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Review Article

COMPARISION OF UPFC AND DPFC

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Abstract

According to recent Survey fast growth of increasing load demand which lead more problems like unbalanced condition on the system and facing improper amount of power requirement at uneven load condition for this there is a need of require to improved the system performance by improving power transfer capability compensation of required power all these task can be done through power electronic based FACTS devices, recent devices from this family are UP FC and DP FC .Here in this paper worked out for the given system by with and without using these devices shown how the performance of the system has been improved by these devices during at balanced and un balanced conditions through Simulink.

Keywords: DPFC . UPFC , VSC ,DC Link , Useful Power , Reactive - Power , Power - Quality

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INTRODUCTION

The Power structure enhancement and improvement in characteristics of the system during abnormal conditions like improper power transfer in the lines , stability and oscillation within the systems all these can be overcomes by mechanical devices with microcontroller during earlier days last few decade devices with components with controlled power electronics based switches called FACTS are come in picture a lot of improvements in the design of connection with the lines like shunt , series facts devices[1] The major objective of this devices is to monitor and vary the specific system parameters in the power structure. This was obtained with the help of converters acts like a regulator in relation between both end power system terminals [2]. The resulting converter delineation can be useful for a different of arrangements. Fundamentally, the group of FACT S gadgets dependent on voltage source converters (VSCs) comprises of an arrangement compensator, a shunt compensator, and a shunt/arrangement compensator. The static Compensator (STATCOM) is a shunt associated gadget that can give reactive power support at a system area far away from the generators [3]. Through this reactive power infuse particle, the STATCOM can manage the voltage at the association hub. The static synchronous arrangement compensator (SSSC) is an arrangement gadget which infuses a voltage in arrangement with the transmission line. Later ongoing devise contain a blend of both shunt and arrangement prompts Unified Power stream controller (UP FC) and Distributed Power stream controller (DP FC) the two Devices worked out for a framework and these are having contrast in execution leve[4]l. Significant contrasts between these depend on the correspondence connect between the arrangement and shunt realities gadgets. In UP FC both Shunt and arrangement are associated through a typical DC connect where IN DP FC through transmission line[5]

Principle and Operation of UPFC

UPFC comprise of two consecutive converters named VSC1 and VSC2, are worked from a DC connection gave by a dc fixed storage capacitor. The placing of these converter purpose is to compensate useful and reactive power requirement by the system. Compensation of reactive power both at load side and source end can be compensate by both converters invidually which are connected one as sereis at load end preferbly and other as a shunt most preferebly at source end real power compensation by sereis converter which supplied by dc side and it was maintained at DC side by the help of parallel converter present at source side. Both of these converters operated by a controllers. Fig 1 shows a line diagram of UP FC[6]

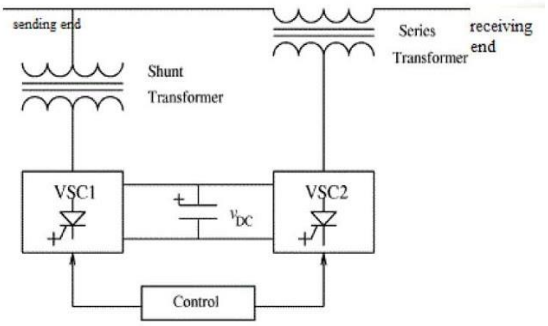


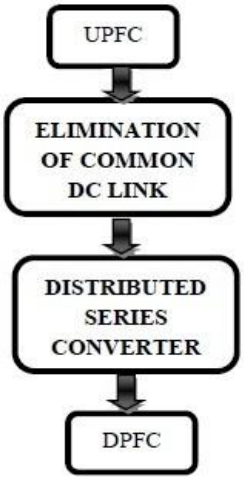
Figure:1 Basic UPFC scheme

PRINCIPLE AND OPERATION OF DPFC

DP FC is a FACTS deivce re modify from UP FC major difference from UP FC is the absence of interlink DC connection between both converters. The link between both converters through tranmssion line with third frequency component. A DP FC contain a shunt and Distributed static series comensators its function also same a UP FC.can compensate active, reactive power besides compensating zero and negative sequence unbalanced currents

Elimination of DC link between the shunt and series converters with the DPFC is illustrated in the flow chart as portrayed in Fig 2. Elimination of common DC line offers greater flexibility to place the series and shunt converters independently. The concepts of employing multiple single-phase converters instead of single three-phase converter of large capacity reduce the rating of the components besides providing high reliability due to redundancy. Here both the converters are having a sperate controllerss and for these the reference signlas are generated by one more controller amed it as central controller[7] The structure of a DPFC in a two bus system is shown in Fig 2.

Flow chart for converting UPFC to DPFC



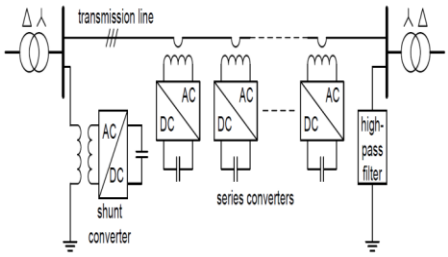


Fig 2: Structure of DPFC

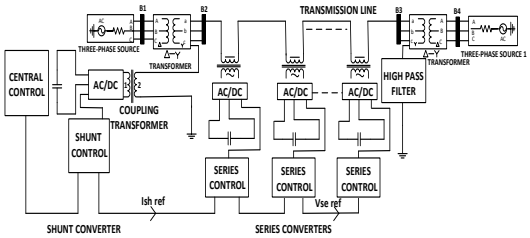


Fig 3: Single line diagram of DPFC

Independent control of current in each phase is possible in DPFC as the series converters are single-phase which can result in both negative and zero sequence compensation of unbalance in currents, monitoring of negative and zero sequence currents from the transmission network and making them zero is possible with the addition of controllers with the existing DPFC. Fundamental frequency componenet of active power is isolated with another frequncy componenet of power componenet.There is no contarints on the passing of active power flow at different frequncy componenet[8].

The reactive power, providing dynamic power required by the arrangement converter is conceivable with the shunt converter which is associated between the line and the ground. DC interface that associates the arrangement converter with the shunt converter in an ordinary UPFC gives the dynamic power traded by sounds and through the AC organize. Dynamic power is characterized as the mean estimation of the result of voltage and current which is the fundamental rule of DPFC

RESULTS AND DISCUSSION

As we consider a system with a three single phase source with a three phase load as per the load the real and reactive power recived at load are 0.637MW and 0.1455 MVAR.shown in fig4

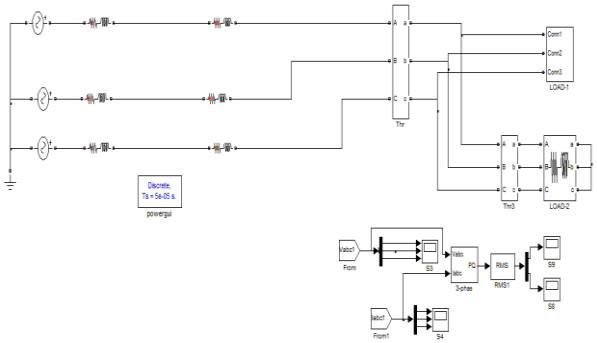


Fig 4 Circuit diagram of system without Facts device

Voltage and current across RL load is appeared in Fig 5 and 6 and its peak to peak value is fundamental rule of DPFC and fig 7 and 8 are real and reactive power for the system without FACTS device.

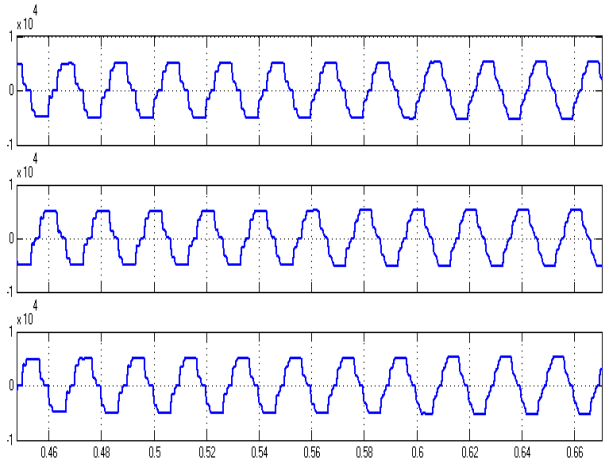


Fig 5 Voltage across RL load

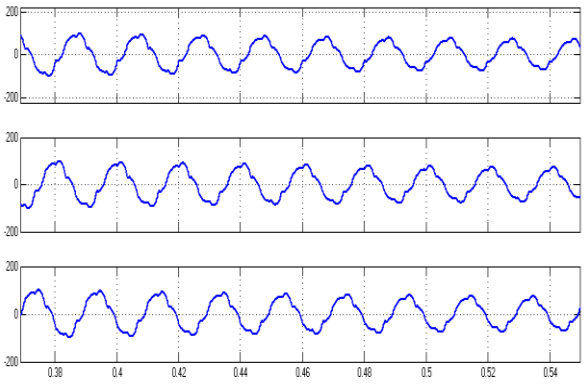


Fig 6 Current through load

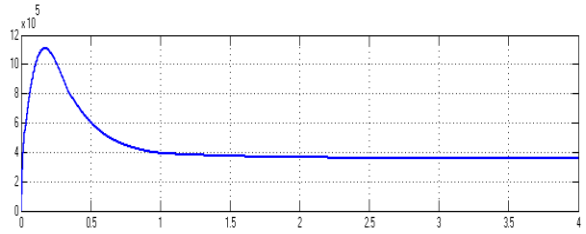


Fig 7 Real power

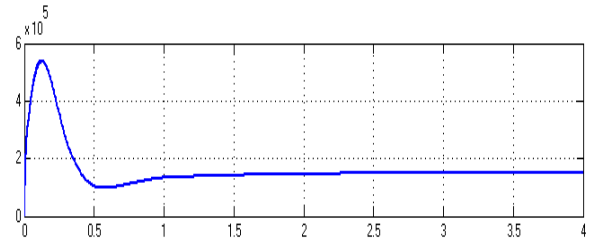


Fig 8 Reactive power

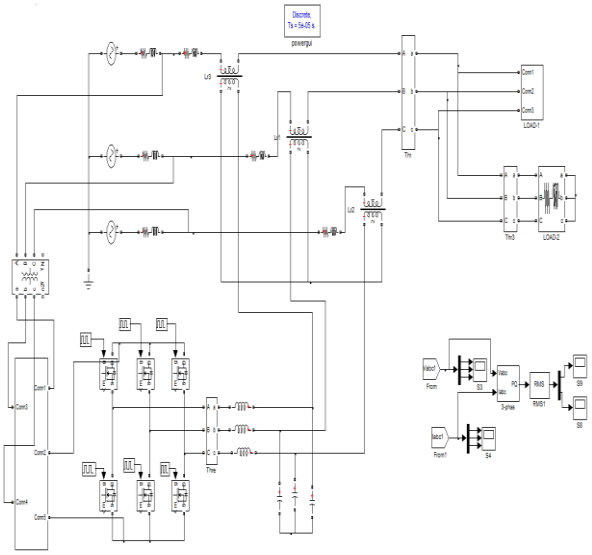


Fig 9 Circuit diagram of UPFC

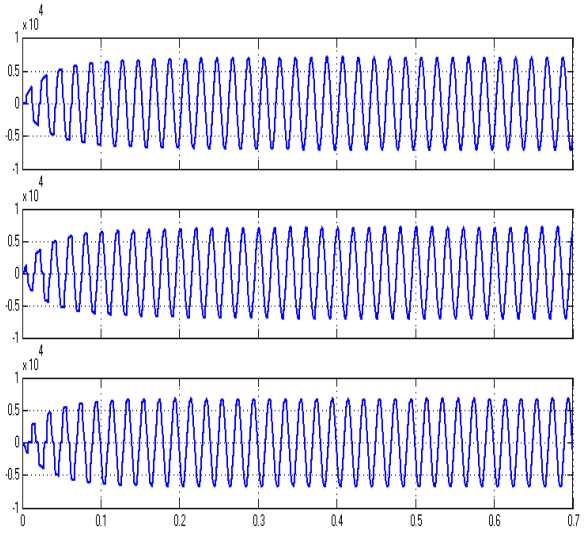


Fig 10 Voltage across RL load

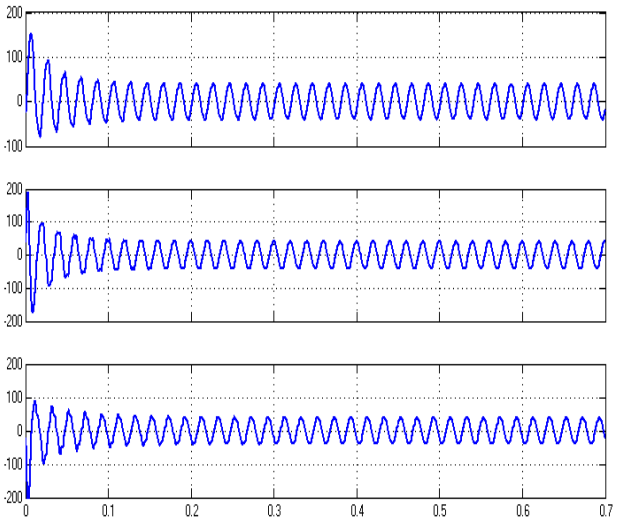


Fig 11 Current through load

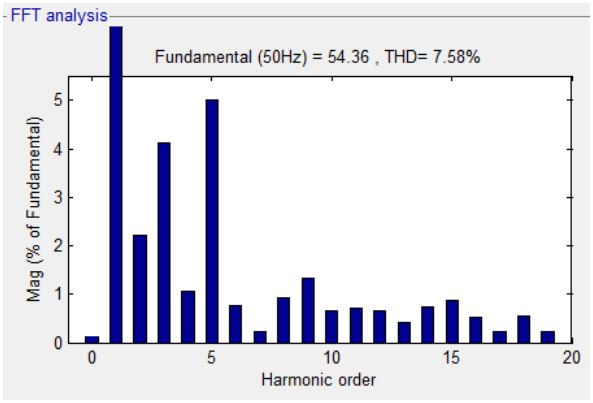


Fig 12 Current THD

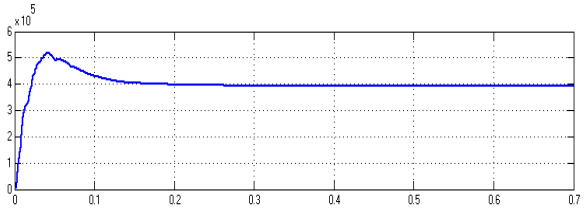


Fig 13 Real power

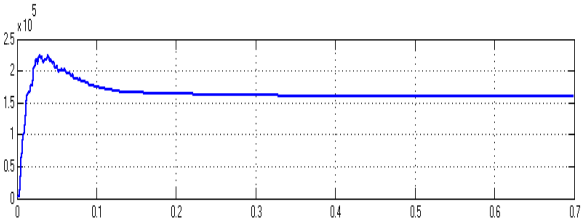


Fig 14 Reactive power

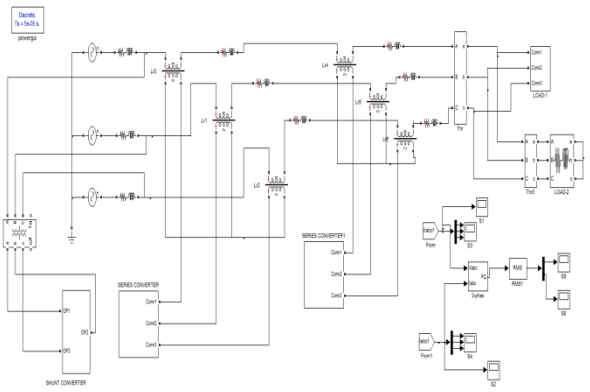


Fig 15 Circuit diagram of DPFC

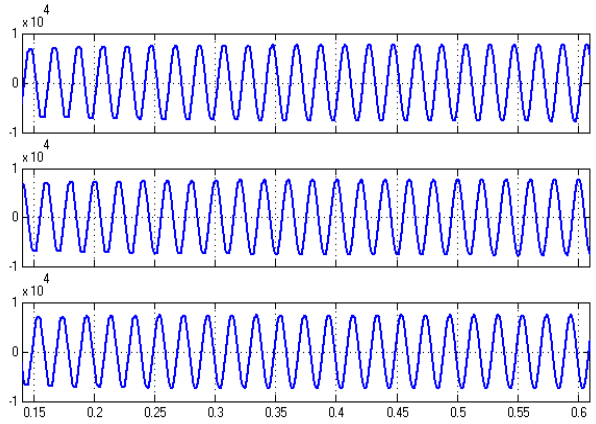


Fig 16 Voltage across RL load

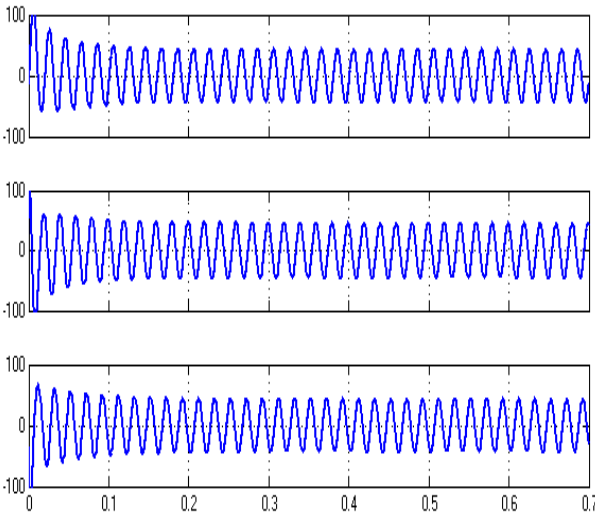


Fig 17 Current through load

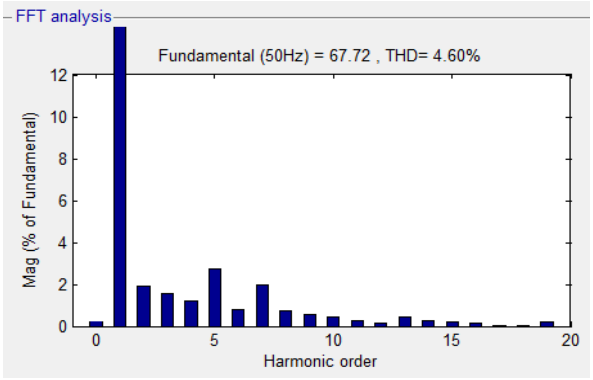


Fig 18 Current THD

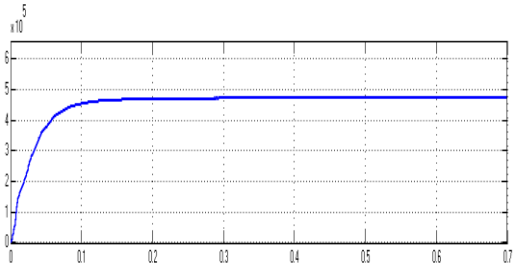


Fig 19 Real power

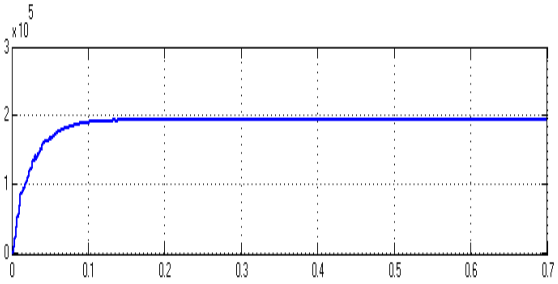


Fig 20 Reactive power

Comparison of output voltage, real power, Reactive Power & current THD is given in Table-2. The comparison of UPFC and UPQC value presented here.

Table -1

Comparison of Real power, Reactive Power & current THD At Unbalanced Condition

CASE	P(MW)	Q(MVAR)	THD
Without Facts device	0.3678	0.1455	12.27%
With Facts device UPFC	0.4015	0.1689	7.58%
With Facts device DPFC	0.4641	0.1957	4.60%

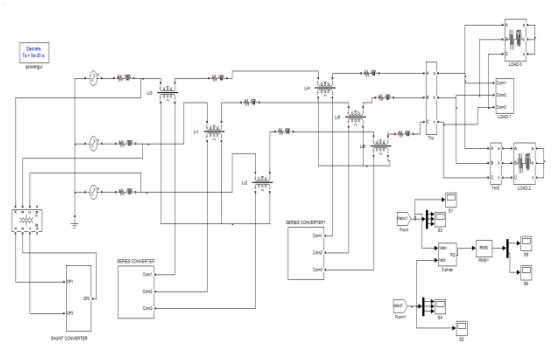


Fig 21 System With DPFC at unbalanced condition

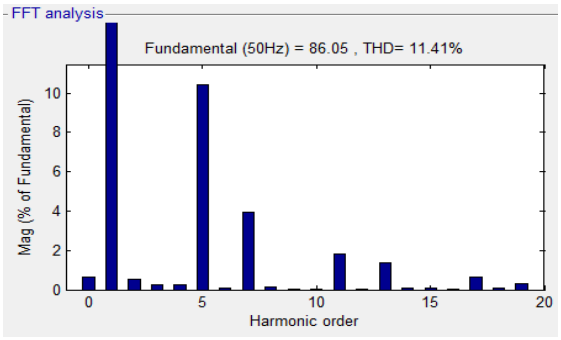


Fig 22 Current THD with unbalanced load

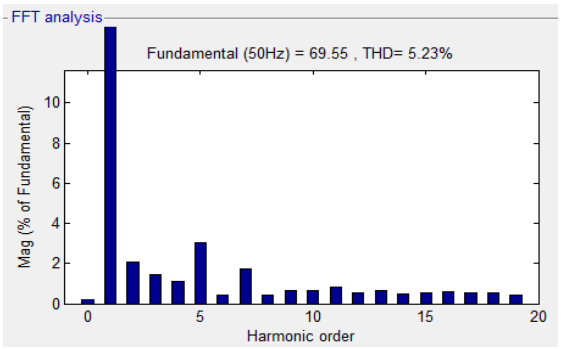


Fig 22 Current THD with DPFC and with unbalanced load

Second case on this work for the given system performance test has be done with system at a given two cases at unbalanced condition with and with out DPFC and the results has been given at table 2

Table 2 Comparison of current THD with & without DPFC

Case	THD
Without DPFC	11.41%
With DPFC	5.23%

CONCLUSION

From the FACTS devices family a comparison is done between the UPFC and DPFC. In the proposed system a comparison is done for two cases case(i) comparison with balanced load case(ii) comparison with unbalanced load. From the table 1 and table 2 clearly it show low THD values for DPFC controller system when compared with without any controller and with UPFC controller.

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