© 2020 IJSRST | Volume 5 | Issue 7 | Print ISSN : 2395-6011 | Online ISSN: 2395-602X

4th National Conference on Advances in Engineering and Applied Science
Organized by : Anjuman College of Engineering and Technology (ACET) Nagpur, Maharashtra, India, In association with
International Journal of Scientific Research in Science and Technology

Hybrid Cascaded Multi-Level Converter Based on STATCOM

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ABSTRACT

In this century the expansion of power systems and electronic devices has been grown at a very fast rate. The most noticeable topic for an electrical engineer is Power Quality in recent years. Power quality problem is an occurrence manifested as a nonstandard voltage, current or frequency that results in a failure or desperation of end-user equipment, sensitive loads, etc. Now at present, a wide range of very flexible controllers, which capitalize on newly available power electronics components and electrical also are emerging for custom power applications and use high-level transmission line and we use high efficiency and good result. Among these, the static compensator is used in the present work. The quick response time to do that work of the Static Compensator (STATCOM) makes it an efficient solution for improving power quality and increases the efficiency of the transmission in systems. STATCOM can use different types of controllers. The device considers in this work is Static Synchronous Compensator (STATCOM) with static linear and static non- linear load and get less amount of losses.

Keywords : Static Synchronous Compensator, STATCOM, High-Level Transmission

I. INTRODUCTION

The introduction of electrical energy in the 19th century, there have been significant technological developments and the modern-day electric power systems have been built. These systems have grown in complexity and nowadays they are the result of a vast network of transmission interconnections, multiple types of generation resources and loads. Due to these technological advancements and many other scientific achievements, in the last century, the quality of life for most people has increased significantly. However, the rapid growth of the population, the development of industry, the increase of generation sources at the load and the networks underlying unpredictability, are starting to strain the power generation systems. This means that the added load demands, growth of interconnections, economic restrictions and factors such as global warming that is a leading concern in the scientific field and is slowly starting to pressure governments to turn to renewable energy systems as a means of replacing old and cheap energy productions methods that produce a significant amount of greenhouse gas are starting to create balancing issues in the delivery systems.

Imbalances in the voltage profile along the electric network are one of the biggest challenges for system operators. Therefore if the voltage and reactive power are not controlled, then the difference in voltage between the generation source and the load can lead to voltage instabilities or even voltage collapse. A solution using Flexible AC Transmission Systems (FACTS) can overcome some of these issues. This solution is extremely important in overcoming

limitations in the static and dynamic transmission capabilities of electrical networks.

The aim of this project is that dissertation is to propose and evaluate a power electronics-based system that is able to guarantee a stable voltage profile in the HV/MV grid for the transmissible power along the power lines to be increased, using reactive shunt compensation, allowing for system operators to have better use and get a low amount losses of line capacity without needing to build new lines and new generation sources which are a costly endeavour and represent a mid to long term strategy. It is important to acknowledge that the use of FACTS will not solve all the existing problems, which means that although extending the line's capacity can bring benefits sometimes it is necessary to build new lines or upgrade current and voltage capabilities of existing lines and corridors

II. WORKING

Synchronous Generators Synchronous generators can generate power and absorb reactive power depending on the excitation. When overexcited they supply reactive power and inject the power in the transmission line when under excited they absorb reactive power. The capability continuously supply are absorbing reactive power is, however, limited by field current, armature current, and end-region heating limits synchronous generators are normally equipped with automatic voltage regulators that continually adjust excitation so as to control the armature voltage.

Transmission line

Transformers

Transformers always absorb reactive power regardless of their loading; at no load, the shunt magnetizing reactance effects predominate; and at full load, the series leakage inductance effects predominate.

Loads

Loads normally absorb reactive power and supply to the load. A typical load bus supplied by a power system is composed of a large number of devices. The composition changes depending on the day, season and weather conditions. The composed characteristics are normally such that a load bus absorbs reactive power. Both the active power and reactive power of the composite loads vary as a function of voltage magnitude. Loads at low-lagging power factors cause excessive voltage drops in the transmission network and are uneconomical to supply. Industrial consumers are normally charged for reactive power as well as active power; this gives them an incentive to improve the load power factory using shunt capacitors.

Compensating devices are usually added to supply or absorb reactive power and thereby control the reactive power balance in the desired manner. In what follows, we will discuss the characteristics of these devices and the principles of application and use in the transmission line.

Reactive Power Compensation

VAR compensation is defined as the management of reactive power to improve the performance of ac power systems and voltage stability. The concept of VAR compensation embraces a wide and diverse field of both system and customer problems, especially related to power quality issues since most of the power quality problems can be attenuate or solved with adequate control of reactive power.

III. CONCLUSION

In this work, the investigation on the role of STATCOM based on hybrid cascaded multi-level converter is carried out to improve the power quality in networks with static linear and nonlinear loads. Test system is analyzed and results are presented in the previous chapter. The results give the satisfactory applications of STATCOM based on hybrid cascaded multi-level converter in the networks under different conditions and it can be concluded that STATCOM based on hybrid cascaded multi-level converter effectively improves the power quality in networks.

IV. REFERENCES

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