NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY [IJIERT]
ISSN: 2394-3696 Website: ijiert.org
VOLUME 7, ISSUE 8, Aug.-2020

OVERVIEW OF POWER FLOW ENHANCEMENT BY USING THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC)

MR. VISHAL RAJENDRA MEHTA
M. Tech. Student, Department of Electrical Engineering,
Padmabhooshan Vasantraodada Patil Institute of Technology,
Budhgaon, Sangli, M.S., India

PROF. L. S. PATIL
Department of Electrical Engineering,
Padmabhooshan Vasantraodada Patil Institute of Technology,
Budhgaon, Sangli, M.S., India

ABSTRACT
Power quality has become one of the most important concerns now a day as the nature of loads changing with new technologies and developments. Non-linear nature of loads leads to the deterioration of power quality. Power system losses and the reliability of power are the important apprehensions to address the issues of power quality. With increasing number of small power generating stations using renewable energy, the problems associated with quality of power are increasing. The enhancement of the quality of power with different combinations of the controlling strategies is proposed by the researchers over last decade and many such solutions are implemented in the power system. Authors have presented the overview of solutions suggested by researchers to enhance the quality of power in the paper.

KEYWORDS: Power System, Power System Stability, Series Compensation, Thyristor Controlled Series Capacitor. Etc**.**

INTRODUCTION:

Generating stations are always located at remote places and transmission system needed for electricity transmission consists of the huge infrastructure in order to effectively make the power available for the end user. The generation with renewable sources is increasing at small scale now a day with the supporting policies of Indian government. Flexible AC transmission systems uses the control devices to enhance the power delivery to load their by addressing the problems like harmonic distortion. Providing better quality power by enhancing the stability of system is the aim behind implementation of various schemes.

Peak demand of load leads to nonlinear characteristics of the system. Grid connected system with implementation of control strategies provides better performance [1]. Fuzzy controllers with various algorithms also found suitable to enhance power flow of the system [2]. Series and shunt schemes of compensation have provided the better solutions for controlling the power flow with different configurations [3]. The communication techniques have made it possible to monitor and analyze the performance of the system parameters in order to design the better control strategies [4]. Renewable system when connected to the grid becomes reliable source of electricity. Such systems require the special purpose devices to control the performance such as harmonics [5]. Performance enhancement includes the control of power flow between different generating stations and the load [6].

Flexibility and reliability of power system are always concerns addressed the most by the researcher working in areas of power system. Developments in power electronic devices have made it possible to enhance the performance of power system though its applications in power system. Series compensation deals with modification of total impedance of power system to enhance delivered power. Shunt methods uses insertion of current at supply point to improve the voltage. Addition of the capacitance in series results in counter effect for inductive reactance and hence the total impedance decreases which gives better power output. This method is found suitable to overcome the losses over long distance. In case of outage, transient loading and other instabilities on system TCSC is found suitable to improve the performance.

BLOCK DIAGRAM OF PROPOSED SYSTEM:

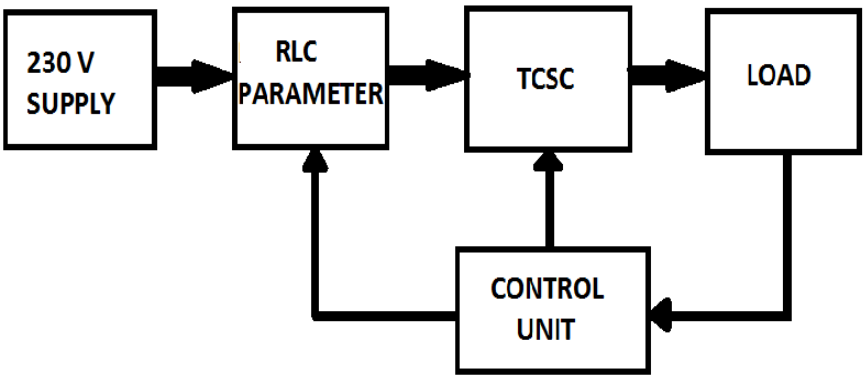

Fig. 1: Block Diagram of TCSC System

- **230 AC SUPPLY** – Input 230v AC supply is given through transmission line to the TCSC
- **RLC PARAMETERS** – RLC line parameter is basically for adding line losses to the system. By using RLC parameters we are reducing power by some amount.
- **TCSC** – TCSC is the main part of our project by varying inductive reactance we can easily getting required power at load side.
- **RL LOAD** – RL load is connected after the TCSC. By using RL load we adding some load to the system.
- **CONTROL UNIT** – In Control unit feedback is given from the load. And it controls the operation of TCSC and we can also varying RLC parameters.
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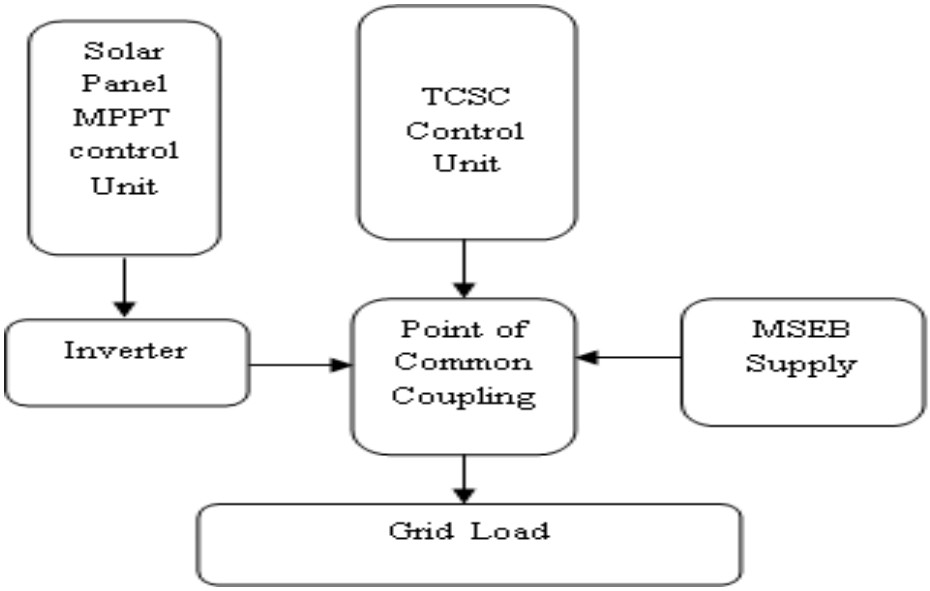

Fig. 2: Block Diagram of Solar MPPT System with TCSC

Figure above shows the basic block diagram of the maximum power tracking system connected to the grid at the common point of coupling. It is always suggested to provide the compensation to the solar systems at near the generating point than to near load. Solar system generates the electricity in DC form which is inverted before inserting it to the load.

MOTIVATION OF WORK:

Electrical power quality is facing many issues with the development of infrastructure and facilities. The number of renewable sources installed and connected to the grid is increasing since last few years. Losses due to the poor quality of power are always a concern to be addresses by the electrical engineers. Renewable sources are the future alternatives to the present conventional electricity generation methods for sustainable development.

SIMULATION OF TRANSMISSION LINE WITHOUT FACTS DEVICES:

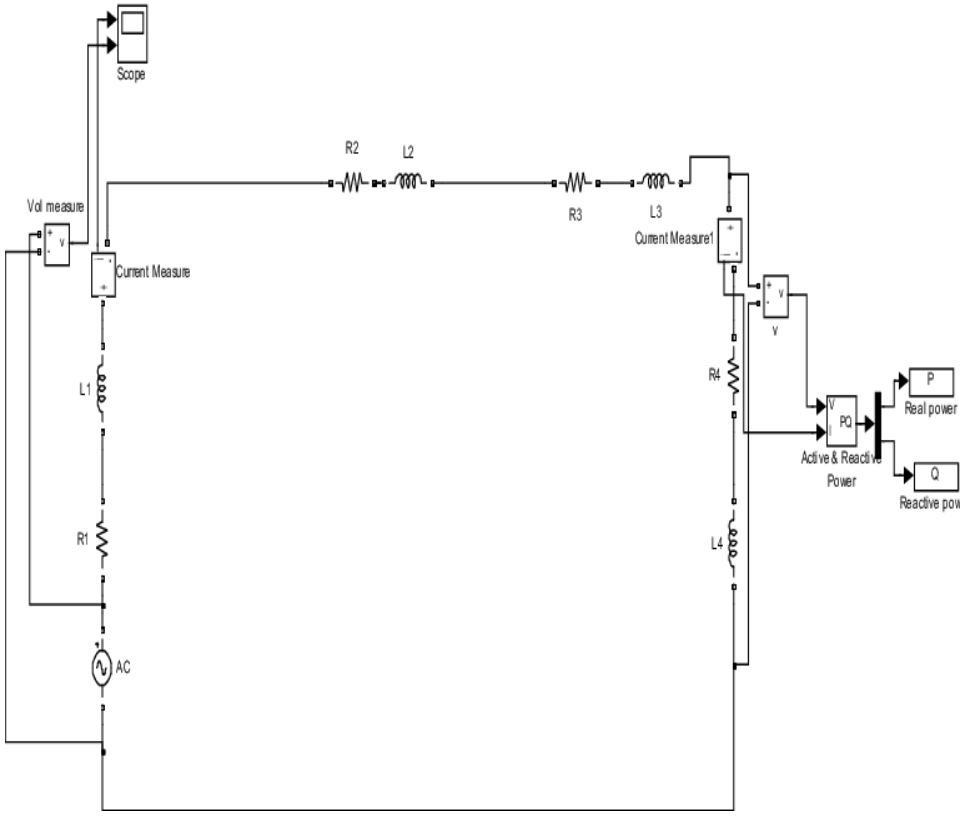

Fig.3: 11KV Transmission Line Model without Compensation

11KV model of short transmission line is simulated to understand the various performance parameters neglecting capacitance. The line length is 50 km with resistance 0.1Ω/km and the inductance 460 mH /km. The load impedance is (1+j0.02) Ω whereas the source impedance is taken to be (5.5+j0.05) Ω.

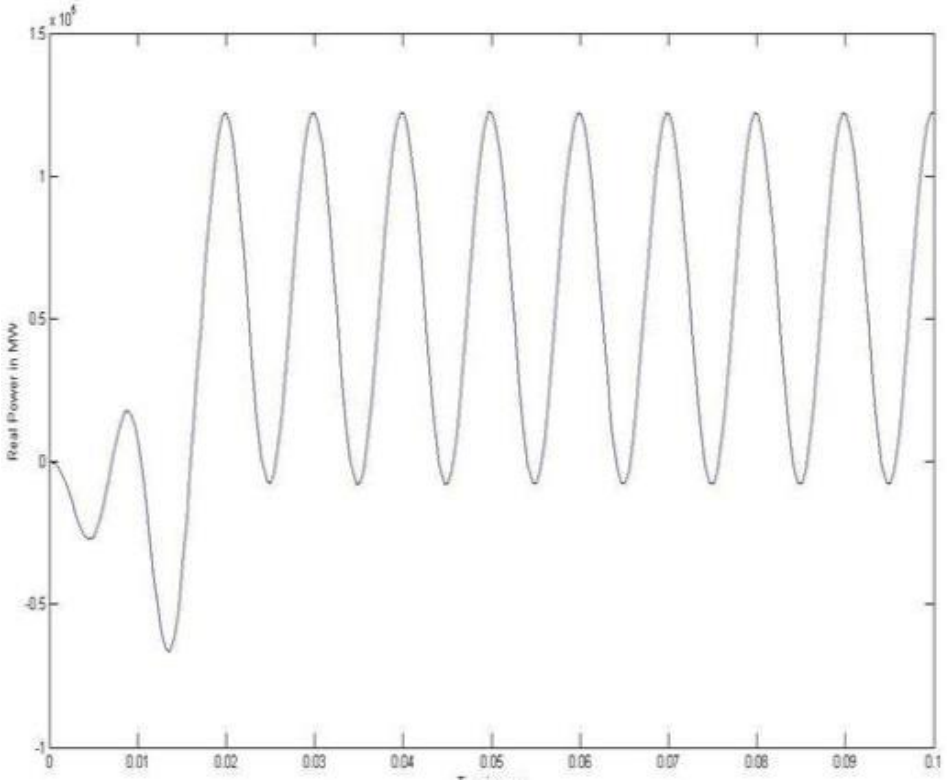

Fig.4: Real Power Vs. Time

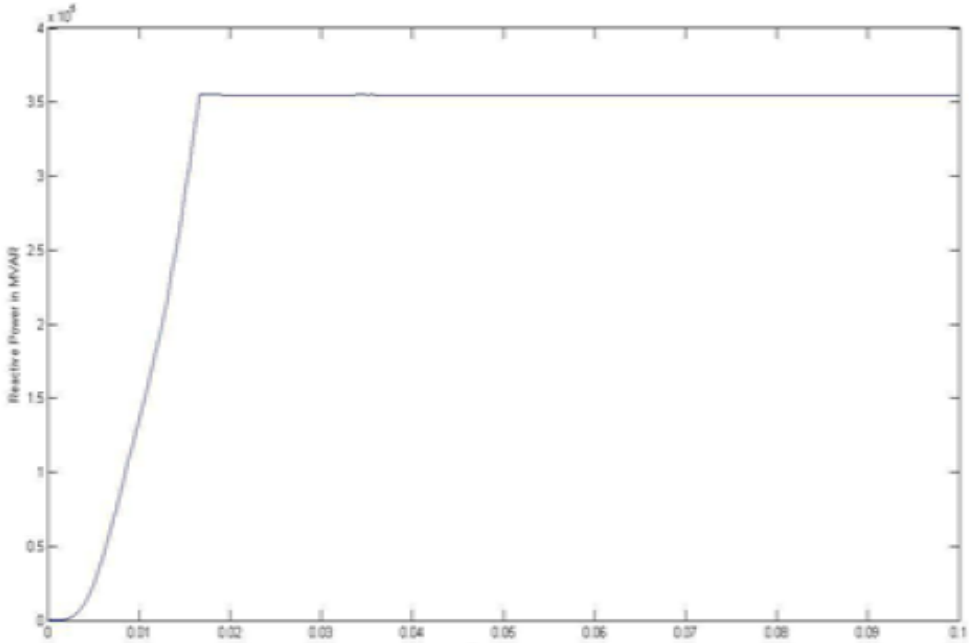

Fig.5: Reactive Power Vs Time

The value of real and reactive power obtained from the simulation was 0.12 MW and 0.35 MVAR respectively without compensation.

CONCLUSIONS

Flow of power between the generating stations to load passes through different stages. Loads with different characteristics and nature are connected to the system on the other hand the various generation schemes also connected with grid. Such grid connected systems when powered with renewable sources along with electronics devices used to control the flow of power results in deterioration of power quality. Authors have presented the overview of the thyristor controlled switched capacitor scheme to enhance the performance of the power system. TCSC schemes are found suitable to address the issues associated with power flow efficiency enhancement.

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