

Power Quality Improvement in Microgrid

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Abstract: This paper discusses on the power quality issues which occurs in the power system and there solutions based on power electronic components various types of power filters are used the increased problem in power network regards to power quality this has taken awareness by power engineers to build a solution to this problem the component design to overcome the power quality problem are filters and are also called as power line conditions are able to satisfy current and voltage harmonic, voltage harmonic, relative power regulated terminal voltage, suppress flicker and to improve voltage balance in 3 phase system they can satisfy several harmonic orders and not be affected by major difference in network characterises and removing the risk of resonance between filters and network impedances the major discussion is on series shunt and hybrid.

Key words:- Power quality improvement, shunt power filter, series power filter, hybrid power filter etc, microgrid etc.

I. INTRODUCTION

Power: power is the combination of current and voltage. Power is one of the major dependences in the world, increasing in world population the generation & distribution side the consumption varies so the quality of the power gets affected. some of the conditions or reason where the power quality is been affected due to lightning, over load, short circuit, and some abnormal conditions, they are some major problems occurs during transmission of power supply these problems leads to power losses in large amount due to this there is a slight downfall in economy and there is an add in burden to the generation stations so to avoid the burden we use renewable energy like solar, wind, hydro. It produces small amount of electricity to contribute to the generating system. As far as the recent UN submits the contribution of fossil fuels (non-renewable resources) should be used less and the usage of renewable energy sources should be high in terms of power generation. To this all the world nations have come up in contribution in world power with the use of renewable sources and reduce in the pollution and they are trying to pollution free earth. The main goal of the distribution's centres is to supply uninterrupted power supply to make this possible we see the various problems like voltage sag, voltage spike, harmonic distortion, voltage unbalance etc.

II. PROBLEMS OCCURS IN POWER QUALITY

1. Voltage sag: - in an electric circuit when the charge is flowing then there is a sudden drop in voltage at short period of time this is called voltage sag, voltage magnitude reduces in short interval of time and its efficiency would be reduced 10% to 90% of the input voltage this problem is occurs by the natural phenomena like lighting, abnormal conditions, human and animal activity and by the switching operations.
2. Voltage swell: - in an electric circuit when the charge is flowing then there is a sudden increase in voltage at short period of time this is called voltage swell, it is a dead opposite to the voltage sag here the voltage is increased to the maximum level due to this the current will be in minimum position this will damage the equipment at continues use this can caused by sudden switch off the loads as well as switch on the capacitor banks.
3. Long interruptions: - in power system when the insulation of the system is failed and the relays did not find the fault and so do the interruption in other cases it occurs due to the miss management of the network power and its design so the interruptions occur the best examples are block outs.
4. Harmonic distortions: - in power system the variation in the sinusoidal wave form that is called harmonic distortion, when a variation in the load its impedance is changed and in affects the electronic component, and the electronic components get heated and the input and output of the supply and thus the harmonics is applied in the output.
5. Voltage unbalance: - in power system when there is a sudden variation in the load thus causes the voltage unbalance in the grid, the supply input is low compared to the required output supply.
6. Voltage fluctuation: - in power supply when the usage of load is higher than the supply voltage given thus cause the voltage gets dipping when load is continuously used the fluctuation in the system occurs.
7. Voltage spike: - spikes is the flash in voltage which increase in it occurs when the sudden load change in grid.

III. METHODOLOGY

Power is very important for day today life, growing in terms of technology power quality is placed a major role in the upgraded system we use in our day today life might be in industries or home appliances power quality at resent times placed a vast role performance and efficacy.

Power used by the home appliances in the resent times in the technology which is used. The quality of power is very much required so that there wouldn't be any disturbance in there working and in performance

In the side of industries, we use the large numbers of machinery that only operate in terms on KV so in case of that we have to draw a suppurate supply line so that there would not be any interruption in supply in case of any shutdown because this is the one of the important areas in which counties economy is been built.

The problems occur in power quality of power are listed above we should try as much as possible to the problems power quality occurred due to its problems related to power quality.

IV. SOLUTION TO POWER QUALITY

There are two methods to control the power losses the main reasons that affect the power quality that is load conditions in which components are less sensitive and can operate under low voltage. The other method is condensing the system that prevents the disturbance in the power system and rectifies it. These methods are based on PWM converts which converts low and medium voltage distribution system in series or shunt power filter performs one or more task to improve power quality

1. Shunt power filter:-

shunt power filter reduces the current harmonic by supplying opposite harmonic but equal amount of current through it this filter acts as current source supplying to the harmonic equipment created by load the phase shift is 180° this can be applied to all the different types of load with constrain to their harmonic supply, with suitable control scheme the active power filter can equalise the load power factor the shunt power filter is shown in figure 1 below.

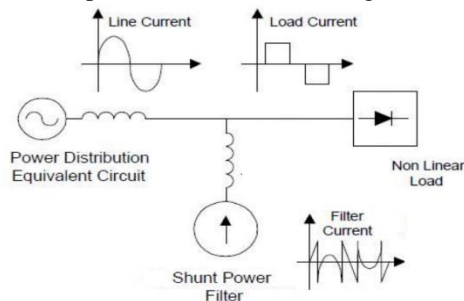


Figure 1: characteristics of shunt power filter

2. Series power filter

Its familiar that series power filter the current disturbance caused through non liner load through high impedance the current harmonics pumps in high current to pass through

inductance and capacitance passive filter which is parallely connected to load high impedance supplied by series power filter is provide by same voltage frequency generated by current harmonic equipment that should be removed the figure 2 shows the series power filter.

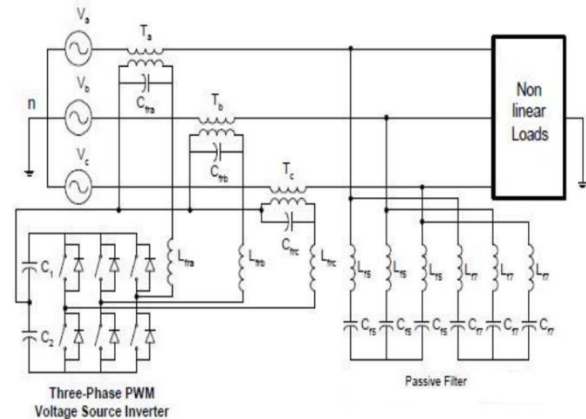


Figure 2: series power filter.[1]

3. Hybrid power filter:-

Power filter used with passive filter improves the loss characteristics in passive filter and avoid chance of generation in series or parallel resonance in figure 2 if passive filters are not connected, series power filter can justify voltage regulation and voltage unbalance if passive filters are not used in figure 2 it cannot justify current harmonics equipment's.

Another way to merge compensating the passive and active power filter by combing active filter series with passive filter as showed in figure 3. This significantly is improved by passive filter, the produced voltage harmonics exponents through the primary winding in series transformers, the forced power harmonics produced by load which is passed through passive filters alternative to power distribution system. The load power factor is control is forced to higher voltage over filter capacitor. The type of configuration is very suitable for high power median voltage non-linear load.

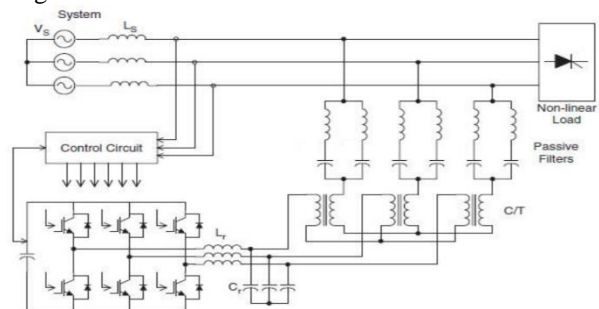


Figure 3: The configuration of hybrid power filter.[8]

V. SIMULATION MODELLING

The example is for the shunt filter to reduce the harmonics procreate the source from non-linear load. This model has a standard shunt AF with IGBT inverter, series inductor on ac side and dc energization capacitor. The load has two

diode rectifiers with 30° degree of phase shift. After 10 cycles the delta-star connected rectifier the load changes from 6-12pulse.

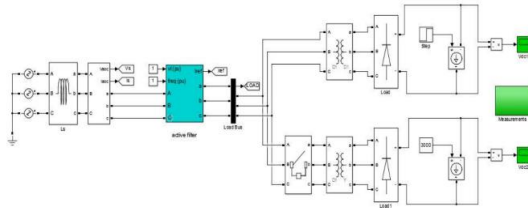


Figure4: Three phase active loads with a non-linear load

VI. SIMULATION RESULTS

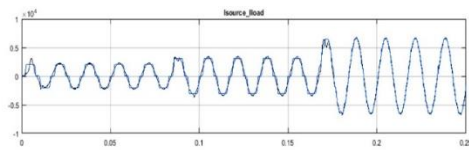


Fig5: Current at source side

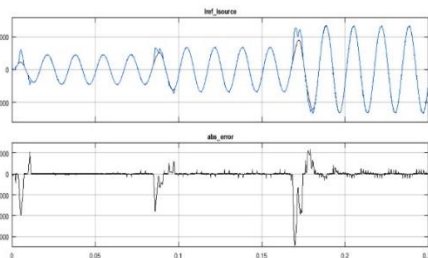


Figure6: Source current

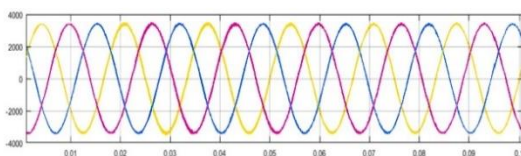


Figure7: Three phase source voltage

Fig 5 shows the reference current at source side, figure 6 shows the source current and in figure 7 three phase source voltage are shown above.

VII. CONCLUSION

The power rectification in power quality by Applying active power filters in distribution system has been presented. The operation of shunt, series as well as hybrid power filters are been described the simulation results shows the performance of PWM converters and filters both balance and unbalanced voltages in situation the components correct rapidly form the supply voltage to keep the load voltage balanced to keep stable at nominal value.

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