load.

And when the load is present and varies then THD will be 3.78% by MATLAB SIMULATION. From this DC capacitor voltage is also reduced. [7]

The hybrid system is of wind and diesel with intellectual controller. A new technique is used Modified Elman Neural Network (MENN) for pitch angle control of wind turbine. It increases the MPPT of sun tracking and also reduces THD of grid. And it gives fast response for controlling the real power. Comparison of PI based STATCOM and with MENN of grid. MENN gives better result for THD reduction i.e. 1.47% and with PI is 2.92%. It gives more efficiency and better transient response. It gives stable response even under disturbance conditions. [8]

Wind diesel hybrid system using bacteria foraging optimization is used for controlling the excitation and input power of synchronous generator. PID controller is used as input power controller. This is very effective in frequency as well as in harmonic reduction. Frequency controller is used for controlling frequency and also power control. Large variation in frequency we can see when controller is not applied. PID with bacteria foraging optimization gives better performance than simple PID. THD and frequency is recorded by MATLAB simulation. Through this technique we can almost control all parameter such as active and reactive power requirement, load terminal voltage, frequency and harmonics. [9]

Premium Power Park (PPP) is used with custom power devices and spot network configuration helps in power quality improvement by mitigation of voltage. Proposed PPP is PPP with custom power devices and controllers. Proposed PPP is more reliable than conventional PPP. Proposed PPP provide unlimited voltage sag and unlimited voltage imbalance. It provides compensation, voltage regulation as well as harmonic voltage variation. With the help of using D STATCOM we can reduce THD of source voltage from 25.9% to 2.77 %. It shows different level of power quality for conventional, sensitive and critical customer. [10]

The main motive is to reduce harmonic and provide better quality of power. Here we use hybrid active power filter is used to compensate reference current base on fast Fourier transform. Hybrid filter is used with fuzzy and PI controller for getting the THD better. In this voltage source inverter topology is used for compensating ac balanced non linear load and dc supplied by dc link compensator is present. The main objective is to show artificial conventional controller (FLC) is better than conventional (PI). THD of FLC is 1.18% and PI is 1.27%. [11]

The combination of PV, cell system, winds energy, fuel cell and battery system. To meet the demand of consumer during the variable conditions of nature we integrated some sources and converter. But here we use motor generator model. Excess energy is converted into hydrogen for later use in fuel cell. In this PLC and HMI is used for power quality improvement. It ensures that the system will provide continuous power supply and reliable supply to the load. It provides the voltage, speed, frequency in acceptable range. PLC and HMI provides effective control on power system. It provides optimum utilization in all the atmospheric condition [12]

The main objective is to reduce current harmonics in balanced and unbalanced condition. In this we use fuzzy (FLC) and PI controller for analyze the behavior of shunt active power filter for mitigation of current harmonics in both conditions. And also to check which give us better result. In balanced conditions fuzzy controller and PI both have same conventional characteristics. But in non linear conditions FLC gives better result it is shown by MATLAB simulation. For unbalance source voltage in normal load PI controller have THD up to 6.80% and with increase in load THD up to 7.55%. For unbalance source voltage in normal load FLC have THD up to 5.86% and with increase in load THD up to 6.14 %. FLC have less THD than PI. And FLC output is in triangular shape. [13]

The unified power quality conditioner (UPQC) is used to compensate voltage sag, harmonic and voltage interruption. Its main advantage is that it is used for deep voltage interruption. And power factor is also improved. It can also improve the power quality at point of installation in power distribution system with fast Fourier transform. UPQC gives best result in reduction of harmonics. It reduce source current THD from 23.44% to 0.16 %. [14]

Unified power quality conditioner left (UPQC- L) is used for load balancing, power factor correction, voltage and current harmonic reduction. In this unit template technique is used to get reference current with series active power filter and shunt active power filter. In this the comparison of UPQC-L with UPQC-R is held. UPQC-L provides voltage dip and dc voltage regulation. The source current THD reduces from 29.16% to 4.69%. And source voltage THD from 2.16% to 1.94%. It gives better performance. [15]

Hybrid filter is used with instantaneous power theory which shows instantaneous power in time domain. Hybrid filter mean one in series and other in shunt. Comparison of both with filter and without filter is carried out which give better result. THD when filter is not present then 18.13% is present and with filter at 0.1s is 6.14%.and when increase the time 0.2s THD is 2.43%. Non linear load draw harmonic current and power theory with time domain is more effective. [16]

PV based dynamic voltage restorer (DVR) is used to handle voltage sag and swell otherwise work as uninterrupted power supply when utility grid fails. DVR used where nominal and supply voltages are different. In this dc-dc boost converter, PWM source inverter, series injection transformer and semiconductor switches. In this comparison is done with DVR waveform of voltage and without DVR voltage waveform. Better result is from with DVR waveforms. [17]

Active power filter is used with Neuro-fuzzy controller. Active power filter is used in parallel with c type high pass filter. C type high pass filter gives better resonance maintains. And active power filter reduce the harmonics present in the system. The THD without use of filter is 29.09% and with use of filter is 1.02% at variable load. [18]

Shunt active controller are used with most important control strategy with real and reactive power method for extracting reference current. Hysteresis controller technique is used for reduction of harmonics. At different power factor we see the value of THD of current harmonics at balanced and unbalanced load. The value of source current THD at different load is 2.09% at 0.439s. [19]

Fuzzy based PID and PI comparison takes place. Fuzzy based PID regulates reactive power. Hybrid system is used here is wind and diesel. Due to change in reactive power and voltage stability occurs. Auto tuned fuzzy logic based PID proposed have steady state value with less settling time and unpredicted load change. Proposed give better result than PI conventional. Fuzzy based PID has shown improvement in settling time and in overshoot. [20]

This paper main objective is to develop and analyze compensation characteristics of cascade multilevel inverter. It is used with shunt active power filter with indirect current algorithm. Due to this algorithm we can generate reference current and phase shift disposition with pulse width modulation. Due to this we can reduce harmonic current THD to 2.93%. We here compare different level of inverter 5 levels, 7 levels and 9 levels inverter. THD value of 9 will be better than THD of 5. [21]

III. CONCLUSION

Hybrid is the best solution for meeting the demand of coming years of electricity. As in future reduction of fossil fuel are diverting us to move towards renewable. This literature survey gives complete knowledge about power quality technique used for hybrid sources system. Through this we can take an idea for which factor we want to compensate

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