SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)
COIMBATORE-35
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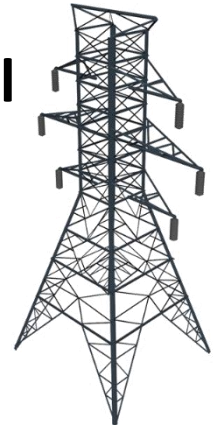
UNIT III: SPEED GOVERNING AND AUTOMATIC GENERATION

TOPIC: Methods of Voltage Control



Introduction

The voltage of the power system may vary with the change in load. The voltage is normally high at light load and low at the heavy-load condition.
For keeping the voltage of the system in limits, some additional equipment requires which increase the system voltage when it is low and reduces the voltage when it is too high. The following are the methods used in the power system for controlling the voltage.

- On – Load Tap Changing Transformer
- Off – Load Tap Changing transformer
- Shunt Reactors
- Synchronous Phase Modifiers
- Shunt Capacitor
- Static VAR System (SVS)

Tap Changing Transformer

1. **Off – Load Tap Changing Transformer – In this method, the voltage is controlled by changing the turn ratio of the transformer. The transformer is disconnected from the supply before changing the tap. The tap changing of the transformer mostly done manually.**

2. **On – Load Tap Changing Transformer – This arrangement is used for changing the turn ratio of the transformer for regulating the system voltage when the transformer delivers the load. Most of the power transformer is provided with on-load tap changer.**

Shunt Reactor

Shunt Reactor – The shunt reactor is the inductive current element which is connected between the line and neutral. The shunt reactor compensates the inductive current from the transmission line or underground cables. It is mainly used in the long distance EHV and UHV transmission lines for reactive power control.

The shunt reactors are used in the sending end substation, receiving end substation and in the intermediate substation of long EHV and UHV line. In the long transmission line, the shunt reactor is connected at the distance of 300 Km to limit the voltage at an intermediate point.

Synchronous Phase Modifiers

The synchronous phase modifier is the synchronous motor running without a mechanical load. It is connected with the load at receiving the end of the line.

The synchronous phase modifier absorbs or generates the reactive power by varying the excitation of the field winding. It keeps the voltage constant at any condition of the load and also improves the power factor.

Series VAR Systems (SVS)

Series VAR Systems (SVS) – The static VAR compensator inject or absorb the inductive VAR to the system when the voltage becomes higher or lower than the reference value. In static VAR compensator, the thyristor is used as switching device in place of circuit breakers.

Nowadays, the thyristor switching is used in the system in place of mechanical switching because thyristor switching is faster and provides transient free operation by controlling the switching.

STATIC VAR COMPENSATOR SVC

A static VAR compensator (SVC) is the first generation shunt compensator. It has been around since 1960s. In the beginning it was used for load compensation such as to provide var support for large industrial loads, for flicker mitigation etc. However with the advancement of semiconductor technology, the SVC started appearing in the transmission systems in 1970s.

Today a large number of SVCs are connected to many transmission systems all over the world. An SVC is constructed using the thyristors technology and therefore does not have gate turn off capability.

With the advancement in the power electronic technology, the application of a gate turn off thyristors (GTO) to high power application became commercially feasible. With this the second generation shunt compensator device was conceptualized and constructed. These devices use synchronous voltage sources for generating or absorbing reactive power. A synchronous voltage source (SVS) is constructed using a voltage source converter (VSC). Such a shunt compensating device is called static compensator or STATCOM. A STATCOM usually contains an SVS that is driven from a dc storage capacitor and the SVS is connected to the ac system bus through an interfacing transformer

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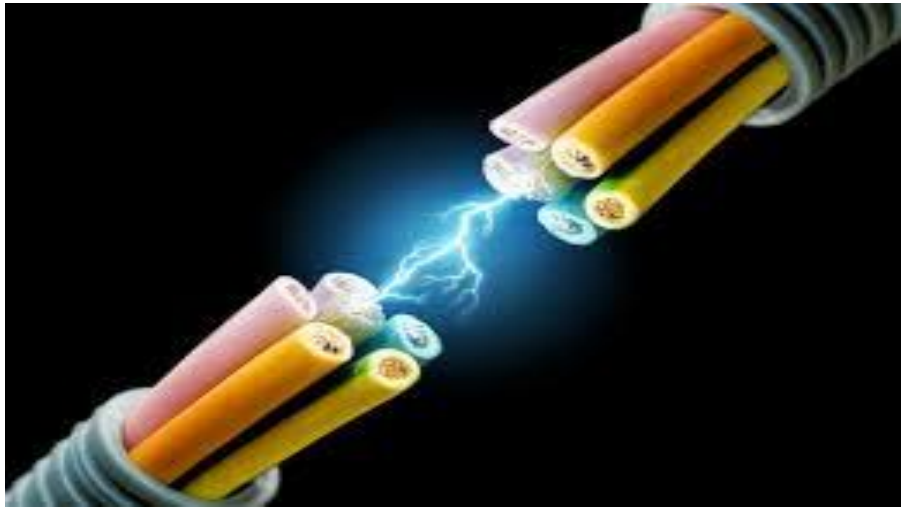

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