

Power Factor Improvement and Balance Of Power System with the Help of FACTS Devices and Renewable Energy Source

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ABSTRACT

The balance of Active power and Reactive power transmitting through the transmission line very important for the operation of the power system. mainly then voltage , phase angle and impedance is the three parameters we have control for balancing of supply transmitting through the line . for improvement for this parameters of the line we have to use such s device which improve the power factor of the line and balance the line.In this paper , the FACT device UPFC is use to provide controllability on line and and also to balance amount of Active and Reactive power level to maintain ing the power factor. also for the imprent of the voltage level and to provide external supply for the transmission line and external supply to FACT device the renewable solar energy also use here. The UPFC is the combination of STATCOM and SSSC I.e. carry advantages of both so, it is beneficial to use improvement of power factor . 3 phase bridge controlled Inverter are use here for the conversion of DC supply to AC to give Booster transformer for mainataning the constant voltage level. the above who'll assembly are of comppnenet which works continuously for maintaiing the balance of power and supply or absorbing through transmission line and try to improve the power factor up to maximum level. the digital filter also impoyed here for regular the constant supply.

Keyword: - UPFC, Digital Filter, STATCOM, SSSC, three phase Inverter.

1. INTRODUCTION

We know that day by day the demand of power from consumer side are increasing and also to fulfill the demand, Generation plant generat the electricity continuesly. Like generation, transfer of the energy also is very important with low loss and maintain constant magnitude. during transmission bthe line are come into contact of various faults and abnormal conditions or due to heavy loading of consumers the balance get loss of the power supply that is reduction of power factor. This power factor is the ratio of Active power to the Apparent power transmitted through the line. but due to some cases the balance of the reactive power get changes. this change of reactive power cause of reduction of power factor and heavy current flow through the conductor. Such heavy current can collapse the power system operation, loss of electricity, overheating of instruments and reduce overall efficiency of transmission line.also to transmit such current large size of conductors are required which instead the capital coast of line and affect the normal working of loads.

So, to balance that Active and Reactive power level through line and increase the power factor and performance here, we are using the FACT device UPFC. this UPFC is the combination of STATCOM and SSSC(static synchronous series compensator). it can be produce the active and reactive power according to requirement of power transmission line. when there is a need of reactive power it can be insert the power into line and whenever extra reactive present in the line then it can absorb it.also in case active power required to the line at that time it can also supply or consume it. Three phase Inverter are use to convert the DC supply from solar panel to give that supply to the filter ,UPFC and Booster transformer.

1.1 Model Description

Solar panel: The light energy from the sun is mostly available renewable energy source . the solar panel contain photovoltaic cell which is made from silicon and it transfer the sun light into electricity.it consist of two silicon cell one positive and another negative and placed under the glass cover. As light beat down at the cell, they knock the electrons. this negative electrons attract permanently on one cell and produce voltage.number of cell produces such voltages and numbers of solar plats are connected on series to generate supply as per requirements. this energy is clean and free from pollution.

Three phase Inverter :The Inverter is a device which convert the input DC supply into variable controlled AC supply.in this Inverter the controlled thyristor are used for the smooth and fast switching operation.this thyristor controlled inverter gives three phase sine wave AC supply at the output end. to produce such supply, a particular switching are use for the operation of the six thyarister. for that also various switching circuit also use.it also possible to change the working of this inverter in various degree.

Digital Filter:Mostly the Filter are use to regulate the any quantity and gives the controlled output.the Digital filter are basically classified into two types that is FIR filter and IIR Filter. the output of FIR filter is depends upon the present input value and previous value of the input and the output of the IIR Filter is always depend upon the present and past value of the input to the Filter.the Filter are impoyed in the power system is to eliminate the unwanted quantities from the supply like frequency that changed than rated frequency, noise, voltage fluctuations etc.

Booster Transformer:The Booster transformer is a static device use to balance the voltage level in the transmission line. It have two winding, one promery is connected to the of the three phase inverter and secondary to the transmission line whose voltage is to be control. If any drop in the voltage séance by the transformer then voltage get induce in the line by viva booster transformer.for a single line one transformer are use.

UPFC:Unified power flow controller is the most promising device in the FACTS. It has ability to adjust the three control parameters i.e. the bus voltage, transmission lone reactance and phase angle between two buses. a UPFC perform this through the control of the in-phase voltage, quadrature voltage and shunt compensation. the UPFC is most versatile and complex power electronics equipment that imerged for control and optimization of power flow in electrical power transmission line. it is combination of STATCOM & SSSC which couple viva DC link to allow bidirectional power flow between series output terminals of SSSC and shunt output terminal of STATCOM. The UPFC is able to control line voltage, impedance, angle, real and reactive power through the line.

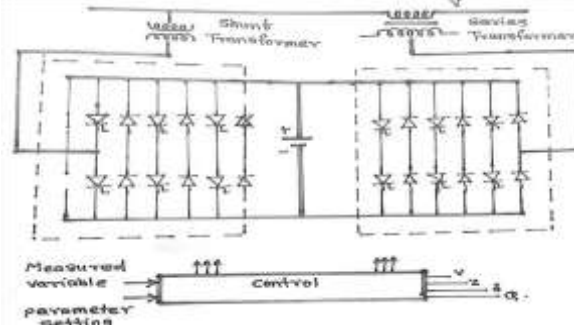


Fig-1:circuit of UPFC

2. WORKING

The solar panel generate electrical energy which continuesly gives to the UPFC, also the shunt capacitor act as a storage device which give the to the both converter-1 and the converter-2 of UPFC.a Booster transformer is connected to the 3- phase alternator and secondary of it connected to transmissions lone which continuesly moniter and induce voltage in it if needed.the most important element is UPFC, if any reduction in reactive power in the line then converter-2 generate reactive power and inject in the line. also if more reactive present in the line then it absorb by the same converter.similarly if active power needed to the line then converte-1 supply the power to line same absorb if more power present in the line. The digital filter is also important part of the power system balance, it the analog current firstly conditioned by it and remove all the unwanted quantities from the line supply like noise, fluctuation and give stable and controlled output supply.

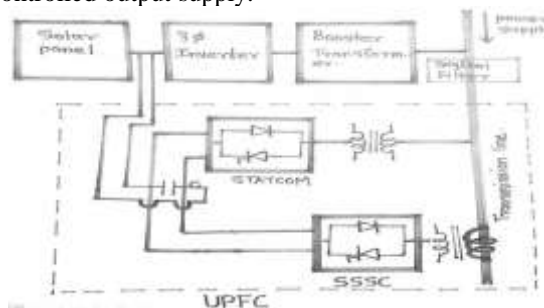


Fig-2 :The assembly of all component for P.F improvement

3. OBSERVATION TABLE:

Table-1: Responding equipment for various parameters

PARAMETER	RESPONDING EQUIPMENT
Voltage	The Booster transformer respond to balance continues to maintain it constant.
Reactive power	Converter-2 of UPFC
Active power	Converte-1 of UPFC
Noise and Pulsations	Digital Filter

4. CONCLUSIONS

From all of above it is conclude that, for the improvement of Power Factor and balance of electrical supply can be achieve by using this design system and can be improve up to certain level during working condition of line.this system respond any change in the line very quickly and try to maintain it.the use of renewable energy also support to UPFC and Booster transformer which is main advantage and give clean operation.the balance and P.F. improvement is can be largely achieve due to UPFC which is combination of STATCOM and SSSC. This system can also improve by using the more digital equipment in future for further achieve the controllability and stable operation of transmission line.

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