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Improvement of Power Quality in Distribution System using Photovoltaic based DPFC

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Abstract: In Modern Power System power quality is the main issue of the power companies. Improvement of power quality in distribution system using photovoltaic based DPFC is declared in this paper. Flexible AC Transmission System (FACTS) device which is known as distributed power flow controller (DPFC)is used. DPFC is derived from UPFC by eliminating common dc link between series and shunt converter. Unified power flow controller (UPFC) is widely used and control all parameters of the system. The UPFC handle the current and voltage with high rating; therefore, the cost of system is high. Therefore, distributed power flow controller (DPFC) is used due to high control capability, high Reliability & low cost. DPFC also measures the transmission angle, line impedance and bus voltage. In distribution system problems occur like voltage sag/swell, Harmonics etc. Photovoltaic system is used as source for DPFC.
Keywords: distribution system, voltage sag, voltage swell, harmonics.

I. INTRODUCTION

In modern power systems, there is an excellent demand for regulation Active flow of energy. Power flow controlling devices (PFCDs) are required for such a purpose, as the facility The nature of the obstruction results in the flow above the lines Thanks to the different types of control capabilities of each line PFCD, the trend is that mechanical PFCD occurs slowly Power Electronics (PE) is being replaced by PFCD. In all PE PFCD, Unified Power Flow Controller (UPFC) It is The most versatile device.

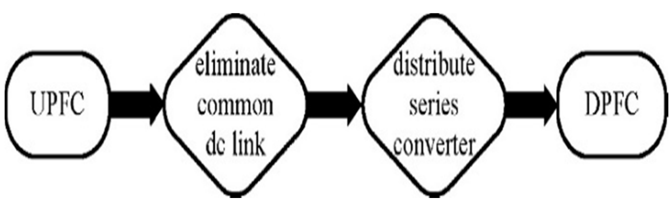

Fig.**1** Flowchart Of UPFC to DPFC

However, UPFC is not widespread Applicable to the utility grid, as is the cost of such a device P.F.C.D. More than the rest of the amount and therefore the reliability is relatively low due to its complexity. The goal The thesis is to develop a replacement PFCD that offers equivalent control capability as UPFC, with low cost and increased reliability. New device, the so-called distributed Power Flow Controller (DPFC) has been invented and introduced This thesis. DPFC may be a further development of UPFC. DPFC General D.C. inside. Removes the link To enable independent operation of UPFC, shunt and Series converter. The de-facts concept is used Design of series converter.

Multiple low-rating single face Converters replace the high-rating three-phase series Converter, which greatly reduces the value and Reliability. Active power by which not accustomed to exchange The usual DC link within UPFC, has now been transferred by Transmission line at 3G harmonic frequency. DPFC Modelling has been done during the rotating DQ-frame. Supported by this model, basic control of DPFC has been developed.

The required control stabilizes the capacitor DC voltage range of each converter and ensures that the converter injects the voltage. Compatible with the command from the center in the network Control. The shunt converter gives the current running injections 3rd harmonic frequency, when stabilized by its DC voltage Basic frequency component. For category Refer to the output voltage on the converter The default frequency is received from the central controller And the DC voltage level is maintained by the 3rd harmonic component

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II. DPFC PRINCIPLE

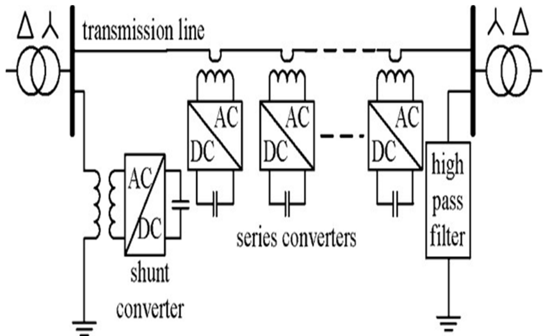

Fig.2 DPFC Configuration

Two methods are used in UPFC to enlarge a file reliability and cost reduction. They are next. First,
removing the normal dc connection of the UPFC and the second distributes the series converter, as shown in Figure 1. By combining the two approaches, the new FACTS device— DPFC available. DPFC contains one shunt and is connected in several series converts. The shunt converter is similar to STATCOM, while the series converter uses the D-FACTS concept, applying multiple changes of one category instead of one a large converted converter. Each converter within the DPFC is independent and has its own DC capacitor to provide required DC voltage. DPFC configuration is displayed in Fig. 2. Apart from the essential elements, the shunt and series converters, DPFC also requires a very high-quality filter is shunt connected to the other side of the transmission cable, and Y - two □□transformers on each side of the line. The different control power of the UPFC is provided by back-and-forth connections between the shunt and the series converters, allowing active power to be exchanged freely.
Ensuring that the DPFC has the same regulatory powers as these UPFC, a method that allows for the exchange of active energy among converters with dc link removed is the initial requirement.

III. DPFC CONTROL

To control most translators, DPFC has three types of controllers. They are a central controller, a shunt controller and series control as shown in Fig. 7. Shunt and series Controls are local administrators and are responsible for maintain their conversion limits. In the middle Control oversees DPFC operations in the power system level.

A. Central Control

The central controller makes reference signals for both shunt converters and DPFC series. Focused on DPFC functions at the level of the energy system, such as energy flow control, suspension of low-frequency power oscillation, and measurement of unmeasured parts. According to system requirement, central control provides compliance signals-reference to the conversion power of a series and active current signal of the shunt converter. All reference features produced by central control is basic usually.

B. Series Control

Each series converter has its own series controls. Controllers used to store the power of its capacitor converter using third-harmonic frequency components and to produce a series of basic frequency voltage that is determined by central control. Third - harmonic usually to control a large control loop with DPFC a series of conversion controls. The principle of vector control issued here to control dc-voltage. Third - harmonic the current through the line is selected as the rotation reference single phase transition frame, because it is easy to be captured by loop-Locked loop (PLL) in Converter series. As the current line contains two frequencies components, a third filter for high throughput is required to reduce current basic. The d-element of the third harmonic voltage parameter used to control dc power, and its reference signal is generated by DC-voltage control loop. Reducing the work capacity caused by third harmonic, series converter is controlled as resistance to a third harmonic multiplication. Part of the third harmonic power is kept at zero during operation. Since the series converter is a single phase, it will be dynamic ripple side dc per converter. File frequency of the explosion depends on the current flowing current through the converter. As the current contains the basics and a third of the harmonic frequency, the dc-capacitor the voltage will contain frequencies of 100-, 200 and 300-Hzpart. There are two possible ways to reduce this ripple. Another is to increase the conversion rate of a single-phase converter of the series converter to reduce the current size flowing to the converter. Another way is to use DC capacitor with larger capacitance.

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C. Shunt Control

The purpose of the shunt control is for continuous third injection the current harmonic in line to provide the effective power of series converters. Currently the third harmonic is locked with bus power is usually basic. PLL is used capture the bus-voltage frequency and output phase signal of PLL is tripled to create a visual rotation Reference frame for the third harmonic component. The shunt Controlling the basic frequency of conversion aims to inject a control currently operating on grid and storage capacitor DC voltage at continuous level. Basic control the frequency components have two cascaded controls. The current controller is an internal control loop, i.e. Adjust the current shunt to the default frequency. Then-part of the reference signal of the shunt converter obtained from the central controller, and the d-component is designed to control dc.

IV. POWER QUALITY IMPROVEMENT

The program contains a three-stage source linked to the file load of nonlinear RLC with parallel transmission lines (Line 1and Line 2) of the same length. DPFC placed on transmission line, to which the shunt converter is connected transmission line 2 parallel to the third Y-□ phase converter, and series converters are still distributed on this line. Imitating dynamic performance, a third stage error considered near the load. The error time is0.5 seconds (500-1000 milliseconds). As shown in Figure 8, aa significant sag of power is visible at the time of the error, except for any compensation. The sag voltage value is about 0.5 per unit. After adding DPFC, the voltage sag load can be reduced successfully.

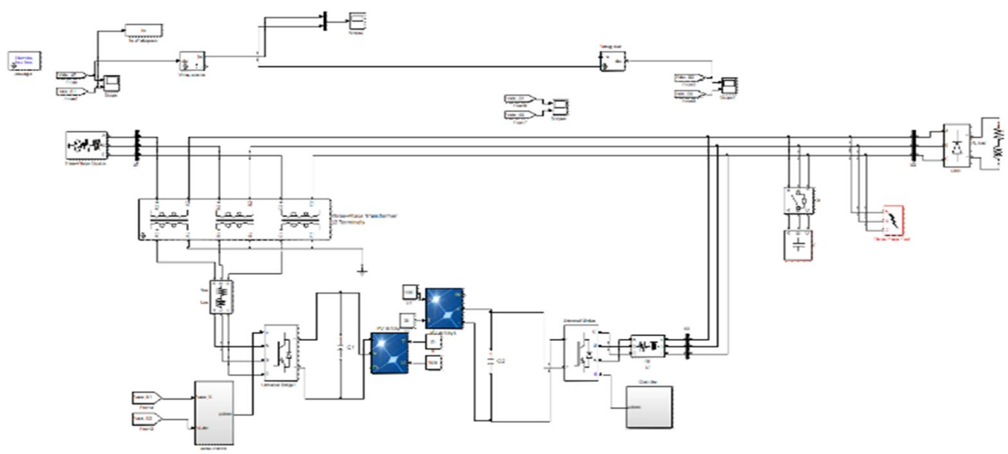

Fig.3 Simulation model

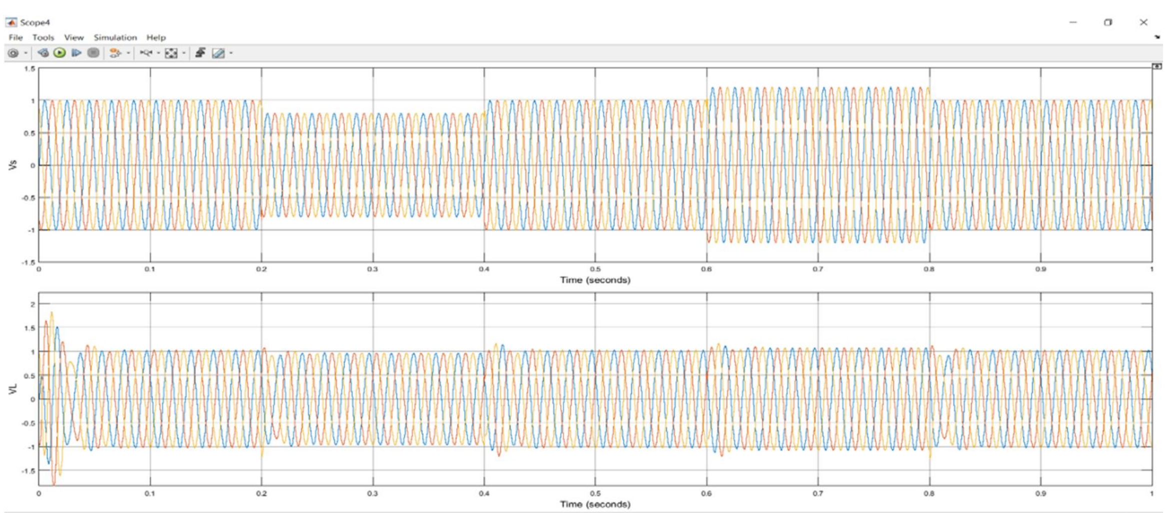

Fig.4 Source and Load Voltage without DPFC

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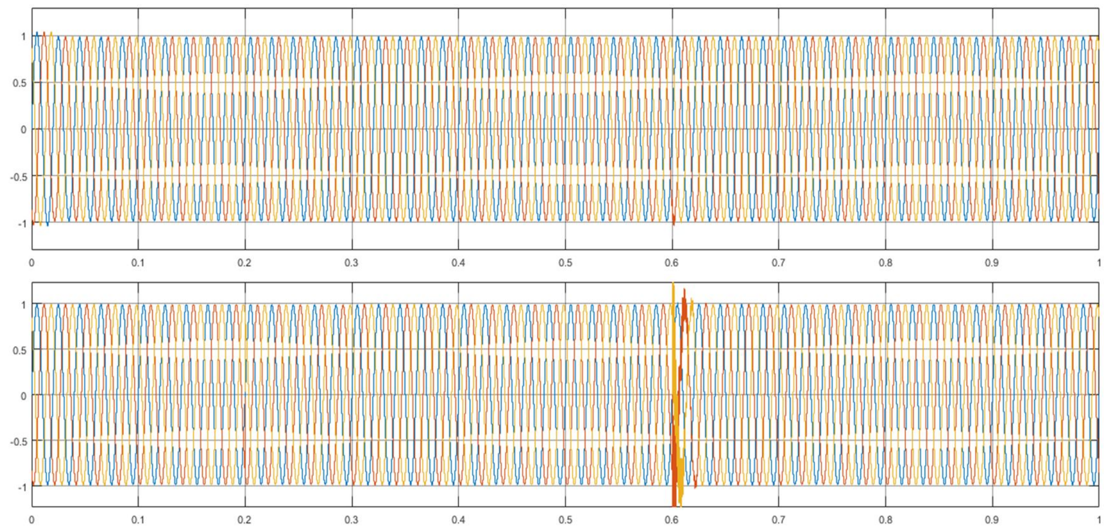

Fig.5 Source and Load Voltage with DPFC

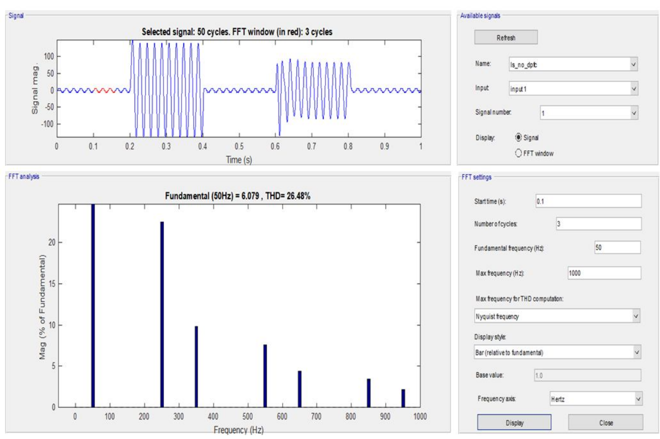

Fig.7 Harmonics withot DPFC

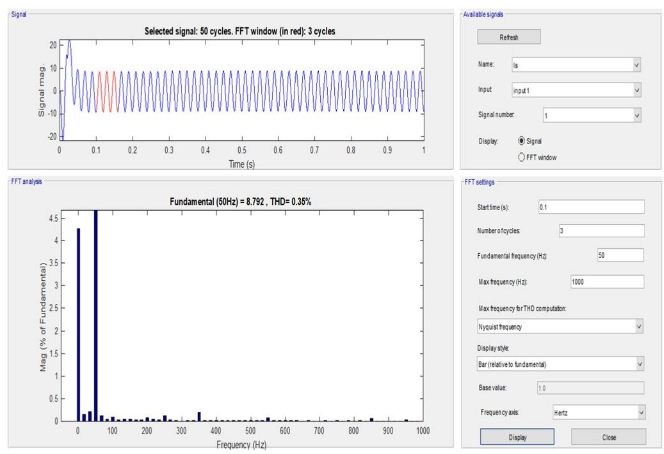

Fig.7 Harmonics withDPFC

V. CONCLUSION

The basic control of DPFC is done according toa powerful model. Basic control stabilizes capacitor DC voltage for each converter and confirm that the translators inject the cables into the network according to the order from the central control. The the shunt converter enters the current every 3harmonic frequency, while its DC voltage is stabilized the basic part of frequency. Series converter, reference power output to the basic frequency is found in the remote-control and level of DC voltage is maintained by 3harmonic components. Control parameters of basic control is determined. Both the model and the basic control is guaranteed in MATLAB Simulink.DPFC is used to reduce low frequency power oscillation is under investigation. DPFC used to wet internal oscillatory mechanisms. Because DPFC can simultaneously configure three system parameters, namely bus voltage, line impedance and transmission angle, the size of the three POD controls can be used in one DPFC. Within the concept, POD the controller is designed to use the residual mode and the two-dimensional network is used in the case study. From the imitating, it can be seen that the DPFC could change three critical oscillatory mechanisms simultaneously. Therefore, it can be concluded that DPFC has the same power such as the UPFC of thermal energy. Using DPFC to compensate for asymmetry he learned. Due to the active energy exchange between shunt converters and series, DPFC can compensate for the effective and efficient asymmetry in basic frequency. Moreover, from the series a single-phase converter, DPFC can do it compensate for zero and negative sequences parts. As such, DPFC is currently at the forefront flexible asymmetry compensation device among all FACTS devices.

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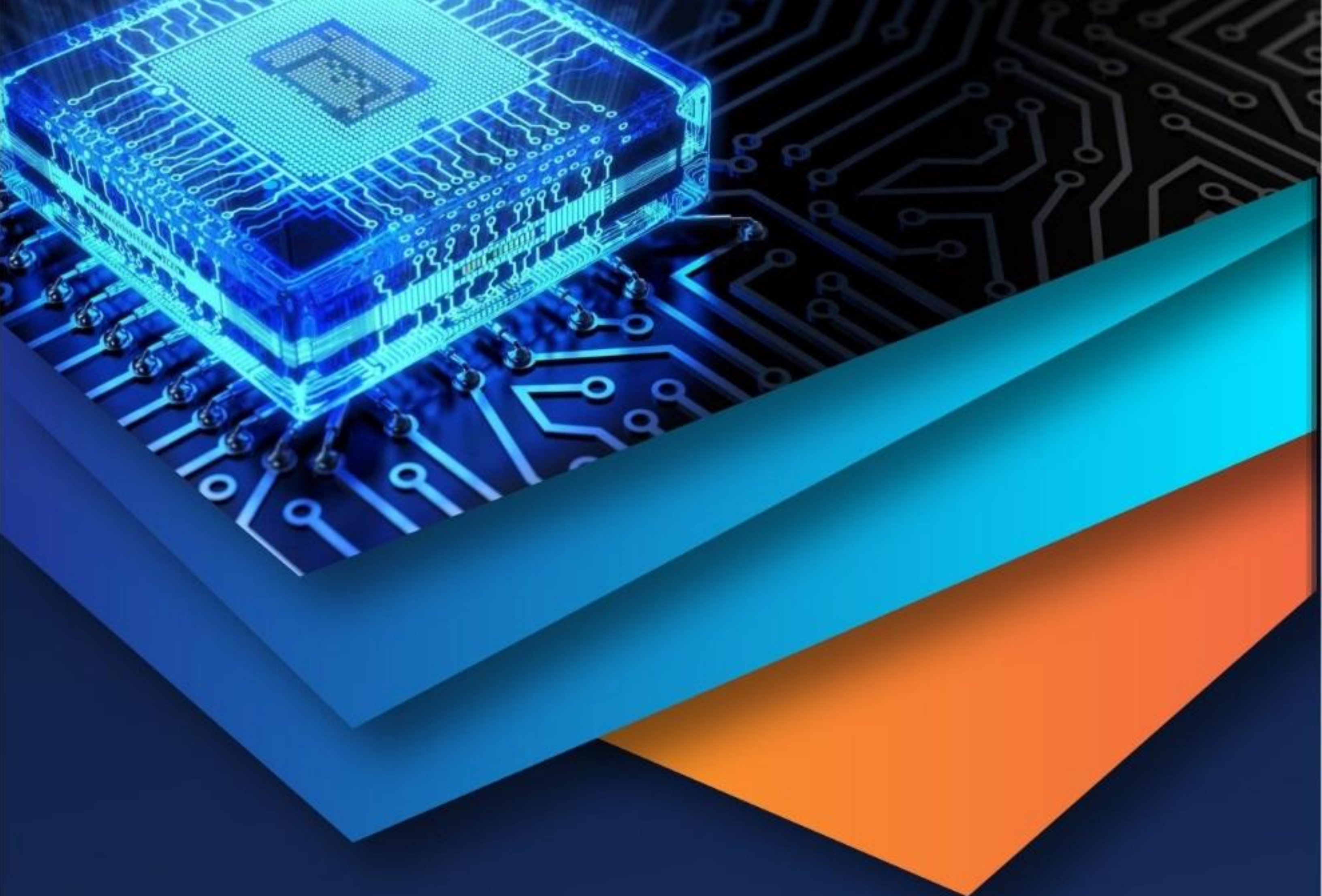

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