

Power Quality Improvement by Using Hybrid Filter

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Abstract: We presents improvement and analysis of power quality (voltage sag, voltage swell performance of grid connected inverter used in distributed generation. The developed controller controls power supplied by the DGs at the PCC. The controller is designed to deliver current at unity power factor at PCC. An increase in reactive power demand at PCC due to change of load and grid impedance variation, would affect the system voltage at PC. This project proposes the structure of the designed controller consists of output power with voltage control. The involved voltage factor in creation of harmonics which have direct effects on the Voltage. One of the main causes of the harmonic distortion is non-linear loads. Voltage level control plays a significant role in ensuring the stable operation of power Systems in the event of large disturbances and faults, and is thus a significant area of research. This paper investigates the improvement of Voltage level of a impromnet by hybrid capacitor

Keywords : Current transformer (CT), point of common coupling (PCC).

I. INTRODUCTION

A voltage is an occurrence manifested in a nonstandard voltage, current, or frequency deviation that results in a failure or a disoperation's of end-use equipment. Power quality is a reliability issue driven by end users. There are three concerns. The characteristics of the utility power supply can have a detrimental effect on the performance of industrial equipment. Harmonics produced by industrial equipment, such as rectifiers or ASDs, can have a detrimental effect on the reliability of the plant's electrical distribution system the equipment it feeds, and on the utility system.

Voltage sag is a short-term, few-cycles duration, drop in voltage on the order of more than 10% to less than 90%. Typically, it lasts from 0.5 cycles to a minute. Voltage sags result from the voltage drop, from starting big motors across-the-line, or from a fault on an adjacent power line. Voltage swell is a short-term increase in voltage of a few cycles duration. The magnitude of the increase is more than 10% and less than 80%. A swell can result from a single line-to-ground fault that raises the voltage on the other two phases. It can also result from dropping a large load or energizing a capacitor bank.

Hybrid Filter In general, the passive filter was designed only to compensate the source current harmonics; the reactive power was not considered, the concern for compensating voltage harmonics is not high due to the fact that power supplies usually have low impedance.

Generally, at the point of common coupling, ridged standards are implemented to ensure a correct level of total harmonic distortion (THD) and voltage regulation is maintained. The problem of compensating for voltage harmonics is to ensure the supply to be purely sinusoidal. This is important for harmonic voltage sensitive devices such as power system protection devices and superconducting magnetic energy storage. Voltage harmonics are related to current harmonics by the impedance of the line. Although compensation of voltage harmonics helps to provide a reduction in current harmonics, this however, does not negate the necessity to current harmonic compensation.

II. BLOCK DIAGRAM

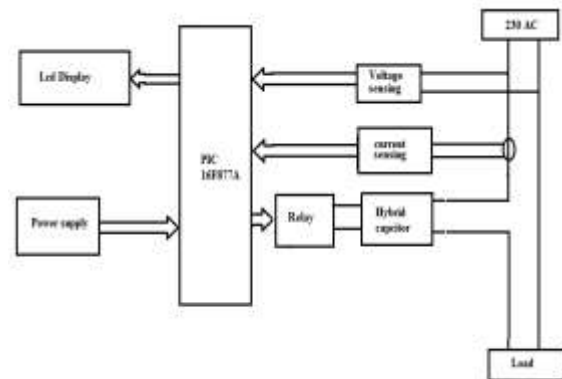


Fig: 1. Block Diagram of the system

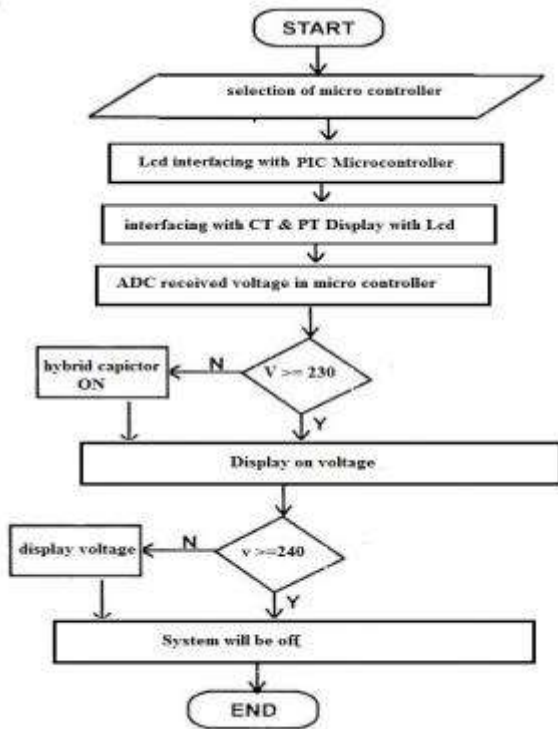
2.1. WORKING PRINCIPLE

It consists of PIC16F877A, voltage sensor, current sensor, LCD Display, Power supply, Relay, Hybrid capacitor.

In our project we improve the power quality, due to these we neglect some power quality issue, like sag, swell, voltage fluctuation etc. With the help of hybrid capacitor. In this system we used CT, PT, which is used for to measured real time voltage and current of line and this measured value give to Controller. LCD Display which connected with controller, It will be display the actually voltage and current. Here controller required 5v power which supplied by power supply. During the normal condition ,230v AC supply is given to the load, at that period capacitor is charged. And display show the voltage and current. When the PQ disturbance occur and the voltage is drop. If the voltage drop, Current and voltage sensor sense the current and voltage which give the output to the controller. Hence PIC16 gives command to the relay and relay is operated, when the relay operated the capacitor bank is ON and fed the charging voltage to load, it main the power quality

improve. When during any condition voltage is increase above 230v that time circuit will trip by relay for short duration.

III. FLOW CHART



IV. HARDWARE CIRCUIT DETAILS AND FUNCTION

Voltage	Condition	Hybrid capacitor
230	$230 \leq$	C_ON
240	$240 \geq$	ckt Trip
230	$230 =$	C_Off



Fig:2. Working of hardware circuit

This figure show that hardware of power quality improvement by using hybrid capacitor. Single phase supply give to load, via the hybrid capacitor at that condition capacitor bank is charging. During this period CT & PT is sense the voltage & current, this show on the LCD display which is connected to controller. If voltage dip occur in line, CT & PT sense the voltage and current this gives to comparator through controller, comparator compare this voltage and current with reference signal. If voltage below the reference voltage it is gives the signal to controller, controller are turn on capacitor bank through relay. When during operating voltage is increase above 230v that time circuit will trip by relay.

V. OUTPUT WAVEFORM OF HARRDWARE CIRCUIT

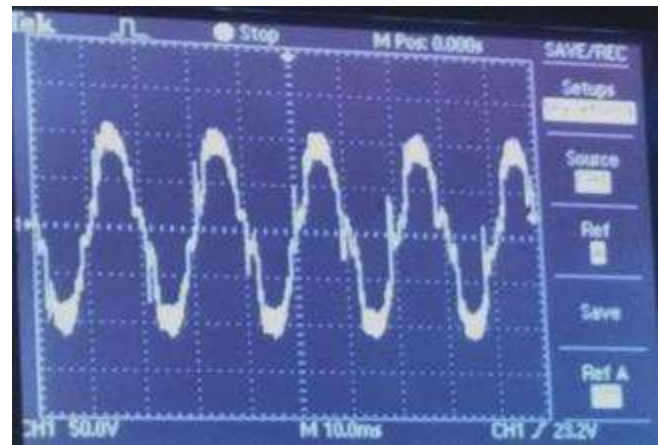


Fig: 3. Output Voltage During Fault

Fig 3 shows that the output waveform of without hybrid capacitor circuit. It shows the distorted waveform.



Fig: 4. Output Voltage with Hybrid Capacitor

Fig 4 shows that the output waveform of with hybrid capacitor circuit. It shows the Sine Waveform i.e it shows power quality will be improved after connecting hybrid capacitor in the circuit.

ADVANTAGES:

- Little maintenance is required as there is no rotating equipment.
- Less cost because of static capacitors.
- Easy connecting arrangement with less weight
- Low losses in this arrangement.

APPLICTION:

- Industry
- Hospital
- Automation domain
- Dairy line
- Servo stabilizer

VI.CONCLUSION:

The main aim of this dissertation work is to improve the voltage profile of the system. This project of hybrid capacitor associated with integrated circuit used to overcome the power quality problems. We developed small Circuit using CT, PT, Controller, Hybrid capacitor and some other component. By using the controller, Load current, Voltage & Actual input values are shows on LCD Display. The system is operated for without Hybrid capacitor and with Hybrid capacitor. In both the cases; source voltage, load voltage, current are recorded. The respective results obtained in both the cases are compared and analyzed. The system of Hybrid Capacitor gives the faster control which is required for mitigation of power quality problems.

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